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Wilhelm Kirch
Editor

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Encyclopedia of Public Health

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Encyclopedia of Public Health

Wilhelm Kirch (Ed.)

Encyclopedia of Public Health

With 75 Figures and 86 Tables

Springer

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For Gabriele, Vanessa and Anne

Preface

Comme quelqu'un pourroit dire de moy que j'ay seulement faict icy
un amas de fleurs estrangeres, n'y ayant fourny du mien que le filet à les lier.

"Essais", Livre III, Chapitre XIII
Michel de Montaigne

Public Health is defined as health promotion by population related measures. This is in contrast to the aims of medicine with its diagnostics and therapy which focus on the individual patient's health. Approaches to Public Health are apparently developing at different speeds in the various countries of the world. But there is a common feeling that the improved health of most of our people can only be achieved if aspects of prevention and health promotion are considered and practiced more successfully than curing the subjects' symptoms and diseases.
For the Encyclopedia of Public Health I have selected editors for the following fields. These I consider to be relevant disciplines for dealing with Public Health (in alphabetical order):

1. Biostatistics
2. Dental Public Health
3. Disaster Aftermath
4. Epidemiology
5. Ethics
6. Family Health
7. Health Behavior
8. Health Care and Rehabilitation
9. Health Economics (Burden of Disease)
10. Health Information
11. Health Management
12. Health Policy
13. Health Promotion
14. Health Technology Assessment
15. Indigenous People's Health
16. Infectious (transmissible) Diseases
17. Migrant Health
18. Nutrition and Physical Activity
19. Occupational and Environmental Health
20. Prevention
21. Public Health Genetics
22. Public Health Law
23. Public Mental Health

I was pleased to recruit for these areas 23 Field Editors, each of whom wrote a synopsis of their area or expertise and who are collectively responsible for producing nearly 300 essays and around 2000 definitions. Maximum quality was ensured by Field Editors recruiting experts in their field to write the essays. Ultimately, 152 scientists from 17 countries became authors of this book. I am sincerely thankful to all of them for enabling us to finalize the Encyclopedia of Public Health in a very timely fashion.

Dresden, April 2008 Wilhelm Kirch

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Aboriginal

Synonyms

Native; Indigenous

Definition

Term is used to denote people inhabiting a region before settlers arrival, i. e. before colonization. Usually it is used for native people in Australia and Oceania.

Cross-References

► Indigenous Health Care Services
► Indigenous Health, South America

Aboriginal People

► Indigenous Health – Australooceaninan
► Indigenous Health, North America

Aborigines

► Indigenous Peoples

Abortion

Synonyms

Miscarriage; Pregnancy loss

Definition

Abortion refers to the spontaneous (miscarriage, stillbirth) or induced termination of a pregnancy with expulsion of the embryo or fetus. Abortion may be induced either medically or surgically. Unsafe abortions are a major cause of maternal deaths around the world. Legalization of abortion reduces significantly the number of unsafe abortions and consequently the case-fatality rates.

Abortive Plague

Synonyms

Mild course of plague; Mild course of Black Death

Definition

Abortive plague is a very mild infection with *Yersinia pestis*. The patients develop mild fever and a slight swelling of the lymph nodes. Nevertheless, abortive plague induces the building of antibodies. Thus the individual achieves immunity against the other forms of plague.

Absence From Workplace

► Absenteeism

Absenteeism

Synonyms

Absence from work; Absence from workplace

Definition

Absenteeism is a general term for habitual absence from a duty or obligation. In occupational health, it refers to nonattendance when expected to work, for any

reason at all, medical or otherwise. Absence from work is not really a medical phenomenon. It can be viewed as a "social" disease of workers that is symptomatic of underlying faults in their ► working environments, and it falls within the realm of occupational health. Sickness absence is a convenient term for absence from work attributed to sickness or injury and accepted as such by the employer or social security system. Sickness absence is a complex phenomenon and is not necessarily the same as the health status of the individual or sickness in a society. Some sickness absence and some absenteeism for other reasons may be regarded as objectively necessary and, therefore, acceptable and normal. Absenteeism becomes abnormal – in medical terms, "pathological" – when it is excessive. This may refer to workday loss or frequency of absence.

Absolute Liability in Tort

► Strict Liability

Absolute Risk

Definition

Absolute risk is the probability of an event in a population under study.

Cross-References

► Risk

Absorption

Definition

Absorption is the process of a (pharmacological) substance entering the body.

Accelometer

Definition

Measuring device for acceleration.

Accidents at Work

► Occupational Accidents

Accuracy

Synonyms

Preciseness; Precision

Definition

Accuracy refers to the closeness of the measured value and true value. In most cases the true value is not known. In practice best estimate of true value is marked as "reference", "criterion" or "gold standard". If best estimate of true value do not exist, then accuracy errors cannot be quantified. Accuracy is influenced by both ► precision and ► bias.

The gold standard in laboratory measurements is defined by the referent laboratory. In diagnostic tests the gold standard is the best criteria or standard on which to base a final diagnosis – true disease status (estimation of diagnostic accuracy is shown in the essay "► Measurement").

In statistical estimation, accuracy is the deviation of an estimate from the true population value (parameter value).

Acid Deposition

► Acid Rain

Acid Precipitation

► Acid Rain

Acid Rain

Synonyms

Ecosystem acidification; Acid deposition; Acid precipitation

Definition

Acid rain is a popular term for the effect that certain air pollutants, combined with atmospheric moisture, have on almost the entire ecosystem – soil, water resources, and pertaining flora and fauna in certain highly polluted areas of the world. It means that ecosystem acidification is a regional effect of air pollution, and the final consequence in a series of chemical reactions. It is nowadays one of the most serious environmental problems. Complex chemical processes include atmospheric precipitation of acid substances (acid rain), and consecutive chemical changes in soil components and water resources, often microbiologically induced. Adverse environmental consequences are often noticeable (e. g. damage to vegetation, especially in forestlands; and erosion of structures built of stone), but human health impairments, due to environmental degradation, are also possible. The main causes of ecosystem acidification are partly natural processes (e. g. volcano eruptions), but mainly anthropogenic influences during the 19th and 20th century (oil and coal combustion). Acid rain was described for the first time in Manchester (England) during 1852, and was a consequence of coal burning (high sulfur dioxide [SO_2] emissions). In the 20th century, acid rains in south Italy were the consequence of the volcanic activity of Vesuvius (hydrogen chloride (HCl) emission). Other important pollutants are nitrogen oxides (NO and NO_2), present worldwide in the air over highly polluted industrial and/or urban areas. These effects of acid rain have been reported mainly in highly industrialized regions of Western Europe, eastern parts of North America, and in southeast China, but also in some other areas of the world due to transboundary transport of pollutants.

Acquired Immunodeficiency Syndrome

- ► Acquiring Social Identity
- ► AIDS
- ► HIV-Infection and AIDS

Acquiring Social Identity

Synonyms

Socialization

Definition

The process of teaching an individual or a group of individuals about how to behave according to the norms and values of a group. This process may occur indirectly at a societal level through exposure to different media (e. g. books, film, television). It may also occur at the group, interpersonal level through interaction and modeling of the behavior of individuals in a person's everyday life (e. g. schoolmates, co-workers, friends, parents). It may also be achieved more directly through instructional media and teaching by persons in positions of power or authority (e. g. parents, teachers, employers).

Action Area

- ► Health Promotion, Fields of Action

Active Flu Immunization

- ► Influenza Vaccination, Active

Active Flu Vaccination

- ► Influenza Vaccination, Active

Active Influenza Immunization

- ► Influenza Vaccination, Active

Active Noise Control

Synonyms

Noise cancellation; Active noise reduction; Antinoise

Definition

Active noise control is a method of ► noise reduction that analyzes the waveform of the background noise

using a computer, then generates a sound wave with the same amplitude and the opposite polarity to the original sound. These waves cancel out in a process called destructive interference, and the result is a reduction in the amplitude of the perceived noise. The first patent for an active noise control system was granted to inventor Paul Lueg in 1934, for describing how to cancel sinusoidal tones in ducts by phase-advancing the wave and canceling arbitrary sounds in the region around a loudspeaker by inverting the polarity. By the 1950s, systems were created to cancel the noise in airplane cockpits. Antinoise is used to reduce noise in working environments with earplugs, and bigger noise cancellation systems are used for engines or tunnels.

Active Noise Reduction

► Active Noise Control

Active Smoking

Definition

Active smoking refers to the voluntary inhalation of mainstream tobacco smoke (smoke inhaled directly from a cigarette).

Active Surveillance

Definition

In this context active surveillance means that department of health officials proactively call physicians' offices to ask if they have identified any cases of a particular disease; in this instance, the information required is detailed because the disease is often not well understood and the ► surveillance system provides a means of collecting information that may help identify its causes or risk factors. Active surveillance is more expensive than ► passive surveillance and it is typically reserved for relatively infrequent but important infections or events.

Activities of Daily Living

Definition

Activities of daily living (ADLs) are the most basic and fundamental functions of self-care, and they are used to describe the functional status or ► functional ability of a person, usually with reference to older people or people needing long-term care. There are several dimensions of ADLs and people are classified as independent or dependent on each of them. These functions are bathing, dressing, using the toilet, transferring in and out of beds or chairs, continence, and eating. As continence is more indicative of a physiological state than a function, it is often removed from the ADL measures. Another term, "instrumental activities of daily living" (IADLs), describes activities that are not necessary for fundamental functioning but needed for independence in the respective environment or community. This includes activities like cooking, cleaning, laundry, shopping, making and receiving telephone calls, driving or using public transportation, and taking medicines.

Activity

Definition

Execution of a task or action by an individual.

Activity-Based Bugdets

Definition

Activity-based budgets are a method of financing hospitals based on their specific level of activity. According to the specific functions of a hospital, activity related budgets are annually established to reimburse hospitals for the treatment of their patients. As ► prospective budgets activity-based budgets do not generally incorporate incentives for the hospital to spend less than the budget fixed before. Under the persisting financial constraints in the hospital sector, many countries during the last 20 years changed their financing method for hospitals towards ► per-case payments based on ► diagnosis related groups (DRGs).

Activity Limitations

► Impairment and Disability

Actors in Health Promotion

► Health Promotion Actors

Actuarially Fair Premiums

► Risk-Related Premiums

Acute Care Bed

Synonyms

Curative care bed

Definition

Acute care beds are beds in hospitals available for curable care for patients, where the principal clinical intent is to –

- manage labor (obstetric),
- cure non-mental illness,
- provide definitive treatment of injury,
- perform surgery,
- relieve symptoms or reduce severity of non-mental illness or injury,
- protect against exacerbation and/or complication of non-mental illness and/or injury that could threaten life or normal functions,
- perform diagnostic or therapeutic procedures.

Acute Health Effects

Definition

A health hazard may produce serious, immediate and direct effects. These are called acute effects. Some health effects result from short-term exposure to a high concentration of a health hazard. The illnesses, diseases and other conditions that can result from health hazards are often referred to collectively as health effects or adverse health effects.

Acute Intoxication

Definition

A condition that follows the administration of a psychoactive substance resulting in disturbances in level of consciousness, cognition, perception, affect or behavior, or other psycho-physiological functions and responses. The disturbances are directly related to the acute pharmacological effects of the substance and resolve with time, with complete recovery, except where tissue damage or other complications have arisen. Complications may include trauma, inhalation of vomitus, delirium (► delirium tremens), coma, convulsions, and other medical complications. The nature of these complications depends on the pharmacological class of substance and mode of administration.

Acute Life-Threatening Infections

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Synonyms

Highly dangerous infectious diseases; Infectious diseases with a critical course

Definition

Acute life-threatening infectious diseases are characterized by the fact that they can take a lethal course within a few hours or a couple of days. The pathogens or their toxins can cause a cardiocirculatory shock, a failure of the functions of the central nervous system, respiratory insufficiency or multiorganic failure.

Basic Characteristics

Reasons for Life-Threatening Courses of Infections

Whether an infectious disease takes a life-threatening course or not, depends on various factors. The sever-

ity of an infection is determined by the virulence of the pathogens and the organs or organic systems that are involved; deadly courses have to be feared in cases where impairment of vital functions or multiorganic failure occur. The development of serious infections is facilitated by a weakened immune status or underlying (chronic) disease. Further important aspects are the prophylactic and therapeutic possibilities. Avoidable severe or even deadly courses can occur due to a neglect of preventive measures, especially due to missing active vaccinations (► immunization, active). Other reasons for a treatable disease taking a lethal course can be a lack of effective drugs (due to a shortage of resources), or the late onset of therapy. The quick introduction of treatment is highly significant in cases of infections with toxin-building germs, like tetanus, ► anthrax infection and ► gas gangrene. If there is no therapy against a number of infecting organisms or their toxins one has to be prepared for a lethal outcome. ► Hemorrhagic fevers belong to this category of infectious disease.

Sepsis

A sepsis is an inflammatory reaction, which involves the whole organism (SIRS = systemic inflammatory response syndrome). Characteristic symptoms are bacteremia, tachycardia, abnormal rapid breathing (tachypnea), a changed body temperature (fever or hypothermia) as well as changes in white blood cell count (> 12/nl or < 4/nl). The various pathogens have typical places of entrance, like wounds, the respiratory, the urinary or the gastrointestinal tracts. From there they reach the circulatory system and spread into other organs. In 70–80% cases of sepsis, gram-negative bacteria are responsible, and in 20–30% gram-positive. Poisons (toxins), which are set free by the bacteria, play an important role in the course of the sepsis. During the destruction of gram-negative germs endotoxins are released, and in the case of gram-positive pathogens exotoxins are released. Staphylococci are responsible for the ► staphylococcal toxic-shock syndrome (TSS) and streptococci for the ► streptococcal toxic-shock syndrome (STSS). In sepsis, substances, which mediate inflammations (cytocines, interleukines), start a cascade process that leads to a condition of life-threatening shock. A complex impairment of immunological, endocrinological, cardiovascular and metabolic functions results. Uncontrollable cardiocirculatory problems (extreme decrease of blood pressure), serious coagulation defects (consumption coagulopathy, disseminated intravascular coagulation = DIC) and organic failure of the lungs and kidneys are responsible for the lethal course of septic shock. Besides combined antibiotic treatment, surgical interventions (drainage of abscesses, removal of necrotic material) as well as intensive care measures (intravenous substitution of volume deficits, cardiocirculatory therapy, application of oxygen, mechanical ventilation) may be required. A typical example of an infectious disease leading to septic shock is meningococcal sepsis, which is also known as ► Waterhouse-Friderichsen syndrome.

Encephalitis

Encephalitis is the inflammation of brain tissue. Most frequently, the pathogens reach the brain via the blood vessels (hematogenic); some germs can also get into the central nervous by nerve tracts. Besides fever and headache, impairment of central nervous functions, cerebral seizures, neurological failure (pareses), impaired consciousness or changes in behavior are all possible symptoms of encephalitis. Therapy depends on the pathogen responsible. Even if treatment is possible and the course of the infection is not lethal, encephalitis is always a serious condition. Neurological defects can persist, which is not only a severe burden for the patient and his relatives but also may lead to the need for costly follow-up treatments. An extremely dreaded infection is herpes-simplex encephalitis. Without treatment, it takes a lethal course in about 70% of cases. Prognosis depends on the level of consciousness at the onset of therapy. A lethality of 20–50% has to be assumed in cases of ► Japan encephalitis. The prognosis is also bad when encephalitis occurs as a complication of ► malaria or ► measles.

Meningitis

Meningitis is an inflammation of the membranes that envelop the central nervous system. Diagnosis is confirmed by an examination of cerebrospinal fluid. In general, the micro-organisms come from the nose-throat area and reach the meninges from the blood vessels. In most cases, the course of a viral meningitis is not harmful. Of the bacterial inflammations of the meninges 60–

70% occur in childhood. In newborns, impaired breathing is the most conspicuous symptom. In older babies, fever, vomiting and agitation predominate. From the age of one year, meningitis is characterized by fever, headache, vomiting and nuchal rigidity (meningism); cerebral seizures and an impairment of consciousness can appear. Bacterial meningitis demands antibiotic therapy; from the age of four weeks, ceftriaxone, a 3rd generation cephalosporine, is the preferred form of treatment. Even though a great number of pathogens can cause meningitis, after the seven weeks of age only three pathogens are of clinical relevance: *Neisseria meningitidis* (meningococci), *Streptococcus pneumoniae* (pneumococci) and *Haemophilis influenzae* type B (Hib). Pneumococci are responsible for 6–20% of meningitis deaths; meningococci or Hib cause less than 5%. Possible long-term effects are impaired hearing, impaired motor and neurophysiological development, cerebral seizures and pareses.

Tetanus

Tetanus is caused by *Clostridium tetani*, a toxin- and spore-building bacterium, which exists worldwide and is found in the soil. Usually, infection is due to dirty wounds. In newborn babies, the navel is the main route of entry. Following an incubation period of 3 days to 3 weeks, in newborns after a short interval, tetanus infection is primarily characterized by muscular spasms and increased muscle tonus. The mouth cannot be opened completely, and a characteristic facial expression results, called "risus sardonicus". The cardiac muscle is damaged. Furthermore, hyperactivity of the sympathic nervous system and impairment of carbohydrate metabolism develop. After the onset of the disease, only ► symptomatic therapy can be carried out. To avoid a further build up of toxins, excision of the wound has to be performed. Death is primarily due to respiratory insufficiency and cardiovascular complications. Although 57 countries are known to have a high risk of tetanus, 90% of all infections occur in only 27 of them. The highest incidence of tetanus is found in the Middle East (Iraq, Yemen), in Africa, South Asia (Afghanistan, Bangladesh, India, Nepal, Pakistan), East Asia and in the Pacific region (China, Indonesia, Cambodia). The risk of a tetanus infection is extremely high if non-immunized women give birth to children under insufficient hygienic circumstances (http://www.who.int/vaccines/en/neotetanus.shtml). Through wounds (for example, when cutting through the umbilical cord) bacteria can reach the blood circulation of mothers and newborn babies. Every year about 250 000 newbornes and 30 000 women die after birth due to a tetanus infection. In newborn babies the infection takes a lethal course in 70%. Thus it is responsible for 14% of deaths in newborns. Prognosis, depends on the onset interval; if this interval is less than 24 hours, lethality is 100%. However, tetanus lethality is also high when the disease occurs later in life. Depending on the incubation period, it is 25–60%. The most important prophylactic measure is active tetanus vaccination (► tetanus vaccination, active). Under certain circumstances, a passive tetanus vaccination (► tetanus vaccination, passive) or a ► simultaneous vaccination is indicated. To prevent tetanus, it is necessary to carry out births under good hygienic conditions.

Rabies

Rabies is a viral infection with a deadly course, which is transmitted by the bite of an infected animal or by contact with contagious spittle. Animals with suspected rabies, show abnormal behavior: thus pets can be aggressive, while wild animals appear tame and trusting. The average incubation time of rabies is 3–8 weeks; it is shorter in injuries near the head than in those distant from the head. Initially, the virus affects muscle cells and then later passes along the nerve tracts to the brain. Finally, it gets into the salivary glands. In humans the course of rabies shows three phases. At the onset of the disease there are nonspecific symptoms like fever and exhaustion, the area of the bite is very sensitive to pain. During the following acute neurological phase, fear and agitation appear as well as changes in the frame of mind (aggressions, depressions). As swallowing induces pharyngeal cramps, the patients become afraid of drinking. To avoid swallowing, they let the spittle flow out of their mouths. Even the perception of water – visually or acoustically – leads to agitation and cramps. This state, which is typical of rabies, is called hydrophobia (or aquaphobia, fear of water). During the final phase of the infection the cramps decrease and progressive pareses inevitably lead to death. As there is no chance of cure after the onset of the disease, therapy should begin immediately after the patient has been bitten by an animal sus-

pected of having rabies. An active (► rabies vaccination, active), and – if necessary – a passive rabies vaccination (► rabies vaccination, passive), is carried out. Persons at risk, like veterinarians and hunters, should receive an active rabies vaccination as a prophylactic measure. It has to be recommended to be careful with unknown and, particulary, free running animals especially, if the animal cannot be caught for examination. These precautionary measures should also be taken seriously by travelers in regions with a high incidence of rabies (http://www.cdc.gov/ncidod/dvrd/rabies/).

Cross-References

► Anthrax Infection
► Gas Gangrene
► Immunization, Active
► Japan Encephalitis
► Malaria
► Measles
► Rabies Vaccination, Active
► Rabies Vaccination, Passive
► Simultaneous Vaccination
► Staphylococcal Toxic-Shock Syndrome (TSS)
► Streptococcal Toxic-Shock Syndrome (STSS)
► Symptomatic Therapy
► Tetanus Vaccination, Active
► Tetanus-Vaccination, Passive
► Tropical Diseases
► Tropical Diseases and Travel Medicine
► Waterhouse–Friederichsen Syndrome

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Acute and Post-Traumatic Stress Disorder (PTSD)

Definition

A post-traumatic stress disorder is the only ► anxiety disorder that, per definition, was caused by a traumatic event. Therefore, this diagnosis can only be made if the person has experienced a trauma and if there are symptoms from the symptom cluster triad: experience distressing recollections of the event (e. g. flashbacks or nightmares), avoidance (e. g. apathy, emotional detachment, avoidance of places or persons connected with the trauma) and hyperarousal (e. g. insomnia, irritability, hyper vigilance). The symptoms of an acute stress disorder begin during or shortly following the trauma. Persons suffering from PTSD can also show ► dissociation. If the symptoms and behavioral disturbances of the acute stress disorder persist for more than one month, and if these features are associated with functional impairment or significant distress to the sufferer, the diagnosis is changed to post-traumatic stress disorder. Post-traumatic stress disorder is further defined in DSM-IV as having three subforms: acute (<3 months' duration), chronic (≥ 3 months' duration), and delayed onset (symptoms began at least 6 months after exposure to the trauma).

Cross-References

► Anxiety Disorders

Acute Spasmodic Laryngitis

► Spasmodic Croup

Acute Stress Disorder

Definition

Acute psychological damage caused by stress.

Acute Stress Reaction

Definition

An acute ► stress reaction is a transient disorder that develops in an individual without any other apparent mental disorder in response to exceptional physical and mental stress. It usually subsides within hours or days. Individual vulnerability and coping capacity play a role in the occurrence and severity of acute stress reactions. The symptoms show a typically mixed and changing picture and include an initial state of "daze" with some constriction of the field of consciousness and narrowing of attention, inability to comprehend stimuli, and disorientation. This state may be followed either by further withdrawal from the surrounding situation or by agitation and over-activity (flight reaction or fugue). Autonomic signs of panic anxiety (tachycardia, sweating, flushing) are commonly present. The symptoms usually appear within minutes of the impact of the stressful stimulus or event, and disappear within two to three days (often within hours).

Cross-References

► Stress

Adaptation

Synonyms

Environmental tolerance

Definition

Environmental tolerance means a process by which an organism becomes tolerant to a new environment so that it continues to survive and reproduce. The species undergoing this evolutionary process gets progressively modified for a better survival and maintenance. The adaptive process entails structural and biochemical changes that may or may not be reversible. On a genetic basis, it is driven by natural selection in which ► alleles enhance survival and reproduction, the frequency of which increases from generation to generation. The ability of penguins to live in the harsh Antarctic environment is one of the classical examples of adaptation. These birds have solid bones, and packed, water-tight feathers to stay underwater, flipper-like wings to fly underwater and insulating blubber to keep them warm.

Cross-References

► Coping Mechanisms
► Vulnerability Concerns

Adaptive Capacity

Definition

Ability of a system to adjust to changes, moderate potential damages, take advantage of opportunities, or cope with adverse consequences.

Addiction

► Substance Related Disorders

Adequate Understanding

► Informed Consent

Adiposity

Synonyms

Obesity; Overweight

Definition

Adiposy is defined as weight more than 20% above what is considered normal according to standard age, height and weight tables. According to individual national studies, the prevalence of obesity in European countries ranges from 10 to 20% in men, and 10 to 25% in women.

Cross-References

► Obesity

Adivasi (Scheduled Tribes in India)

► Indigenous Health, Asian

Adjusted Rates

Definition

Adjusted rates are summary measures of the rate of morbidity or mortality in a population in which statistical procedures have been applied to remove the effect of differences in composition of the various populations. There are two methods for the adjustment of rates: the direct method and the indirect method. Direct and indirect refer to the source of the rates.

Cross-References

► Standardized Rate

Adjustment

► Standardization

Adjustment Disorders

Definition

States of subjective ► distress and emotional disturbance, usually interfering with social functioning and performance, arising in the period of adaptation to a significant life change or a stressful life event. The stressor may have affected the integrity of an individual's social network (bereavement, separation experiences) or the wider system of social supports and values (migration, refugee status), or represented a major developmental transition or crisis (going to school, becoming a parent, failure to attain a cherished personal goal, retirement). Individual predisposition or vulnerability plays an important role in the risk of occurrence and the shaping of the manifestations of adjustment disorders, but it is, nevertheless, assumed that the condition would not have arisen without the stressor. The manifestations vary and include depressed mood, anxiety or worry (or a mixture of these), a feeling of inability to cope, plan ahead, or continue in the present situation, as well as some degree of disability in the performance of the daily routine. Conduct disorders may be an associated feature, particularly in adolescents. The predominant feature may be a brief or prolonged depressive reaction, or a disturbance of other emotions and conduct.

Administration

► Management of Occupational Diseases

Administration Law

► Administrative Law and Public Health

Administrative Act

Synonyms

Administrative order; Administrative deed

Definition

The administrative act is a core legal tool of the state administration (i. e., the government and its administrative institutions). An administrative act is a physical act performed or a decision issued by the administration which is determined to regulate and resolve a specific case (e. g., to mitigate a public health risk). Such acts have direct legal effects vis-à-vis the addressee of the act. Administrative acts include, among others, public health agency decisions that order the isolation of a person, the closure of a business, the abatement of a nuisance or the grant as well as the revocation of a professional license.

Administrative Deed

► Administrative Act

Administrative Law and Public Health

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Synonyms

Administration law; Regulatory law

Definition

Administrative law is the body of legal rules that govern the exercise of sovereign powers by the state administration. Administrative law governs the legal relationships between private subjects (individuals and private legal entities) and the state administration with respect to the exercise of sovereign powers. Administrative law provides the tools and procedures for administrative practice. It includes the creation and funding of administrative departments and regulatory agencies. Administrative law also governs the relationships between the state administration institutions. Administrative law is a part of ► public law.

Basic Characteristics

Public health law is a branch of administrative law (Jacobson et al. 2007; Gostin et al. 2007; Grad 1990). Public health practice is governed by the rules, procedures and principles of administrative law. As legal background, administrative law itself is a branch of public law.

The Branches of Law

When trying to subdivide the laws, in most jurisdictions, three main branches of law can be differentiated, i. e., ► private law, public law and ► criminal law (*See* Fig. 1). The three branches can be further subdivided into specific sub-fields. For example, private law includes the law of contracts as well as the law of torts or family law.

Public law encompasses the legal rules that govern the relationship between individuals (including private legal entities) and the state institutions. Therefore, public law includes the relationships between individuals and the legislative powers, the judiciary powers (i. e., the courts) and the executive powers (i. e., the government and administrative agencies). Accordingly, subdivisions of public law include constitutional law and court procedure laws as well as administrative law. The latter is of particular interest for the practice of public health, although the former subdivisions are also relevant.

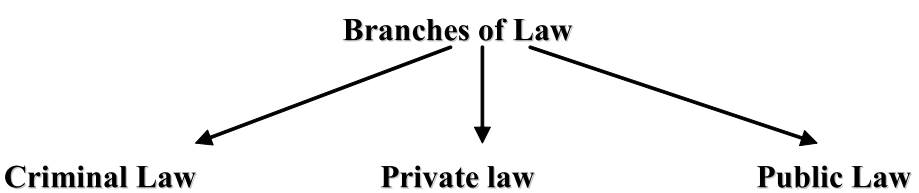
Administrative law is one field of public law; public health practice and public health law are also attributed to public law. The qualification of public health law as part of administrative law has consequences for public health practice because administrative law provides for specific principles, tools and decision-making procedures.

Actors and Means in Administrative Law

The protagonists of administrative law are the institutions of the state administration. These include the government and all administrative and regulatory agencies. Therefore, health departments and regulatory agencies as well as non-regulatory agencies fall in the scope of administrative law. The central actor of administrative law is the government. Thus, the government is probably the most important actor in public health policy and practice (*See* also Gostin et al. 2007).

The actors of administrative law are entitled to apply specific legal means. The governments may promulgate regulations that are legally binding. The legislator grants the government the power to issue regulations in order to specify general and abstract legal rules. As such, the government is commonly authorized in many laws to promulgate regulations to specify "the current state of the art". In addition to regulations (which are strong legal tools), governments may create standards and rules to specify technical or scientific terms and rules. Administrative laws also grant authority to the governments to create new administrative agencies and, in doing so, to create the necessary administrative infrastructure to exercise the state powers.

The *government* creates administrative agencies and delegates powers to them within the scope of their mission (Grad 1990). Consequently, agencies exercise state powers. Public health agencies belong to the old-



Administrative Law and Public Health, Figure 1 The Branches of Law

est administrative agencies in history (Parmet 2007). In the exercise of public powers, administrative agencies are provided with and bound to a certain set of legal tools:

- They may issue administrative orders (e. g., by ordering individuals to stay in hospital);
- They may perform physical acts (e. g., by destroying a dangerous object);
- They may enact ordinances (e. g., for zoning and planning purposes);
- They may set standards and make rules (e. g., specify the "state of the art");
- They may enter contracts governed by public law.

In addition to these means, *administrative agencies* in most jurisdictions are entitled to enforce compliance with their orders, including the use of coercion (administrative enforcement). The right to enforcement of its own orders by applying coercive measures is a characteristic of the exercise of state powers. In contrast, between individuals and private entities (in private law), no one is entitled to coercively enforce a right on his own. In private law, individuals must go to courts and take legal actions if they wish to enforce a private claim. Overall, public health law as a branch of administrative law has a powerful set of legal tools at its disposal. A health department may, for example, order the revocation of a license against a medical doctor and order the closure of his medical practice. If the doctor defies the order, the health department may effectuate the closure of the practice by using coercion. Similarly, if the health department orders the quarantine or isolation of certain persons, it is entitled to enforce these orders by coercively detaining the persons. Instruments of administrative enforcement are:

- Coercive enforcement penalties in case of non-compliance;
- Execution by substitution if the order addressee fails to comply; and
- Direct coercion to effectuate the ordered result.

Many practice areas of public health are specialized fields of administrative law. For example, the regulation of food, pharmaceuticals and chemicals, together with environmental law, occupational safety law and infectious diseases control laws are fields in the scope of special administrative law. Therefore, public health departments or health-related regulatory agencies are also entitled to order and enforce public health actions, and exercise extensive powers vis-à-vis individuals and private entities. Because of the reach and intensity of these powers and the possibility of severe intrusion of the rights of individuals, the administration has to respect specific principles and rules when exercising sovereign powers.

Principles and Rules of Administrative Law

The administration has to follow the *principle of legality*. The administration may only take measures and intrude personal rights if there is a legal basis allowing such actions. The administration is not allowed to act without the act being grounded in law. Particularly, this premise prohibits any kind of arbitrariness. In addition, the administration is not allowed to act *against* existing laws. This includes the administration's duty to respect the *principle of proportionality* (in German jurisdictions: *Grundsatz der Verhältnismäßigkeit*) between the combated threat and the personal and economic consequences of the selected administrative measures (*See* for U.S. law Gostin 2000, referring to the "Means/Ends-Test"). The European Court of Justice (i. e., the Supreme Court for the European Union that reviews community law matters) has acknowledged that the "principle of proportionality" is an element of primary European Community Law. Obviously, in all jurisdictions, the administration must perform a careful legal balancing of the conflicting rights before invading personal rights and interests. Further, the administration has to respect and must be consistent with the hierarchy of laws.

With respect to the administrative decision-making process, in most jurisdictions *specific administrative procedure rules* exist which are binding to administrative agencies (e. g., in the U.S. the "*Administrative Procedure Act*", or the German *Verwaltungsverfahrensgesetz*). These procedure laws impose duties in order to respect the individual's rights in the course of an administrative proceeding. Conversely, administrative procedure laws grant procedure rights to parties subject to administrative proceedings. These procedure rights intend to ensure the right to a "fair procedure" before an administrative order is issued. The administration's duty to guarantee a "fair procedure" includes, among others, the following measures, which must be observed before an order is released:

- Neutrality of the decision-making procedure with transparent and clear criteria;

- Exclusion of potentially partial persons (with conflicts of interests) from the proceedings.
- Prior notification to addressees (an individual or legal entity) of envisioned ► administrative acts (notification must be complete, timely and in writing);
- ► Hearing the addressees of administrative acts and allowing them to file objections, present their own facts and evidence and challenge the administrative findings;
- Allowing addressees access to the underlying proceeding records;
- Allowing representation before the administration by legal counsel;
- Providing addressees of administrative acts with reasons for decisions in writing.

When an administrative act is released, the administrative agency must provide the factual and legal justification for the particular order (decision reasons). Therein, the agency must evince that it has considered the individual case facts, including the hearing results and the evidence provided by the addressee. These procedural rules are designed to ensure that all state powers (sovereign powers) must be exercised with a high level of scrutiny.

In principle, the procedural requirements have to be met prior to all administrative orders issued by public health departments. However, in urgent cases or emergencies, administrative agencies or their officers are exceptionally relieved from some of the procedural obligations. In such cases, they may not be obliged to issue the order with reasons in writing. Notably, such alleviative emergency competencies are also granted by law.

In addition to these procedural requirements, administrative agencies have to follow *substantive decision-making rules*. These substantive requirements are particularly aimed at the protection of the rights of the addressees of administrative action. The discussion of these requirements would extend the scope of this essay (► legal balancing of conflicting rights).

A final but basic element of administrative procedure laws is the individual's *right to file opposition proceedings* against an administrative order at the next, higher level of the administration. This is an institutionalized inner-administrative control measure and a right of the affected individual to appeal the initial order within the administration at the superior administrative instance.

Administrative Courts and Judicial Review

Administrative law includes the individual's right to appeal administrative decisions in court. The guarantee of judicial review is a central element of democratic states. As all state powers derive from the people and as the powers are separated between the legislative, executive and judicial powers, the people have the right to challenge administrative decisions in court. This is one of the constitutional and human rights and is subject to the Universal Declaration of Human Rights of the United Nations.

Most jurisdictions provide for *specialized administrative courts*. Additionally, their proceedings are governed by specific administrative procedure laws in court, which are complementary to the criminal or civil procedure laws. Within the judicial review, courts review whether administrative decisions comply with procedural and substantive legal requirements. Among the formal aspects, courts assess whether the agency was competent and legally authorized to order the challenged action. If the agency lacked sufficient authority, the courts will reverse the challenged orders regardless of the desirability or ratio of the order.

The judicial review also comprises the administration's decision-making process, which particularly includes whether:

- The agency has interpreted the authorizing laws properly;
- The agency has gathered all relevant case facts;
- The agency has weighed the case facts appropriately (this is also why agencies have to provide reasons for administrative orders as they must enable the individual and the court to understand the administrative weighing, balancing and judgment);
- The agency has made a sound evaluation of the facts when assuming that the elements of the executed law are given (e. g., when determining the existence of a public health threat). As these decisions rely on specific expertise and particular case constellations at the time of the decision, courts regularly acknowledge that the agency officials have a scope of evaluation and judgment.
- The agency – when selecting a legal measure – has made appropriate use of its discretion (if there was room for discretion). Here, courts review the discretion use in light of the scope of the agency's mission and the public health threats at stake.

Overall, the judicial review has to assess whether the challenged administrative order complies with the underlying substantive and procedural laws. It is an integral part of administrative law and, as such, also part of public health law and public health practice.

Forms of Action Outside Administrative Law

Even though they are bound to administrative law, state agencies are allowed to involve private entities in the provision of public health services. For example, health departments may assign certain medical services to specialized doctors. In recent years, the importance of larger scale public-private cooperations is increasing, particularly in the realm of public health. In the practice of health promotion, the use of ► public-private partnerships to supply these services is increasing. Further examples of such public-private partnerships exist in the realm of health services and managed care (*See* Jacobson et al. 2007). The inclusion of private entities in the performance of administrative obligations does not absolve the administrative agency from its public responsibilities for the public's health. The agency has to ensure through pertinent contractual agreements that their private partners also provide the services with due care and respect for the personal rights and interests of the addressees of their services.

Cross-References

► Criminal Law and Public Health
► Environmental Law and Public Health
► Health Information
► Infectious Diseases Control Law
► Labor and Occupational Safety Law
► Legal Balancing of Conflicting Rights
► Legal Basis of Public Health
► Public Health Law, Legal Means
► Tort Law and Public Health

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Administrative Order

► Administrative Act

Adolescence

Definition

Adolescence is the time of growing up from childhood to adulthood or the period of life between puberty and maturity. The age span is defined differently, depending on the conceptualization of adolescence. The World Health Organization (WHO) defines adolescence as the period between the ages of 10 and 19 years. Adolescence is a transitional stage of development involving intense biological, social and psychological changes.

Adolescent Health and Development

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Definition

Adolescence is defined as the period between childhood and adulthood when multiple developmental processes occur. These areas of development include physical growth, pubertal maturation, cognitive transitions, and psychosocial and social maturation. Early, middle, and late adolescence are defined in pediatrics by sub-categories of chronological age: early adolescence is characterized as ages 11–14; middle adolescence, ages 15–

17; and late adolescence as 18–21 years of age. However, young people between the ages of 10 and 24 years are considered, especially in light of the fact that the age at which young people assume adult roles is increasing globally. Although chronological age is an important indicator of adolescent development and provides an objective and practical measure, it does not account for individuals on different developmental trajectories in terms of physical, cognitive, and psychosocial maturation.

The notion of "adolescence", defined as an exploratory period between childhood and adulthood when young people typically have few responsibilities, has been said to be relevant mainly to advanced economies; young people (both men and women) in other parts of the world move directly from childhood to taking on adult roles. However, as compared with 20 years ago, there is evidence that a large number of young people (the total population of 10–24 year olds is estimated to have reached 1.5 billion worldwide by 2005) are now entering adolescence earlier and healthier, are more likely to stay in school longer, to postpone entry into the labor force, and to delay marriage and childbearing (National Research Council and Institute of Medicine 2005). A focus on adolescence is therefore gaining more attention worldwide. The need to help young people transition to successful adult roles such as work, citizenship, marriage, and parenthood is being advocated.

Basic Characteristics

Adolescent Development

Physical Growth and Maturation Adolescents experience rapid acceleration in physical growth (increase in height and weight; ► physical maturation), and pubertal and sexual maturation (► pubertal maturation), including further development of reproductive organs and development of secondary sexual characteristics (such as breast development in girls, genital development in boys, and pubic hair in both). Age at ► menarche is the most commonly reported indicator of sexual maturity in girls. Other physical manifestations include changes in body composition, and the quantity and distribution of fat and muscle. There are also changes in circulatory and respiratory systems which lead to increased strength and tolerance for exercise. The growth spurt occurs about 2 years earlier in girls compared with boys. These physiological changes occur between the ages of 9 and 16; however, there is inter-individual variation in the timing and tempo of these events (Steinberg 1993).

Cognitive Transitions From early adolescence onwards, adolescent thinking is characterized by increased knowledge, multi-dimensional thinking, and the ability for hypothetical reasoning (► cognitive development). Piaget described a shift from concrete to abstract thinking (such as the ability to see various sides of an issue and the perspective of others). The ability to think abstractly is made possible by cognitive advances that emerge between the ages of 11 and 20 years (Keating 1990). A liability of this developmental shift can be an overestimation of abilities.

Psychological and Social Transitions Adolescents grapple with issues of identity development, achievement, autonomy, intimacy, and sexuality during the adolescent period (► psychosocial development). The process of identity formation can take various paths (with a variable degree of exploration, seeking of alternatives, and sense of commitment), and some of these tend to be more adaptive than others. There are multiple domains of self-evaluation and self-description including scholastic and athletic achievement, and physical appearance, etc. The process of individuation, and increasing autonomy during this period, although culturally variable, can be the basis of potential conflict with authority figures, including parents. There is a line of research studying the effectiveness of different types of parenting style on teens, including democratic, autocratic and permissive styles, which allow a different degree of autonomy and negotiation. The choice and effectiveness of the various styles may be based on cultural preferences and social context.

Adolescence is a time of life when people expand their circle of significant others to include peers and other adults (► social transition). Young people also begin to navigate through social institutions such as school. Parents, guardians, teachers, classmates, and friends are important socializers. Social acceptance and integration become salient, and we see the development of friendships; in particular with larger ► peer groups and/or more intimate relations, such as in close friendships. There is a shift from same sex to opposite sex interest, and young people may begin dating, experience romantic relationships and become sexually active.

Adolescent Health and Development, Figure 1

Adolescent Health

Good physical and mental health, as well as the knowledge and means to sustain good habits, are key for healthy development in adolescents as many health compromising behaviors emerge during this period. It is known that the major causes of mortality and morbidity in youth are behavior related, and therefore can be prevented. In the United States, for example, youths between the ages of 15 and 25 are more likely to suffer from unintentional injuries (such as motor vehicle accidents, drowning and sports/recreational-related incidents), homicide, violent crimes, and suicide. Other health related problems that are prevalent in youth include alcohol use, tobacco use, illicit drug use, obesity/weight problems, eating disorders, teenage pregnancy and childbearing, and sexually transmitted infections, including HIV. There are regional variations in causes of death; for example, HIV/AIDS is the main cause of death in youth in Sub-Saharan Africa, whereas deaths from non-communicable diseases are more prevalent in other regions, as discussed earlier (National Research Council and Institute of Medicine 2005). Pregnancy and childbirth-related mortality and morbidity due to early childbirth (in Sub-Saharan Africa and South Asia) and abortion (in all developing regions) are substantial. Health compromising behaviors have a grave impact on individuals, societies and economies in the long-run.

Mental health illnesses pose a major burden of disability worldwide. In the US, mental and addictive disorders (including anxiety disorders, disruptive disorders, mood disorders, and substance use disorders) are prevalent in one out of five 9–17 year olds (USDHHS 1999). Mood disorders such as depression, for example, are known to be associated with academic, social, and behavioral problems (including suicide) during adolescence. Risk factors such as poverty, violence, and trauma, among others, contribute to mental illness in youth worldwide. There is a need to address the stigma associated with adolescent mental health. Global policies that will integrate mental health policy into the overall healthcare system and assess the global treatment gap are programmatic challenges are being advocated by the World Health Organization (WHO) (WHO 2005). It is important to promote preventive interventions, as they have been shown to cause sustained reduction of depression and feelings of hopelessness, but also aggressive and delinquent behavior, and alcohol, tobacco and drug use (WHO 2003).

Health Interventions

Steps can be taken to help young people navigate successfully through the multiple transitions and influences of adolescence, and remain healthy. Different approaches have been undertaken to understand and enable positive health and development in youth. These include developmental, ecological, and life cycle approaches, among others. Contemporary developmental theory and research stresses the dynamics of individual-context relations in understanding behavior and developmental change. Ecological approaches address the individual-level (such as timing of puberty, temperament, and age), micro-level (the immediate relationships such as parents, peer, and teachers), environmental (the home, school, and neighborhood), and broader macro-level influences and forces (such as cultural factors, poverty, political instability, and the media) that influence adolescent health and development for successful intervention. The life cycle approach requires the understanding that promoting and sustaining the health and development of youth begins in childhood, and continues throughout the life of individuals. It is useful to end with the WHO conceptual framework, which presents a wide array of enabling factors that begin early in life to promote healthy adolescent development. These fac-

tors include promotion of healthy behaviors, life-long learning and education during adolescence, preceded by good nutrition, a safe environment, and healthy development, beginning in childhood (The World Bank Group 2006).

Cross-References

- ► Cognitive Development
- ► Menarche
- ► Peer Group
- ► Physical Maturation
- ► Psychosocial Development

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Adoption Studies

Definition

The adoption studies approach is used to separate childhood rearing effects from genetic effects by studying the similarity of adopted children with their biological and foster parents. These studies are the most successful in populations where adoption records are systematically collected. The first step in this type of investigation is the identification of affected parents and control parents who have given up children for adoption. In the next stage, the frequency of disease in the children is then compared between the affected and control groups.

Adult Family Homes

- ► Assisted Living Facilities

Adult Foster Care

- ► Assisted Living Facilities

Adult Tuberculosis

- ► Post Primary Tuberculosis

Advanced Reproductive Technologies

Definition

Advanced reproductive technologies are medical treatments or procedures designed to enhance a woman's fertility, such as in-vitro fertilization. Advanced reproductive technologies are commonly referred to as assisted reproductive technologies.

Cross-References

- ► Infertility

Adverse Drug Reaction

Synonyms

Side effect; Adverse effect; Adverse events

Definition

An adverse drug reaction (abbreviated ADR) is a term to describe the unwanted, negative consequences sometimes associated with the use of different medications. It includes a wide range of outcomes that can be toxic,

physical or psychological reactions to a drug. The reaction may be allergic, predictable or unpredictable. The scientific discipline that focuses on the study of ADRs is pharmacovigilance.

Cross-References

► Side Effect

Adverse Effect

Synonyms

Adverse events; Adverse outcome; Complication; Side effects

Definition

Adverse effects are harmful and undesired effects resulting from either medication or interventions like chemotherapy or surgery. Adverse effects that result from medication are called ► side effects when those effects are secondary to the main or therapeutic effect of the drug, sometimes due to unsuitable or incorrect dosage or procedure. Adverse effects from medical procedures may occur in the course of surgery, like infection, hemorrhage, inflammation, scarring, loss of function, or changes in local blood flow. Non-surgical procedures like high intensity radiotherapy might result in burned skin, for example. Adverse effects can cause reversible or irreversible changes.

Cross-References

► Adverse Drug Reaction
► Side Effect

Adverse Events

Definition

An adverse event (AE) is any adverse change in health or "side-effect" that occurs in a person during a clinical trial or within a pre-specified period after dosing of a drug is complete. Not every adverse event is causally related to the treatment being studied, but researchers must report all adverse events to the relevant regulatory authority in the country where the drug is to be registered. Adverse events categorized as "serious" (for example death, illness requiring hospitalization, events deemed life-threatening, etc.) must be reported to the regulatory authorities immediately, whereas minor adverse events are merely documented in the annual summary sent to the regulatory authority.

Cross-References

► Adverse Drug Reaction
► Adverse Effect
► Side Effect

Adverse Outcome

► Adverse Effect

Adverse Selection

Definition

Adverse selection refers to a situation in which individuals are able to purchase health insurance at a premium that is below actuarially fair premiums. Adverse selection occurs because of ► information asymmetries: consumers are better informed about their health status than health insurers are. The consequence of adverse selection of unregulated health insurance markets is market instability.

Advertising

Definition

Advertising in this context refers to "Direct to consumer advertising" about pharmaceuticals.

Advising

► Social/Emotional Support

Advocacy

Synonyms

Health advocacy; Public health advocacy; Health lobbying

Definition

Advocacy is the act of arguing or pleading in favor of an issue or an idea that is thought to enhance the well-being of another person, a group or a population. It involves campaigning for political, regulatory or organizational change on the local, district or national level. The goal of advocacy is to create conditions that are conducive to health. Since the determinants of health are multisectoral, advocacy, too, must extend well beyond the health sector. Advocacy for health and lobbying in the political arena should be an integral part of any health promotion effort. Key strategies are:

- Educating policy makers: e. g. by distributing fact sheets
- Creating advocacy coalitions: mobilizing support from colleagues, academics, institutions, groups
- Media advocacy: strategic use of media to advance the initiative, thereby enhancing visibility and credibility of the campaign
- Judicial advocacy: health professionals offer support in filing a lawsuit and take on the role of an expert witness
- Community advocacy: mobilizing the community to advocate for its own health concerns.

Advocacy for Health

Synonyms

Advocate

Definition

There are two possible roles, and thus definitions, in advocacy:

1. The act of directly representing or defending others; championing the rights of individuals or communities through direct intervention or through ► empowerment.
2. A combination of individual and social actions designed to gain political commitment, policy support, social acceptance and systems support for a particular health goal or programme.

Advocacy, particularly in the latter sense, is one of the three ► health promotion action strategies of the ► Ottawa charter and may be taken by and/or on behalf of individuals and groups. It can take many forms including the use of the mass media, the new information technologies, political lobbying and community mobilization to create coalitions of interest around defined issues. Health professionals have a major responsibility to act as advocates for health at all levels in society.

Advocate

Synonyms

Advocacy for health

Definition

Good health is a major resource for social, economic and personal development and an important dimension of quality of life. Political, economic, social, cultural, environmental, behavioral and biological factors can all favor health or be harmful to it. ► Health promotion action aims at making these conditions favorable through advocacy for health.

Affective Disorders

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Definition

In affective disorders, the fundamental disturbance is a change in mood to depression (with or without associated anxiety) or to elation (► mania). The mood change is usually accompanied by a change in the overall level of activity; most of the other symptoms are either secondary to, or easily understood in the context of, the change in mood and activity. Most of these disorders tend to be recurrent (► recurrent depressive disorder) and the onset of individual episodes is often related to stressful events or situations.

Basic Characteristics

Introduction

Hippocrates was one of the first to use the term "melancholy", literally meaning "black bile", to describe depressive symptoms. Usually, sadness accompanies

tragic situations; for example, the death of a loved one or loss of employment. Everyone will experience such sad phases during their lifespan and everyone will experience other common symptoms of depressive disorders during times of stress; for example, problems with concentration, sleep disturbances, and changes in appetite. However, a depressive disorder differs both qualitatively (e. g., much more pervasive) and quantitatively (i. e., longer duration) from "normal" sadness or reactions to stress. Thus, actual definitions of depressive disorders (e. g. according to DSM-IV, ICD-10) define a severity threshold (depending upon a specific number of symptoms) and a minimum duration (2 weeks). Major depression is associated with female gender, lower social status, and stressful life events (e. g., hospitalization for a serious illness, pregnancy, death of a close relative, divorce). Depression can strike a person at any age (Cave: even small children!). Major Depressive Disorder (MDD) is very highly associated with potential morbidity and mortality (suicide, medical illness, disruption in interpersonal relationships, substance abuse, and lost work time).

► Dysthymia is a "chronic" form of depression. It is defined by its subsyndromal nature (i. e., fewer than the five persistent symptoms required to diagnose a major ► depressive episode are present) and a protracted duration of at least 2 years for adults. The symptoms of dysthymia alone do not meet the criteria for Major Depression and low mood is the primary symptom.

Patients with bipolar disorders (► bipolar affective disorder) suffer from depressive episodes and/or manic/hypomanic episodes (i. e., bipolar I and bipolar II disorders). A manic syndrome is defined as a period of unusual and extreme good mood or extreme irritability. Manic patients often show a decreased need to sleep and strong hyperactivity. Episodes of ► hypomania are typical. Bipolar disorders are associated with significant morbidity and mortality rates.

► Cyclothymia is also marked by manic and depressive states. Oscillation of high and low moods is typical. However, those phases are neither of sufficient intensity nor duration to merit a diagnosis of bipolar disorder or MDD.

Epidemiology

Depressive disorders are more common in women than in men (female/male ratio = 1.5–2/1). One year prevalence rates of depression in European countries are estimated between 1.9% (Netherlands and Great Britain; Bijl et al. 1998; Jenkins et al. 1997) and 8.3% (Germany Jacobi et al. 2004). Dysthymia affects about 2% of the adult population per year; women seem to be slightly more affected than men. The one year prevalence estimate of bipolar disorders in adults is 0.9% (Pini et al. 2005). Almost 2% of the adult population suffers from bipolar disorders (i. e., lifetime prevalence, Kessler et al. 1994). Because the costs in existing economic studies are based on a ► top-down approach (and depend on assumptions in terms of resource use), it is impossible to assess the exact economic burden. Depressive disorders have a high economic burden due to their high prevalence and their association with high disability in acute depressive phases (e. g., lost workdays, reduced working capacity). Unipolar major depression is one of the 10 leading diseases of the global disease burden (Lopez et al. 2006).

Pathophysiology/Etiology

The pathophysiology of MDD has not been clearly defined. Different studies have suggested a disturbance in CNS serotonin (i. e., 5-HT). Norepinephrine (NE) and dopamine (DA) are other important neurotransmitters for MDD ("monoamine hypothesis"). However, this hypothesis is not sufficient to explain the complex symptoms of depression. One problem is that many other neurotransmitter systems are altered in depressive disorders (e. g., GABA and acetylcholine). Another problem is that improvement of monoamine neurotransmission with medication and lifting of the clinical signs of depression do not prove that depression is actually caused by defective monoamine neurotransmission. Accordingly, in different studies, no objective biological markers exist that correspond definitively with the disease states of bipolar disorder (► bipolar affective disorder), ► dysthymia, and ► cyclothymia. Overall, the etiology of affective disorders is multimodal (e. g., biological factors, psychosocial factors, stressful life events) with a strong genetic component.

Consequences

The relationship between depressive disorders and comorbidity of other mental disorders (especially anxiety disorders, i. e. ► generalized anxiety disorders,

► panic, ► agoraphobia, and ► post-traumatic stress disorders) as well as physical illness is well established. Patients suffering from bipolar disorders frequently show comorbid anxiety disorders and substance use disorders. Accordingly, dysthymic disorders are associated with higher rates of comorbid substance abuse. Suicide is the most severe complication of major depression. Depressive disorders account for about 20 to 35% of all deaths by suicide (Angst et al. 1999). Men are much more likely to succeed in committing suicide than women (ratio about 4:1). However, women ► attempt suicide about four times more often than men.

Treatment

Antidepressant medication and/or cognitive-behavioral psychotherapy have the strongest evidence for the treatment of depressive disorders. In severe depressions (with or without psychotic symptoms), patients are mostly treated with antidepressants and cognitive-behavioral psychotherapy. Antidepressants should be changed if there is no clear effect (after an additional attempt of dose increase) within 4 to 6 weeks. Accordingly, revisions to a psychotherapeutic treatment plan should be considered, including the addition of antidepressant medication, if there is no symptomatic improvement within 3 or 4 months of therapy. Further, to reduce relapse rates, anti-depressive medication should be used routinely for at least 6 months after remission (i. e., continuation phase therapy). Cognitive-behavioral psychotherapy is also important for relapse prophylaxis. In recurrent depressive patients (► recurrent depressive disorder), either antidepressants or special medication for relapse prophylaxis and mood stabilization, respectively (e. g., lithium, valproate), may be used for years (i. e., maintenance phase therapy). Such maintenance pharmacotherapy is typically recommended for individuals with a history of three or more ► depressive episodes, chronic depression, or bipolar disorder.

Cross-References

► Depressive Episode
► Dysthymia
► Hypomania
► Mania
► Recurrent Depressive Disorder

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Affective Personality Disorder

► Cyclothymia

African Trypanosomiasis

► Sleeping Sickness

Aftermath Risk Awareness, Perception, Assessment, and Communication

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Synonyms

Mitigation strategies

Definition

Various aspects of attitude towards risk after a disaster.

Basic Characteristics

Improvement of information about hazards is badly needed for raising awareness and enhancing the consultative process that leads to a hazard (► mitigation strategies). Only informed stakeholders can make rational decisions about the choice of strategy in an objective and rational cost-benefit framework. Informed citizens are likely to behave in a way that is compatible with disaster management activities.

Experience has demonstrated that repeated occurrence of a disaster in the same place within a relatively short time might enhance the positive learning effect. For example, there were two large floods on the Rhine, in December 1993 and January 1995. The maximum water levels in Cologne were of comparable magnitude (the second being actually even a little higher), but the values of the damage caused by each of the two floods differed largely. The damage in the second (higher) flood was considerably lower. Occurrence of the first flood raised awareness and triggered actions towards improvement of the flood preparedness system, based on the lessons learned. The first flood was still fresh in memory when the second flood occurred just a year later.

Misconceptions and myths about natural disasters and flood protection are deeply rooted in society – for the general public, politicians, and decision-makers alike. It is of utmost importance to dispel and rectify misconceptions and counter-productive "principles" that are held throughout political and social systems, such as the short-memory principle, where implementation is called the rule of hydro-illogical cycle with regards to floods and droughts. Flood (or drought) occurrence triggers high expenditures on flood (or drought) protection (► mitigation strategies). Yet, memory fades and, after some time without flood (or drought), the willingness to pay for costly preparedness systems drastically decreases. It is not easy to communicate this truth effectively to the electorate and decision-makers, whose term of office is short. A major natural disaster may not be likely to occur during decision-makers' terms of office.

Efficient actions aimed at raising awareness are of utmost importance for a disaster preparedness system (► mitigation strategies). There is a systemic lack of experience with a natural disaster of extreme dimensions. Among over 50 fatalities of the 1997 flood in Poland, many could have been avoided were the awareness better. Most flood fatalities in the US are related to vehicles whose drivers underestimate the danger and get trapped. Alone, car drivers obeying simple rules of conduct could help reduce the number of fatalities in many flood events.

The media may play an essential role in raising awareness and providing information. The ► risk perception is to a large extent determined by media coverage. In some cases, an atmosphere of risk is created and warmed up by the media (e. g. the impacts of the Three Mile Island accident, where the actual damage was low).

Risk perception involves the beliefs, attitudes, judgments, and feelings of individuals, as well as their wider social and cultural values and disposition towards hazards (being risk-prone, risk-neutral, or risk-averse). It also depends on age, gender, education, and past traumatic experiences.

In many areas, river levees (dikes) are the principal flood defenses. Existence of properly dimensioned and maintained levees, which adequately protect adjacent areas against small and medium floods, creates a misconception – an unjustified feeling of complete safety among the riparian population. When a dike breaks during an extreme flood, the damage may be higher than it would have been without a dike. The Netherlands, a country remembering the tragedy of coastal flooding in 1953 and which has a large part of the country located in depressions, below the mean sea level, has higher safety standards (flood protection design) than any other country in the world. Yet, even in the Netherlands, safety levels are now re-examined to account for global change effects. Building flood risk consciousness among the public and rectification of misconceptions, such as false feelings of absolute safety, is of paramount importance. No matter how high a flood design is, there is always a possibility that a greater flood will occur, inducing losses. Should dikes be designed to withstand a 100-year flood or a 500-year flood? The latter solution would give a better (but still incomplete) protection, but

is far more costly (prohibitively costly in most places, with the Netherlands being a notable exception as it is embarking on high safety standards with design values of 1250-, 4000-, and 10 000-year events for protection against river, large river, and coastal flooding). Water managers in a few countries, including the Netherlands, Australia, the UK, and the USA have begun to consider the implications of climate change explicitly in flood protection. Measures to cope with the increase of the design discharge for the Rhine in The Netherlands from 15 000 to 16 000 m^3/s must be implemented by 2015 and an increase in the design discharge to 18 000 m^3/s is planned in the longer term due to climate change.

Disaster risk communication is a difficult issue, especially communication of uncertainties, which requires assistance in understanding. When issuing warnings – communicated messages that a hazard is producing specific risks for a particular segment of the population – the response depends on the source, channel credibility, and past experience (relevance and accuracy of earlier warnings). People are likely to heed warnings if past warnings did not "cry wolf."

Cross-References

► Mitigation Strategies

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Age-Dependency Ratio

Definition

The age-dependency ratio is a summary measure of age composition in a population that incorporates specific assumptions about "productive" and "unproductive" groups. Age-dependency ratios represent the relative numbers of dependents to supporters in the population. The child dependency ratio compares the population of children (0–14 years) to the working age (15–64 years) population, while the aged dependency ratio compares those aged 65 years and over to the same working-age reference group. The total age-dependency ratio compares the combined youngest and oldest population to the intermediate working age group.

However, the use of chronological age alone for classifying individuals as "dependent" or "productive" assumes a uniformity of contribution in each age group which is unlikely to be accurate. For example, continued education may delay economic contribution for the intermediate group, and persons may continue to be economically productive past age 65. Where detailed data on employment and economic activity are lacking, age-dependency ratios are nonetheless a helpful estimate of economic dependency.

Agency Theory

Definition

Agency theory refers to a situation where one person (the agent) makes decisions on behalf of another person (the principal), usually because of asymmetry of information (► information symmetry). In ► health economics, agency theory is applied to the relationship between the physician (the agent) and the patient (the principal).

Agenda 21

Definition

Agenda 21 is a plan of action for the preservation of the Earth that was adopted at the UN conference on the environment and development at Rio de Janeiro in 1992. No fewer than 181 countries signed the document. Agenda 21 not only aims to solve environmental problems but also covers economic and social injustice in the world. Democracy, equality and the fight against poverty play an important role. It is a comprehensive blueprint of action to be taken globally, nationally and locally by organizations of the UN, governments, and major groups in every area in which humans impact on the environment. The number 21 refers to the 21st century.

Agent (of Disease)

Definition

A factor, such as a microorganism, chemical substance, or form of radiation, whose presence, excessive presence, or (in deficiency diseases) relative absence is essential for the occurrence of a disease.

Age-Specific Fertility Rate (ASFR)

Definition

Age-Specific Fertility Rate (ASFR) represents the annual number of births to women in a particular age group per 1000 women in that age group. It is used for comparisons in fertility behavior at different ages, ► fertility at different ages over time and fertility across countries or populations.

Aging and Health

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Synonyms

Elderly and health; Health of the elderly; Older people and health

Definitions

Population aging, the demographic process by which older persons become a proportionally larger share of the total population, is associated with changing patterns of mortality, morbidity, and disability (UNPD 2002). In the older population different aspects of health have to be considered. ► Gerontology, the scientific study of the biological, psychological, and sociological phenomena associated with old age and aging, and ► geriatrics, the branch of medicine that focuses on health promotion and the prevention and treatment of disease and ► disability in later life, both deal with the well-being of older people.

Basic Characteristics

A gradual ► demographic transition – from patterns of high fertility and high mortality to patterns of lower fertility and later mortality – has been underway across the globe. Lower birth rates and growing longevity have led to an overall increase in both the absolute number and relative proportion of older people in the general population. By 2002, the population of individuals 60 years and over reached 626 million, or 10 percent of the total world population. Of these, nearly 70 million are among the oldest-old, aged 80 or over. The older population is projected to expand rapidly in the coming decades, more than tripling its current size and reaching 2 billion by 2050. The oldest-old population is expected to grow more than 5.5 times to reach 379 million by 2050. Decreasing fertility rates contribute to the prediction that older individuals will at that time constitute 21 percent of the total world population, twice their current proportion and equal to the number of predicted children. The proportion of the oldest-old will quadruple to 4 percent by the same year (UNPD 2003). Women constitute the majority of older people in most countries (Velkoff, Lawson 1998).

The demographic changes are linked with ► epidemiologic transitions, in particular a shift in the leading causes of death away from infectious, acute diseases in early life towards chronic and degenerative illness-

es in mid- and later life. Given the increase in total ► life expectancy, a number of gerontological theories addressing the implications of increased longevity for population health have emerged, each proposing different relationships between old-age mortality, morbidity, and disability, or limitations in performing activities of daily living. (For a review, see Agree, Freedman 1999) The theories range from the most pessimistic – in which delayed mortality is translated to increased years of life with disease and disability – to the most optimistic, in which morbidity and disability are compressed towards the end of life, increasing the healthy proportion of total life expectancy. More nuanced perspectives recognize the complexity, mutability, and inter-connectedness of the processes determining morbidity, disability, and mortality, and suggests a continuous dynamic relationship between them. International trends in mortality and disability outcomes are mixed, supporting a dynamic model of longevity and health in later life that is influenced by a multitude of biomedical, environmental, and social factors.

► Population aging is an aggregate mark of human success in reducing fertility, improving living conditions, and curbing risks of death through innovations in public health and medicine. However, insufficient preparedness for the needs of an aging population on the part of health and social service providers is a challenge confronting societies at all levels of development.

Geriatric Health

Aging populations have higher rates of chronic disease and ► disability, and the likelihood of having multiple co-morbidities rises significantly with age. In high and low-income countries alike, ischemic heart disease and cerebrovascular diseases are the leading causes of death. In more developed nations, cancers (lung, colon, rectum, stomach, and breast), chronic obstructive pulmonary diseases, diabetes mellitus, and Alzheimer's Disease and other dementias are also among the most prevalent causes of death. A range of chronic and adult-onset conditions including depression, hearing loss, alcohol-use disorders, osteoarthritis, schizophrenia, bipolar disorders, and chronic obstructive pulmonary diseases are among the leading causes of global disability (Murray et al. 2001). Chronic diseases may contribute to the gradual loss of senses such as sight and hearing, to impaired mobility, to increased risks of falls and fractures, and to disability in the performance of activities of daily living.

As ► senescence, or the slowing-down of physical systems that takes place as the body ages, progresses, a range of physical and mental capacities is weakened. Age-related mental illness, especially dementia, are particularly difficult to cope with for both patients and caregivers alike. Dementia is a condition of irreversible decline in cognition, functioning and behavior. Alzheimer's disease (AD) accounts for approximately 60–70% of dementia cases, with vascular dementia accounting for the majority of the rest. The prevalence of AD is estimated to be 8–15% in persons over 65. The primary risk factor for dementia is age, with the prevalence doubling for every 5-year age group after the age of 65 and reaching as high as 39 percent after age 90 (Jorm, Jolley 1998).

Chronic diseases exact a heavy burden on older adults due to associated long-term illness, diminished quality of life, and increased health care costs. Although the risk of disease and disability clearly increases with advancing age, poor health is not an inevitable consequence of aging. A healthy lifestyle (including regular physical activity, a nutritious diet, and avoidance of tobacco) is the recommended course for prevention. Screening for early detection is also recommended for those illnesses (e. g. some cancers, diabetes and its complications, etc.) for which a course of treatment is available.

Aging and Pharmacotherapy

Older people are particularly susceptible to the risks of medication use. Age-related loss of physiologic reserve leads to pharmacokinetic changes and increases inter-individual variability. The loss of renal function, for example, decreases the clearance of common drugs in older people, while the loss of lean body mass and fat mass leads to an altered volume of drug distribution.

Polypharmacy – the use of multiple (usually 5 or more) medications – is a common issue since geriatric patients frequently have multiple co-morbidities each treated with one or more medication. Furthermore, some medications bring about ► side effects that then lead to the prescription of additional drugs to treat the added symptoms. Polypharmacy increases the potential of drug interactions, adverse drug reactions, and the use of inappropriate medications, or drugs that should be

avoided in certain doses, disease states, or in combination with other drugs (Hanlon et al. 2001).

Care-Giving

Historically, older people in need of assistance received care from younger family members. However, previously high levels of mortality and fertility meant that the proportion of individuals reaching older ages was relatively small while a larger pool of children and relatives was available to share care-giving responsibilities. More recently, the proportion of the population at older ages has been expanding as the numbers of younger family members available to provide care has been shrinking.

Women – wives, daughters, daughters-in-law, nieces and granddaughters – have traditionally provided the bulk of family care-giving and continue to do so despite rising levels of labor force participation. Older people are as likely to provide care as they are to receive it, and in developing and developed countries alike, spouses are the main caregivers for both men and women. Because of the sex differential in longevity, however, women are more likely than men to find themselves without a spouse and to be living alone when they need care (Velkoff, Lawson 1998).

A relatively small proportion of older people – between 1 and 10 percent – reside in institutions in developed nations (Velkoff, Lawson 1998). There has been growing concern – though not much documentation – that as networks of family caregivers shrink the rate of institutionalization among older people may rise. Additional concerns about the quality and cost of institutional care are garnering attention in many countries.

Aging in Developing Nations

In developing nations a rapid ► demographic transition has outpaced economic development. Since 1980, developing countries have been home to a larger proportion of the world's population of persons aged 60 and above than their industrialized counterparts (Lloyd-Sherlock 2000). By 2000, 249 million people, or 59% of the world's 65 years of age and over population lived in developing countries (US Census Bureau 2001). According to demographic projections, by 2050, more than three-quarters of the world's older people will be living in developing countries. By 2050 developing countries will posses a similar age structure to today's more industrialized nations. Older people will then comprise over 30% of the population in East Asia, more than 20% of the population in Southern Asia and Latin America, and approximately 10% of the population in Africa (UNPD 2003).

Though they are among the most disadvantaged populations in developing nations, older people have not been prioritized by international aid agencies. Eighty percent of older people in developing countries have no regular incomes, and approximately 100 million older persons live on less than a dollar a day. Older people in developing regions are often excluded from economic development, healthcare and education programs due to age limits and discrimination and humanitarian agencies often fail to identify older people as a target in the planning and delivery of services in conflict areas (Help – Age International 2002). While incidence of chronic and age-related disease has been rising rapidly in developing nations, there is a lack of professionals in geriatric medicine, preventing older adults from receiving the health care they need (Keller et al. 2002).

Though norms of filial piety are still strong in many developing countries, changes in family structures and co-residence patterns are rendering traditional support networks more vulnerable. Recognizing the need for increased awareness and action on issues related to global aging, the Second World Assembly on Aging adopted the Madrid International Plan of Action in 2002. The Plan calls on governments, non-governmental organizations, and the international community to adopt the concept of "a society for all ages," to end age-based discrimination and abuse, and incorporate the concerns of older people into national and international economic and social development policies (United Nations Programme on Ageing, 2002). The formation of implementation and monitoring strategies for the Plan is now in progress.

Cross-References

► Age-Dependency Ratio
► Demographic Transition
► Disability
► Epidemiologic Transition
► Geriatrics
► Gerontology
► Life Expectancy

► Population Aging
► Senescence

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Agoraphobia

Definition

The ancient term *agoraphobia* is translated from Greek as fear of an open marketplace. Accordingly to the International Classification of Disease of WHO (ICD-10), agoraphobia is characterized as the fear or avoidance of crowds, public places, traveling alone, etc. At least two symptoms of psycho-physiological agitation (e. g. tachycardia, fear of losing control) have to appear simultaneously. The psychological stress for persons suffering from agoraphobia is significant, especially as most realize that their safety-seeking behavior is exaggerated. Most people develop agoraphobia after the onset of ► panic disorder. Agoraphobia is best understood as an adverse behavioral outcome of repeated panic attacks and the subsequent worry, preoccupation, and avoidance.

Cross-References

► Anxiety Disorders

Agreement

Synonyms

Contract

Definition

Agreement for two measurement procedures is examined in the absence of a gold standard, and it refers to the closeness of two measured values, not to whether those values are correct or not. Inter-rater agreement (inter-rater reliability) for two or more raters is a measure of the closeness of the raters' decisions. When the result of measurement is binary data, the agreement is estimated by ► proportion of agreement or ► kappa coefficient, and in the case of continuous data agreement is estimated with ► Pearson's correlation coefficient (Pearson's r) or with intraclass correlation coefficient.

Cross-References

► Contract

AHRQ

Definition

The Agency for Healthcare Research and Quality (AHRQ) is the lead US Federal agency charged with improving the quality, safety, efficiency, and effectiveness of health care. As one of 12 agencies within the Department of Health and Human Services, AHRQ supports health services research that will improve the quality of health care and promote evidence-based decision making. Information from AHRQ's research helps

people to make more informed decisions and improve the quality of health care services. AHRQ was formerly known as the Agency for Health Care Policy and Research.

Aid Agency

► Humanitarian Agency

Aid Organization

► Humanitarian Agency

AIDS

Synonyms

Infection with the human immunodeficiency virus; Acquired immunodeficiency syndrome; HIV-infection; HIV/AIDS

Definition

HIV (human immunodeficiency virus) is a retrovirus that primarily infects vital components of the human immune system such as $CD4^+$ T cells (a subset of T cells), macrophages and dendritic cells. It impairs the body's ability to fight infection and certain cancers. HIV infection is diagnosable by antibody or antigen testing. Treatment aims to suppress HIV replication by combinations of drugs that inhibit HIV enzymes. Any of a list of illnesses that, when occurring in an HIV-infected person, leads to a diagnosis of AIDS, the most serious stage of HIV infection. AIDS is also diagnosed if an HIV-infected person has a CD4 count below 200 cells/mm^3, whether or not that person has an AIDS-defining condition. The Centers for Disease Control and Prevention (CDC) published a list of AIDS-defining conditions in 1993. The 26 conditions include candidiasis, cytomegalovirus disease, Kaposi's sarcoma, mycobacterium avium complex, pneumocystis carinii pneumonia, recurrent pneumonia, progressive multifocal leukoencephalopathy, pulmonary tuberculosis, invasive cervical cancer, and wasting syndrome.

Cross-References

► HIV (Human Immunodeficiency-Virus)-Infection
► HIV-Infection and AIDS

AIDS-Defining Diseases

► AIDS-Defining Symptoms

AIDS-Defining Symptoms

Synonyms

AIDS-defining diseases; AIDS-defining illnesses; Opportunistic infections in AIDS

Definition

The term "AIDS-defining diseases" are the so-called opportunistic infections, which do not appear in immunocompetent individuals, and particular tumors. The tumors are Kaposi's sarcoma, a tumor of the connective tissue, and non-Hodgkin's malignant lymphoma. Opportunistic infections can be caused by viruses, bacteria, fungi or parasites. Typical AIDS-associated viral infections are cytomegalovirus and herpes infections. The bacterial infection, which most frequently occurs in connection with HIV-infection, is **tuberculosis** (► S. tuberculosis and other mycobacterioses). Fungal diseases, which have to be mentioned, are Candida-infections and cryptococcoses. A parasitic disease typical for AIDS is pneumonia caused by *Pneumocystis carinii*. In 1980 the so-called "wasting-syndrome" was identified; it is characterized by a loss of body weight of more than 10%, tiredness, persisting diarrhea and fever.

Cross-References

► HIV-Infection and AIDS

AIDS-Therapeutics

► Fusion Inhibitors
► Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)
► Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)
► Protease-Inhibitors (PI)

Ailment

Synonyms

Disease; Illness

Definition

Disease represents impairment of the normal state or functioning of the body as a whole or of any of its parts. Some diseases are acute, producing symptoms that last short period of time, for example, flu, pneumonia. There are also chronic disorders, such as, arthritis, hypertension, etc. that last for a long time. Diseases are usually classified according to cause. External factors that produce disease are infectious agents, including bacteria, viruses, fungi, but also disease may occur as a consequence of different chemical and physical agents such as drugs, poisons, radiation. Some diseases are inherited and some of them acquired due to environmental, infectious and various lifestyle factors. Also, many diseases are attributed to emotional disturbances. Most diseases occur as a result of an interaction between the body and the environment. In ancient times disease was ascribed to supernatural, spiritual, and humoral factors.

Ainu (Japan, Russia)

► Indigenous Health, Asian

Airborne Particles

► Suspended Particles

Air Quality and Pollution

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Definition

Air quality refers to the physical, chemical, and biological characteristics of air, both in outside space and in enclosed spaces, such as most industrial settings, other non-industrial working places, and residencies. Air pollution is the abnormal presence of various substances (gases, vapors or particles) in the air in sufficient concentrations such that accumulated substances lead to poor air quality and affect human health, living matter and other materials. These substances may be released into the air by natural processes or by human activities.

Basic Characteristics

Air is a mixture of gases, water vapor, solid and liquid airborne particles in a wide range of concentrations that range from essential for life to chemically inert. Some of them are even hazardous, but are normally present in low concentrations. Air is what constitutes Earth's atmosphere and it is present as an almost transparent, thin envelope around our planet. The atmosphere significantly determines the necessary conditions for various forms of life on Earth, and also shapes and modifies the subtle combination of environmental factors that we call climate.

The normal chemical composition of dry air in the troposphere is as follows: major gases are nitrogen and oxygen (78,09% and 20,94%, respectively, by volume); minor gases are argon (0,93%) and carbon dioxide (0,03%); and trace gases (the whole group totaling 0,01%) are neon, helium, methane, krypton, hydrogen, nitrogen oxides, ozone, ammonia, and sulfur dioxide. Water vapor content in the low atmosphere is highly variable, ranging from less than 1% to 5–6% by volume.

Air quality may range widely from quite good (satisfactory) to poor, in various degrees. Air quality is good when there is normal chemical composition of air without significant variations in physical (or physico-chemical, e. g. radiological) and biological characteristics. Air quality is poor and detrimental if air is odorous and stale, if physical parameters are out of optimal values, or if air is polluted by chemicals of various origin. The main physical characteristics of air that affect air quality are temperature, humidity, air velocity, and radiant heat. Biological origins of air quality deterioration include bacteria, viruses (humans are the main sources in indoor spaces), fungi (molds), insects (fleas and cockroaches), arthropods (e. g. ► house dust mites), mammals (e. g. home pets – their excreta, hair, dander or feathers), and plants (pollen grains). There are two

main groups of sources of air pollution – natural, and artificial or man-made sources.

Natural Sources of Air Pollution

Over the millennia it has been in existence, the atmosphere has been relatively balanced and stable in composition, being polluted mainly by natural processes. Like now, natural sources of pollution have been volcanic eruptions, forest wildfires, biochemical release of pollutants from soils and oceans, soil erosion, windstorms, lightning, and plant pollen release, etc. Natural sources are much stronger than artificial ones, but pollutants are usually diluted or widely dispersed over the whole atmosphere, often far from human habitation.

Artificial Sources of Air Pollution

During the last 150–300 years, which have seen agricultural and industrial revolutions, human technology has reached a point where it is disturbing the global balance of the atmosphere. Man has begun to pollute air in a much stronger manner than ever before. Pollution has been caused by an enormous output of harmful substances into the atmosphere, emitted from a variety of stationary or mobile sources. These artificial or man-made sources are usually situated inside human settlements or close to them; for this reason, they are much more threatening to human health than natural sources. The most important sources of pollution are: a) power and heat generation objects (e. g. fossil fuel power stations, domestic combustion appliances, and biomass burning); b) industrial objects (smelteries and foundries) and agricultural activities; c) transportation (motor vehicles with internal combustion); d) waste sites (the burning or spontaneous evaporation of pollutants out of dumps); and e) Other human activities producing gases, vapors or aerosols (fumigation, spraying, etc.).

Ambient or Outdoor Air Pollution

Major pollutants are slightly different throughout the world, depending on the predominance of pollution sources locally. However, the six major types are the organic pollutants carbon monoxide and hydrocarbons, and the inorganic pollutants nitrogen oxides, sulfur dioxide, particulates, and low ozone. ► Smog, a contraction of the words smoke and fog, is a common term used to indicate the presence of a mixture of multi-source pollutants in the air around large human settlements.

Indoor Air Pollution

Indoor space is the interior of each working or residential building in the commercial, public or private sectors, not including industrial working interiors or outdoor space. Indoor spaces are: a) private residences; b) non residential, commercial and public buildings, e. g. offices, libraries, cinemas, indoor market places, restaurants, hospitals, schools and indoor sport arenas, and c) transportation, e. g. the interior of private cars, buses, aircrafts and subways.

The indoor environment is now more significant for health considerations than the outdoor environment. Concerns about potential public health problems due to indoor air pollution are based on epidemiological evidence that urban residents spend approximately 90% of their time indoors. By such activity patterns, they have more exposure to harmful agents that exist indoors. The most important pollutants are nitrogen oxides, volatile organic compounds, formaldehyde, carbon monoxide, ozone, and ► suspended particles. If tobacco smoking is not restricted, a mixture of dangerous pollutants may be detected. Inside many indoor spaces, airborne allergens such as dust mites are present, and sometimes even the radioactive gas radon. Carbon dioxide is a marker of indoor air pollution rather than a specific pollutant.

Adverse Effects of Air Pollution

Enormous and continually increasing rates of outdoor air pollution may have significant consequences on the quality of air, human health and the whole environment. Local, regional and even global environmental effects are well known and scientifically proven. Considering local health effects, increased morbidity and mortality rates are reported among vulnerable population groups in highly polluted areas. Usually registered are: a) upper respiratory tract illnesses; b) lower respiratory tract illnesses (bronchitis, asthma and pneumonia); c) malignant diseases of the respiratory tract; d) ocular mucous membrane illnesses and complaints; and e) decreased resistance to common allergens. Effects on the local climate are also pronounced as climate characteristics change significantly over polluted areas.

Over certain regions of the Earth, air pollution induces ecosystem acidification and acid deposition (► acid rain), with both noticeable adverse environmental consequences (e. g. damage to vegetation), and human health impairments. Air pollution has also led to deterioration of the atmosphere on a global scale. The most important global consequences are ozone layer depletion in the stratosphere (ozone holes), and the greenhouse effect. As a consequence of ozone layer depletion, the amount of harmful short-wave ultraviolet reaching the Earth's surface has been enhanced. The ► greenhouse effect (global warming of the atmosphere) is mainly a result of carbon dioxide and methane being released into the atmosphere due to burning of fossil fuels and farming practices, respectively.

During the last decade of the 20th century, the US Environmental Protection Agency consistently ranked indoor air pollution among the top five risks for health impairments in general population groups. There is mounting evidence that exposure to polluted indoor air is the cause of excessive morbidity and mortality. The main health consequences of indoor air pollution are grouped into a) ► specific building- and home-related illnesses (SBRI), and b) ► chemical sensitivity syndromes.

Cross-References

► Acid Rain
► Chemical Sensitivity Syndromes
► Greenhouse Effect
► House Dust Mites
► Smog
► Specific Building- and Home-Related Illnesses
► Suspended Particles

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Akha

► Indigenous Health, Asian

Alaska Native

► Indigenous Health, North America

Albertus Magnus (1200–1280)

Definition

One of the most accepted Christian preachers during the middle ages. He was granted 'holy' status by Pope Pius XI in 1931 and was recognized as a teacher in church practices.

Alcohol Abuse

► Alcoholism

Alcohol Consumption

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Definition

Different forms of alcohol have different functions: as part of cleaners, fuel, medicine, etc. Worldwide the substance ETHANOL is well known as a component of different alcoholic beverages. These beverages differ not only in taste, look and quantity of alcohol, but also within various populations the forms of usage are very different too. People use alcohol as a luxury, as part of their lifestyle; integrated into daily life, to cope with stressful situations for example. The general level of alcohol consumption of a population depends on socio-cultural factors, availability, production, trade, the distribution network and the regulations concerning sale. Therefore, throughout the world, there is a wide variation between countries and regions in forms and rates of alcohol consumption. For national health planning it is helpful to monitor trends of per capita production of beer, wine and spirits in different regions as well as per capita alcohol consumption of the population in general and in social groups in particular.

At the individual level alcohol consumption can be distinguished in three general forms: moderate drinking, heavy drinking and excessive drinking that is linked with dependence on alcohol. These different forms of alcohol consumption are integrated into individual daily lives, and misuse is connected with alcohol related problems. The terms "alcohol-related problems" and "alcohol problems" refer to the damaging consequences of alcohol consumption and the various adverse effects not only on the individual drinker but also on the family and society at large.

Trends in Rates of Alcohol Consumption

There have been considerable increases in average rates per capita alcohol consumption in recent years. Certain countries show a high rate of increase in per capita consumption of each category of alcoholic beverage. In considering the changing trends of consumption within a given population it is necessary to take account of changing demographic structures (► data collecting). For instance, in many developed countries the population is aging and the average consumption level is much lower than in developing countries with a younger population, and, whereas most females may not drink, the average consumption level of adult males may be four times that of the total population.

Although in alcohol-producing areas the dominant type of alcoholic beverage consumed is the type produced in that area and accounts for most of the increase in consumption, the use of additional beverage types also contributes significantly to the increase. In countries with traditional wine drinking, for instance, there has been a marked increase in consumption of beer and spirits, whereas in countries where beer was the preferred drink, the consumption of wine and spirit has become more general.

Socio-Cultural Factors

Socio-cultural factors are involved in both the causes and the consequences of moderate and heavy drinking. Such factors also determine whether or not the consequences of drinking are labeled as problems (► cultural beliefs). Among the factors that have been studied are the cultural beliefs about the value and symbolic functions of alcohol and the consequences of drinking, drinking contexts (such as use in rituals, functions, public and family occasions) and use of alcohol by different social and occupational groups.

Possible alcohol culture effects are:

- drinking is integrated into the community, not a banished or discredited conduct;
- drinking is an act of common life and not a private behavior;
- drinking is part of given rituals;
- drinking rules are made with common sense;
- drinking rules have a strong authority derived from common knowledge and shared experiences;
- drinking rules give rhythm (quality, quantity, frequency) and good order;
- drinking is not allowed everywhere and every time – given a place and special time, so it has a start and an end.
- drinking rules keep drinking in a frame and give orientation;
- drinking rules take no responsibility away but demand it from everyone.

That is why in any population where alcohol is socially acceptable there is a far higher percentage of moderate drinkers than of heavy drinkers.

When a positive alcohol culture prevails, alcohol consumption can be a beneficial experience within a supportive and protective environment; physical and mental health problems are minimized. With changing

socio-cultural conditions, resulting partly from the impact of opposing cultures, many forms of socio-cultural control seem to be breaking down: alternative customs are being followed, the limits of acceptable behavior and drinking are no longer clear and rapid increases in alcohol consumption are occurring in some population groups.

Socio-Demographic Groups

To understand the effects of alcohol consumption within a given population, consideration has to be given to specific socio-cultural situations and variations between population groups and the way social control is maintained and strengthened. The relaxation of cultural controls and emancipation of certain socio-demographic groups probably account in part for the increasing number of young people and women taking up drinking and often running the risk of suffering from the adverse effects of alcohol consumption and of causing alcohol problems.

To understand the dominant patterns of drinking, for instance in women and young people, it is necessary to have a look at the specific functions that alcohol consumption has in each of these socio-demographic groups. Drinking patterns in youth groups are not comparable with the drinking patterns in groups of adults, and the risks and alcohol-related problems are not the same.

Developmental factors affecting alcoholic consumption in youths:

- Special motives to start: come together, have fun together, feelings of social get-together.
- Special functions of drinking: access to peer-groups, bonding rituals, mimicking adult behavior, feeling male, feeling strong.
- The effects of strong drinking: often there is a standstill in developmental progress.

It is known that alcohol problems disappear as development progresses, so strong drinking is normally quit by the time youngsters grow to adulthood. Finally addiction seldom starts early in youth; that means help and support for young drinkers is more educational than therapeutic.

Alcohol Related Problems

Alcohol problems affect the health and development of individuals and nations and have political, economic and social implications. Alcohol problems may be the consequence of either acute episodes of heavy drinking or of prolonged drinking (▶ drug abuse). The development of alcohol problems can be viewed in the perspective of the public health model as complex interaction between the agent (ethanol), the host (drinker) and the environment (physical, mental and socio-cultural setting, the family and the general community).

Consequences of Acute Episodes of Heavy Drinking

- Short-term impairment of functioning and control, with aggressiveness and accident proneness
- Exposure to climatic conditions and physical disorders
- Arrest for drunkenness
- Alcohol poisoning

Consequences of Prolonged Heavy Drinking

- Increase risk of certain disorders, including liver cirrhosis, certain cancers, cardiovascular diseases and brain atrophy
- Aggravation of other physical disorders, e. g. malnutrition
- Prolonged impairment of functioning and control with increased proneness to accidents and impairment of working capacity
- Alcohol dependence syndrome
- Alcoholic psychosis
- Premature death
- Suicide

Possible Concomitants

Loss of friends, of family, of self-esteem, job, means of support and liberty.

Evidence is accumulating that a number of pathological conditions may however be related to the consumption of a small amount of alcohol, and may cause a much greater burden on the community than resulting from the alcohol dependence syndrome (costs of illness – utilities).

Preventing and Managing Alcohol Related Problems

If health is to be looked upon as an integral part of economic and social development measures to solve alcohol problems must be part of general health programs

and must be planned with the primary care approach in mind; responding to alcohol problems must be a joint responsibility of people and government.

Prevention

- Reducing the availability of alcohol beverages (control of distribution, price regulation)
- Reducing the demand for alcohol (information and education on alcohol and alcohol problems, inform about the upper "safe" level of daily consumption. Restrictions on advertising, moral and religious forces)
- Additional preventive measures (control measures focus on limiting the amounts of alcohol available to the drinker, educational measures concentrate on building up the host's resistance and reducing demand for alcohol, measures might be developed from consideration of links between the putative drinker and his environment).

Treatment

- Treatment and management of persons identified as being "alcoholics" and "heavy drinkers"
- Family support
- Management in occupational settings (initiated discussions with key personnel in a range of occupational settings to identify and reduce alcohol problems)
- Programs related to traffic safety (legislation regarding drinking and driving, high-risk drivers).

Alcohol Policies in a Health Context

A policy statement concerning alcohol availability and problems may be seen as an essential contribution to the formulation of national health policies, strategies and plans of action. It may be valuable to formulate at a high level the principles that should underlie the action to be taken and to establish priorities and strategies. The following have to be considered:

- Value of policy statement
- Focus on substance abuse or on alcohol problems
- Participation in policy development (range of participants, community involvement, coordinating bodies)
- Constraints on policy formulation and implementation
- Information needed for policy formulation
- Preparation to implement a national policy.

Cross-References

► Cultural Beliefs
► Data Collecting
► Drug Abuse

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Alcohol Dependency

► Alcoholism

Alcohol Induced Delirium

► Delirium Tremens

Alcoholism

Synonyms

Alcohol abuse; Alcohol dependency

Definition

Alcohol abuse and dependency are commonly called alcoholism. Alcohol intoxication can cause irritability, violent behavior, feelings of depression, and in rare instances hallucinations and delusions. Longer-term, escalating levels of alcohol consumption can produce tolerance as well as such intense adaptation of the body that cessation of use can precipitate a withdrawal syndrome usually marked by insomnia, evidence of hyperactivity of the autonomic nervous system, and feelings of anxiety.

Alexithymia

Synonyms

Emotional inarticulateness

Definition

This is a word that is frequently used in counseling and psychotherapeutic circles to denote the supposed inability of men to experience and/or express affect adequately. It literally means to be without words for desire. It is often used in an adjectival sense as in the assertion that men tend to be *alexithymic* in comparison to women. This usage seems to focus on an enduring state of a man or a trait of men rather than used to describe a particular response to a specific situation or circumstance. What might be more accurate is to stay that men, like women, can be at a loss for words at certain times and places. For most men, a tendency towards *alexithymia* might be more an indication of the lack of perceived safety than an accurate denotation of facility with language and self-awareness. Its use should be limited to those cases which actually warrant the use of the word in terms of individual diagnosis after observing the person in a wide rage of settings.

Allele

Synonyms

Allelomorph

Definition

Diploid organisms like humans carry two copies of each autosomal chromosome (paired homologous chromosomes) and thus, also two copies of every autosomal gene. One of the paired chromosomes (one of the two copies of a gene) of an individual is transmitted by the father, the other by the mother. The sequence (order of base pairs) of the two copies of a gene does not have to be completely identical due to normal variation (► polymorphisms) or ► mutations. Alleles are the different (alternative, non-identical) forms of a gene or DNA sequence at a specific genomic/chromosomal position (locus). An individual can only possess two alleles at each specific position on a pair of homologous chromosomes, but a group or population may contain a lot of different alleles at a certain locus.

Allelomorph

► Allele

Alliance

Synonyms

Partnership; Cooperation

Definition

An alliance for health promotion is a partnership between two or more parties that pursue a set of agreed upon goals in health promotion.

Allopathic Medicine

► Western Medicine

Alpha Error

Synonyms

Type I error

Definition

An alpha error is an error that results if a true null hypothesis is rejected or if a difference is concluded when no difference exists between comparison groups. In most research, it is desirable that the probability of making such an error is lower than 5%.

Cross-References

► Type I Error

Altayans

► Indigenous Health, Asian

Alternative Hypothesis

Synonyms

Research hypothesis

Definition

The Alternative Hypothesis represents a statistical statement indicating the presence of an effect or a difference. It is the opposite of the null hypothesis. Since the statement of the research typically predicts an effect or difference, the researcher generally expects the alternative hypothesis to be supported based on rejection of the null hypothesis. It is represented by the notation H_A.

Alternative Medicine

Synonyms

Traditional medicine; Holistic medicine

Definition

Alternative medicine encompasses techniques of treatment and prevention of disease that are regarded by modern, Western medicine as scientifically unproven or unorthodox. Alternative medicine includes different therapies such as chiropractic, homeopathy, acupuncture, herbal medicine, massage therapy, aromatherapy, naturopathy and many others. Although many alternative therapies have been successfully used for a long time in the treatment of disease, the scientifically oriented modern medical establishment is often strongly opposed to the use of alternative medicine.

Cross-References

► Complementary Medicine
► Holistic Medicine
► Traditional Medicine

Altitude Sickness

Synonyms

Mountain sickness; Altitude illness

Definition

Altitude sickness is a medical condition caused by acute exposure to high altitudes. It usually occurs at altitudes of 2500–3000 m with the following symptoms: headaches, nausea, vomiting, fatigue, dizziness, insomnia, excitability, breathing difficulties, regurgitation, and peripheral edema (swelling of hands, feet, and face). Acute mountain sickness can progress to pulmonary edema or cerebral edema with high lethality. Altitude acclimatization is the prevention of altitude sickness; it is the process of adjusting to decreasing oxygen levels at higher elevations. In addition, acetazolamide and drinking large amounts of water are suggested. Injections of steroids are used in cases of pulmonary edema, and inflatable pressure vessels are used to relieve and evacuate severe mountain-sick persons.

Alveolar Bone

► Alveolar Process

Alveolar Process

Definition

The alveolar process is the thickened ridge of the jawbones that contains the teeth and the tooth sockets (alveoles) in which the ► roots of each tooth are held. The bone forming the alveoles is called alveolar bone.

Ambulant or Inpatient Service

► Secondary Care

Ambulatory Care

► Outpatient Care

Ambulatory Health Care

► Outpatient Health Care

Ambulatory Surgery

Synonyms

Outpatient surgery

Definition

Ambulatory surgery is surgery that does not require an overnight stay in a hospital and is therefore performed in an outpatient setting such as a physician's office or an ambulatory surgical center. Ambulatory surgery has become more popular in recent years for ► cost containment reasons, especially in the case of minor surgical procedures that where formerly performed in more costly hospital settings.

Amebiasis

Synonyms

Amebic dysentery; Infection with Entamoeba histolytica

Definition

Although *Entamoeba histolytica* is an intestinal parasite, which can be found worldwide, infections primarily occur in tropical regions. Contagious cysts are shed in the stool. After ingestion of fecally contaminated material – in most cases foodstuff – cysts develop into trophozoites in the bowel. Frequently, the infection is asymptomatic; in some cases symptoms like flatulence or mild diarrhea occur. When there is great number of amoeba, more serious symptoms can appear, like bloody diarrhea, abdominal cramps, fever and headache. In severe cases there might be a perforation of the intestinal wall and peritonitis. If the parasites reach the liver via the portal vein they can cause an abscess. This abscess can burst into the abdominal cavity, the chest cavity or the pericardial sack. *Entamoeba histolytica* can be detected in the stool. Treatment consists of metronidazole, tinidazole or diloxanide furoate administration; in intestinal perforation dihydroemetin is additionally administered. The most important means of prophylaxis of amebiasis is compliance with hygienic rules.

Cross-References

► Amebic Dysentery

Amebic Dysentery

Synonyms

Infection with Entamoeba hystolyticum; Amebiasis

Cross-References

► Zoonotic and Parasitic Infections

American Indian

► Indigenous Health, North America

American Trypanosomiasis

Synonyms

Chagas disease

Definition

Chagas' disease is tropical parasitic disease typical for South and Central America caused by the parasite Trypanosoma cruzi. It usually affects children and young adults and is transmitted by the feces of infected insects, typically the assassin bug. Most of those infected have mild symptoms, such as fever and swelling and redness around the eyes, but from 10% to 30% develop chronic disease that may result in serious or fatal inflammation of the brain and heart tissues. There is no vaccine and no satisfactory treatment for chronic cases.

Cross-References

► Chagas Disease

Aminoglycoside Antibiotics

Synonyms

Aminoglycosides

Definition

Aminoglycoside antibiotics are bacteriostatic, that means they impede the bacteria's growth. This is achieved by a change in the permeability of the bacterial cell wall or disturbances of metabolism. The highest efficacy is seen for gram-negative germs. In comparison with other antibiotics, aminoglycosides have only a narrow therapeutic range. Overdose may result in damage to hearing, the organ of equilibrium or the kidneys (oto- and nephrotoxic side effects). Nevertheless, especially in a severe septic course of a disease, aminoglycosides are indispensable antibiotic therapy. Apart from local application as salves or drops (which can, for example be used for infections of the eyes), aminoglycosides can only be given parenterally.

Amnesic Syndrome

Definition

A syndrome associated with chronic prominent impairment of recent and remote memory. Immediate recall is usually preserved and recent memory is characteristically more disturbed than remote memory. Disturbances of time sense and ordering of events are usually evident, as are difficulties in learning new material. Confabulation may be marked but is not invariably present. Other cognitive functions are usually relatively well preserved and amnesic defects are out of proportion to other disturbances.

Cross-References

► Substance Induced Disorders

ANAES

Definition

The Agence Nationale d' Accréditation et d' Evaluation en Santé HAS (ANAES) is the French healthcare accreditation and assessment agency, with comparable responsibilities to the ► AHRQ in the USA.

Analgesics

Synonyms

Pain medications; painkillers

Definition

Analgesics is a term which describes different classes of substances that reduce pain. They can be distinguished into ► opiods and non-narcotic analgesics (e. g. aspirin, diclofenac). Some non-narcotic analgesics contain more than one active ingredient and some are combined with caffeine or codeine.

Cross-References

► Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Analysis of Categorical Data

► Analysis of Frequencies

Analysis of Frequencies

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Synonyms

Analysis of categorical data; Categorical data analysis

Definition

Analysis of frequencies is applied on data obtained from individuals categorized into mutually exclusive categories according to one or more variable.

Basic Characteristics

Analysis of frequencies is applied in analysis of data originating from qualitative variables and in analysis of data originating from quantitative variables when such data are converted into grouped data. In the analysis of frequencies, several different procedures are applied depending on the aim of the study. ► Goodness-of–fit tests are applied when the aim is comparison of

sample frequencies against expected frequencies that are based on theory or previous research. ▶ Tests of homogeneity are applied when the aim is comparison of frequencies from different samples. ▶ Tests of independence are applied when the aim is to test association between two variables based on data given in the form of frequencies. A ▶ chi-square test is usually used for testing hypotheses in these situations. This test is used to evaluate the significance of differences between observed and expected frequencies. The formula for the chi-square test statistic is:

$$\chi^2 = \sum \frac{(O-E)^2}{E},$$

where O is the observed frequency and E is the expected frequency. Expected frequencies equate to a null hypothesis, by which we assume that the observed frequencies do not deviate significantly from the expected ones (Altman 1990). The value of the test statistic will follow the chi-square distribution with a specified number of degrees of freedom, and the null hypothesis is rejected when the chi-square statistic is equal to or higher than the critical value for the specified number of degrees of freedom and level of significance (usually 0.05 or 0.01).

Goodness of Fit Tests

The significance of differences between the frequencies of particular categories occurring in a sample and the expected frequencies can be assessed with the use of the chi-square ▶ goodness-of-fit test (McKillup 2006). In this test, expected frequencies are assessed based on previous research, theory, or the assumed statistical model of distribution of the observed variable. Data is presented in the form of a simple table (distribution by one variable). The number of degrees of freedom is $r-1$, where r is the number of categories or class intervals.

Assumptions for the application of the chi-square goodness-of-fit test are (Cochran 1952; Siegel 1956):

1. If the test includes only two categories ($r-2r=2$) of the variable under consideration, each expected frequency should be no less than 5;
2. For $r>2$, there should be no more than 20% of the expected frequencies that are less than 5; otherwise, neighboring categories should be merged.

Analysis of Frequencies, Table 1 Blood groups: chi-square goodness-of-fit test between observed frequencies and expected frequencies

Blood group	Observed frequencies (O)	Expected frequencies (E)	$\frac{(O-E)^2}{E}$
O	55	62.3	0.855
A	59	54.5	0.378
B	19	16.9	0.251
AB	7	6.3	0.078
Total	140	140.0	$\chi^2 = 1.562$

Example 1:

The aim of the study was to compare current and previous data on blood group frequency. Current data were obtained from a sample of 140 persons. Previous studies have shown that the relative frequencies of blood groups are as follows: group O – 44.5%, group A – 38.9%, group B – 12.1%, group AB – 4.5%. By multiplying these percentages (expressed as proportions) with sample sizes in the actual study, expected frequencies (E) were obtained. Thus, for example, the expected frequency of blood group A was 0.389 × 140 = 54.5. Observed and expected frequencies are presented in Table 1. The significance of differences between these frequencies was tested with the chi-square goodness-of-fit test. The number of degrees of freedom used was $r-1=4-1=3$.

The chi-square statistic was less than the critical value ($\chi_0^2 = 1.56 < \chi^3_{0.05,3} = 7.82$), *so it was concluded that blood group frequencies in the study described did not show any statistically significant difference from the expected.*

The chi-square goodness-of-fit test is also applied to check whether a certain mathematical model is suitable for studying a phenomenon. In this context, observed frequencies are compared with the frequencies expected based on an assumed model, such as normal, binomial, or Poisson distribution. The number of degrees of freedom is calculated as r–1, where r is the number of group or class intervals. If parameters of the statistical model are not known (e. g. arithmetic mean or parameters of binomial and Poisson distribution), but have to be assessed based on sample data, the number of degrees of freedom is reduced by the number of parameters assessed in that way. The null hypothesis states that the assumed model "fits" the data. If the val-

ue of the chi-square statistic is higher than the critical level, the null hypothesis is rejected and the alternative accepted, stating that the assumed model does not "fit" the data, and therefore it is not suitable for studying the phenomenon. Alternatives to the chi-square goodness-of-fit test are the ► Kolmogorov-Smirnov test or Lilliefors normality test.

Contingency Table Analysis

The significance of a difference between the observed and the expected frequencies, presented in the form of ► contingency table, can be assessed with the use of the chi-square ► test of homogeneity and the chi-square ► test of independence (LeBlanc 2004). The manner of calculation for these two tests in ► contingency table analysis is the same, the only difference being the concept and manner of sampling. Depending on the number of categories of tested variables, a contingency table can have different numbers of rows and columns. The smallest contingency table is 2×2, when the tested variables are dichotomous, that is, with only two categories each (e. g. yes-presence or no-absence of some characteristics). The frequencies need to be put into the table format given in Table 2:

The expected frequency for the given cell in the contingency table is calculated according to the formula:

$$\text{expected value of a cell} = (\text{row total}) \times (\text{column total})/(\text{table total}) .$$

The number of degrees of freedom is calculated as $df = (r-1)(c-1)$, where r is the number of rows in the contingency table (number of categories of the first variable), and c is the number of columns in the contingency table (number of categories of the second variable).

In the chi-square test of homogeneity, two or more samples are selected from the population according to one classification criterion. If the classification is dichotomous, there will be only two samples. Sample sizes, which are marginal frequencies under the classification criterion according to which the groups are formed, are controlled by the researcher. The null hypothesis states that populations are homogeneous regarding the proportions of categories of the second variable, or second classification criterion. If the null hypothesis is rejected, it is concluded that the above proportions are different in the observed populations.

Example 2:

In a prospective cohort study, there were two samples. The first group comprised 50 subjects from the smoking population, and the second group comprised 60 subjects from the non-smoking population. The incidence of acute respiratory infection during the three winter months was monitored. The null hypothesis stated that the populations of smokers and non-smokers are homogeneous regarding the proportion of persons suffering acute respiratory infections in winter. The results are shown in Table 3.

The percentage of persons who suffered from acute respiratory infection was 52% and 28%, in the groups of smokers and non-smokers, respectively. The chi-square statistic based on the data in Table 3 was 6.42. Since this value was higher than the critical value ($\chi^2_0 = 6.42 > \chi^3_{0.05,1} = 3.84$), the null hypothesis was rejected, and it was concluded that the proportion of persons suffering from acute respiratory infections during the winter period is larger in the smoking population.

The chi-square test of independence is used to test the independence of two variables i. e. to assess the significance of their association (hence the name, chi-square test of association). In this situation, the researcher has control over the total sample size, while marginal frequencies are random quantities. For all units of the random sample, categories of both variables are registered and frequencies are presented in a contingency table. Testing the independence of variables serves to assess if

Analysis of Frequencies, Table 2 General contingency table format

		Variable 2		
		Yes	No	Total
Variable 1	Yes	a	b	a+b
	No	c	d	c+d
	Total	a+c	b+d	a+b+c+d

a, b, c, d – observed frequencies

Analysis of Frequencies, Table 3 Smoking status and acute respiratory tract infection in prospective cohort study

		Acute respiratory tract infection		
		Yes	No	Total
Smoking	Yes	26	24	50
	No	17	43	60
	Total	43	67	110

Analysis of Frequencies, Table 4 Smoking status and acute respiratory tract infection in cross-sectional survey

		Acute respiratory tract infection		
		Yes	No	Total
Smoking	Yes	22	17	39
	No	16	35	51
	Total	38	52	90

the distribution of one variable is conditionally dependent on the distribution of the second variable. The null hypothesis states that the variables are independent. If the null hypothesis is rejected, it is concluded that the variables are dependent, i. e. that there is association between them.

Example 3:

In a cross-sectional study, a sample was formed of 90 subjects from the general population. Information on smoking status was obtained for every subject (smoker or non-smoker), as well as data on whether the subjects had suffered from acute respiratory infection during the previous winter. The null hypothesis stated that smoking status and suffering acute respiratory infection are independent variables, i. e. that there is no association between them. The results are shown in Table 4.
The chi-square statistic based on the data in Table 4 is 5.68. Since this value is higher than the critical value ($\chi_0^2 = 5.68 > \chi^3_{0.05,1} = 3.84$)*, the null hypothesis was rejected and it was concluded that smoking status and suffering from acute respiratory infection are dependent variables, i. e. that there is association between them.*

Same variables are analyzed in both ways, e. g. in both the second and third example – smoking status and suffering from acute respiratory infection – but with different aims and designs of studies. In the third example, the researcher only controlled total sample size, and did not have control over the selection of two samples from the two populations. It was therefore impossible to test the homogeneity of the populations, but it was possible to test the dependence of the two variables.
In 2×2 contingency tables, assumptions for applying the ► chi-square test are as follows (Cochran 1954; Siegel 1956):

1. When the total frequency in the contingency table is more than 40, the chi-square test can be applied if all the expected frequencies are ≥ 1.
2. When the total frequency in the contingency table is between 20 and 40, the chi-square test can be applied if all the expected frequencies are ≥ 5.
3. When the total frequency in the contingency table is less than 20, the test cannot be applied.

If these assumptions are not met, ► Fisher's exact test can be applied.
In contingency tables larger than 2×2, assumptions for applying the chi-square test are as follows (Cochran 1954; Siegel 1956):

1. None of the expected frequencies should be < 1.
2. No more than 20% of cells should have an expected frequency < 5.

If the above assumptions are not met, neighboring categories should be merged, thus reducing the number of rows or columns. Merging of neighboring categories can continue to the dimensions of the smallest table, which is 2×2.

Measures of Association in Contingency Tables

When the null hypothesis of independence of two variables is rejected, it is useful to have a measure of the strength of this dependence (association). Several measures of association can be calculated for data in contingency tables. Some of these coefficients and the manner of calculating them (Indrayan and Sarmukaddam 2000), using the example of the data in Table 4, are:

- Phi (φ) coefficient:

$$\phi = \sqrt{\frac{\chi^2}{N}} = \sqrt{\frac{5.68}{90}} = 0.25$$

- Contingency coefficient:

$$C = \sqrt{\frac{\chi^2/N}{1+\chi^2/N}} = \sqrt{\frac{5.68/90}{1+5.68/90}} = 0.24$$

  The contingency coefficient is not a good parallel with the correlation coefficient since its value never reaches 1 and depends on table dimensions.

- Cramer's V:

$$V = \sqrt{\frac{\chi^2/N}{\text{minimum}\,(r-1, c-1)}} = \sqrt{\frac{5.68/90}{1}} = 0.25$$

- Odds ratio:

$$\text{OR} = \frac{a \cdot d}{b \cdot c} = \frac{22 \cdot 35}{17 \cdot 16} = 2.83$$

Analysis of Frequencies from Paired Samples

When data originates from ▶ paired groups (matched samples or dependent samples), appropriate tests are McNemar's test (for two paired groups) and Cochran's Q test (for more than two paired groups).

Analysis of Relationship between Exposure to Risk Factor and Occurrence of Risk Event

In epidemiological studies, the result is often frequency of exposure to the ▶ risk factor or occurrence of the risk event (e. g. disease, injury, or death). Risk is defined as the proportion of the population at risk that was affected by the risk event during the observation. Relative risk is the ratio of risk of the group that is exposed to the risk factor and risk of the group that is not exposed. In cohort studies, risk and relative risk can be estimated directly (Katz 1997; Timmreck 2002). In Example 2, the cohort study, exposure to smoking as a risk factor was observed, and the occurrence of acute respiratory infection was a risk event. The risk of suffering from acute respiratory infection in the group that was exposed to smoking and the risk in the group that was not exposed was as follows:

$$\text{Risk}_{\text{exposed}} = a/(a+b) = 26/(26+24) = 0.52$$

$$\text{Risk}_{\text{unexposed}} = c/(c+d) = 17/(17+43) = 0.28$$

The **risk difference** (attributable risk) was:

$$\text{AR} = \text{Risk}_{\text{exposed}} - \text{Risk}_{\text{unexposed}} = 0.52 - 0.28 = 0.24$$

The **relative risk** (risk ratio) was:

$$\text{RR} = \text{Risk}_{\text{exposed}}/\text{Risk}_{\text{unexposed}} = 0.52/0.28 = 1.8$$

The risk of suffering from acute respiratory infection during the winter months is therefore 1.8 times higher in the group of smokers compared with the group of non-smokers.

The **attributable risk percent in the exposed** was:

$$\text{AR\%}_{\text{exposed}} = [(\text{Risk}_{\text{exposed}} - \text{Risk}_{\text{unexposed}})/\text{Risk}_{\text{exposed}}] = [(0.52 - 0.28)/0.52] = 0.46$$

In **case-control studies** and **cross-sectional studies**, it is not possible to calculate the relative risk directly, but it is possible to calculate the odds-ratio, which can be taken as an estimate of relative risk (Schechtman 2002).

Analysis of Frequencies, Table 5 Acute respiratory tract infection and smoking status in retrospective case-control study

		Smoking		
		Yes	No	Total
Acute respiratory tract infection	Yes	41	29	70
	No	30	50	80
	Total	71	79	150

Example 4:

In a retrospective case-control study, there were two samples of subjects, divided based on whether they had an acute respiratory infection in the previous three winter months. The first group consisted of 70 subjects who had an acute respiratory infection in the previous three winter months, and the other group consisted of 80 subjects who did not have an acute respiratory infection in the same period. Information regarding smoking status was then obtained from the subjects. The null hypothesis stated that populations of persons who had and those who did not have acute respiratory infections are homogeneous with regard to the proportion of smokers. The results are presented in Table 5.

The percent of smokers was 59% and 38% in the groups of people who had and who did not have acute respiratory infections, respectively. This difference was statistically significant ($\chi_0^2 = 6.65 > \chi^3_{0.05,1} = 3.84$). *The odds-ratio was* $\text{OR} = \frac{41 \cdot 50}{29 \cdot 30} = 2.36$ *(95% CI 1.22–4.54). The conclusion was that there is a significant statistical association between smoking and contracting acute respiratory infections during the winter months.*

Cross-References

- ▶ Chi-Square Test
- ▶ Contingency Tables Analysis
- ▶ Fisher's Exact Test
- ▶ Goodness of Fit Test
- ▶ Kolmogorov-Smirnov Test
- ▶ Paired Groups Design
- ▶ Risk
- ▶ Test of Homogeneity, Chi-Square
- ▶ Test of Independence, Chi-Square

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Analysis of Variance

► ANOVA

Analytical Studies

► Observational Studies

Analytic Method

► Observational Studies

Anangu (Northern South Australia)

► Indigenous Health – Australooceaninan

ANCOVA

Synonyms

Covariance models

Definition

Models containing some quantitative and some qualitative explanatory variables, where the chief explanatory variables of interest are qualitative and the quantitative variables are introduced primarily to reduce the variance of the error terms. Analysis of covariance – ANCOVA – combines features of ANOVA and regression. It augments the ANOVA model containing the factor effects with one or more additional quantitative variables that are related to the response variable. The intention is to make the analysis more precise by reducing the variance of the error terms.

Ancylostomiasis

Synonyms

Infection with Ancylostoma Duodenale

Andamanese (India)

► Indigenous Health, Asian

Anemia

Synonyms

Deficiency of erythrocytes

Definition

Deficiency of erythrocytes refers to a reduction of red blood cells (erythrocytes) and/or dysfunction or decreased concentration of hemoglobin (the oxygen-carrying protein in the red blood cells) and/or decreased hematocrit (packed cell volume; volume percentage of red blood cells in the blood) resulting in reduced vitality. Causes of anemia may be in the production of red blood cells (hematopoiesis), the function of the cells, or an excessive destruction of red blood cells (hemolysis). Chronic and severe bleeding, pregnancy, infections, cancer and malnutrition may induce anemia. Signs and symptoms of anemia may be shock, fatigue, reduced vitality, dyspnea, tachycardia and angina pectoris.

Anesthesiology

Definition

Anesthesiology is the field of medicine specialized in the application of drugs and other agents that cause

insensibility to pain. It involves preoperative evaluation, intraoperative and postoperative care and supervision, and the management of the systems and personnel that are required to support the different activities. The subspecialties within anesthesiology include cardiothoracic anesthesiology, critical care, neuroanesthesia, obstetrical anesthesiology, pain management, pediatric anesthesiology, and ambulatory anesthesia.

Anitiviral Drugs

► Virustatics

Anopheles Mosquito

Synonyms

Malaria transmitting mosquito

Definition

There are about 400 species of the *Anopheles* mosquito, 60 of which transmit malaria. An infection is only caused by the females of the species as they feed on blood; males only sip nectar and fruit juice. *Anopheles* mosquitoes are primarily found in tropical and subtropical regions, where they live and breed near stagnant water. Mosquitoes cannot exist above an altitude of 2000–2500m. They are predominantly night-active and – most frequently – bite indoors between sundown and sunrise. To spread malaria, two blood meals within a specific timescale are necessary. On the first bite of an infected source, the mosquito takes up the plasmodia in the blood, which then develop inside the insect. With the second blood meal, plasmodia are transmitted to the human host.

Anorexia

► Eating Disorders

Anorexia nervosa

Definition

Persons suffering from anorexia nervosa show self-inflicted, substantial weight loss and retention of weight that is too low for their age (BMI $< 17.5\,kg/m^2$ in adults), or insufficient weight gain, accompanied by the conviction that one is overweight despite being underweight. Anorexia nervosa occurs most often at the age of 14.

Cross-References

► Eating Disorders

ANOVA

Synonyms

Analysis of variance

Definition

A test for significant differences between multiple means, achieved by comparing variances. It concerns a normally distributed response (outcome) variable and a single categorical explanatory (predictor) variable, which represents treatments or groups. The term analysis of variance refers not to the model but to the method of determining which effects are statistically significant. Major assumptions of ANOVA are the homogeneity of variances (it is assumed that the variances in the different groups of the design are similar) and normal distribution of the data within each treatment group.

Antagonism

Definition

Antagonism represents the situation in which the combined effect of two or more factors is smaller than predicted by the causal model being used. Antagonism is opposite of synergism.

Anterior Horn Cell Disease

► Motor Neuron Diseases

Anthelminthic Drugs

► Anthelminthic Therapy

Anthelminthic Therapy

Synonyms

Anthelminthic drugs; Medicinal treatment of worm infections; Therapeutics against worm infections

Cross-References

► Therapy of Infectious Diseases

Anthrax Infection

Synonyms

Infection with *Bacillus anthracis*

Definition

Anthrax is an infection with the spore- and toxin-building *Bacillus anthracis*. The disease primarily occurs in wild and domestic ruminants and is most frequent in warm countries. Anthrax can be transmitted to humans by direct contact with infected animals, breathing in of spores or ingestion of contaminated animal products. Incubation period ranges between a few hours and a couple of days. Without therapy or if treatment is induced too late, the course can be lethal within 2–3 days. Depending on the place of entrance, infection leads to skin anthrax, lung anthrax or gastrointestinal anthrax. Purulent vesicles develop on the skin and bloody swellings (hemorrhagic edema) are found in the inner organs. Surgical intervention is not allowed in cases of skin anthrax as the risk of spreading the toxins and causing sepsis increases. Lethality is assumed to be 5–20% in skin anthrax, 25–60% in gastrointestinal anthrax and > 90% in lung anthrax. Therapy should be carried through with gyrase inhibitors (ciprofloxacin); alternatives are penicillin G, tetracyclin, erythromycin and chloramphenicol. *Bacillus anthracis* has been used in biological warfare, for example, in 2001, letters were sent in the United States, which contained a powder contaminated with *Bacillus anthracis*. People who opened the letters were put at risk of breathing in the spores, being infected and dying of lung anthrax.

Antibiotic-Resistant Bacteria

Definition

Antimicrobial resistance (insensitivity) is the ability of a microorganism to prevent an antimicrobial (e. g., antibiotic) from working against it. Resistance to particular antibiotics can develop naturally. The use of an antibiotic for any infection, in any dose and over any time period forces bacteria to either adapt or die in a phenomenon known as “selective pressure”. The microbes that adapt and survive carry genes for resistance that can be transferred between individuals. When an antibiotic is given, it kills the sensitive bacteria but any resistant bacteria can survive and multiply. Microorganisms that are not killed or inhibited by an antibiotic are called “antibiotic resistant”. If a bacterium carries several resistance genes, it is called multiresistant.

Antibodies

Synonyms

Immune globulins; Immunoglobulins

Definition

Antibodies or immune globulins are proteins which react specifically against substances foreign to the organism. Their structure was described first in 1959 by G. Edelmann and R. Porter. From all immune globulins the types IgG, IgM, IgD, IgA and IgE can be differentiated. While IgD and IgE do not play a role in the defence of infectious diseases, IgA has an important function concerning non-specific defence mechanisms, particularly in viral infections. The immune globulins of the types G and M interact specifically with the different pathogens. As IgM is responsible for the primary immune response, it is the first immune globulin detected in the blood after contact with a pathogen. IgG is produced a little later. This type of immune globulin, which reacts very specifically against the antigen, becomes part of the immune memory. If there is a new contact with the same pathogen defence mechanisms are quickly available. In contrast to IgM antibodies, antibodies of the IgG type can pass through the placenta and thus protect the unborn baby in the womb from

a number of infectious diseases (see also ► nest protection).

Cross-References

► Immunization, Passive

Antibodies Transferred During Pregnancy

► Nest Protection

Antifungal Therapeutics

► Antimycotics

Antifungal Therapy

► Antimycotics

Anti-HIV Medications

► Fusion Inhibitors
► Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)
► Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)
► Protease-Inhibitors (PI)

Antimycotic Drugs

► Antimycotics

Antimycotics

Synonyms

Drugs against mycoses; Drugs against fungal infections; Antimycotic therapy; Antimycotic therapeutics; Antifungal therapy; Antifungal therapeutics

Definition

Antimycotics are used to treat fungal infections of the skin and the mucous membranes and systemic mycoses. Several groups of substances with different effects are available. The polyen-antimycotics amphotericin B and nystatin are effective against dermatophytes and yeasts by influencing the synthesis of the fungal cell membrane. Substances, which belong to the group of azole antimycotics, are clotrimazole (against yeasts and cryptococcosis), ketoconazole (for local and systemic mycoses) as well as miconazole and fluconazole (both against yeasts and dermatophytes). Azole antimycotics influence different parts of the fungal metabolism. Flucytosine, which also interferes with metabolic processes of the fungus, is used parenterally in systemic yeast infections (candidiasis) and cryptococcosis.

Antimycotic Therapy

► Antimycotics

Antinoise

► Active Noise Control

Antioxidants

Definition

There are natural antioxidants like vitamin C, vitamin E, carotinoids and artificial citrates. They are used in food, pharmaceuticals and in synthetic materials to avoid the oxidation (reaction with aerial oxygen or other oxidize chemicals) of sensitive molecules. Mostly they act as scavengers. Because natural antioxidants delay or advert the growth and development of many cells they possibly block the development of cancer. A lot of antioxidants which decrease the hazards of cancer are found in fruit and vegetables. And they also make aggressive oxygen particles harmless. It is supposed that a high intake of fresh fruit and vegetables has a protective effect against the development e. g. of cancer.

Antipyretics

► Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Antiretroviral Medications

► Fusion Inhibitors
► Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)
► Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)
► Protease-Inhibitors (PI)

Antisepsis

► Antiseptic

Antiseptic

Synonyms

Antisepsis; Disinfectant; Disinfection of surfaces

Definition

Word-for-word translated from Greek an antiseptic is a substance used against putrefaction. Disinfectants reduce the amount of germs on surfaces. Antisepsis involves the disinfection of areas, materials and objects as well as disinfection of skin and wounds.

Antiviral Agents

► Virustatics

Antiviral Substances

► Virustatics

Antiviral Therapy

► Virustatics

Anxiety Disorders

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Synonyms

Panic disorder; Agoraphobia; Social phobia; Specific phobia; Simple phobia; General anxiety disorder (GAD); Obsessive-compulsive disorder (OCD); Acute and post-traumatic stress disorder (PTSD); Hypochondria; Health anxiety; Health phobia

Definition

Fear and anxiety are not primarily pathological, but ubiquitous phenomena necessary for life and survival. It is only in its extreme form that anxiety becomes problematic. Anxiety is a feeling of apprehension and fear characterized by physical symptoms such as palpitations, sweating, and feelings of stress. Anxiety disorders are a cover term for a variety of mental disorders in which severe anxiety is a salient symptom. Unlike the relatively mild, brief anxiety caused by a stressful event such as an exam or a business presentation, anxiety disorders are chronic, or can become chronic, or grow progressively worse if not treated, and are pathologically associated with other mental disorders.

Basic Characteristics

Epidemiology

Anxiety disorders rank among the most frequent psychological diseases. 1–2% of the total population are affected by an anxiety disorder in need of treatment. Epidemiological studies concluded that the lifetime prevalence of anxiety disorders is 14% (Regier 1998). The 12-month prevalence of anxiety disorders is 12.0%, ► specific phobias are most frequent (7.8%), followed by ► panic disorders (12-month prevalence: 2.3%; Wittchen and Jacobi 2005). The lifetime prevalence of panic disorders is estimated to be 3–5 percent (Faravelli et al. 2005). General anxiety disorder (GAD) shows a lifetime prevalence of 5% in adults (Ballenger et al. 2001). Prevalence rates of GAD are highest in middle-aged women (>45 years).

Aetiology

In a general model, anxieties can be explained as a consequence of a dysfunctional interpretation of events, which go hand in hand with a behavior that more and more strengthens the dysfunction (e. g. avoidance). According to this model, the ill-making interpretations are the result of individual, relatively stable convictions and doctrines. These are triggered by specific situations, physical reactions or thoughts that influence the (consequently very selective) processing and interpretation of information. Most patients, for example, over estimate dangers and underestimate their own capacity to deal with them. As soon as a perceived danger is assessed, a number of negative, automatic thoughts build up (e. g. self-doubt, sceptic predictions). This process of building up can be described as a vicious circle: signs of an assumed dysfunction enhance the perception of violability and influence the situational cognitions and the dysfunctional attempts to cope with it; these consist mainly in avoidance and safety-seeking behavior. Consequently, the person is convinced that only this behavior will avert the dreaded catastrophe. Experiencing that the catastrophe did not occur or perceiving that the situation could only be managed with this behavior, suppresses the development of functional assessments and behaviors. The term "safety-seeking behaviors" (Salkowskisk 1991) refers to every behavior used to avoid the dreaded event (e. g. diction or voice modulation of socially insecure people, always carrying a mobile phone or medication by people with panic disorders). Cognitive-behavioral therapy therefore stresses the need to modify this safety-seeking behavior; the behavioral-therapeutic approach also distinguishes between risk-factors (genetic precondition, life story), triggering or releasing factors (stages or events of life that were particularly stressful) and maintaining conditions (e. g. self-energizing processes based on self-evaluation and assessment of events as catastrophic, leading to avoidance).

From a psycho-dynamic point of view, in contrast, the symptoms of anxiety are seen as a result of inner conflicts or of deficits of the so-called self-structure, depending on the underlying concept. According to the conflict model, the psychological defense of unacceptable emotions (e. g. aggressive or egoistic impulses) leads to a massive inner conflict which in turn "is frightening" in the original sense. According to this model, people would rather suffer from anxiety than have a conflict with their consciences, an external authority or other images of themselves; they, however, are not aware of this inner conflict. The deficit model, on the other hand, assumes that the anxiety cannot be fought efficiently because of a weak ego, which then leads to increasingly strong appearances of anxiety in the form of symptoms. The continuous failure of psychological defenses in the face of increasingly trivial stimuli therefore leads to frequent and massive bouts of anxiety.

Consequences

In most anxiety disorders spontaneous remission is very rare. On the contrary, these disorders tend to become chronic at an early stage and sufferers have a high probability of developing a second anxiety disorder (up to 50%) or a depression (up to 50%). A common combination is anxiety disorder and substance abuse (up to 40%); this, however, in most cases, has to be regarded as an unsuccessful attempt by sufferers to treat their anxiety themselves. It is quite common that an anxiety disorder finds its expression in somatic symptoms (e. g. stomach ache) which are mistaken for symptoms of a physical disease and consequently wrongly treated. This in turn can lead to feelings of insecurity in the patient and in extreme cases result in a kind of vicious circle of increasing anxiety and increasing somatic symptoms.

Treatment

Until a few years ago, anxiety disorders had been regarded as difficult to treat. In recent years, however, newer and more effective therapeutic strategies have been developed. For all forms of anxiety disorders, psychotherapy is the method of choice. The benefit or lack of an additional treatment with medication is still under debate. The benefit of a pharmaco-therapy as an interim solution before the onset of psychotherapeutic measures is undisputed. A permanent therapy with medication (e. g. antidepressants, benzodiazepines), however, is not always appropriate, as it prevents the establishment of functional interpretations and coping strategies and is also probably not quite harmless because of potential addictions (as in the case of benzodiazepines). The general objective of psychotherapy for anxiety disorders is an adequate reduction of symptoms, a gener-

al psychological and physical improvement and, at the same time, an increase in the quality of life.

Behavioral-therapeutic measures for the treatment of anxiety disorders are based on the realization that anxieties are mainly influenced by learning processes, maintaining conditions (e. g. morbid gain in the form of social care) and distorted interpretations. Consequently, the specific therapeutic approach focuses on changing these conditions, e. g. confrontation with anxiety-eliciting stimulus, relaxation techniques, etc.

A decisive focus in which the psychoanalytical therapy differs from cognitive-behavioral approaches is the psychoanalytical handling of the therapeutic relationship with its specific interactions that are governed by the patient's unconscious conflicts. The objective is that these unconscious conflicts, which are inextricably linked to previous relationships, can be experienced and dealt with in the present relationship with the analyst.

Cross-References

- ► Acute and Post-Traumatic Stress Disorder (PTSD)
- ► Agoraphobia
- ► Dissociation
- ► General Anxiety Disorder (GAD)
- ► Hypochondria
- ► Obsessive-Compulsive Disorder (OCD)
- ► Panic Disorder
- ► Social Phobia
- ► Specific Phobia

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Anxiolytics

► Hypnotics and Sedatives

Appraisal

► Evaluation, Models

Approximal Surfaces

Definition

The approximal surface of a tooth is the part of the crown that faces an adjacent tooth in the dental arch. Usually the approximal surfaces of the adjacent teeth touch punctiform (contact point), therefore forming a wedge-shaped interdental space that is difficult to reach for cleaning.

Aquinas, Thomas

Definition

Thomas Aquinas was born in Italy in 1225 and died in March 1274. He is known as one of the greatest philosophers and theologians in history. The Italian man belongs to the most important Catholic teachers; he is the principal agent of philosophy of the high middle age.

"Arising From Habit"

► Ethics and Religious Aspects

Aristoteles

Definition

A prominent advocate of philosophical reasoning. He was involved in the Natural Sciences and a very for-

ward thinker of the wider European world on religious history. He became involved in several other disciplines that he had formed himself and/or greatly influenced.

Arithmetical Skills Disorder

Synonyms

Specific developmental disorder of scholastic skills

Definition

The main feature is a specific and significant impairment in the development of arithmetical skills that is not solely accounted for by mental age, visual acuity problems, or inadequate schooling. During school age, emotional and behavioral problems are often associated with arithmetical skills disorder. Such disorders often continue into adolescence.

Artemether/Lumefantrine (Riamet®)

Definition

Lumefantrine is derived from the alkaloids of the bark of the South American cinchona tree (quinine and quinidine). Its effect results from the impairment of the metabolic processes in plasmodia. Artemether, which is extracted from *Artemisia annua* (Quinghasoso), impairs parasitic enzymes as well. The substances are effective against all forms of malaria, therapy is performed for three days. Side effects are headache, sleeplessness, dizziness and gastrointestinal symptoms.

Arthritis

Definition

Arthritis is a group of chronic conditions characterized by joint inflammation. It is one of the leading causes of disability in people older than 55 years. There are more than 100 types of arthritis, with osteoarthritis and rheumatoid arthritis among the most prominent. Although the various forms of arthritis are quite different from each other, they produce common symptoms which include sore, stiff, inflamed, and painful joints. There are different causes for arthritis; for some types theses are not even fully explored. Rheumatoid arthritis is an autoimmune disorder in which the immune system begins to act abnormally. Osteoarthritis occurs following trauma or infection of the joint, or as a result of aging. Usually, the first line of treatment is medication to reduce inflammation, swelling, and pain. The medication is often supported by physical therapy that might reduce the rate of deterioration of the joints. Surgery is only applied for the most severe cases.

Artifactual Association

► Spurious Association

Artificial Neural Network

Synonyms

Neural network

Definition

An analytic modeling technique modeled after the (hypothesized) processes of learning in the cognitive system and the neurological functions of the brain. It is capable of predicting new observations (on specific variables) from other observations (on the same or other variables) after executing a process of so-called learning from existing data. Artificial neural networks (ANN) are nonlinear and capable of modeling extremely complex functions by creating connections between processing elements – the computer equivalent of neurons. For example, the onset of a particular medical condition could be associated with a very complex (e. g., nonlinear and interactive) combination of changes on a subset of the variables being monitored (e. g., a combination of heart rate, levels of various substances in the blood, respiration rate). Neural networks have been used to recognize this predictive pattern so that the appropriate treatment can be prescribed. A distinction can be made between two different types of ANN – networks designed for supervised learning tasks (e. g., Multilayer Perceptron, Bayesian networks, Genetic algorithms) and networks primarily designed for unsupervised learning (Self Organizing Feature Map (SOFM, or Kohonen) networks).

Ascariasis

Synonyms

Ascaridosis; Roundworm infection

Definition

Roundworms are spread worldwide; in Africa more than 90% of the population is infected. Worm eggs can survive in the soil and stay contagious for a long time (up to years). People are infected by ingestion of contaminated foodstuff (containing worm eggs). A transmission by flies is also possible. In the intestines the eggs free their larvae. The larvae penetrate the intestinal wall, reach the liver via the portal vein and then get into the pulmonary circulation. Penetrating the alveolar wall, the larvae reach the bronchial system, the windpipe and then the pharynx. Here they are swallowed again and reach the intestines where they develop into adult worms. The females are 30–40cm long, the males 12–30cm. Shedding the eggs with the stool closes the developmental cycle. The larvae can cause inflammatory reactions in the various organs, moreover, ascariasis is responsible for general symptoms like a lack of appetite, stomach pain and nausea. In severe cases an ileus can develop, or worms can be vomited. The infection can be diagnosed by detection of worm eggs in the stool, or when worms are expelled with the feces. Ascariasis can be cured by pyrantel, mebendazole or albendazole.

Ascaridosis

► Ascariasis

Asepsis

► Sterilization

Assessment

► Evaluation
► Evaluation, Models
► Measurement
► Measurement: Accuracy and Precision, Reliability and Validity

Assessment and Mitigation

► Risk Management

Assessment of Work Ability

Synonyms

Fitness for work assessment

Definition

Assessment of work ability is an objective assessment of the health of employees in relation to their specific jobs, in order to ensure they can do the job and will not be a hazard to themselves or others. The assessment should always be conducted with reference to the specific job the worker holds or intends to hold. The reasons for assessment of work ability are numerous, such as the application or consideration for entry into employment and assignment to a specific job, the need to avoid diseases becoming chronic, return to work after sick leave, or assessment for social benefits.

Assessment of work ability must be specifically job-related, with judgments of fitness being based on the principle that the employees' state of health in relation to their individual jobs will not be hazardous to themselves or others. It is preferable that these activities should be undertaken by individuals who are specially trained or well experienced in occupational medicine.

Assessment of work ability, according to the definition of work ability, usually involves the measurement of activities related to personal care, mobility, sensory perception, communication, recreation, socializing, and intimacy. It is also related to mental and intellectual status, psychological distress, individual work environment, various occupational requirements, and even personal demographic characteristics. Assessment of work ability is a difficult task and probably cannot be performed by a single individual. Available methods that measure certain dimensions of work ability, such as functional capacity, physical performance components, or physical work performance, are generally considered

to be hardly sufficient measurements of the real work ability.

Occupational health service personne are in an excellent position to make an assessment of work ability as they have access to both medical and workplace data.

The work ability index (WAI), developed by the Finnish Institute of Occupational Health, is an instrument, with high validity, which can provide an integrated number useful for comparative longitudinal study and follow-up.

Assessment of Workplace Hazards

Synonyms

Workplace hazards measurements

Definition

Assessing health hazards involves the measurement of the concentration of potentially hazardous agents in the workplace to evaluate whether or not there is a risk of exposure (► workplace hazards).

Once a potential hazard has been recognized in the workplace, the next step is to assess it to determine if it is possible for a worker to be exposed and/or determine if exposure is at a harmful level. The exposure of workers to the agent must be evaluated to see if there is a risk of injury to their health. If so, a control will be needed.

Exposure means being in contact or exposed to a potentially hazardous agent for a determined period of time. Some agents can cause health effects even though the period of exposure is very short. Others are harmful only if exposure is for a prolonged or excessive period of time. In both cases, the higher the exposure level, the greater the potential for harm.

Assisted Living Facilities

Synonyms

Residential care facility; Personal care home; Domiciliary care facility; Adult foster care; Adult family homes

Definition

Assisted living facilities offer private rooms or apartments to people who are not able to live on their own but are still independent enough that they do not yet need the continuous care of a ► nursing home. The facilities offer meals, housekeeping assistance, assistance with ► activities of daily living, assistance with medication administration, social activities, and 24-hour support by trained staff. Usually, assisted living facilities have the mission of offering personal autonomy, independence, and privacy to often frail elderly people in order to provide homelike settings for them. Facilities that were built in the recent past are more likely to cater for the specific requirements of disabled people.

Association

Synonyms

Correlation; (Statistical) dependence; Relationship

Definition

An association is a statistical dependence between two or more events, characteristics, or other variables. An association is present if the probability of occurrence of an event or characteristic, or the quantity of a variable, depends upon the occurrence of one or more other events, the presence of one or more other characteristics, or the quantity of one or more other variables. The association between two variables is described as positive when the occurrence of higher values of a variable is associated with the occurrence of higher values of another variable. In a negative association, the occurrence of higher values of one variable is associated with lower values of the other variable.

Association Studies

Definition

The association studies approach is based on showing a higher or lower ► allele frequency among cases and controls, candidate genes presumed to include the disease-causing alleles are then studied. Although two types of genetic association studies are described (family- and population-based), the rationale is similar, ascertainment of mutation related to disease risk in genomic screening by identification chromosomal regions shared by patients.

Associative or Classical and Operant Conditioning

► Conditioning Model

Asymmetric Information

► Information Asymmetry

Asymmetry of Information

► Information Asymmetry

Atheism

Definition

The word Atheism is derived from the Greek adjective ‘atheas’ and when translated means ‘without God’. An atheist believes that the failings of the world can be found in the manner in which religious practices are conducted. It denies any presence of a god (or gods) and a transcendent power.

Atmospheric Condition

► Climate and Microclimate

Atovaquon + Proguanil (Malarone®)

Definition

Atovaquon interferes with the transport of electrons inside the plasmodia, proguanil impairs protein metabolism. The combination of both substances is effective against all forms of malaria. Treatment is carried out for three days. As water solubility of atovaquon is poor, it should be taken with a fatty meal to improve intestinal resorption. Side effects of the drugs are headache, cough and gastrointestinal symptoms (primarily vomiting and diarrhea).

Attention Deficit Disorder (ADD)

► Attention Deficit / Hyperactivity Disorder (ADHD)
► Hyperkinetic Disorder

Attention Deficit Hyperactivity Disorder (ADHD)

Synonyms

Hyperkinetic disorder

Definition

Accordingly to ICD-10, ADHD is characterized by an early onset (usually in the first five years of life), lack of persistence in activities that require cognitive involvement, and a tendency to move from one activity to another without completing any one, together with disorganized, ill-regulated, and excessive activity. Children with ADHD have difficulty paying attention to details and are easily distracted by other events that are occurring at the same time; they find it difficult and unpleasant to finish their schoolwork; they put off anything that requires a sustained mental effort; they are prone to make careless mistakes, and are disorganized, losing their school books and assignments; they appear not to listen when spoken to and often fail to follow through on tasks. The symptoms of hyperactivity may be apparent in very young preschoolers and are nearly always present before the age of 7. Such symptoms include fidgeting, squirming around when seated, and having to get up frequently to walk or run around. Several other abnormalities may be associated. Children with ADHD are often reckless and impulsive, prone to accidents, and find themselves in disciplinary trouble because of unthinking breaches of rules rather than deliberate defiance. Their relationships with adults are often socially disinhibited, with a lack of normal caution and reserve. They are unpopular with other children and may become isolated. Impairment of cognitive functions is common, and specific delays in motor and language development are disproportionately frequent. Secondary complications include dissocial behavior and low self-esteem.

Attention Deficit/Hyperactivity Syndrome (ADHS)

► Attention Deficit / Hyperactivity Disorder (ADHD)

Attributable Risk (AR)

Definition

Attributable risk (AR) is the proportion of the incidence of a disease in exposed individuals that is due to exposure. It is the incidence of a disease in the exposed population that would be eliminated if exposure were eliminated. It can be calculated as *rate difference* (the rate in the exposed group minus the rate in the unexposed group) or *risk difference* (the difference between the risks in the exposed and unexposed groups). When the level of risk in both exposed and unexposed groups is the same, the risk difference is 0. If an exposure is harmful (e. g., cigarette smoking), the risk difference is expected to be greater than 0. If an exposure is protective (e. g., vaccine), the risk difference will be less than 0.

The AR is sometimes referred to as attributable risk in exposed individuals because it is used to quantify the risk that can be attributed to exposure in the exposed group. The AR is the measure of association that is most relevant when making decisions for individuals.

Attributable risk percent (AR%) is the percent of the incidence of a disease that is due to exposure in exposed individuals. It is the percent of the incidence of a disease *in the exposed population* that would be eliminated if exposure were eliminated.

Attributable Risk Fraction

Definition

The attributable risk fraction is an epidemiological parameter. If there are several causes for the development of a health problem, the attributable risk fraction describes the percentage of the risk that is due to a certain risk factor, e. g. the percentage of risk for lung cancer caused by smoking.

Attributable Risk Proportion

Synonyms

► Population Attributable Risk (PAR)

Definition

The term "attributable risk" describes the proportion of disease that can be attributed to exposure to a ► risk factor (► hazard) that persons in a population have experienced. Population attributable risk (PAR) is the risk of a specified disease or other outcome of interest in a defined population that can be attributed to an exposure of interest. The PAR is the incidence rate of a condition in a specified population that is associated with or attributable to exposure to a specific risk factor (hazard).

The PAR in a total population is the proportion of the incidence or risk of a disease that can be attributed to exposure to a specific risk factor; this means the difference between the risk in the total population and the risk in the unexposed group.

The PAR in occupational health is the percentage of a given illness or outcome that could be prevented if the occupational factor causing or contributing to the illness or outcome was eliminated.

Atypical Anorexia nervosa

Definition

Atypical anorexia nervosa disorders are disorders that fulfill some of the features of ► anorexia nervosa but in which the overall clinical picture does not justify that diagnosis. For instance, one of the key symptoms, such as amenorrhoea or a marked dread of being fat, may be absent in the presence of obvious weight loss and weight-reducing behavior.

Cross-References

► Eating Disorders

Atypical Bulimia nervosa

Definition

Atypical bulimia nervosa disorders are disorders that fulfill some of the features of ► bulimia nervosa, but in which the overall clinical picture does not justify that diagnosis. For instance, there may be recurrent bouts of overeating and overuse of purgatives without significant weight change, or the typical overconcern about body shape and weight may be absent.

Cross-References

► Eating Disorders

Atypical Mycobacteria

► MOTT (Mycobacteria Other than Tuberculosis)

Audiogram

Definition

An audiogram is a graph showing hearing level as a function of frequency, as measured by an audiometer. The vertical lines on an audiogram represent pitch or frequency. The most important pitches for speech are 500–3000 Hz. The horizontal lines represent loudness or intensity. A reading of 0 dB on an audiogram denotes the hearing threshold level regarded as the normal audiometric standard at that frequency. Points below zero on the scale denote louder threshold levels, whereas those above, expressed in negative decibels with respect to the zero level, are less intense levels that, because of individual hearing differences, some people may normally hear. The softest sound a person is able to hear at each pitch is called the threshold and is recorded on the audiogram. Thresholds of 0–25 dB are considered normal (for adults).

Audit

► Evaluation, Models

Auditory Hallucinations

► Psychotic Disorders

Autochthonous

Synonyms

Endemic; Native; Indigenous

Definition

Endemic disease – the constant presence of a disease or infectious agent within a given geographic area or population group; may also refer to the usual prevalence of a given disease within such area or group.

Cross-References

► Native

Autochthonous Population

Synonyms

Natives; Original inhabitants

Definition

Autochthonous population is a general and more neutral term for natives or original inhabitants of a country or region. The term ‘autochthonous’ is used to avoid static ideas implied in terms like ‘native’ or ‘original’. The terms ‘allochthonous’ population and ‘immigrants’ can be seen as synonyms. The difference between autochthonous and allochthonous populations is not absolute – it is a relative one. The difference depends on both context and time, combined with a range of variables (e. g., ideas of origin, legal status, social inclusion and status, ethnic or racial background, religion) in a specific national or regional context.

Autologous

Definition

The term “autologous” refers to the source of cells or tissue for transplantation purposes. Cells are autologous

when obtained from the same patient who is treated. Hence, cells present the same surface molecules as the recipient tissue and are not rejected by the immune system. If cells are "allogeneic", they derive from a genetically different organism of the same species. Under this condition, immune responses have to be suppressed by appropriate medication. "Xenogeneic" transplantation deals with tissues or cells from individuals that do not belong to the same species. In humans, such experiments are performed using porcine heart valves. In contrast, "xenoplastic" grafts consist of synthetic substrates such as bone replacement materials.

Autonomy

Synonyms

Self-direction

Definition

Autonomy implies respect for the individual and that individual's personal rights. The essay "On Liberty", by the 19th century philosopher John Stuart Mill, strongly enunciated the autonomy principle. Mill states: "The only purpose for which power can be rightfully exercised over any member of the civilized Community, against his will, is to prevent harm to others. His own good, either physical or moral, is not sufficient warrant … In the part which merely concerns himself, his independence is, of right, absolute." This is an absolute principle in ► bioethics.

Cross-References

► Self-Direction

Aversion

► Disdain

Avian Flu

► Avian Influenza

Avian Influenza

Synonyms

Avian flu; Bird flu; Fowl pest; Fowl plague

Cross-References

► Influenza and Avian Influenza

Bacille Calmette-Guérin (BCG) Vaccination

Synonyms

Bacille Calmette-Guérin immunization; Vaccination against tuberculosis (tbc); Immunization against tuberculosis (tbc)

Definition

Immunization against Bacille Calmette-Guérin (BCG) was developed in the 1930s, using a live, weakened strain of *Mycobacterium bovis*, which is similar to the germ causing tuberculosis in humans (*Mycobacterium tuberculosis*). While tuberculosis is no problem in many countries, and thus vaccination is not recommended there, it is highly prevalent in other areas of the world. In countries with high rates of tuberculosis, BCG vaccination should preferably be performed at time of birth as a single intradermal injection. After correct injection, an induration of the skin and afterwards a small scar develops at the needle site. The protection rate achieved by BCG vaccination is 70–80%. In all individuals older than six months, a tuberculin skin test (Mantoux test) should be carried through prior to BCG immunization to find out if the person has already come into contact with tuberculosis. In this test a small amount of tuberculin units is inoculated by an intradermal injection. The induration has to be measured by a trained person 48–72 hours after administration, with a red lump > 5 mm meaning a positive result. Contraindications for BCG vaccination are prior tuberculosis, acute illness with fever, generalized skin disease and immunodeficiency.

► Immunization, Active

Bacille Calmette-Guérin Immunization

► Bacille Calmette-Guérin (BCG) Vaccination

Background

► Environment

Background Meanings

Definition

Background meaning is a personally held, culturally derived, sense of reality which is taken for granted. It is often difficult for people to be aware of their meanings and values, but they are always present and give an approach to life and events which, in good faith, is thought to be the best.

Back-to-Normal

► Recovery Strategies

Bacterial Plaque

► Dental Plaque

Baghdad Boil

► Leishmaniasis, Cutaneous

Bajau

► Indigenous Health, Asian

Baka (Western Africa, Cameroon, Congo, Gabon, Central African Republic)

► Indigenous Health – Africa

Balancing of Legal Interests

► Legal Balancing of Conflicting Rights

Balkan Sore

► Leishmaniasis, Cutaneous

Bang's Disease

► Brucellosis

Basic Immunization

Synonyms

Basic vaccination

Definition

In order to achieve immunity against one or several pathogens, it is necessary to administer a certain number of injections of the ► vaccine following a fixed procedure. The initial implementation of a course of vaccination is known as basic immunization. Subsequent vaccinations serve to boost the immune protection. Basic immunization is only complete when all of the vaccinations included in the procedure have been administered. However, in the case that the recommended time intervals have been exceeded, it is not necessary to restart the procedure or to repeat the single vaccinations. Each vaccination counts. Therefore in order to complete the basic immunization, it is only necessary to administer the missing vaccinations.

Basic Reproduction Rate

Definition

The basic reproduction rate characterizes the spread of an infectious disease. It is calculated as R_o = $\beta \times k \times D$. In this formula β is the risk of transmissions per contact (attack rate), k is the number of potentially infectious contacts of an individual in a certain time interval, and D is the duration of contagion of an infected person. When the basic reproduction rate is >1, a further spread of the disease has to be assumed.

Basic Rights

► Human Rights and Public Health

Bayes' Theorem

Bayes' Theorem allows new information to be used to update the conditional probability of an event, i. e., a formula for revising *a priori* probabilities after receiving new information. The revised probabilities are called *posterior* probabilities. The formula for Bayes' Theorem is as follows:

$$P(A_i/B) = \frac{P(A_i) * P(B/A_i)}{\sum_{i=1}^{k} P(A_i) * P(B/A_i)}.$$

For example, consider the probability that someone will develop an intestinal cancer in the next year. An estimate of this probability based on general population data would be *a priori* estimate; a revised (*posterior*) estimate would be based on both on the population data and the results of a specific test for this cancer. Let $A_1 =$ the event of a tumor being present, $A_2 =$ the event of a tumor not being present, and $B =$ the event of a positive screening test. If somebody has a tumor, the screening test has an 85% chance of detecting it, i. e., $P(B/A_1) = 0.85$. However, it also has a chance of falsely indicating that a tumor is present when there is no tumor, i. e., $P(B/A_2) = 0.10$. The probability of a person having a tumor is 0.02, i. e., $P(A_1) = 0.02$. If the screening test is positive, the probability of having a tumor is $\frac{0.02*0.85}{0.02*0.85+0.98*0.10} = \frac{0.017}{0.017+0.098} = 0.148$.

Bayesian Network

Definition

A probabilistic graphic model to generate hypothesis using joint probability distributions. This method is used in gene expression to group similar genes together for gene expression analysis (► serial analysis of gene expression).

Behavioral Patterns

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Definition

Behavioral patterns such as tobacco smoking, excess alcohol consumption, ► substance dependence, inappropriate nutrition, lack of ► physical activity, failure to use safety equipment including automobile seat belts, certain ► sexual practices, and failure to follow preventive guidelines and ► disease screening are all associated with elevated risk of disease or death. Causal conclusions have been strengthened, dose/response relationships have been clarified, the influence of many of these behaviors on overall public health has been quantified, and scientific guidelines have been formulated.

Basic Characteristics

Risk behaviors rarely occur in isolation, but cluster in patterns that in combination influence a person's risk of disease. Thus, a sedentary life-style in industrial societies connotes a pattern of mutually influencing behaviors such as taking little exercise, eating foods of poor nutritional value, consuming caloric drinks and possibly also smoking cigarettes. While these factors do not determine disease in an inevitable sense, they place the person at elevated risk of ► obesity, high blood pressure, and subsequently of cardiovascular disease as well as impairment of ► musculoskeletal health. Other unhealthful behavioral patterns include the connections among ► smoking behavior, malnutrition, and drug taking, and those among ► alcoholism, aggression, violence and ► suicide. Each of these patterns is reinforced by membership in a social milieu that brings similar people together, as well as by individual personal traits. Each pattern also trends to correspond to personal values and beliefs, which form the connection between behavior and culture.

Two general explanations have been suggested for unhealthy behavior. The first theorizes that some people are unaware about the harmful effects of substance abuse, smoking and obesity. An alternative explanation emphasizes that people engaging in unhealthy behaviors do not correctly weigh the health/lifestyle pros and contras regarding these behaviors (Wagner et al. 2005). It seems doubtful that the first explanation is reasonable. For example, virtually all women and most men recognize that lowering weight is desirable from a health perspective. While it is clear that obese people often differ in their energy metabolism from thin people, it is also obvious that some of the obesity in the developed countries results from eating foods considerably in excess of the amount that is known to be healthy. The attempt to control food intake by dieting is nearly universal at some point in the lifetime of women in the US and Northern Europe. Studies of incoming college freshmen women demonstrate that only 8–13% of women do not adhere to a diet (Krahn et al. 1992). With the median age of onset of dieting close to age 12, it is unlikely that the message is not getting to young women or is reaching them too late (Drewnowski and Hann 1999). Whether food preferences reflect dietary habits is an interesting issue. Data from epidemiological studies suggest that food consumption patterns show parallel influences of age, sex, health status, education, and income (Harnack et al. 1997). Generally, age influences both food preferences and food intake patterns in the direction of more healthful diets (Block and Subar 1992).

In the area of substance abuse, there is even more convincing data, documenting that knowledge is not the key problem. Studies of several school-based substance abuse prevention (► prevention and health promotion) programs found that these programs definitely increased student's knowledge regarding the health risk of these substances but, unfortunately had no effect or even increased the rate of substance abuse (Hansen 1992). Therefore, it appears unlikely that a simple lack of knowledge is what prevents people from avoiding harmful behavior.

Another area of research has examined the tendency to novelty seeking. For example, many adolescents begin smoking as novel behavior that seems to offer relief from thinking they are not as "with it" (Pomerleau et al. 1992). People who evidence early alcoholism are significantly higher on the dimension of novelty than are other individuals (Cloninger 1987). At the other end of the spectrum are those who are focused on avoiding harm (Harkness et al. 1995). Those high in novelty seeking and low in harm avoidance are thought to be most impulsive. People who are highly impulsive tend to be vulnerable to the short-term rewards offered by many high-risk behaviors (Newman and Wallace 1993). In a laboratory reward versus risk situation, highly impulsive people behave more quickly and give themselves less time to consider options. Behavioral intervention programs aim at introducing some delay in decision-making, so that the participants have some time to reflect on short-term benefits versus long-term-harm.

Cross-References

- ► Alcoholism
- ► Disease Screening Practices
- ► Musculoskeletal Health
- ► Obesity
- ► Physical Activity
- ► Prevention and Health Promotion
- ► Sexual Practices
- ► Smoking Behavior
- ► Substance Dependence
- ► Suicide

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Behavior of Nutrition

Synonyms

Nutritional behavior; Eating habits

Definition

Patterns of action cover the conscious control of the choice and absorption of human ► nutrition. Nutritional behavior is the result of a process of psychological processing of all stimulus factors which lead to adoption or rejection. This process is for the most part learned behavior and is determined by a complex eating situation which is characterized by social determinants like food supply, preparation, classification and social arrangement.

Belmont Report

Definition

In the USA, the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research in their document known as the "*Belmont Report*", in 1979 underlined three basic principles to be used to generate specific rules and regulations in response to US research scandals: ► respect for persons, ► beneficence, and ► justice. Applications of the general principles to the conduct of research leads to consideration of the following requirements: ► informed consent, risk/benefit assessment, and the selection of subjects for research.

Beneficence

Definition

Beneficence goes back to the ► hippocratic oath (4th BC), which concerned the doctor-patient relationship, focusing on the physician's code of conduct. It stated: "I will use treatment to help the sick according to my ability and judgment." To the letter it means "doing good". In the modern connotation, it includes other aspects, like the physician's duty to refer to another health professional when needed, always keep updated with the latest discoveries and innovations in medical science, and so on.

Benefits

► Outcome

Berbers (Northern Africa, Tunisia, Algeria, Libya, Morroco)

► Indigenous Health – Africa

Beta Error

Synonyms

Type II error

Definition

A beta error is an error that results if a false null hypothesis is not rejected or if a difference is not detected when a difference exists between comparison groups. This error can happen when the sample size is too small. Most studies aim to have less than 20% probability of such an error.

Between Subjects Design

► Unpaired Groups Design

Bias

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Synonyms

Bias: Systematic error; Confounding: Bias due to confounding; Interaction: Effect modification

Definition

The important issues in deriving causal inferences are: bias, confounding and interaction.
"Bias can be defined as deviation of results or inferences from the truth, or processes leading to such deviation".
"Confounding is a situation in which the effects of two processes are not separated".
"Interaction is the interdependent operation of two or more causes to produce or prevent an effect" (Last 2001).

Basic Characteristics

The goal of an epidemiological study is ► accuracy in measurement. Epidemiological studies are prone to ► error. Errors can be either random or systematic.
Since the errors can never be eliminated, much attention is devoted to minimize them, and to assess their importance. The principles of study design emerge from consideration of approaches to reduce both types of errors. Random error is the divergence, due to chance alone, of an observation on a sample, from the true population value, leading to lack of ► precision in the measurement of an association. Sources of random error are: individual biological variation, sampling error and measurement error (Bhopal 2002). Random error can never be completely eliminated. The best way to reduce it is to increase the size of the study.

Validity

The validity of a study is usually separated into two components: internal validity and external validity.
Internal validity implies that the index and comparison groups are selected and compared in such a manner, that

observed differences between them on dependent variables under study may be attributed only to the hypothesized effect under consideration.

External validity concerns validity of the inferences as they pertain to people outside the study population. External validity depends on internal validity, which is its prerequisite, but it depends also on the results of other studies, theoretical knowledge of the disease process and related factors, and biological considerations.

Internal validity is the degree to which the results of an observation are correct for the particular group of people being studied. Internal validity can be threatened by all sources of systematic error (bias) but can be improved by good design of a study (Rothman and Greenland 1998).

There are three main types of biases: selection bias, information bias and confounding.

Selection Bias

Selection bias occurs when there is a systematic difference between characteristics of the people selected for a study and the characteristics of those who are not. There are a number of reasons for the occurrence of this type of bias. Common feature for all of them is that the relationship between the ► exposure and disease observed among those who participate in the study is different from that for the individuals who would have been eligible to participate but were unwilling or not selected by the investigator (Rothman and Greenland 1998).

Example: Selection bias can occur if investigators include hospital cases or cases under a physician's care and exclude those who die before admission to hospital because the course of their disease was severe, those with mild symptoms not requiring hospital care, cost of hospital treatment or other factors.

Information Bias

Information bias occurs whenever the study subjects are erroneously categorized with respect to either exposure or disease. The effect of this bias depends on whether this misclassification is differential or non-differential (Rothman and Greenland 1998).

Differential misclassification occurs when the proportion of subjects misclassified differ between the study groups. It can occur when there is any systematic difference in the soliciting, recording or interpreting of information from study participants.

Example: Mothers whose children have had or have died of leukemia are more likely than mothers of healthy children (control group in a ► case-control study) to remember details of diagnostic x-ray examinations to which these children were exposed in utero (recall bias).

The effect of differential misclassification is overestimation of an association even if it does not really exists, or underestimation or lack of an association when it really exists.

Non-differential misclassification occurs when inaccuracies in the categorization of subjects by exposure or disease are present in similar proportion in each of the study group. Such misclassification is often present because of inaccuracy of most measurements in biomedicine.

Non-differential misclassification almost always results in an underestimate of the true strength of the association. Some degree of this misclassification is present in almost all types of epidemiological studies and this bias may account for some apparent differences in the results of epidemiological studies (Hennekens and Buring 1987).

The control of potential biases must be accomplished by careful study design. Some of design features that can minimize potential biases are: carefully prepared ► questionnaire (close-ended questions), clearly written protocol, trained study personnel, the use of multiple sources of data whenever possible etc.

Confounding

The word confounding is derived from a Latin word meaning to mix up. The word's meaning in everyday language is to confuse or puzzle. Confounding mixes up causal and non-causal relationships.

Confounding is a major cause of bias in epidemiology, and the more difficult one to understand. The potential for it to occur is whenever the cardinal rule' compare like-with-like' is broken. This rule is perhaps never attained except in experimental research. Comparing like-with-like may be achieved in experimental studies where subjects can be randomly allocated to one group or another, a technique which employs the laws of chance to create comparable groups (Bhopal 2002).

Confounding is one of the most important problems in observational studies.

Example: In a study of mortality rates, investigators find that mortality rates in an English seaside resort are much higher than in a country as a whole. Why might this be so?

One possible explanation:

A holiday town attracts the elderly, so has a comparatively old population.

What is confounding factor in this example?

Age, which is associated with both living in a resort and with death.

The Control of Confounding

Several methods are available to control confounding, either through study design or during the analysis of the results (Hennekens and Buring 1987; Rothman and Greenland 1998)

The Control of Confounding in Study Design

► *Randomization* is applicable only in experimental studies. It is method which ensures that potential confounding variables are equally distributed among the groups being compared.

► *Restriction* is used to limit the study to people who have particular characteristics. For example, in a study on the effects of coffee on pancreatic cancer, participation in the study could be restricted to nonsmokers, thus removing any potential effect of confounding by cigarette smoking.

► *Matching* ensures that study participants are selected so that potential confounding variables are evenly distributed in the groups being compared. For example in a case-control study each patient with a disease can be matched with a control of the same sex and age group to ensure that confounding by sex and age does not occur.

Control of Confounding in the Analysis of Results

► *Stratification* involves the measurement of the strength of association in well-defined and homogeneous categories (strata) of the confounding variable. If the confounding variable is age, the association may be measured in 10-year age groups. Stratification is often limited by the size of the study and it cannot help to control many factors simultaneously. In this situation, *mathematical modeling* is required to estimate the strength of the associations while controlling for a number of confounding variables.

The multivariate modeling involves ► logistic model and analysis of covariance (Rothman and Greenland 1998).

Interaction

According to MacMahon interaction can be defined as follows: "When the ► incidence rate of disease in the presence of two or more risk factors differs from the incidence rate expected to result from their individual effects" (MacMahon 1972). The effect can be grater than that we would expect (positive interaction, ► synergism) or less than what we would expect (negative interaction, ► antagonism).

The problem is to determine what we would expect to result from the individual effects of the exposures.

In exploring the possibility of interaction, the first question is whether an association between exposure and a disease exists. If it exist, is it due to confounding? If it is causal, is it equally strong in each of the strata that are formed on the basis of some other variable? (Gordis 2004).

Example: If the association of smoking and lung cancer is equally strong in all strata formed on the basis of degree of urbanization, there is no interaction. But if the association is of different strength in different strata formed on the basis of age, there is interaction.

Conclusion

Biases reflect inadequacies in the design or conduct of a study and affect its validity. Because of that, biases need to be assessed and, if possible, eliminated, while confounding and interaction describe the reality of the relationships between certain factors and a certain outcome (Gordis 2004). Such relationships are particularly important in investigating the role of various factors in disease causation.

Cross-References

► Accuracy
► Antagonism
► Case Control Studies
► Error
► Incidence Rate
► Logistic Model
► Matching
► Precision
► Questionnaire

- ► Randomization
- ► Restriction
- ► Stratification
- ► Synergism

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Bilharziasis

► Schistosomiasis

Binge-Eating Disorder

Definition

The term binge-eating disorder was introduced only in 1990 and involves regular bouts of ravenous eating, but without fulfilling the other criteria of anorexia or ► bulimia nervosa. Individuals suffering from binge-eating disorder eat large amounts of food and they eat much more rapidly than normal. ICD-10 classifies binge-eating disorder as an "other ► eating disorder not otherwise specified".

Cross-References

► Eating Disorders

Binomial Distribution

Binomial distribution is a discrete probability distribution of the number of successes in a binomial experiment. A binomial experiment consist of a fixed number of n independent Bernoulli trials, each of which has two outcomes, usually labeled "success" and "failure", and a constant probability of success from trial to trial. The term "independent trials" means that the outcome in one trial does not depend on the outcome of any other trial. "Success" in binomial experiment is typically used to designate the occurrence of an event of interest such as improvement, death and adverse effects.

Binomial distribution is denoted by $B(n, p)$, where n and p are called parameters of binomial distributions – n is the number of Bernoulli trials in binomial experiment and p is probability of success in one Bernoulli trial. Consequently, the probability of failure is 1-p. Probability (also called binomial probability) of x successes in a binomial experiment is given by the binomial formula:

$$P(X = x) = \frac{n!}{x!\,(n-x)!} p^x (1-p)^{n-x}.$$

In this formula $n!/(x!\,(n-x)!)$ is the binomial coefficient, which denotes the number of combinations that x successes can be drawn from n trials.

The mean of the binomial distribution is np, and variance is $np(1–p)$.

Bioactive Substances

Definition

Bioactive substances consist of secondary plant compounds, fiber and special products of fermentation like lactic acid. In general, it is a matter of nutritional contents that do not belong to nutriments.

Biocomputing

► Bioinformatics

Bioconcentration

Definition

Bioconcentration considers the uptake of substances from the non-living environment (soil), while the second stage, i. e. biomagnification, describes the uptake of such substances through the food chain. Both of these processes happen simultaneously during bioaccumulation. Some chemical contaminants have long half-lives,

but in other cases derivative chemicals are formed from decay of primary soil contaminants. Some toxic compounds may stay in a system for a much longer period of time, and if the input is greater than the rate of biotransformation or loss, produce bioaccumulation. For many fat-soluble and persistent chemicals, biomagnification is a dominant factor in the risk they pose; examples include DDT and lipid soluble poisons, including tetra-ethyl lead compounds (the lead in leaded petrol). These compounds are stored finally in the body's fat, and when the fatty tissues are used for energy, the compounds are released and cause acute poisoning. Another important example is the accumulation of Strontium 90, mistaken by mammalian and human bodies for calcium, and laid down in the bone tissue, where its radiation can cause long-term damage.

Bioengineering

► Biotechnology

Bioethics

Definition

Bioethics is a more inclusive term for ► ethics in clinical medicine. It is normative ethics applied to decision making and public policy in the domains of biology, medicine, and health care. It is also concerned with matters of basic scientific research and with the social applications of biological knowledge and biomedical technology. It is a new, broad field of study that has arisen largely during the last few decades, as new powers, new choices, and new dilemmas have been opened up by the biological revolution.

Cross-References

► Ethics in Clinical Medicine

Bioinformatics

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Synonyms

Computational biology; Biocomputing

Definition

Due the relative young age of the field, there have been many definitions produced. While bioinformatics purists emphasize the analysis of large-scale genomic and transcriptomic data, looser definitions define bioinformatics as any intersection of biology and computer science including analysis of scientific literature, epidemiological statistics, etc. Perhaps an inclusive definition can be proposed:

The application of computational, statistical, and mathematical methods to biological information to complement, aid, and expedite scientific discovery and enhance biological research. The three main aims include:

1) DATABASE: acquisition, gathering, storage, organization and management of large-scale data
2) ALGORITHM/TOOLS: development of algorithms and computational tools to analyze and classify the data
3) CONCLUSIONS/PREDICTIONS: process, abstract, and integrate the data to make conclusions and predictions

The data include and are not limited to nucleotide, proteomic, genomic, phylogenetic, chemical, structural, phenotypical, functional, ontological, and transcriptomic information.

Basic Characteristics

Since the development of protein sequencing by Sanger in 1955 and the Atlas of protein sequences by Margaret Dayhoff in 1965, there has been a revolution of high-throughput technologies that generate biological information on an increasingly large scale. In August 2005, the International Nucleotide Sequence Database Collaboration announced that the public collections of DNA and RNA sequences had exceeded 100 gigabases (or 100,000,000,000 bases, or "letters" of the genetic code), which represent both individual genes and partial and complete genomes of over 165,000 organisms. In response to this deluge of data, computer scientists and biologists collaborated in creating a new field of study named bioinformatics.

Bioinformatics of Genomes

Bioinformatics is driven by high-throughput technologies. In 1977, Fred Sanger introduced nucleotide/DNA sequencing technology (Sanger et al. 1977) and by 1980, the first complete gene sequence for an organism (FX174) was completed. In 1995, the first complete ► genome, H. influenze genome was completed. The draft of the human genome was reported in 2001 and completed in 2003. As of 2006, there are over 350 complete genomes with over 450 more in progress. Bioinformatics is thus necessary to organize and analyze all this data.

Currently, the major databases for genomic information include Genbank at NCBI, Ensembl at the European Bioinformatics Institute, DNA Data Bank of Japan at the National Institute of Genetics, and the UCSC Genome Browser at UC Santa Cruz.

There are many computational tools and algorithms that enabled the genomic revolution. Most notably, Jim Kent's GigAssembler (Kent 2001) program enabled the consolidation of sequence information from over ten labs to produce the draft human genome for the public effort. A computational problem central to sequence analysis is the alignment and comparison of sequences. The program was first solved by Needleman-Wunsch (Needleman 1970) and current implementations are based on ► multiple sequence alignment (MSA) algorithm suite named Clustal (Higgins, Sharp 1988). Another important problem has been the identification of similar sequences in whole genomic and databases searches. Current implementations that solve the problem include BLAST (Altschul et al. 1990), PSI-Blast (Altschul et al. 1997), and Blat (Kent 2002).

Bioinformatics of Transcriptomes

Besides large-scale sequencing, two other groups of technologies have revolutionized bioinformatics, namely transcriptomics (► transcriptome) and proteomics. In 1995, two independent technologies were developed to measure gene expression on a large-scale: ► serial analysis of gene expression (SAGE) (Velculescu et al. 1995) and microarray (Shena et al. 1995). By 1997, it was possible to measure the entire transcriptional profile of a complete Eukaryotic genome (Saccharomyces cerevisiae) on a microarray chip (DeRisi et al. 1997).

Consolidated databases of gene expression include Array Express repository at the EBI, Gene Expression Omnibus at NCBI, mouse Gene Expression Database at Jackson Laboratory, Sym Atlas with Novartis, and the Stanford Microarray Database.

A large set of different algorithms were developed to analyze these expression data.

Initial algorithms were based on clustering genes with similar gene expression together (► clustering algorithms) (Niehrs 1999) while programs incorporated later methods such as ► self organizing maps (Tamayo et al. 1999), ► bayesian networks (Friedman et al. 2000) and ► principal component analysis.

Bioinformatics of Proteomes

Since the development of protein sequencing in 1955 by Fred Sanger, protein research has greatly advanced. The study of proteomics relies on technologies such as two-dimensional gel electrophoresis and mass spectrometry to identify the entire constitution of proteins in an organism. The first ► proteome was published in 1995 by Wasinger for the smallest known self-replicating organism, Mycoplasma genitalium (Wasinger et al. 1995). Yeast-two hybrid technology allowed researchers to identify all the interactions between proteins. Furthermore, as more and more crystal structures were solved for the different proteins, in 1973, the Brookhaven Protein Databank was created to store the data.

The main databases for protein information include Pfam (Bateman et al. 2000), UCSC Proteome Browser (Hsu et al. 2004), Swiss-Prot, and UniProt (Wu et al. 2006) and many databases exist for specific proteins or post-translational modifications. The major structural genomics databases and classification schemes include Protein DataBank (PDB) at Brookhaven National Labs, Structural Classification of Proteins (SCOP) (Murzin et al. 1995), CATH (Pearl et al. 2005) Protein Structure Classification Database (UCL), and FSSP Database (Holm, Sander 1996).

The major question in proteomic bioinformatics is the in silico prediction of structure of proteins, also known as the ► protein folding problem. On all three levels of primary, secondary, and tertiary structure, numerous methods have been attempted such as comparative modeling, threading, energy minimization, and ab initio sequence methods. Various algorithms have also been developed to query structure databases for similar struc-

tures, such as DALI Server at EBI and Vector Alignment Search Tool (VAST) at NCBI.

Paradigm Shifts in Bioinformatics

In this post-genomic age, with the availability of large amounts of information on all levels, biological research is no longer confined to experimental methods based on single genes. Now, investigators have a wealth of information at their disposal. The new challenge is to consolidate, integrate, evaluate, and obtain data from established sources to generate hypotheses or produce a set of targets that can then be validated and investigated using experimental methods.

With more computation resources and more data available, researcher can now start to think of genes and proteins in relation to the vast network of interactions within the genome and think more in terms of pathways and systems. Just like biotechnological advances such as PCR, Western blots, and microarrays have revolutionized biology, future biological research will be intimately involved with bioinformatics databases, tools, and analyses.

Cross-References

- ▶ Bayesian Network
- ▶ Clustering Algorithms
- ▶ Genome
- ▶ Multiple Sequence Alignment
- ▶ Principal Component Analysis
- ▶ Protein Folding Problem
- ▶ Proteome
- ▶ Self-Organizing Maps
- ▶ Serial Analysis of Gene Expression
- ▶ Transcriptome

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Biological Terrorism

► Bioterrorism

Biomedical Research

Definition

Biomedical research refers to a class of activities designed to develop or contribute to generalizable knowledge in relation to health; it includes medical and behavioral studies pertaining to human health.

Biopiracy

Definition

Biopiracy refers to the appropriation, generally by means of patents, of indigenous biomedical knowledge by foreign entities (including corporations, universities and governments) without compensatory payment.
Biopiracy also refers to various forms of power imbalance between richer and poorer countries which arise out of poorer countries' tendencies towards high biodiversity and richer countries' tendencies towards needing or wanting the benefits of that high biodiversity. In 1992, the Convention on Biological Diversity (CBD) recognized the value of traditional knowledge in protecting species, ecosystems and landscapes, and incorporated regulations regarding access to it and its use. By 2006, 188 countries had ratified the Convention and agreed to be bound by its provisions, the largest number of nations to accede to any existing treaty (the United States is one of the few countries that has signed, but not ratified, the CBD).

Bioremediation

Definition

Bioremediation can be defined as any process that uses microorganisms, fungi, or their enzymes to return the contaminated soils to their original condition. Bioremediation may be employed against specific soil contaminants (such as degradation of chlorinated hydrocarbons by exogenous bacteria), or with a more general approach, like cleanup of oil spills by the addition of fertilizers (to facilitate the decomposition by indigenous bacteria). There are cost/efficiency advantages to bioremediation employed in areas that are inaccessible without excavation. Some examples of bioremediation technologies are bioventing, landfarming, composting, bioaugmentation, rhizofiltration, and biostimulation. Not all contaminants are easily treated by bioremediation; heavy metals such as cadmium and lead are not readily absorbed or captured by microorganisms. Genetic engineering creates organisms specifically designed for bioremediation like *Deinococcus radiodurans* (the most radio-resistant organism known), modified to consume and digest toluene and mercury from highly radioactive nuclear waste. However, the assimilation of metals such as mercury into the food chain may worsen matters in the whole biosphere.

Biostatistical Design

Definition

Biostatistical design is a unified approach to a common core of problems of statistical design that are central to many related fields in the biomedical sciences, in the health sciences, in the social sciences and in health services research led by three fundamental principles: 1) all problems occur in a system of interconnected processes, 2) variation exists in all processes, and 3) understanding and reducing variation are the keys of success. It covers at least the following elements: identification of the data to be collected (this includes the variables to be measured, their role in a study, ways of measurement, the number of experimental units, namely, the size of the study, and the way they were chosen and followed-up); the design of a comparison/relationship strategy; an appropriate analytic model for describing and processing data; and a list of questions to be answered throughout the study (What inferences does one hope to make from the study? What conclusions might one draw from the study? To what population(s) is/are the conclusion(s) applicable)?

Biostatistical Software

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Synonyms

Statistical software; Statistical packages

Definition

Biostatistics – is the application of statistics to the analysis of biological and ► medical data. Biostatistical software is a suite of computer programs specialized for statistical analysis of biological and medical data. It enables people to obtain the results of standard ► statistical procedures and statistical significance tests, without requiring low-level numerical programming. Most statistical packages also provide facilities for data management.

Basic Characteristics

Nowadays, very often, biostatistics uses general statistical packages, which include many procedures that are seldom used in the solution of biostatistical problems.
Statistical software used for biostatistics' problems should encompass routine procedures, such as: ► data entry and data management; summarizing information from data in tables and graphs and summary statistics; probability, probability distribution, randomization of patients, sufficient sample size to have adequate statistical power; for making inference from data: confidence intervals and hypothesis test; specifying α – type error I, β – type error II and ► power analysis; estimating and comparing mean or differences in mean; comparing three or more means (ANOVA); estimating and comparing proportions; associations and prediction; statistical methods (parametric and nonparametric) for analyzing survival data; statistical methods for multiple variables; evaluating diagnostic procedures, time series analysis, etc.
Bearing in mind that different statistical software's contain routine procedures more developed than other software's, we are frequently compelled to use more than one statistical package in the process of solving one particular biostatistics' problem. Also, given the moment in time that we are all living in, statistical software's tend to become rapidly outdated forcing software vendors to continually update and correct their product (often issuing patches or service releases that correct errors and bugs). Consequently, buyers – via vendor's web sites – can provide themselves with information regarding errors, bugs, macros and add-ons that extend the capability of the basic package. The same way, they are offered the possibility of a free 30-day trial of fully functional new version which enables them to test them with their own biostatistics' problems.
All in all, there are no ► data management packages available on the market which are designed and optimized for biostatics' softwares, nevertheless, each package comes with the data entry and data management options and it is their functionality that permits data adjustments for particular statistics' routine procedures and for connection with the existing database systems.

Statistical Software for Successful Biostatistics' Problem-Solving

For a successful biostatistics' problem-solving, it is possible to use one of the commercial packages, general public license packages, analysis packages with statistics add-ons, as well as some general purpose languages with statistics libraries. Consistent with that, some of the aforementioned are described later.

SAS/STAT® Software (www.sas.com)

From traditional analysis of variance and predictive modeling to exact methods and ► statistical visualization techniques, SAS/STAT software provides tools for both specialized and enterprizewide analytical needs.
Key features: analysis of variance, regression, categorical data analysis, multivariate analysis, survival analysis, psychometric analysis, cluster analysis, nonparametric analysis, survey data analysis, multiple imputation for missing values, study planning.
SAS/ETS contains popular forecasting methods such as regression analysis, trend extrapolation, exponential smoothing, Winter's method (additive and multiplicative), ARIMA (Box-Jenkins) and dynamic or transfer function models.

JMP
(http://www.jmp.com/)

SAS created the JMP desktop statistical discovery software, that uses a structured, problem-centered approach for exploring and analyzing data. The intelligent interface guides users to the adequate analyzes. JMP automatically displays graphs with statistics, enabling users to visualize and uncover data patterns.

BMDP
(http://www.statsol.ie/html/bmdp/bmdp_home.html)

BMDP has its roots as biomedical analysis packages from the late 1960s. It is a comprehensive library of statistical routines from simple data description to advanced multivariate analysis, and is backed by extensive documentation. Each individual BMDP subprogram is based on the most competitive algorithms available and has been rigorously field-tested. The BMDP package contains over 40 interrelated statistical programs. All of the programs share common instructions and convenience features to save time and effort.

SPSS
(www.spss.com)

Data Analysis with Comprehensive Statistics Software, statistical and ► data management package for analysts and researchers. SPSS for Windows is a modular, tightly integrated, full-featured product line for the analytical process – planning, data collecting, data access, data management and preparation, data analysis, reporting, and deployment. Using a combination of add-on modules and stand-alone software that work seamlessly with SPSS Base enhances the capabilities of this statistics software. The SPSS Programmability Extension™ enables analytic and application developers to extend the SPSS command syntax language to create procedures and applications – and perform even the most complex jobs – within SPSS.

StatSoft STATISTICA
(http://www.statsoft.com)

StatSoft's flagship product line is the STATISTICA suite of analytic software products. STATISTICA provides the most comprehensive array of data analysis, data management, data visualization, and data mining procedures. Its techniques include the widest selection of predictive modeling, clustering, classification, and exploratory techniques in one software platform. The STATISTICA Visual Basic language that can be used to write custom extensions.

NCSS and PASS
(Statistical & Power Analysis Software)
(www.ncss.com)

NCSS software provides a complete, easy-to-use collection of over 200 statistical and graphics tools to analyze and visualize data.
PASS (► power analysis and Sample Size) software is an easy-to-use research tool for determining the number of subjects that should be used in a study, performs power analysis and calculates sample sizes for over 150 statistical tests.

Mathematica, WOLFRAM RESEARCH
(http://www.wolfram.com/)

Mathematica's statistics capabilities are part of Mathematica's standard add-on packages. Like any statistics package, Mathematica provides a numerical and graphical toolset to illustrate, simulate, and find approximate numeric solutions to numerical problems.

Matlab
(http://www.mathworks.com/)

MATLAB® is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.
The Statistics Toolbox, for use with MATLAB®, is a collection of statistical tools built on the MATLAB numeric computing environment. The toolbox supports a wide range of common statistical tasks, from random number generation, to curve fitting, to design of experiments and statistical process control. The toolbox provides two categories of tools: Building-block probability and statistics functions and Graphical, interactive tools. The first category of tools is made up of functions that can be called up from the command line or from an individual's own applications. Many of these

functions are MATLAB M-files, series of MATLAB statements that implement specialized statistics algorithms.

R Project for Statistical Computing (http://www.r-project.org/)

R is a language and environment for statistical computing and graphics. It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues. R can be considered as a different implementation of S. There are some important differences, but much code written for S runs unaltered under R. R provides a broad variety of statistical (linear and nonlinear modeling, classical statistical tests, time-series analysis, classification, clustering, etc.) and graphical techniques, and is highly extensible. The S language is often the vehicle of choice for research in statistical methodology, and R provides an Open Source route to participation in that activity. R is available as Free Software under the terms of the Free Software Foundation's GNU General Public License in source code form.

Free Statistical Software (http://statpages.org/javasta2.html)

This page contains links to free software packages that can be downloaded and installed onto a computer for stand-alone (offline, non-Internet) computing. They are listed below, under the following general headings: General Packages: support a wide variety of statistical analyses; Subset Packages: deal with a specific area of analysis, or a limited set of tests; Curve Fitting and Modeling: to handle complex, nonlinear models and systems; Biostatistics and Epidemiology: especially useful in the life sciences; Surveys, Testing and Measurement: especially useful in the business and social sciences; Excel Spreadsheets and Add-ins: need a recent version of Excel; Programming Languages and Subroutine Libraries: customized for statistical calculations; need to learn the appropriate syntax; Scripts and Macros: for scriptable packages, like SAS, SPSS, R, etc.; Miscellaneous: do not fit into any of the other categories; Other Collections of Links to Free Software.

Cross-References

- ▶ Data Entry
- ▶ Data Management Packages
- ▶ Medical Data
- ▶ Power Analysis
- ▶ Statistical Procedure
- ▶ Statistical Visualization Techniques

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Biostatistics

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Introduction

▶ Biostatistics is the application of ▶ statistics in health-related fields, including public health, medicine and biology, and the development of new tools to study these areas. Biostatistics constitutes the quantitative foundation for public health practice and research. It comprises the reasoning and methods for using ▶ data as evidence to address public health and biomedical questions.

Statistics itself has various definitions, but all definitions have as essential components that statistics is a science of generating information and knowledge through the collection, analysis and interpretation of data that are subject to ▶ random variation. It is a curious amalgam of mathematics, logic and judgment (Altman 1999). Statistics has its origins in three branches of human activity: first, the study of mathematics as applied to games of chance; second, the collection of data as part of the art of governing a country; and third, the study of errors in measurement, particularly in astronomy. At first, the connection between these very different fields was not obvious, however it came to be appreciated that data are governed to a certain extend by chance, that decisions have to be made in the face of

uncertainty and that errors in measurement have a random component (Senn 1997).

Biostatistics as a subject is very largely about data. However, data alone have little significance – to be meaningful, they must be placed in a context. Biostatistics works with data, yet its goals are: insight, discovery, exploitation, confirmation, explanation, ► prediction, control and decisions related to problems of human health and disease, Fig. 1. In order to achieve this, public health practitioners and researchers ought to implement ► statistical thinking following three fundamental principles: 1) all problems occur in a system of interconnected processes, 2) variation (► variability) exists in all processes, and 3) understanding and reducing variation are the keys of success. It involves an understanding of why and how information and knowledge are generated. This method of inquiry includes recognition and understanding of the entire statistical investigative process (from asking the questions to data collection, analysis selection, testing assumptions, etc.); understanding how models ► statistical model are used to simulate ► random phenomena and how the data are produced to estimate probabilities; recognition of how, when, and why existing inferential tools can be used; and at last, being able to understand and utilize the context of a problem to plan investigations and draw conclusions.

The domain of biostatistics includes: statistical aspects of public health and biomedical research design (how and why the data have been collected), descriptive statistics (description or summarization of a collection of data) and ► inferential statistics (the drawing of inferences about a pool of data when only a part of the data are observed). The latter can also be seen as the modeling of patterns in the data, in a way that accounts for randomness and uncertainty in the observations, to draw inferences about the process or ► population being studied.

This synopsis provides an overview of the field of biostatistics, setting a context for more specific articles – essays in this domain. It addresses: the history of biostatistics; key terms and concepts fundamental to the subject of biostatistics; building blocks of biostatistics – ► probability, measurement, research excellence and decision making; survey of biostatistical methods and its area of specialization; and the current scope of the field, which is increasingly fragmented into specific areas of inquiry. The other articles – essays, provide detailed reviews of different statistical methods and specifically focused areas of biostatistics.

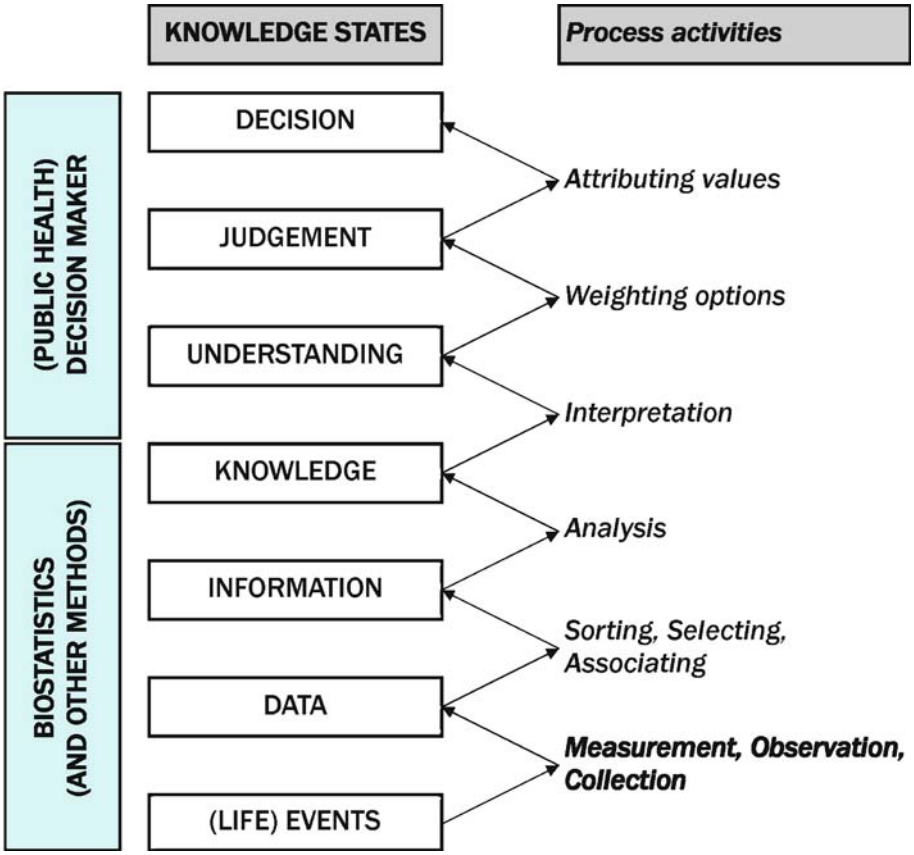
History of Biostatistics – the Origins, the Foundations and Important Contributors

The history of biostatistics, in its very large part, is the history of statistics as well.

The Rise of Modern Statistics

The beginnings of modern statistics are often dated to the early 20th century due to works of Karl Pearson (1857–1936) and Ronald Aylmer Fisher (1890–1962). Near the end of the 19th century, scientists began to gather a great amount of biological data. They faced obstacles because their data had so much variation, i. e. biological systems were so complex that a particular outcome had many causal factors. There were already a body of probability theory, however prevailing scientific wisdom supposed that this theory and actual data are separate entities and should not be combined (Chen 2003). Due to the work of Karl Pearson, this attitude was changed, and statistics was transformed from an empirical social science into a mathematical applied science. He transformed statistics from a descriptive to an inferential discipline.

Beside Pearson, another founder of modern statistics was Sir Ronald A. Fisher. He made numerous original contributions to almost every branch of statistics including, correlation, regression, significance tests, theory of estimation, analysis of variance, and multivariate analysis. Indeed many of these and other fields in statistics were originally developed by Fisher. Pearson who has been in a long dispute with Fisher (Johnson 1997) used large samples, which he measured and from which he tried to deduce correlations. Fisher, on the other hand, followed William Gosset (1876–1937) in an attempt to use small samples and, rather than deduce correlations, find the causes. In the course of developing statistical methods for design and analysis of the experiments, he proposed three fundamental principles – the essentiality of ► replication, ► randomization and the possibility of reducing errors by appropriate organization of experiments. For Fisher, statistical analysis and experimental design were merely two aspects of the same whole, and they accounted for all the logical requirements of the complete process of adding to natural knowledge by experimentation (Chen 2003).



Biostatistics, Figure 1

The new developments in statistical theory brought about by Fisher's work have also facilitated the emergence of the modern clinical trial. The first modern clinical trials were carried out by the Medical Research Council in the United Kingdom and their prime initiator was Austin Bradford Hill (1897–1991). The year 1946 marked the first clinical trial with a proper randomization on the use of streptomycin in the treatment of pulmonary tuberculosis. The core element was the random assignment of subjects to different therapeutic or preventive options. While randomization does not guarantee comparability of the study groups, it does eliminate the potential bias that may result from an investigator's preconceptions. Randomization makes it impossible to predict the assignment of the next person enrolled in the study. The trial involved patients from several centers, and they were randomized to two treatments – streptomycin plus bed-rest, or bed-rest alone. Disease endpoints were patient survival and radiological improvement evaluated independently (blindly and replicated) by two radiologists and a clinician. Both were significantly better on streptomycin. Hill's work set the trend for future clinical trials where both, the insight of physician and the statistical design of professional statisticians, were combined.

The emergence of the randomized clinical trials coincided with the change of definition about statistics as a discipline. Chernoff and Moses in 1959 said, "Years ago a statistician might have claimed that statistics deals with processing of data. Today's statistician will be more likely to say that statistics is concerned with the decision making in the face of uncertainty"(► decision making under uncertainty) (Chernoff 1959).

The Foundation of Statistics

The origins of statistics, however, can be traced back for centuries. Much of what we now call statistics has been known by other names since biblical times, and contributors to the field were not limited to mathematicians. Long before the birth of Christ, census counts were taken. Firstly, in order to register the number of people, then potential taxpayers, and lately to count disease events. The counting of disease events, representing the

idea of relative frequency, can be traced to John Graunt (1620–1674), who investigated in detail the bills of mortality in London, and William Petty (1623–1687), who proposed that a central statistical office be established and suggested what uses might be made of the data collected. Graunt introduced the notion of inference from a sample to an underlying population and described the calculations of life expectancy.

Late 17th Century

The origins of probability and statistics as sciences are usually found in the same period – the late 17th century – in the mathematical treatment of the systematic study of mortality data, as well as of games of chance. This period was the age of the scientific revolution and some of the leading scientists, Blaise Pascal (1623–1662), Christiaan Huygens (1629–1694) and Jakob Bernoulli (1654–1705), gave thought to probability influencing its further development. Much of the Pascal and Huygens' work into probability problems consisted of deriving mathematical laws in order to enumerate ways in which particular types of events may occur. One well known illustration of such a law, the binomial law, is given by Pascal's triangle. The last of them, Bernoulli, has been designated as a father of the quantification of uncertainty introducing a theory of probability in 1713. He demonstrated that because probabilities could be calculated for ratios of chance events (such as the fall of sets of dice), it can also be proved that the greater the number of experiments (or rolls of dice) the more closely the estimated ratios would come to the true ratio of their probabilities – law of large numbers which is central to the science of statistics.

18th Century

In the first half of the 18th century, probability established itself in physics, particularly astronomy, its most developed branch. The most enduring of these applications to astronomy dealt with the combination of observations. The resulting theory of errors was the most important predecessor of modern statistical inference, particularly of estimation theory. Abraham de Moivre (1667–1754) was the first to state the properties of the normal curve. Later the celebrated *Essay towards solving a Problem in the Doctrine of Chances* by Thomas Bayes (1702–1761), published in 1763, was the first attempt to use the theory of probability as an instrument of inductive reasoning; that is, for arguing from the particular to the general, or from the sample to the population. The work on conditional probability with applications to inverse probability defines the postulate of the celebrated ► Bayes' theorem.

Whereas Bayes excelled in logical penetration, Pierre-Simon Laplace (1749–1827) was unrivaled for his mastery of analytic technique. A direct result of Laplace's study of the distribution of the resultant of numerous independent causes was the recognition of the normal law of error and consequently – the ► central limit theorem. He viewed medical therapy as a domain for application of probability and assumed that the summary of therapeutic successes and failures from a group of patients could guide the future therapy (Chen 2003).

Carl Friedrich Gauss (1777–1855) was a younger contemporary of Laplace and undoubtedly a father of modern ► statistical reasoning. He approached the problem of statistical estimation in an empirical manner, raising the question of the estimation not only of probabilities, but also of other quantitative parameters, and finding solution through the method of maximum likelihood. Gauss, further, perfected the systematic fitting of regression formulae, simple and multiple, by the method of least squares, which, in the cases to which it is appropriate, is a particular example of the method of maximum likelihood. The contrasting figures of Laplace and Gauss dominated this period and work on the theory of errors had reached its climax.

Early 19th Century

The first census of population was taken in 1801, and the Statistical Society of London was established in 1834. This period saw the beginning of a philosophical literature on probability. The rise of statistical reasoning and thinking is connected to John Stuart Mill (1806–1873), who suggested these processes. In his view, if conclusions are found to accord with experience, a hypothesis is verified. Modern views have put this verification slightly differently: if the hypothesis is not contradicted, it remains a conjectured explanation of a relationship; if the hypothesis is contradicted, in even a single instance, it is rejected. This period also saw the beginning of the most glamorous branch of empirical time series analysis – the sunspot cycle.

Lambert Adolphe Jacques Quetelet (1796–1874) was the first to apply statistical analyzes to human biology, organize the first statistics conference, and had an extremely profound effect on the generations that followed. He studied the distribution of people's characteristics observed and, in parallel, the properties of the normal distribution curve – one of the central concepts in statistics. A prominent physician, Pierre Louis (1787–1872), following the ideas of Laplace, deemed that enumeration was synonymous with scientific reasoning. In his study of typhoid fever, for which the data had been collected between 1822 and 1827, Louis observed the difference in age, the duration of residency in Paris and the difference between the groups of patients who died and those who survived. More importantly, he studied the efficacy of bloodletting as a therapy for typhoid fever (Senn 1997). This study raised two crucial research questions – first being the insufficient sample size, and second one on choice of the control group.

Late 19th Century

A few important applied fields opened up in the second half of the 19th century. Probability found a major new application in physical science, in the theory of gases, which developed into statistical mechanics. Statistics entered the fields of psychology and economics, as well. The statistical study of heredity developed into the science of biometry and many of the advances in statistical theory were associated with this subject. Biostatistical reasoning and modeling were critical in the formation of the foundation theories of modern biology. After the rediscovery of Gregor Mendel's (1822–1884) work, the conceptual gaps in understanding between genetics and evolutionary Darwinism led to a vigorous debate between biometricians and Mendelians. The work of Pearson and Fisher (already described), and other biostatisticians helped bring together evolutionary biology and genetics into a consistent, coherent whole that could begin to be quantitatively modeled.

Methodological Controversies in the 20th Century

The 20th century is characterized by some major methodological battles. Firstly, there was a disagreement with regard to the preference for correlational large scale studies (Pearson) versus experimental small scale studies (Fisher). The field of experimental small scale studies witnesses the emergence of a second controversy: H_0 testing (Fisher) versus the inclusion of H_1 and the concept of Power (Jerzy Neyman (1894–1981) and Egon Pearson (1895–1980)). Thirdly, Charles Spearman's (1863–1945) belief in one general intelligence factor, which supposedly was the driving force behind the development of factor analysis, led to arguments, which have lasted for several decades, with Louis Thurstone (1887–1955) and others who gradually looked upon factor analysis as just a way of simplifying the data (Johnson 1997).

Biostatistical Methods in the 20th Century

Biostatistical methods expanded rapidly during the 20th century. Before the Second World War Andrei Kolmogorov (1903–1987) presented an axiomatic basis for probability and, together with Aleksandr Khinchin (1894–1959), developed a general theory of stochastic processes; Harold Hotelling (1895–1973) worked on principal component analysis, canonical correlation and discriminant analysis. The war generated research problems which led to Norbert Wiener's (1894–1964) work on prediction and Abraham Wald's (1902–1950) effort on sequential analysis. After the Second World War, non-parametric analysis boomed with the work of Frank Wilcoxon (1892–1965), William Kruskal (1919–2005), David Kendall (b. 1918) and John Tukey (1915–2000). The latter in 1977 presented an exploratory data analysis (EDA) as an antidote to the ritualized testing of hypotheses, instead of initially looking at the data. Sir David Cox's (b. 1924) 1972 paper on proportional-hazards regression ignited the fields of survival analysis and semiparametric inference. At the same time John Nelder (b. 1924) published a paper on generalized linear models. In 1976, Gene Glass (b. 1940) published his article on combining the results of multiple studies and named this approach meta-analysis. Bradley Efron (b. 1938) introduced bootstrap methods in 1976.

During the late 20th century, rapid improvements in computer support were essential to the growing role of empirical investigation and statistical inference. The changes following the introduction of computers have been much more radical than those following the use of mechanical calculating machines at the end of the 19th century. With the availability of computers traditional activities took less time and new activities became possible. Statistical tables and tables of random num-

bers first became significantly easier to generate and then they disappeared as their function was subsumed into statistical software packages. Significantly larger data sets could be assembled and analyzed and exhaustive data-mining became possible. Much more complex models and methods could be used and new methods have been designed with computer performance in mind. With the introduction of computer-based methods for generating pseudo random numbers, much more ambitious Monte-Carlo investigations (introduced by John von Neumann (1903–1957)) became possible. The Monte-Carlo experiment became a model of investigation on the finite sample behavior of statistical procedures.

Key Concepts and Terms Underlying the Subject of Biostatistics

Biostatistics depends on certain basic concepts that provide the necessary fundamentals for more specialized expertise in any area of statistical analysis. It is imperative to be clear about common terms used in this text as well. The selected topics illustrate the basic assumptions of most statistical methods and represent the components of one's general understanding of the "quantitative nature" of reality (Nisbett et al. 1987).

Data

In general, the term data refers to factual material used as a basis for discussion and decision making, while in biostatistics it refers to the material available for analysis and interpretation. By definition, data are facts, observations, realizations of one or more underlying ► variables recorded on one or more observational units.

Data are the results of taking measurements of certain characteristics or properties of observational units, which are of interest to us. By observational unit, we mean the source that imparts the value of the variable. It may be an individual item (e. g. an object, person or event) or it may be a collection of items (e. g. household, litter or set of symptoms). By measurement, we mean the assignment of numerals to these observational units according to a certain rule. Sources of public health data are numerous and diverse, but in practice five main sources are used: facts obtained in the course of research, certificates of vital and other health-related events, health surveys, medical records and unobtrusive data sources (e. g. economic statistics, police reports, insurance claims).

Data can be either categorical or numerical (otherwise known as qualitative or quantitative). Categorical data represent the simplest type of observation on an individual, which is the allocation of that individual to one of two or many possible categories (e. g. male/female, smoker/non-smoker, blood group, country of birth, social class, various staging systems of cancer, degree of pain). Numerical data arise either from counting processes (number of children in family, number of visits to health care institution, etc.) or through physical measurements (e. g. height, temperature, blood pressure). Since statistics deals with numerical data, we can artificially (codes/ranks) turn categorical data into numerical data. Still, they would be numerical in name only, because they do not share any or some of the properties of the numbers we deal with in ordinary arithmetic.

The terms data and information are used interchangeably in many contexts. This may lead to confusion. Definitely, there is a distinction between them. Data are physical representations of information. Through a context, data become transformed into information (i. e. when it becomes relevant to a specific decision problem). That context is a fusion of substantive knowledge of a topic, methodological approach to gathering the data and the statistics used to derive meaning.

Variation, Variability and Uncertainty

Biostatistics is very largely about variability (► variability, variation). Sometimes, it is the variability itself that is of prime interest, such as when describing the likely values of some measurement in a group of people. However, we are often more interested in detecting underlying trends which may be obscured by variability. The terms variability and variation are often used as synonymous in the literature. Precisely, the term variation refers to the differences that are actually present among the individuals in a population or a sample. It can be directly observed as a property of a collection of items. In contrast, variability is a term that describes the potential or the propensity to vary.

Sources of variation in public health and medical observations are true biological variation, temporal variation, measurement error and sampling error. True biological variation, which is inherent in natural populations,

refers to all those factors that tend to make one individual different from another (e. g. age, sex, race, genetic factors, diet, socioeconomic status and past medical history). Temporal variations refer to all those factors that produce variation in observations within an individual from one time to another (e. g. emotional state, circadian rhythms). Measurement error concerns all the factors that tend to produce differences with different measurements of the same phenomenon (e. g. observers, measuring instruments, technician errors, laboratory conditions). Sampling errors occur when estimates are derived from a sample rather than a census of the population. The sample used for a particular survey is only one of a large number of possible samples of the same size and design that could have been selected. Even if the same questionnaire and instructions were used, the estimates from each sample would differ from the others. This difference, termed sampling error, occurs by chance, and its variability is measured by the standard error associated with a particular survey.

The use of biostatistics is essential for making judicious decisions in the fields of public health and medicine. Due to variations, the outcomes of these decisions cannot be predicted exactly – they are always accompanied by an amount of uncertainty. The uncertainties can be measured, they can be assigned numbers and numbers can be interpreted. These numbers are called probabilities. It is thus necessary to be conversant with the proper techniques for dealing with such variations and uncertainties.

Although we related the concepts of variation, variability and uncertainty to human subjects, the similar considerations apply if one is studying variation from one country to another (for example in infant mortality rates), comparing characteristics of the groups of individuals, or looking at measurements of the same subject under different conditions.

Variable

A variable is any characteristic (property) of the observational unit with outcomes (data) that vary from one observation to the other. A variable may have a different value out of a specified set of values in different people, in different places or at different times. Some examples of variables include the height of adult females, the gender of preschool children, and IQ test score of patients seen in mental clinics. The variables are often referred to as random variables when the value of a particular outcome is determined by chance (i. e. by means of random sampling). To represent a particular random variable, statisticians generally use an upper case Roman letter, say X or Y. The particular value that this random variable represents in a specific case is often denoted by the corresponding lower case Roman letter, say x or y. Any characteristic that does not vary is a constant.

Each variable should be precisely defined, i. e. given a name (to know exactly what the variable is) and a description given of how it is measured – operational definition of a variable. The defined way of measurement in operational definition may produce different types of numbers, in the sense that some numbers are assigned different meanings and implications from others. There are four scale types, distinguished by the types of numbers produced by the measurement of a specific variable: nominal, ordinal, interval and ratio.

There are three main classifications of variables: 1) quantitative or qualitative; 2) continuous or discrete; and 3) independent or dependent variables. In the first classification – the quantitative (numerical) variable is one that can be measured in the typical, traditional, sense. For example, we can obtain measurements on height of adult females or values in mmHg of the variable systolic blood pressure. They can be measured either on an interval or on a ratio scale. Measurements made on quantitative variables convey the concept of amount. The qualitative (categorical) variable has values (attributes) that are intrinsically non-numerical, but can be put in a numerical form. For example, gender of preschool children or social class of citizens in a specific district. The latter can be ordered or ranked. Such variables are measured either on a nominal or on an ordinal scale.

The second classification comprises the distinction between a continuous and a discrete variable. Some variables (such as weight, height, reaction time) are measured on a continuous scale, meaning that there are an infinite number of possible values these variables can take. In contrast, discrete variables, such as the number of children in a household or their gender, can take only a limited number of values. Categorical variables are necessarily discrete ones, while numerical variables may be either continuous or discrete.

The third classification makes a distinction between an independent and a dependent variable. An independent variable is one whose changes relate (sometimes

cause) other variables to change in value. The independent variable is what researcher or nature manipulates – a treatment, a program, or a cause. Common types of independent variables, beside manipulated variables, are subject variables (e. g. age, gender). A dependent variable is the one that has its values affected by change in independent variable – effect or outcome. They are only measured or registered. All other variables that may affect the dependent variable are called covariates. Their relationship with the dependent variable, ideally, should be adjusted before the effects of the specified independent variables are examined. Common types of dependent variables are physiological measures (e. g. heart rate, blood pressure), self-reported measures (e. g. rating scales, opinion polls/questionnaires), behavioral measures (e. g. accuracy or speed of response, frequency of response), etc. A given research can use a single dependent variable, two or more separate dependent variables or a composite dependent variable (several measures combined into a single dependent variable). In modern statistics the terms independent and dependent are usually replaced by their statistical equivalents – explanatory and response variable.

Population and Sample

Population (or universe, or target population) is any finite (e. g. the babies born in Serbia in 2005) or hypothetical (e. g. the babies that will be born in Serbia in 2015) collection of observational units (persons, things, or measurement values) for which there is an interest at a particular time. In general, we are interested in different numerical characteristics of the population. We get them in the form of a ► parameter–information on statistical characteristics about populations. Sometimes, many populations are too large to measure (due to time and cost); others cannot be measured because they are partly conceptual. Thus, except for some data collected by a complete population census, we do not know the population parameters.

The best one can usually do is to select a subset of values from a population – sample, to make inferences about the population based on information contained in the sample. This is one of the major objectives of modern statistics. By definition, a sample is a collection of objects or individuals meant to represent a larger collection (the population). The population on which we are seeking information is called the target population. The population to be sampled is called the sample population. The sampling is a process of selecting a sample from a population.

The innovation made by statisticians was the recognition that if objects were selected randomly from a population of interest, those selected (the sample) would be representative of that population, and that measures of the error resulting from the use of the sample (e. g. rather than the population) could be computed. In other words, apart from random error, the information derived from the sample is expected to be the same had a complete census of the target population been carried out.

Parameter and Statistic

A parameter is a summary value (numerical quantity measuring some aspect of a population values) which in some way characterizes the nature of the population in the variable(s) under study. Often, it is a mathematical function of the population values of the variable(s) (e. g. the population mean, the population variance, the population proportion, the population correlation coefficient). Greek letters (μ, σ^2, π, ρ, respectively) represent parameters. The parameters are rarely known and they have to be estimated.

A ► statistic is a summary value (numerical quantity measuring some aspect of a sample values) calculated from the observations in a sample (e. g. the sample mean, the sample variance, the sample proportion, the sample correlation coefficient). Statistic is usually used as an estimator of some population parameter. They are represented by Roman letters ($\bar{x}$, s^2 or sd^2, p, r, respectively).

In general, if we use a statistic (sample information) to make an inference about a population parameter (in one of two ways: estimate its value, i. e. provide an point or interval estimate; or make decisions about its value, i. e. test a hypothesis about its value), we introduce an element of uncertainty into our inference. Consequently, it is important to report the reliability of each inference we make. Typically, this is accomplished by using a probability statement that gives us a high level of confidence that the inference is true. Reliability of the estimate is measured with confidence coefficient (in interval estimates), and the reliability of the hypothesis testing is measured by the probability of making an incorrect decision.

Statistical Model

Most statistical procedures are based on model assumptions – that is, one or more assumptions about a variable's distribution, or how data is selected, or about ► relationships between variables. A model is a representation, often in mathematical language, of the essential aspects of a system, situation, or process. A probability model is a mathematical model that incorporates an element of randomness. This contrasts with a deterministic model, in which reliable predictions are made only on account of observed variables. One of the most commonly used probability models is the normal, or Gaussian, probability distribution, of which there are many examples in biology, medicine, and public health. Variations in height, blood pressure, and attack rates in outbreaks of disease are examples of Gaussian distribution. Moreover, the distributions of many test statistics are normal or follow some form that can be derived from the normal distribution.

A statistical model is a simplified or idealized description of random phenomena, in probabilistic terms, that is a basis for inferences and predictions. The aim is to explain available data, thereby learning about the underlying processes that have formed these data sets. For example, a major contribution to our knowledge of public health comes from understanding trends in disease rates and/or examining relationships among different predictors of health. Biostatisticians accomplish these analyzes through the fitting of statistical models to data. The models can vary from a simple straight-line fit to models with a variety of nonlinear multiple predictors whose effects change over time.

In addition, worthy of note are three key steps associated with statistical model building. First, certain assumptions are made when a model is chosen, and it is important to attempt to verify that these are reasonable. An obvious common example is the assumption that the data have an approximately normal distribution, some form of which appears in most of the models used. Second, it is also important to consider how well the model fits the data. Goodness of fit (► goodness of fit test) refers to the procedures that assess how well a given model describes a particular collection of data. Third, the model that fits the data well should be capable of being utilized successfully when applied to new data. Model validation involves an assessment of how the fitted statistical model will perform in practice – that is, how successful it will be when applied to new or future data.

There are two principal aspects of the use of statistical models – exploratory and confirmatory. In the exploratory phase, models are used to describe various characteristics of the data that may be important for understanding it. Confirmatory use is the attachment of probabilities to the characteristics observed to assure that any conclusion drawn is not merely due to chance.

Biostatistical Design of Studies

Finally, some of the principles of ► biostatistical design are introduce. This is a reminder that statistics is not an end in itself, but a tool to be used in investigating the world around us (van Belle et al. 2004).

Biomedical and public health studies arise in many ways and the problems studied may be investigated in a variety of ways. There are several different schemes for classifying study designs: quantitative or qualitative studies; primary or integrative studies; experimental or observational studies; prospective or retrospective studies, cross-sectional or longitudinal studies; population or sample studies; studies with or without hypotheses; etc. Whatever the design of the study may be, it has to consider at least the following elements: identification of the data to be collected (this includes the variables to be measured, their role in a study, ways of measurement, the number of experimental units, namely, the size of the study, and the way they were chosen and followed-up); an appropriate analytic model for describing and processing data; and a list of questions to be answered throughout the study (What inferences does one hope to make from the study? What conclusions might one draw from the study? To what population(s) is/are the conclusion(s) applicable)? The remaining steps in study performance are: the study is carried out and the data are collected; the data are analyzed and conclusions and inferences are drawn; and the results are used (changing operating procedures, publishing results, and/or planning a subsequent study). The only step that lies outside the realm of statistics *per se* is the formulation of the problem to be studied. In all others, different statistical issues, previously mentioned in brief, are involved. Some of them are specifically related to certain types of studies, randomization, for example, while others are universal.

Building Blocks of Biostatistics

Probability

The mathematical foundation of statistics lies in the theory of probability, which is applied to problems of making inferences and decisions under uncertainty. Though statistics and probability theory are related, they do differ significantly. Probability theory is deductive; it is used for reasoning. Deductive reasoning is powerful in the manner that the conclusions drawn using deduction are guaranteed to be true when the premises are true. Statistical inference is inductive and it is used for learning. The power of inductive inference is the ability to draw general conclusions from observations, i. e. generalizing from the observed information in the sample to uncertain conclusions regarding the population. The conclusions made using inductive learning are not necessarily the true ones.

Probability Interpretations In statistics, there are two broad categories of probability interpretations. Frequentists assign probabilities only to events that are random, i. e. random variables, which are outcomes of actual or theoretical experiments. The relative frequency of occurrence of an experiment's outcome, when repeating the experiment, is a measure of the probability of that random event – frequency probability (informally statistical probability). On the other hand, there are several other interpretations classified as Bayesian probability. They assign probabilities to any proposition whatsoever as a way to represent its subjectivity, even when no random process or population is involved. Bayesian probability is named after Thomas Bayes, who proved a special case of what is now called ► Bayes' theorem. At the heart of Rev Thomas Bayes' paper titled *An essay towards solving a problem in the doctrine of chances* is a simple result that provides a way of combining *a priori* distribution for a parameter with the likelihood to provide *a posteriori* distribution for the parameter (Bayes 1763). Three interpretations can be given to prior distributions: as frequency distributions based on previous data, as objective representations of what is rationale to believe about a parameter, or as a subjective measure of what a particular individual actually believes to be true.

Likelihood The concept of likelihood is central to both the frequency and the Bayesian theory of inference. In general use, the word ► likelihood is a synonym for probability but in statistics, it has a more specific meaning – it is the probability of the observed data given the probability model, which gave rise to the data. Likelihood is used to compare different possible candidate values for the parameters of the model. The one with the greatest likelihood is considered to be more likely. Parameter values for which the probability of the observed data is greatest are most likely values, or maximum likelihood estimates. The ratio between likelihoods is used in hypothesis testing.

Odds In the groundwork for a way of measuring subjective probabilities, the concept of odds (and betting odds) is introduced. Odds are an alternative way to express the likelihood that an event (e. g. catching the flu) will occur. Probability would be the expected number of the flu patients divided by the total number of patients seen in primary health center. Odds would be the expected number of flu patients divided by the expected number of non-flu patients. Precisely, the odds that an event will occur against that it will not occur are given by the ratio of probability that it will occur to the probability that it will not occur. In a more complex situation when we have two instead of one event, the concept of odds ratio is introduced. It is capable of comparing odds of first with odds of second event occurring (e. g. the ratio of the odds of disease in exposed cohort divided by that in an unexposed cohort). The two, probability and odds of an event, can be converted from each other. They contain the same information, but express it differently.

Risk In biostatistics, the term risk is often mapped to the probability of some event, which is seen as undesirable (e. g. the probability that an individual without disease will develop disease over a defined age or time interval). The ratio of the risk of disease in an exposed cohort over a defined time interval to the risk of disease in an unexposed cohort over this same time interval is called relative risk. While the relative risk is mainly used to establish an association in etiological research, the attributable risk – probability of disease cases that can be attributed to exposure – has a public health interpretation as a measure of preventable disease.

Probability Sampling Statistical inference assumes that only if samples are properly selected, probabili-

ty methods can be used to estimate the error in the resulting statistic. For this reason, investigators must plan the sample size appropriate for their study prior to beginning research as well as a sampling method. The last may be classified as "probability sampling" (simple random, stratified, cluster, or systematic samples) and "non-probability sampling" (convenience, inverse or quota, judgment and purposive samples); or sampling with and without replacement. The sampling methods based on probability assure possibility of generalizations to the entire population. In summary, it is not only the sample-size but also the sampling method that are equally responsible for the power of the study.

Measurement

Measurement is the process of assigning numbers or other symbols to the specific characteristics of objects, persons or events in such a way that the relationships of the numbers or symbols reflect relationships of the attribute being measured (see essay ► measurement: accuracy and precision, reliability and validity). Because virtually all measurements involve errors, the problem of error is one of the central concerns of measurement theory. Understanding the nature and source of errors can help reduce their effect and prevent the drawing of incorrect conclusions. Among the various types of errors that must be taken into account are errors of observation (which include instrumental errors, personal errors, systematic errors, and random errors), errors of sampling, and indirect errors.
Measurement is the activity that produces the raw material that statistical methods analyze. If statistics is concerned with the connection between inference and data, and measurement theory is concerned with the connection between data and reality, then, both statistical and measurement theory are necessary to make inference about reality. Thus, the relationship between measurement and statistics is of a substantial importance.

Level of Measurement A particular way of assigning numbers or symbols to measure something is called a scale of measurement. The level of measurement of a variable is a classification proposed in order to describe the nature of information contained within numbers assigned to objects, therefore, within the variable. The most frequently used classification of measurement scales in statistics, even though subjected to many serious criticisms, is one defined by Stanley Smith Stevens in his article *On the theory of scales of measurement*, (Stevens 1946). An extremely important part of Stevens's contribution is the claim that "statistical manipulation that can legitimately be applied to empirical data depend upon the type of scale against which the data are ordered." Stevens's system includes four level of measurement: nominal, ordinal, interval and ratio. Each of them involves different properties (relations and operations) of the numbers or symbols that constitute the measurements as well as a set of permissible transformations.
The simplest of the scale types is the nominal scale, where the measurement of a variable involves the naming or categorization of possible values (attributes) of the variable (e. g. cause of death, gender, or blood type). The only relation pertinent is equivalence, i. e. a specific value of a variable either falls into a specific category, or it does not. Ordinal measurement involves rank ordering values of a variable (e. g. severity of condition, age group). Numbers assigned on an ordinal scale signify relationships between measurements but the distances between them do not have any meaning, i. e. the interval between values is not interpretable. The relations pertinent to this scale are those of equivalence and ordering (=, >, and <). Interval scales not only rank objects by the degree with which they possess a characteristic, but also indicate the exact distance between them (e. g. IQ, temperature in Celsius). For this scale, there is no absolute zero point. Arithmetic operations can be carried out, but cross-scale comparisons are questionable. Finally, in ratio measurement there is always an absolute zero that is meaningful (e. g. height, blood pressure). This scale involves all the above mathematical functions but also "/" and "x", (Polgar 1991).

Types of Measures Measurement is not limited to physical quantities and relations but can extend to the quantification of a magnitude of any kind – health, psychological and mental phenomena, for example. The difference can be attributed also to the unit of measurement (individual or population-level measures); purpose (descriptive, predictive, explanatory, and evaluative); according to their level of aggregation (aggregate, environmental, and global indexes, for example); instrument of measurement; standardization method applied (see essay ► standardization); type of numbers generated (absolute or relative); and to the dimensional-

ity of a measure (unidimensional or multidimensional). The adequacy of a measure is represented by its reliability and validity.

Research Excellence

Fixed vs. Sequential Sample Size Design The majority of studies have a fixed sample size, specified at the outset and determined by a formal sample size calculation. The importance of sample size calculation comes from the fact that the estimates will be sufficiently precise and the difference of interest is likely to be detected. These calculations rely on clearly defined study objectives, the study design, the main outcome, the planned analysis strategy, and determined statistical methods (see essay ► sample size determination). In sequential studies, enrollments continue until a stopping boundary (superiority or inferiority of treatment) is crossed. The last one, on average, requires a smaller sample size.

Primary vs. Integrative Studies The explosion of published primary research evidence, questionable sample sizes in primary studies and consequently a reliability of clinically important effects, a need for completeness of reliable evidences when judgment about a particular treatment should be made, gave rise to meta-analysis – systematic and quantitative review of the results of a set of individual studies, intended to integrate their findings and to provide an overall interpretation (see essay ► meta-analysis). More recently, the term systematic review has been introduced in order to refer to the whole process of qualitative and quantitative review, restricting the term meta-analysis to the quantitative aspects (see essay ► systematic reviews).

Individual-Level vs. Group-Level Studies A group-level or aggregate study focuses on the comparison of groups, rather than individuals, for example, health services, community based, and ecologic studies. The underlying reason for this focus is that individual-level data are missing on the joint distribution of at least two and perhaps all variables within each group (Kleinbaum et al. 1982). The distinctions between individual-level and group-level studies are probably best seen through the concepts of unit's level measurement and analysis.
The source of data used in studies typically involves direct observation of individuals (e. g. age, gender, and health status) but they may also involve observations of groups, organizations or places (e. g. type of health care system, ethnic group, and air pollution). These observations are then organized to measure specific variables in the study population: individual-level variables are properties of individuals, and group-level variables are properties of groups, organizations, or places.
The unit of analysis is the common level for which the data on all variables are reduced and analyzed. In an individual-level analysis, a value for each variable is assigned to every subject in the study and analyzed as such. It is possible, for one or more predictor variables to be group-level measures, e. g. exposure level. In that case, the average exposure level of each district might be assigned to every subject who is a resident of that district. In a completely group-level analysis, all variables (exposure, disease, and covariates) are group-level variables so that the unit of analysis is the group, e. g. district, workplace, health care facility, or demographic stratum. In a partially group-level analysis we have information on both, individual-level and group-level measurements.
There are various statistical methods capable of including both individual and group-level measures in the same analysis. Most frequently, the two multivariate analyzes are applied. The first one – contextual analysis is a simple extension of generalized linear modeling such as logistic regression. Its main limitation is that outcomes of individuals within the same groups are treated as independent, which is obviously not the case. The second one capable of handling this problem of within-group dependence is a statistical multilevel analysis – a special type of modeling technique that combines analysis conducted at two or more levels.

Randomized vs. Nonrandomized Trials Typically, in experimental studies a question of bias in the formation of the treatment groups is raised. The usual method for achieving similarity of treatment groups, as well as avoiding bias in the assignment process, is randomization. In the evaluation of nontherapeutic interventions, including educational programs or lifestyle modification, units of randomization are not individuals themselves, rather they are households or families, communities, classrooms, worksites and hospital wards – clusters of individuals. This characteristic then leads to cluster randomization in which clusters of individuals are randomized to different intervention groups.

The cluster randomization trials are characterized by between-cluster variation, i. e. the variation between observations in different clusters exceeds the variation within clusters. In order not to substantially decrease statistical efficiency, the attention should be on sample size determination, and methods for adjusting the effect of clustering.
In some circumstances, a non randomized trial with a historical control group might be considered. The difficulty to overcome is to show that the groups receiving new or standard treatment had comparable probabilities of favorable outcome.

Analysis "as Randomized" vs. "as Treated" Intention-to-treat analysis is an analysis that includes all randomized patients in the groups to which they were randomly assigned, regardless of what happened afterward. Treatment received analysis is an analysis that includes all patients according to the treatment actually given, (Petkova 2002). The gap between the two concepts is substantial. For now, intention-to-treat analysis is a widely used strategy for the analysis of comparative clinical trials in the definitive comparison of treatments. The treatment received analysis is used either as a secondary analysis to the intention-to-treat analysis, or for explanatory assessment of efficacy in subgroups defined by factors that could have differential response rate (e. g. compliance, age or gender).

Cross-Sectional vs. Longitudinal Studies Time is an important element of any research design, and makes one of the most fundamental distinctions in research design nomenclature: cross-sectional versus longitudinal studies. A cross-sectional study estimates the distribution of the quantity of interest (or joint distribution of several quantities) in a target population, at a certain single point in time. The primary use of this study is to determine the association between an outcome variable and some explanatory variables. Traditional statistical methods are those comprising model building efforts with one or more independent variables.
A longitudinal study is one that takes place over time – there are at least two (and often more) waves of measurement done on the same study units. A further distinction is made between two types of longitudinal designs: repeated measures and time series, based on the number of measurements over time made (20 is a conventionally used limit). In both types, the assumption of dependence between successive measurements should be taken into account. Statistical techniques used to analyze data from longitudinal studies include cross-sectional reduction of data or multivariate techniques.

Case-Control vs. Cohort Studies The goal of analysis in case-control studies is usually to identify risk factors that are related to the disease. As in other non randomized situations, the analysis must address the possibility of confounding and effect-modification by measured covariates. The most commonly used approach is a logistic regression, in which the dependent variable is the logarithm of the odds of disease. The independent variables could be discrete or continuous, regardless of distribution. When matched case-control studies are in question, a conditional logistic regression, which allows general matching schemes, arbitrary exposures, continuous or discrete confounders and effect-modifiers, is the optimal solution.
Cohort studies constitute a central epidemiological approach to the study of relationships between personal characteristics or exposures and the occurrence of health-related events. They involve a cohort of individuals moving forward in time and observing the occurrence of events of interest, over some follow-up period. Traditional approaches to the analysis of cohort studies include person-years analyzes of rare events, survival analysis for more general time-to-event data (see essay ► survival analysis), and longitudinal data analysis for repeated data (Breslow 1987).

Decision Making

Confidence Intervals vs. Hypotheses Testing There are advantages to considering analysis of trials in terms of confidence intervals rather than null hypothesis significance testing and its corresponding p value. The last one bears many critiques such as that null hypotheses cannot be proved – they can only be disproved (rejected). Moreover, failing to reject them does not mean that they are true. The misconceptions about p values are widespread and severe, too (Goodman 1999). In an attempt to address these problems the medical literature over the past decade has been moving away from tests of significance toward the use of confidence intervals – focusing on what the effect is, rather than on what the effect is not. Arguments for the use of confidence inter-

vals include: (a) they are easy to compute, requiring no more information than that required for a statistical test; (b) they provide a range of values within which the true effect is likely to lie; (c) they are just as useful as statistical significance tests for deciding whether an observed difference is due to chance or sampling variability; and (d) they facilitate the interpretation of results in terms of practical and useful clinical significance.

Statistical Significance vs. Clinical Significance Statistical significance refers to whether or not the value of a statistical test exceeds some prespecified level while clinical (in general a subject-matter) significance refers to the medical importance of a finding (see essay ► statistical vs. clinical significance). They often agree, but not always. In order to overcome this problem the studies are designed with appropriate power to detect clinically important differences in their outcomes.

Multiple Comparisons This term concerns the interpretation of the multitude of hypothesis tests that might be undertaken. The major sources of ► multiple comparisons are: multiple outcome measures (e. g. death, relapse, local and distance recurrence; morbidity outcomes), multiple treatment groups (e. g. two monotherapies and their combination in clinical trials; many geopolitical regions in ecologic studies), multiple items in a questionnaire measuring an exposure variable (e. g. some dietary questionnaires that have almost a 100 food items; quality of life questionnaires), repeated measurements over time of a specific outcome measure (e. g. viral suppression over time; creatinine clearance in dialyzed patient), and comparisons of outcome over subpopulations of subjects (e. g. subgroups defined by the values of some covariate – gender, age, race, stage of disease). Statistical analysis will give rise to many statistical tests with a high likelihood of finding many statistically significant test results purely by chance. The problem centers on the error rate that should be controlled either by multivariate global tests, adjusted marginal tests or by using summary measures.

Association, Correlation and Causal Relationship Association is a common form of dependence affecting changes in the mean values, or some other measures of level of response; association thus implies that the general level of one variable changes according to the value of another variable. Correlation expresses numerically the strength of association that might exist between two or more variables. A statistical association does not in itself provide direct evidence of a causal relationship among the variables concerned. One variable may fluctuate in relation to the other due to chance (coincidence) or both may be strongly affected by one or more confounding variables. Direct causal relationships, e. g. the relationship between vitamin C deficiency and scurvy, can rarely be proved without a randomized trial. In observational studies, causality can be established on non-statistical grounds. A causal connection probably does exist if we can establish that: there is a reasonable explanation of cause and effect; the connection happens under varying conditions; and potential confounding variables are ruled out.

Collinearity (Multicollinearity) Collinearity refers to a high level of correlation within the set of explanatory variables and is of special note in the regression modeling situation. The ► collinearity existence affects the independence of explanatory variables, and the precision of regression coefficients estimates, as well. With multicollinearity, the regression coefficient does not reflect any underlying effect of the variable on outcome, but rather a marginal effect that depends on what other variables are included in the model. The identification of collinearity can be done by computation of the variance inflation factor, by noting extremely large variance of the regression coefficient estimate, and by substantial difference between coefficient estimates from fitting simple and a multiple regression models.

Survey of Biostatistical Methods and its Areas of Specialization

Statistical methods can be used for different purposes. Firstly, to summarize or describe a collection of data – descriptive statistics (see essay ► descriptive statistics). Secondly, to draw inferences about the process or population being studied trying to reach conclusions that extend beyond the immediate data alone – inferential statistics (see essays ► confidence intervals and ► statistical tests). More precisely, inferential statistics is used to model patterns in the data, accounting for randomness and drawing inferences about the larger population. These inferences may take the form of answers to yes/no questions (hypothesis testing), estimates of numerical characteristics (estimation), descriptions of

association (correlation), or modeling of relationships and prediction of future observations (regression, and others). Nevertheless, before any data analysis the data should be carefully prepared (see essay ► data preparation). Data preparation involves developing and documenting data structure that integrates the various measures, data entry and coding, data screening, and data transformation and modification.

The use of multivariate statistical methods has developed substantially whatever the study design is in question. The difference between univariate, bivariate and multivariate statistics lies in the number of variables analyzed at a time, no matter if the aim of that analysis is to efficiently describe data or to make inferences upon them. Statistical methods most frequently used in terms of univariate statistics are: information on the value or range of a measured variable (e. g. mean, standard deviation, skewness, etc.), parameter estimation (confidence intervals), effect size calculation, and calculations of probability based on observed patterns found within one variable (t-test, analysis of variance, U test, etc.). When the bivariate statistics is in question, a numerical function describing the relationship between two variables (regression modeling) accompanied with calculation of probability based on observed patterns found between them (correlation coefficients or chi-square test) is typical. Methods applied in the multivariate statistics are a subject of particular essay – ► multivariate statistics, in this publication.

General implementation of biostatistical analysis techniques with emphasis on data application can be divided into categorical data analysis (see essay ► analysis of frequencies), ordinal data analysis and statistical analysis of continuous data. The amount of data being massed alone in all areas of biological sciences requires new thinking (how to think about very large data problems and how to think of stochastic processes) and new tools (statistical computing and software (see essay ► biostatistical software)).

With the increasing complexity of public health research, biostatistics and its areas of inquiry have become increasingly focused and specific. Areas of increased activity include epidemiological studies, clinical trials, health services assessments, basic laboratory research, biomedical imaging and most recently, genetics and genomics. The growing importance of investigations based on genetic and molecular data in the 90s, especially studies involving linkage analysis, segregation analysis, and research on polygenic inheritance of disease, require new study designs and new statistical methods for quantifying relationships at the molecular level. The other group of studies, mostly in molecular epidemiology, usually examines a classifiable genetic trait of an individual as either a risk factor or an effect-modifier for a disease outcome – the principles of study design and data analysis are similar to those encountered in epidemiological studies using other types of risk factors.

Finally, a word on the role of statistical science on public health policy issues is required. Policy issues in public health are becoming dominant in both internal and external affairs of many countries (e. g. worldwide AIDS epidemic, environmental threats, the outbreak of Sars, lifestyle risks, etc.). Many policy decisions facing these problems are based on quantitative information. The inputs to the decision makers are usually data, perhaps refined and integrated into quantitative models – models capable of predictions. This provides a chance for biostatisticians to expand their role, by not only being responsible for the collection, analysis and interpretation of data, but also by taking a greater leadership role in helping to make policy (Zelen 2006). This can be a major goal for the future of biostatistics.

Where to go?

The appearance of new concepts and methods, which are described below, creates further challenges for modern public health research and practice.

Statistical Learning Methods

During the past decades, there has been an explosion in computation and information technology. With these advances has come a vast amount of data in a variety of fields such as medicine, biology, public health, and financing. The challenge of understanding these data, the challenge of sorting through all of this data and separating out the consistent patterns from the noise, has led to the development of new tools in the field of statistics, and spawned new areas such as data mining, machine learning, and bioinformatics, (Hastie et al. 2001). The important ideas in these areas have a common conceptual framework – the concept of statistical learning from data, i. e. extracting knowledge from data. Statistical learning can be distinguished between supervised and unsupervised learning methods.

In supervised statistical learning methods, we are usually given an object with a set of variables – often called predictors, and a corresponding target – often called response or outcome values. The goal is to build a good model or predictive function capable of predicting the unknown, future target value, given input values. When the response is numeric, the learning problem is called "regression." When the response takes on a discrete set of *k* non-orderable categorical values, the learning problem is called "classification." There are many commonly used learning procedures including linear/logistic regression, discriminant analysis, generalized additive models, neural networks, kernel methods, decision trees, etc.

In contrast, in unsupervised learning, no outcome measurements are available. The aim here is to summarize or model the data in a way convenient for some objective. It is necessary to identify patterns in a given set of predictors and/or reduce the dimensionality of the predictor variables. In this case, there are no response variables and the technique of unsupervised learning is used to find and group data into similar sets of observations. Commonly used learning procedures are cluster analysis, principal components analysis, multidimensional scaling, self-organizing maps and the discovery of association rules.

Computationally Intensive Statistical Methods – Resampling Techniques

The continuing revolution in computing is having a dramatic influence on statistics. Modern computers and software make it possible to look at data graphically and numerically in ways previously inconceivable. Statistical study of very large and very complex data sets becomes feasible. But another impact of fast and cheap computing, and the only "great breakthrough" in statistics since 1970 as Kotz and Johnson stated, probably is less obvious – appearance of new methods that apply previously unthinkable amounts of computation to small sets of data in order to produce confidence intervals and tests of significance in settings that do not meet the conditions for the safe application of the usual methods of inference, (Kotz 1992). The bootstrap, permutation tests, and other resampling methods are part of this revolution.

Resampling refers to the use of the observed data (sample) or of a data generating mechanism (such as a die) to produce new hypothetical samples, the results of which can then be analyzed. Resampling repeated experimental trials on the computer enable the data (or a data-generating mechanism representing a hypothesis) to express their own properties, without difficult and misleading assumptions.

Resampling methods cover a variety of methods for computing summary statistics using: subsets of available data (jackknife), drawing randomly with replacement from a set of data points (bootstrapping), or switching labels on data points when performing significance tests (permutation test, also called exact test, randomization test, or re-randomization test), (Simon 1997). They require fewer assumptions than traditional methods and generally give more accurate answers (sometimes very much more accurate). Using such techniques, we can focus on reasoning and on understanding the data, not on complicated formulas and tables.

Frequentists vs. Bayesians

Most public health workers are surprised to learn that statistics is not monolithic. In fact, statistics as a discipline remains sharply divided even on the fundamental definition of "probability."

The logic of statistical inference presented previously is called the Neyman–Pearson approach, but it also might be termed classic, standard or frequentists' statistics. This approach assumes that the probability of an event is defined as the relative frequency of occurrence of the event in an infinite set of well defined random experiments.

Thus, frequentists believe that a population mean is real, but unknown, and unknowable, and can only be estimated from the data. Knowing the distribution for the sample mean one constructs a confidence interval, centered at the sample mean. Here the problem with logic starts. Either the true mean is in the interval or it is not. So the frequentist cannot say there is a 95% probability that the true mean is in this interval, because it is either already in, or it is not. That is because to a frequentist the true mean, being a single fixed value, does not have a distribution. However, the sample mean does. Thus, the frequentist must use a construct like "95% of similar intervals would contain the true mean, if each interval were constructed from a different random sample like this one." When would frequentist be

able to say, "There is a 95% probability that this interval contains the true mean"? – only after the performance of the interval estimate in repeated sampling (an infinite set of random experiments). Therefore, this would be helpful in the situation where one is performing a large number of 95% confidence intervals, but does not help the applied statistician who is interested in making an inference based only on a single dataset.

The main alternative approach to classic statistics – Bayesian approach, assign probabilities to any statement whatsoever (not only events as frequencionist do), even when no random process is involved, as a way to represent its subjective plausibility, (Carlin 2000). Bayesians also hold that Bayes' theorem can be used as the basis for a rule for updating beliefs in the light of new information – such updating is known as Bayesian inference. Bayes's Theorem begins with a statement of knowledge *prior* to performing the experiment usually in the form of a probability density. Now, it is desirable to improve this state of knowledge, and an experiment is designed and executed to do this. Bayes's Theorem is the mechanism used to update the state of knowledge to provide *a posterior* distribution. This *posterior* probability could be used as the starting *prior* probability for a second experiment. After successive iterations, it would be expected that the *posterior* probability would approach the truth.

Concerning the estimation problem illustrated before (as frequencionist see it), Bayesians have an altogether different world-view. They say that only the data are real. The population mean is an abstraction, and as such, some values are more believable than others based on the data and their prior beliefs. The Bayesian constructs a credible interval, centered near the sample mean, but tempered by "prior" beliefs concerning the mean. Now the Bayesian can say what the frequentist cannot: "There is a 95% probability that this interval contains the mean," when only a single dataset is in question.

Summary

The 20th century has seen a remarkable evolution of biostatistics, the quantitative science of public health and medicine. As the editors of the *New England Journal of Medicine* recently concluded, "Among the most important scientific developments of the 20th century is the explosive growth in statistical reasoning and methods for application to studies of human health" (Looking back on the millennium in medicine 2000). Examples include developments in epidemiological, environmental, spatial and imaging statistics, clinical trials, experimental design, survival analysis, meta-analysis, statistical computing and statistical genetics.

Substantive problems in public health and biomedical research, as well as in public health policy issues, have fueled the development of statistical methods, which in turn have improved our ability to draw valid inferences from data. Moreover, the appearance of new concepts and methods creates further challenges for modern public health.

Cross-References

- ▶ Analysis of Frequencies
- ▶ Biostatistical Software
- ▶ Classification
- ▶ Confidence Interval
- ▶ Data Preparation
- ▶ Decision Making Under Uncertainty
- ▶ Descriptive Studies
- ▶ Measurement: Accuracy and Precision, Reliability and Validity
- ▶ Meta-Analysis
- ▶ Random Variation
- ▶ Sample Size Determination
- ▶ Standardization
- ▶ Statistical Tests
- ▶ Statistical vs. Clinical Significance
- ▶ Survival Analysis
- ▶ Systematic Reviews

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Biotechnology

Synonyms

Bioengineering; Ergonomics; Genetic engineering

Definition

Biotechnology represents the use of biological processes through the exploitation and manipulation of living organisms or biological systems, in the development or manufacture of a product or in the technological solution to a problem. It is applied in pharmacology, medicine, agriculture, and many other fields. Example of biotechnology are techniques of genetic engineering.

Bioterrorism

Synonyms

Biological terrorism

Definition

Bioterrorism describes a form of terrorism that uses micro-organisms or toxic agents from living organisms to attack people, animals or plants for terrorist purposes. The difference between bioterrorism and conventional terrorism is mainly the duration from the time of attack to the time of the presentation of victims.

Bipolar Affective Disorder

Synonyms

Manic-depressive illness; Manic-depressive psychosis; Manic-depressive reaction

Definition

Bipolar affective disorders are characterized by two or more episodes in which the patient's mood and activity levels are significantly disturbed, this disturbance consisting on some occasions of an elevation of mood and increased energy and activity (► hypomania or ► mania) and on others of a lowering of mood and decreased energy and activity (depression). Repeated episodes of hypomania or mania only are classified as bipolar.

Bird Flu

► Avian Influenza

Birth Attendants

► Indigenous Health Care Services

Birth Control

► Contraception

Black Death Sepsis

► Plague Sepsis

Blame

► Fault

Blinding

Definition

Blinding or masking prevents conscious or subconscious biases in research. It is not inherent to randomized trials, but should be used whenever possible, as placebo effects are powerful. Blinding requires a placebo that cannot be distinguished from the treatment.

Bloodpoisoning

Synonyms

Septic infection; Systemic inflammatory reaction; Systemic inflammatory response syndrome (SIRS); Generalized infection

Cross-References

► Acute Life-Threatening Infections
► Sepsis

Bloodstream Infections

Synonyms

Sepsis; Bacteremia

Definition

Hospital bloodstream infections (BSI) constitute a serious health problem and are associated with high mortality. According to CDC definitions, a hospital BSI is defined as a patient with a clinically important blood culture positive for a bacterium or fungus that is obtained more than 48 hours after being admitted to the hospital. BSIs can be "laboratory confirmed BSI" or "clinical sepsis". BSIs can be further categorized as primary or secondary. Primary BSI occurs without any recognizable focus of infection elsewhere. Secondary BSIs are infections that develop subsequent to a hospital infection with the same microorganism at another body site. Vascular catheters account for most cases of hospital BSI.

Body Fluid Balance

Synonyms

Body fluid household; Equilibrium of body fluids; Fluid balance of the organism

Definition

The body fluid balance includes all the mechanisms that control and influence the excretion and retention of body fluids. The organism endeavors to reach an optimal amount of fluids inside and outside the cells and – at the same time – the optimal composition of these fluids. Besides intake and excretion of fluids the invisible loss of fluids also has to be taken into considered. Fluids are lost by breathing and over the skin, especially through the sweat. Larger amounts of fluids can be lost in diarrhea or vomiting and feverish conditions.

Body Fluid and Electrolyte Balance

Synonyms

Body fluid and electrolyte household; Equilibrium of body fluids and electrolytes; Fluid and electrolyte balance of the organism

Cross-References

► Therapy of Infectious Diseases

Body Fluid and Electrolyte Household

► Body Fluid and Electrolyte Balance

Body Fluid Household

Synonyms

Body fluid balance; Equilibrium of body fluids; Fluid balance of the organism

Cross-References

► Therapy of Infectious Diseases

Body Function

Synonyms

Physiological function

Definition

The physiological or psychological functions of a body are defined as body functions. According to the WHO's International Classification of Functioning, Disability, and Health (ICF), body functions are categorized into different subfunctions. Mental functions, such as the functions of the brain, can be differentiated into global mental functions (consciousness, energy, drive) and specific mental functions (memory, language, calculation). Sensory functions include functions like seeing, hearing, tasting, etc., as well as the sensation of pain. Voice and speech functions produce sounds and speech. There are functions of the cardiovascular system (heart and blood vessels), the hematological and immunological systems (blood production and immunity), and respiratory systems (respiration and exercise tolerance), as well as functions of the digestive system (ingestion, digestion, and elimination), the metabolic system, and the endocrine system. The genitourinary functions refer to urination, and the reproductive functions include sexual and procreative functions. The neuromusculoskeletal and movement-related functions are responsible for movement and mobility, and include the functions of joints, bones, reflexes, and muscles. Finally, there are the functions of the skin and related structures, like nails and hair.

Body Lice

Synonyms

Clothing lice; Pediculosis vestibularis

Cross-References

► Infectious Diseases in Pediatrics

Body Mass Index (BMI)

Definition

Body mass index is defined as the individual's body weight divided by the square of the individual's height (kg/m^2). The BMI is used for classifying underweight, overweight and obesity in adults. The BMI is a simple metric that relates weight and height. If an adult for example weighs 75kg and its height is 1.80m, the BMI will be 23.1. The cut-off points as defined by the WHO are <18.50 for underweight, 18.50–24.99 for normal range, 25.00–29.99 for overweight and ≥30 for obese. Those BMI values are age- and sex-independent in general, yet the BMI might not correspond to a similar degree of fatness in different populations. There are different health risks related with an increasing BMI, e. g. type 2 diabetes and cardiovascular disease.

Body Parts

Synonyms

Body Structures

Definition

Anatomical parts of the body such as organs, limbs and their components.

Body Structure

Synonyms

Body parts

Definition

Body structures describe the anatomic parts of the body like organs, limbs, and their components. Body structures are classified in the WHO's International Classification of Functioning, Disability, and Health (ICF). The structures of the nervous system include the structure of the brain, spinal cord, and related structures; the structure of the meninges; and the structure of the sympathetic and parasympathetic nervous systems. There are the structures of the eye (eye socket, eyeball, around eye), the ear (external ear, middle ear, inner ear), and the structures involved in voice and speech (nose, mouth, pharynx, larynx). The structure of the cardiovascular system includes the heart, arteries, veins, and capillaries. The structure of the immune system includes the lymphatic vessels, lymphatic nodes, thymus, spleen, and bone marrow. The structure of the respiratory system includes the trachea, lungs, thoracic cage, and muscles of respiration. The structures related to the digestive, metabolic, and endocrine systems comprise the salivary glands, esophagus, stomach, intestine, pancreas, liver, gall bladder and ducts, and endocrine glands. There are structures related to the genitourinary system (urinary system, pelvic floor), reproductive systems, and movement (head and neck region, shoulder region, upper extremity, pelvic region, lower extremity, and trunk). Skin and related structures cover the areas of skin, skin glands, nails, and hair.

Bone Marrow Cells

Definition

The bone marrow of adult human beings contains a heterogenous cell population. The adult cell pool mainly consists of osteoblasts, osteoclasts, fibroblasts and adipocytes. However, there are also undifferentiated cells: the hematopoietic stem cells (HSC) and the mesenchymal stem cells (MSC). The former have been recognized as stem cells more than 40 years ago and have been studied extensively in a clinical setting. Both HSC and MSC are investigated intensely with respect to the notion that any adult stem cell may be a bone marrow cell which has homed to a specific organ after circulating in the peripheral blood. Bone marrow cells (BMC) can be collected by apheresis or by puncturing the pelvic crest. They are often administrated to the organism without purification. Hence, it is not clear, whether HSC or MSC contribute to functional improvement of an organ following transplantation.

Bonesetter

Definition

Bonesetter is a person, usually not a licensed physician, who sets broken or dislocated bones.

Cross-References

► Indigenous Health Care Services

Bonfferoni Correction

Definition

This is a multiple comparison technique used to adjust the α error level.

Bootstrapping

Definition

Bootstrapping is a non-parametric technique to estimate the shape of distribution of a sample or estimate under conditions of ► uncertainty. The basic idea behind bootstrapping is a large number of repetitive computations. The empirically determined sample is regarded as the population from which repeated random samples of the same size are drawn with replacement. The bootstrap samples are analyzed and, by repeating the steps a large number of times, bootstrap confidence intervals are estimated. The bootstrapping technique is used increasingly often for health economic analyses, especially cost-effectiveness models.

Borderline Schizophrenia

► Schizotypal Disorder

BORG Scale / RPE Scores

Definition

Perceived perception of exertion.

Bottom-Up Approach (For Cost-Estimation)

Definition

In a bottom-up approach the costs are collected directly from patients suffering from a defined disease. The figures from those patients are extrapolated to represent the whole population by using national prevalence figures.

Bovine Spongiforme Encephalopathy

► BSE

Breakbone-Fever

► Dengue Fever

Breastfeeding

Synonyms

Nursing

Definition

Breastfeeding is the process of a woman feeding an infant or young child with milk from her breasts. It provides ideal food for the healthy growth and development of infants and also contributes to the health and well-being of mothers.

Bridges

Definition

Dental prosthetic means to replace missing teeth. Bridges (also referred to as fixed partial dentures) are normally anchored by crowns on teeth adjacent to the tooth gap. They cannot be taken out by the patient.

Bronchial Asthma

Synonyms

Bronchoconstriction

Definition

Asthma is a disease condition in man with airways inflammation and obstruction characterized by the presence of intermittent wheezing, chest tightness, shortness of breath, and cough. Exposure to certain allergens and different types of non-specific stimuli initiates a cascade of cellular activation events in the airways. A release of certain mediators into the air passages lead to alterations in the tone of airway smooth muscle, hypersecretion of mucus and damage to the airway epithelium. The magnitude of asthmatic attack varies within and between individuals. Asthma is the most common chronic pulmonary disease. It is relatively more common in children and occurs more frequently in boys than in girls.

The fundamental abnormality in asthma is increased responsiveness of airways to stimuli. This may include physiologic and pharmacologic factors such as histamine, and methacholine, exercise, air pollutants and allergens like penicillin, animal dander and wood dusts. Asthmatics commonly produce IgE antibodies in response to allergen exposure.

Bronchiolitis

Synonyms

Inflammation of bronchioli; Inflammation of small bronchi

Definition

Bronchiolitis is an inflammation of the peripheral bronchi and bronchioli, which causes ventilation problems. In babies, severe apneas have to be feared.

Cross-References

► Bronchoconstriction

Bronchoconstriction

Synonyms

Bronchial asthma

Definition

Asthma is a chronic condition in the airways of the lungs. It has two main components: (1) constriction, the tightening of the muscles surrounding the airways, and (2) inflammation, the swelling and irritation of the airways. Constriction and inflammation cause narrowing of the airways, which may result in symptoms such as wheezing, coughing, chest tightness, or shortness of breath. Furthermore, there is increasing evidence that, if left untreated, asthma can cause long-term loss of lung function.

Brucellosis

Synonyms

Infection with Brucella; Undulant fever; Malta fever; Bang's disease

Definition

Brucellosis, which is caused by bacteria, is spread worldwide, but it is most common in Mediterranean countries, Asia and Latin America. Cows, sheep and goats (in most cases by direct contact with small injuries of the skin or mucous membranes) are the main sources of infection. Transmission is also possible by contaminated milk or milk products. Following an incubation period of 1–3 weeks the disease starts with headache, rheumatic pain and a feeling of weakness. Later on, fever and gastrointestinal symptoms (nausea, vomiting, and diarrhea) develop. Moreover, cardiac arrhythmia and neurological symptoms are possible. Brucellosis is treated by antibiotic therapy.

Brundtland-Commission

Definition

The Brundtland Commission, formally the World Commission on Environment and Development (WCED), known by the name of its Chair Gro Harlem Brundtland, was convened by the United Nations in 1983. The commission was created to address growing concern "about the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development." In establishing the commission, the UN General Assembly recognized that environmental problems were global in nature and determined that it was in the common interest of all nations to establish policies for sustainable development.

BSE

Synonyms

Bovine spongiforme encephalopathy; Mad cow disease

Definition

BSE is an infectious disease, which is caused by prions and was initially transmitted by the feeding of meat-and-bone meal to cows. In 1984, it appeared for the first time in Great Britain. The symptoms of BSE are similar to Creutzfeld–Jakob disease (CJD) in humans. The incubation period is very long, lasting 5–7 years. The disease starts with aggressive behavior and difficulties in coordination. Due to the death of nerve cells, the disease takes a lethal course within a couple of months. A quick test has been available since 1998, but up to now this test can only be carried out on the brain tissue of dead animals and humans. The highest concentration of prions is found in the brain, the bones, the eyes and the spleen. A transmission of BSE to humans is possible. In humans, BSE is characterized by psychiatric symptoms, like depressions and states of panic, followed later by neurological disorders. Dementia develops leading finally to death. Specific therapy or vaccination is not available.

Bubonic Plague

Synonyms

Infection with Yersinia pestis

Definition

Bubonic plague is caused by the bite of a rat flea which is infected with the bacterium *Yersinia pestis*. The onset of the disease is characterized by fever, headache, joint pain, malaise and muzziness. A swelling of the lymph nodes causes painful bubons at the neck, in the armpits and the groins. Due to hemorrhages, these bubons become black. After suppuration occurs within the bubons they rupture. Spreading of the bacteria into the skin causes subdermal bleedings and acral necroses. Without treatment, in 25–50% of cases, a hematogenic spread of germs leads to plague sepsis.

Buddhism

Definition

The religious teaching of Buddhism attracts some 350 to 500 million followers throughout the world. Its historical background dates to 500 BC in India.

Bulimia Nervosa

Synonyms

Eating Disorder

Definition

Bulimia nervosa is characterized by frequently occurring bouts of binge eating and a permanent preoccupation with food. Bouts of binge eating are followed by attempts to compensate the fattening effects of the food through various behaviors (emesis, abuse of laxatives, fasting). Repeated vomiting is likely to give rise to disturbances of body electrolytes and physical complications. There is often, but not always, a history of an earlier episode of ► anorexia nervosa, the interval ranging from a few months to several years. It occurs most often at the age of 18 to 20 years.

Cross-References

► Eating Disorders

Bulk Minerals

► Major Elements (Macronutrients)

Burden of Disease

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Synonyms

Burden of illness; Cost of illness

Definition

The term burden of disease generally describes the total, cumulative consequences of a defined disease or a range of harmful diseases with respect to disabilities in a community. These consequences include health, social aspects, and costs to society. The gap between an ideal situation, where everyone lives free of disease and disability, and the cumulated current health status, is defined as the burden of disease.
In the 1990s, the World Health Organization (► WHO), in co-operation with Harvard University and the World bank, developed a methodological concept to quantify the global burden of disease; this was based to a large extent on statistical measurement of the ► disability-adjusted life year (DALY). The DALY aggregates the time lost because of premature mortality and the time spent in a limited health state. Consequently, the DALYs for a defined disease or health condition are calculated as the sum of the years lost due to specific premature mortality and the years lost due to disability for incident cases of the health condition.

Basic Characteristics

The burden of illness or burden of disease approach used in public health and the epidemiological literature combines measurement of mortality and morbidity with respect to non-fatal outcomes such as quality of life aspects. With regards to these basic attributes,

burden of illness-concepts – and especially the DALY – include some key elements of utility-concepts, such as the QALY (► value, human life – utilities). However, due to the lack of foundation in economic theory, burden of illness is primarily seen as a descriptive epidemiologic concept, such as the regular burden of disease report of the US Center for Disease Control (Centers for Disease Control and Prevention 2004). Although it is possible to express the gain from the avoided loss of burden of disease relative to additional costs, this specific cost-outcome relation is very rarely found in the literature and is not regarded as a common health economic measure.

The most well-known and widespread concept following the burden of disease principle is the DALY (Homedes 1996). DALYs represent one key element in the WHO ranking of worldwide health care systems "The global burden of disease" (Mathers et al. 2003; Murray et al. 1997; Lopez et al. 2006). The first results of this project, for the year 1990, have been published, with regular updates and extension being carried out (Murray 2007; WHO 2007).

The cumulated disease-specific DALYs, aggregated according to the country-specific prevalence of the diseases and disabilities considered, reflect the burden of disease of a specific society or a specific country. The Global Burden of Disease concept of the WHO compares large numbers of low-, middle- and high-income countries with regard to their country-specific burden of disease. It offers mortality figures, which refer to the number of people who die and the causes of death. Thus, a comprehensive and consistent set of estimates of mortality and morbidity expressed by the single indicator DALY and differentiating by age, sex, and region, is given.

There are some specific aspects of the DALY concept, such as further time discounting and non-uniform age weights, which give less weight to years lived at a younger age. According to this concept, the death of an infant is equivalent to 33 DALYs and the death of a person between 5 and 20 years of age is about 36 DALYs. Consequently, the death of 100 infants in a society would be equivalent to 3,300 DALYs, which corresponds to 5,500 persons with blindness at an age of 50 years. The weight factors reflecting the severity of the disability or disease (e. g. the disability weight for blindness of 0.6) were originally defined by international experts. New concepts using health-related quality of life and utility concepts are currently being implemented.

In recent decades in most western industrial nations, a clear tendency regarding the burden of disease can be observed. There is an ageing of societies, with a decrease in mortality, accompanied by an increase in morbidity. The increase in morbidity is mainly due to an increase in the prevalence of chronic diseases and risk factors such as cardiovascular disorders, cancer, diabetes, and obesity. Mortality estimates are higher in low- and middle-income countries than in high-income countries. People in low- and middle-income countries die at a much younger age. In Africa, mortality is mainly cause by infectious diseases – mainly HIV/AIDS and malaria – which affect younger shares of the population compared with China, where the pattern of diseases is dominated by non-infectious diseases. The burden of disease in Africa is estimated to be more than four times higher than in high-income countries. The populations of Africa and India represent about one third of the population of the world, but the burden of disease in these two regions is nearly half of the total global burden of disease. Furthermore, the health inequities gap is widening in a considerable number of countries. The WHO Global Burden of Disease report from 2002 (Lopez 2006) reports three major trends: slowing down of gains and widening of health gaps; increasing complexity of the burden of disease; and globalization of adult health risks.

Although an improvement in health conditions and burden of disease has been observed in many low- and middle-income countries over the last decade, a large proportion of risk factors and diseases are still preventable, e. g. about one-fifth of the global burden of disease can be attributed to under-nutrition. In Africa about one-fifth of the burden of disease is attributed to unsafe sex leading to HIV and other sexually transmitted infections. Concerning high-income countries, tobacco consumption is the leading avoidable risk factor, accounting for 12 per cent of the burden of disease. Globally, about 42 per cent of the total burden of disease can be attributed to the leading 10 risk factors when joint effects are taken into consideration. The leading five risk factors are responsible for about one quarter of the total loss of healthy years of life. These figures demonstrate the enormous potential for improving mortality and morbidity by prevention and decrease of well-known risk factors. This underlines the importance of

research to develop cost-effective strategies for a relatively small number of risk factors to reduce a relatively large share of the global burden of disease (Mathers 2003; Murray 2007).

Cross-References

- ► Disability Adjusted Life Years (DALYs)
- ► Value, Human Life – Utilities
- ► WHO

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Burden of Illness

- ► Burden of Disease
- ► Cost of Illness – Costing

Buryats

- ► Indigenous Health, Asian

Bushmen

- ► Indigenous Health – Africa

Business Intelligence Tools

Definition

Business intelligence tools are a type of software application designed for the analysis and presentation of data. Examples are different types of reporting software and online analytical data processing to support a management information system, and data mining to extract useful information from large amounts of data.

Caisson Disease

Synonyms

Decompression sickness; Diver's disease

Definition

Caisson disease is a medical condition related to sudden exposure to a reduction in the pressure surrounding the body. It can happen in many situations: in divers ascending from a dive, in workers coming out of a pressurized caisson or mine, or in pilots if the cabin pressurization system of an aircraft fails. This causes inert gases (mainly nitrogen), which are normally dissolved in body fluids and tissues, to come out of physical solution and form gas bubbles in blood and tissues. Symptoms include "the bends" (joint pain) in shoulders and knees, headache, visual disturbances, extreme fatigue, lack of strength, breathing difficulties ("the chokes"), and in some cases cardiovascular collapse, unconsciousness and paralysis. The only effective treatment is recompression, carried out in a recompression chamber, where the pressure is gradually decreased.

Calculus

Definition

Hardened ► dental plaque is called calculus. Hardening occurs if dental plaque is not being removed and accumulats in the absence of proper oral care resulting in the calcification of the plaque by the minerals of the salvia. Calculus can not be removed by rinsing or tooth brushing. Once formed, it should be removed by professional cleaning by a dentist or dental hygienist. Its rough surface provides an ideal medium for bacterial growth. Calculus can even extend into pockets created between the tooth and the gum.

Cancer

Synonyms

Malignant tumors; Neoplasms

Definition

Cancer is the general term for more than 100 different distinct diseases that can affect every part of the body. Cancer is defined by a rapid abnormal cell growth beyond usual boundaries that can affect adjoining parts of the body including other organs. This process is referred to as metastasis which is the major cause of death from cancer. Cancer is caused by changes in the genes responsible for cell growth and repair, driven by interaction between genetic host factors and external agents. These external agents can be categorized into physical carcinogens, chemical carcinogens and biological carcinogens. Prevention strategies play a vital role in reducing the burden of cancer as up to one third of all cases could be avoided by: changing tobacco and alcohol use, adjusting dietary and physical activity patterns or reducing exposure to sunlight, etc. Early detection and treatment of cancer is another key element in reducing the burden of cancer as it significantly improves the prognosis. When cancer is treated, the main objectives are curing, prolonging life and improving the quality of life of the patients affected. The common treatment methods are surgery, radiotherapy and chemotherapy.

Cancer Palliative Care

Synonyms

Palliative therapy in oncology; Symptomatic cancer palliation; Chemotherapy-effects and palliative care

Definition

Palliative care aims to improve the symptoms of patients with advanced incurable cancer who may undergo surgery, radiation therapy and/or chemotherapy, and symptomatic treatments and may suffer the unwanted effects of these therapies. The goal of cancer palliative care is to improve the quality of the remaining life. Palliative management usually is founded on a multimodality approach based on the advice of experts from various disciplines and careful coordination.

Cancrum Oris

► Noma

Canonical Correlation Analysis

Definition

A canonical correlation analysis is a multivariate statistical technique that investigates the relationships between two (or more) sets of variables. In most applications, however, the two sets are not treated symmetrically; rather, one set is the predictor set, which is the set of independent variables, and the other set is the response set, which is the set of dependent variables. For example, one may want to study the relationship of various risk factors to the development of a group of symptoms; compute the (simultaneous) relationship between three measures of scholastic ability with five measures of success in school; or investigate the relationship between two predictors of social mobility based on interviews, with actual subsequent social mobility measured by four different indicators. The underlying principle is to develop two linear combinations (i. e., canonical variables) of variables in each set (both dependent and independent if such a distinction is made) that best explain the variation in the variables of the other set, i. e. such that the correlation between the composite variates is maximized.

Canons

► Ethical Principles

Capitation

Definition

In capitation-based payment systems, payment is made for individual patients. Physicians receive a specified sum of money for the care of individual patients for a specified period of time. Payment is independent of the extent of services individual patients require. Ideally, payments to physicians are risk-adjusted (► risk adjustment) for differences in morbidity of patients in order to reduce incentives for ► dumping. Physician income is determined by (risk-adjusted) capitation multiplied by the number of individual patients enrolled with the physician. There may be limits as to the maximum number of patients enrolled with one physician or decreasing capitation payments above a threshold of patients.

Capitation Payment

► Per Capita Payment

Carbohydrate Metabolism

Definition

Biochemical pathways to burn carbohydrates.

Cardiac Surgery

Definition

Cardiac surgery is surgery on the heart, in most cases applied to correct congenital heart disease or the complications of ischemic heart disease or valve problems, which can be caused by different causes e. g. endocarditis.

Cardiovascular Diseases

Definition

Cardiovascular disease is the general term for several ► chronic diseases concerning the heart and circulatory system. The major cardiovascular diseases (CVD) are coronary (or ischemic) heart disease (heart attack), cerebrovascular disease (stroke), hypertension (high blood pressure), heart failure and rheumatic heart disease. According to the WHO, CVD made up almost 17 million (19%) of total global deaths of which around 80% occurred in low and middle-income countries. It is expected that CVD will be the leading cause of death in developing countries by 2010. Several risk factors exist for CVD which can be categorized in unmodifiable factors (e. g. male, gender and heredity) and modifiable factors (e. g. cigarette smoking, high blood pressure, high blood cholesterol levels, physical inactivity, diabetes and obesity). It is estimated that more than 50% of the deaths and disabilities from heart disease and stroke could be avoided with effective prevention efforts targeted at reducing the modifiable risk factors.

Care

► Prevention, Tertiary

Caregiver

► Health Care Provider

Caregiver Burden

Definition

Caregiver burden refers to the stress experienced by family, professional and other providers when assisting others, especially individuals with disabling medical or psychiatric problems.

Caretaking

► Social/Emotional Support

Caries

► Dental Caries

Caries Decline

Definition

The term “caries decline” describes the decrease of dental caries prevalence in children and adolescents during the last two decades of the 20th century. Causes of this improvement of oral health are not quite clear and multi-causal. It is assumed that it probably can be traced back to, for example, fluoridation becoming widespread in public (toothpaste, water, salt) and improved dental hygiene among the public. This development was observed mainly in the Western world.

Caries Index

► DMFT-Index

Carlowitz, Hans Carl von

Definition

Hans Carl von Carlowitz was born on 24th December in 1645 in Oberrabenstein, near of Chemnitz (Saxony/Germany), and died on 3rd of March 1714 in Freiberg (Saxony/Germany). He was a mine captain and responsible for cameralistic accountancy. Carlowitz created the term sustained yield forestry and mentioned it in his publication about the economic cultivation of silvicultures (Sylvicultura oeconomica or ‘die haußwirtschaftliche Nachricht und Naturmäßige Anweisung zur wilden Baum-Zucht’) in 1713. Carlowitz is considered to be the creator of sustained yield forestry.

Case

Definition

In ► epidemiology, a case is a person in the population or study group identified as having a disease or disorder of interest.

Case Cohort Study

Definition

In a case-cohort study, cases are defined as those participants of the cohort who developed the disease of interest, but controls are identified before the cases develop. This means that controls are randomly chosen from all cohort participants regardless of whether they have the disease of interest or not, and that baseline data can be collected early in the study.

Case-cohort studies are very similar to nested case-control studies. The main difference between a nested case-control study and a case-cohort study is the way in which controls are chosen. Generally, the main advantage of case-cohort design over nested case-control design is that the same control group can be used for comparison with different case groups in a case-cohort study. The main disadvantages of the case-cohort design is that it requires a more complicated statistical analysis and it can be less efficient than a nested case-control study under some circumstances (e. g., in studies with long follow-up).

Case Control Studies

Definition

Studying infrequent events, such as death from cancer, using randomized clinical trials or other controlled prospective studies requires that large populations be tracked for long periods in order to observe disease development. Case-control studies use patients who already have a disease or other condition and look back to see if there are characteristics of these patients that differ from those who don't have the disease. The case-control study provides a much cheaper and quicker study of risk factors. If the evidence found is convincing enough, then resources can be allocated to more "credible" and comprehensive studies. The case-control study begins with the identification of an outcome or effect and a number of potential causative factors. A group of cases which exhibit the outcome under investigation is selected. A number of control subjects (or controls) who do not exhibit the outcome or effect under investigation are then chosen. These controls should match the cases as closely as possible with respect to the non-risk variables; this allows the proposed non-risk variables to be ignored in the analysis. Sometimes more than one control group is used. The case and control groups are then compared for the proposed causal factors, and statistical analysis is used to estimate the strength of association of each factor with the studied outcome.

Case-control studies are a valuable investigative tool, providing rapid results at low cost, but caution should be exercised unless results are confirmed by other, more robust evidence.

Cross-References

► Observational Studies

Case Finding

Definition

The identification of cases within routine systems of health care delivery, e. g. during a visit at the doctor's office for some related or unrelated cause. It may include special clinical or technical procedures in addition to the routine medical care of a patient. Case finding does *not* include a systematic invitation of the target population.

Case Reports

Synonyms

Case series

Definition

A case series describes characteristics of a number of patients with a given disease. No control group is involved.

Case series and case reports, since they do not use control groups, have no statistical validity.

Case Series

Synonyms

Case reports

Definition

A descriptive, observational study of a series of cases, typically describing the manifestations, clinical course, and prognosis of a condition, is called a case series. A case series provides weak empirical evidence because of the lack of comparability unless the findings are dramatically different from expectations. Case series are best used as a source of hypotheses for investigation by stronger study designs, leading some to suggest that the case series should be regarded as clinicians talking to researchers. Unfortunately, the case series is one of the most common study types in the clinical literature. Closely related to the case series is the case report, which provides only anecdotal evidence. It is a description of a single case, typically describing the manifestation, clinical course, and prognosis of that case. Due to the wide range of natural biologic variability in these aspects, a single case report provides little empirical evidence to the clinician. They only describe how others diagnosed and treated the condition, and what the clinical outcome was.

Case Studies

► Case Control Studies

Categorial Data

Definition

Categorial data are presented in a contigency table. It is a way of summarizing the relationship between variables. A contingency table usually shows frequencies for particular combinations of values of two discrete random variables X and Y, i. e., the joint frequency distributions of variables X and Y. Each cell in the table represents a mutually exclusive combination of X-Yvalues. The values in the rows of a contingency table are contingent upon (dependent upon) the values in the columns. Sometimes three-way (and more) contingency tables are used.

Categorical Data Analysis

► Analysis of Frequencies

Catheter

Definition

A catheter is a flexible tube for insertion into a body cavity, duct, or vessel, which creates a channel for the passage of fluid or the entry of a medical device.

Causal Factors

► Causation
► Risk Factors and High Risk Groups

Causality

► Causation

Causation

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Synonyms

Causality

Definition

A cause of a disease can be defined as an event, condition, or characteristic that plays an essential role in producing an occurrence of the disease (Rothman 1986). The most important aim of epidemiology is to identify the causes and the ► risk factors of a disease, and to improve public health by reducing or eliminating exposure to these factors.

Basic Characteristics

Epidemiological – Ecological Models

A disease is a result of the ► interaction of host factors and the environment. Several models have been developed in order to depict the ways in which these interactions influence the occurrence of the disease: the triangle, the wheel, and the web of causation.

The triangle – This model consists of three components, ► agent, host, and environment, which are in a kind of dynamic equilibrium. Change in any of these components will alter an existing equilibrium and increase or decrease the frequency of the disease. This model has been the most frequently applied to infectious diseases in which infectious organisms were separated from other environmental factors and identified as agents.

For diseases that have not been linked to specific agents, two other models have been developed.

The Wheel – In this model, the host, with its genetic make-up as its core, is presented as the hub of the wheel, surrounded with the environment, which is separated into biological, social and physical components. This separation is artificial since these three parts of the environment are closely interrelated with one another and with host factors.

The Web – The web model emphasizes the concept that effects never depend on single causes but develop as the result of causal chains, which make the web. Each link in the web is the result of antecedents, and breaking of the web at any level can prevent occurrence of the disease. This means that full knowledge of etiology is not needed for effective disease prevention and control. (Mausner, Kramer 1985; Bhopal 2002)

Search for Causal Relationship

There are two approaches to testing hypotheses about causes of disease, experimental and observational. Experimental study can establish the causal relationship of a factor with a disease more conclusively, but since experiments in epidemiology are performed on humans, for ethical reasons the effects of some possible causal factors cannot be investigated directly. Observational studies have therefore been providing the major contribution to the understanding of many diseases.

The first step in an investigation of causal relationship is to see whether there is an ► association between a disease and a postulated causal factor. If an association exists, it does not necessarily mean that it is a causal one. It can be: a) spurious (► spurious association), b) secondary (► secondary association), or c) causal. Before an association is assessed for the possibility that it is causal, other alternative explanations, such as chance, selection bias, information bias, and confounding, have to be excluded.

A Concept of Necessary and Sufficient Cause "A causal factor whose presence is required for the occurrence of the effect" (Last 2001), that is, without which the disease never develops, is the necessary cause. Sufficient cause is a "minimum set of conditions, factors or events needed to produce a given outcome; minimal implies that none of the conditions or events is superfluous" (Rothman 1986). A sufficient cause is not usually a single factor, but often comprises several components – component causes or contributing causes. A disease can have several sufficient causes and these may have one or more contributing causes in common.

Types of Causal Relationship A causal factor can be either necessary or sufficient, both, or neither:

1. Necessary and sufficient

A factor can be both necessary and sufficient, which means that the disease never develops without that factor, and that factor always produces the development of the disease. This type of causal relationship occurs rarely. For example, a person who has three copies of chromosome 21 instead of two will inevitably be mentally retarded – Down's syndrome (Bhopal 2002).

2. Necessary but not sufficient

The factor, although necessary, cannot produce the disease without the presence of some other factors, called component or contributory causes. For clinically manifest tuberculosis, in addition to the bacillus, which is the necessary cause, contributing causes such as poor nutritional and socio-economic conditions are needed.

3. Sufficient but not necessary

Although sufficient for producing the disease, the factor (usually more than one) is not necessary because there are some other factors that can also produce the disease. Either radiation exposure or benzene exposure can produce leukemia independently of each other (Gordis 2004).

4. Neither sufficient nor necessary

Smoking is a cause of lung cancer but not everyone who smokes develops this type of cancer and not everyone who develops lung cancer has smoked.

Guidelines for Causal Reasoning in Epidemiology Although epidemiologic evidence by itself is insufficient to establish causality, Bradford Hill (Hill, 1965) suggested that the following attributes (criteria) of an association be considered in assessment of the possibility that it is a causal one.

1. Strength of the association – The strength of association is measured by the relative risk (odds ratio), that is the ratio of disease rates for those exposed and those not exposed to the hypothesized causal factor. The stronger the association, the more likely it is that the relation is causal. However, it does not mean that a weak association cannot be judged to be a causal one. "The strength of an association is not a biologically consistent feature, but rather a characteristic that depends on the relative prevalence of other causes" (Rothman, 1986).
2. Dose-response relationship – A dose-response is established when, with increasing level of exposure ("dose" or duration), the risk of disease also increases. The absence of a dose-response relationship does not rule out the possibility of causal association since, for some causes, a threshold may exist and a disease may not develop unless a certain level of exposure is present.
3. Consistency of the association – A cause-effect relationship is supported when similar results are obtained in a number of studies performed in various populations or population groups, by different investigators, and with different methodology. The causal relationship might not be found in some studies because "the effect of a causal agent cannot occur unless the component causes act, or have already acted, to complete a sufficient cause" (Rothman 1986).
4. Temporality – Exposure to the postulated causal factor must precede the onset of disease by a period of time consistent with the proposed biologic mechanism (► induction, ► incubation, ► latency). In some diseases, especially chronic and those with a long period of latency, temporality cannot always be easy to establish. Although the only indispensable attribute among all Hill's conditions, a temporally correct association between two events does not necessarily mean that it is that of cause and effect. They could both be generated by the same factor.
5. Biologic plausibility – The existence of a cause-effect relationship is enhanced if it is coherent with the current body of biologic knowledge. This, of course, depends on the state of scientific information at a given time. An association that is biologically implausible at one time may eventually prove to be plausible.
6. Experimental evidence – Causal understanding can be greatly advanced by "in-vivo" and animal experiments, but data obtained in that way must be integrated with observations in the human population. Because of ethical reasons, experimental evidence is seldom from the human population. However, evidence for a causal relationship is supported if reduction or elimination of exposure to a certain factor (postulated causal factor) is related to decline of disease frequency.
7. Coherence – Coherence implies that a cause-effect interpretation of an association does not conflict with the generally known facts of the natural history and biology of the disease.
8. Specificity of the association – An association is specific when a certain exposure is associated with only one disease. Taking into account the multifactorial nature of disease and the fact that one factor can cause more than one disease, the specificity is the least important criterion to satisfy, and "should be probably deleted from the list" (Gordis 2004).

In making decisions about causation, the list of criteria presented above should be considered only as guidelines. If temporality is viewed as part of the definition of causation, "there is no necessary or sufficient criterion for determining whether an observed association is causal" (Rothman, Greenland 1998; Rothman, Greenland 2005). Decisions about causation must always remain a matter of judgment based on all available evidence "achievable through hypothesis generation and testing, with data interpreted using a logical framework of analysis, which draws on multidisciplinary perspectives" (Bhopal 2002).

Hill himself pointed out that these "viewpoints" cannot be used as criteria for causal inference, but can help to make a judgment, and to act on the premise that a causal relationship exists rather than awaiting further evidence: "All scientific work is incomplete – whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time".

Most definitions are taken from the last edition of Last's Dictionary of Epidemiology (Last, 2001). We are much obliged to Professor Last for his kind consent.

Cross-References

► Agent (of Disease)
► Association
► Incubation
► Induction
► Interaction

- ► Latency
- ► Risk Factor
- ► Secondary Association
- ► Spurious Association

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Cause of Injury

Definition

The cause of injury is the route of the dangerous occurrence that led to ► occupational injury. It is important to recognize this in order to develop preventive measures. Quite often there are several causes leading to one ► occupational accident and it is not easy to identify it. In such complex cases, expert knowledge is needed to identify the most important causes. The success of preventing occupational accidents is directly dependent on the process of recognizing causes of an accident.

Causes of Disease

► Causation

Cavity

► Dental Caries

CD_4

Definition

CD_4 is a protein, which can be found on the surface of various cells, among others T-lymphocytes (T4-cells, helper T-cells). By binding to the CD_4-molecules, HI-viruses can pass into the cells. CD_4-test determines the amount of helper T-cells. The CD_4-value is reverse proportionally to the impairment of the immune system, this means, the lower the level is, the more immunodeficiency has progressed. Normal values for CD_4 are 600–1000 cells/pl.

In HIV-infections the graduation into the CD_4-helper status 1 to 3 depends on the CD_4-value: Status 1 means a value of 500 cells/pl, status 2 is reached when the value is 200–400 cells/pl, in status 3 CD_4-count is below 200 cells/pl.

cDNA Microarray Hybridization and Analysis

► Transcriptomics

CEE Immunization, Active

► Tick-Borne Encephalitis (TBE) Vaccination

CEE Vaccination, Active

► Tick-Borne Encephalitis (TBE) Vaccination

Censored (Patient)

Definition

A patient is scored as censored if he or she did not suffer the outcome of interest. In survival analysis, patients who do not have an "► event" during a specified period are said to have censored observation. A *right-censoring* situation occurs when the terminal event is not observed; instead, it is only known that this event is at least later than a given point in time. Censored observations can arise in three ways: 1) the patient is known to be still alive when the trial analysis is carried out; 2) the

patient was known to be alive at some past follow-up, but the investigator has since lost trace of him; 3) the patient has died of some cause totally unrelated to the disease in the survival analysis.

Centers for Disease Control and Prevention (CDC)

Definition

The Centers for Disease Control and Prevention (CDC) was founded 60 years ago to help control malaria. Today it is the leading U.S. government agency of the Department of Health and Human Services for protecting the health and safety of the people of the U.S., with the following vision for the 21st century: "Healthy People in a Healthy World – Through Prevention". The CDC focuses national attention on prevention and control of infectious and chronic diseases, disabilities, injuries, and environmental health threats. It is headquartered in Atlanta, Georgia.

Central European Encephalitis (CEE)

► Tick-Borne Encephalitis (TBE)

Central Limit Theorem

Definition

The Central Limit Theorem is a statement about the characteristics of the sampling distribution of means of random samples from a given population. That is, it describes the characteristics of the distribution of values we would obtain if we were able to draw an infinite number of random samples of a given size from a given population and we calculated the mean of each sample. The Central Limit Theorem consists of three statements: 1) the mean of the sampling distribution of means is equal to the mean of the population from which the samples were drawn, 2) the variance of the sampling distribution of means is equal to the variance of the population from which the samples were drawn divided by the size of the samples and 3) if the original population is distributed normally, the sampling distribution of means will also be normal. If the original population is not normally distributed, the sampling distribution of means will increasingly approximate a normal distribution as sample size increases (i. e. when increasingly large samples are drawn).

C

Central Nervous System

Definition

The central nervous system (CNS) represents the largest part of the nervous system and consists of the brain and the spinal cord. The CNS and the ► peripheral nervous system (PNS) have a fundamental role in the control of behavior. The CNS acts as the main "processing center" for the entire nervous system and is responsible for the integration of all nervous activities.

Centre for Evidence-Based Medicine

Definition

The Centre for Evidence-Based Medicine was established in Oxford as the first of several centers in the UK whose broad aim is to promote evidence-based health care and to provide support and resources to anyone who wants to make use of them.

Centre for Reviews and Dissemination (CRD)

Definition

The Centre for Reviews and Dissemination (CRD) is the UK HTA agency and works closely with a number of other health, social research, and information organizations, as well as with international networks such as the Cochrane and Campbell Collaborations. It is a member of the International Network of Agencies for Health Technology Assessment (► INAHTA) and the Guidelines International Network (G-I-N). CRD has undertaken work for a number of different agencies including the National Institute for Clinical Excellence (NICE), the Home Office, the Social Care Institute for Excellence (SCIE), the Economic and Social Research Council (ESRC), the Health Technology Assessment Programme (HTA), and the Service Delivery & Organisation Programme (SDO).

Cephalosporins

Definition

Cephalosporins were first detected in *Cephalosporium acremonium* in 1945. They are quite similar to penicillin's. Like penicillin's, cephalosporins are bactericidal; they kill bacteria by interfering with the building of the bacterial cell wall. Three generations of cephalosporin have been developed. Cephalosporins act against both gram positive and gram negative germs. Their development from the first to the third generation saw an increased efficiency in their effect on gram negative organisms. Cephalosporin can be given orally or parenterally. Some of the drugs (like cefotaxime and ceftriaxone) penetrate well into the cerebrospinal fluid. Due to this quality they play an important role in the treatment of meningitis. Because of their similarity, an allergic reaction provoked by penicillin can also be provoked by cephalosporin. This phenomenon is called cross-allergy.

Cercarial Dermatitis

Synonyms

Dermatitis in schistomoniasis; Schistosome dermatitis; Swimmer's itch

Definition

From a few hours up to two days after cercaria, which are the larval form of schistosomas, have penetrated the skin, there appears strong itching and an exthematic reaction at the site of entry. These symptoms are called cercarial dermatitis or swimmer's itch. Usually, the dermatitis heals within two weeks.

Chagas Disease

Synonyms

American trypanosomiasis; Infection with trypanosoma cruzi

Definition

Chagas disease, which is found in Central and South America, is caused by the parasite *Trypanosoma cruzi*. It is transmitted by the bite of night-active predatory bugs. Up to 10% of the infections take a lethal course. Besides humans, the most common reservoirs of the parasite are armadillos; domestic animals (especially dogs and cats), which do not fall ill themselves, can also be infected. Chagas disease has 4 stages. At first, a local reaction appears at the site of the bite; 2–4 weeks later the acute phase occurs with non-specific symptoms, like fever stomach ache, diarrhea and edemas of the face and the feet. The acute phase is followed by a latency phase, which can last for years. The last stage is the chronic phase. In this phase, inflammations of the heart muscle can appear which might lead to heart insufficiency or cause a sudden cardiac death. Besides the heart muscle, nerve cells and the musculature of the intestines can be involved. An impairment of intestinal peristalsis leads to an abnormal dilatation of the colon (megacolon). Chagas disease can be treated with nifurtimox and benznidazole. Prophylactic measures are the use of insecticides and personal protective measures, like covering clothing and the use of mosquito nets.

Cross-References

► American Trypanosomiasis
► Tropical Diseases and Travel Medicine

Chancroid

► Ulcus Molle

Chancroidal Bubo

► Ulcus Molle

Characteristic Property

Synonyms

Variable

Definition

A variable is any characteristic property of the observational unit with outcomes (data) that vary from one observation to the other. A variable may have a different value out of a specified set of values in different people,

in different places or at different times. Some examples of variables include the height of adult females, the gender of preschool children, and IQ test score of patients seen in psychiatric clinics. The variables are often referred to as random variables when the value of a particular outcome is determined by chance (i. e. by means of random sampling). Types of variables refer to the several different and important classifications of variables which are most essential to know in order to understand and appropriately use the most important and frequently used applied biostatistical methods. Three main classifications of variables are: 1) quantitative or qualitative; 2) continuous or discrete; and 3) independent or dependent variables.

Cross-References

► Cultural Determinants

Chemical Sensitivity Syndromes

Definition

Among the chemical sensitivity syndromes that are well described and usually reported are: (a) multiple chemical sensitivity syndrome or MCS, (b) sick building syndrome or SBS, (c) chronic fatigue syndrome, and (d) Gulf war syndrome. The first three are sometimes referred to as "syndromes in environmental medicine". Multiple chemical sensitivity syndrome is an acquired disorder presenting as recurring multiple and polysystemic subjective symptoms, such as fatigue, malaise, headache, asthenia, depression or irritability, gastrointestinal disorders, etc. In most cases, MCS appears as a response to very low doses of common environmental chemicals (one or more of them) that have a characteristic odor, and that do not cause harmful effects to the rest of the general population. These specific chemicals may be exhaust fumes, organic solvents, perfumes, air fresheners, paints, formaldehyde, cigarette smoke, or pesticides, etc. MCS should not be confused with sick building syndrome. As opposed to SBRI and MCS, sick building syndrome produces nonspecific and often unclear subjective complaints in a certain number of indoor space occupants but without a single known cause. Symptoms are difficult to confirm by laboratory tests and available medical examinations but they are benign, always reversible, and rapidly disappear or ameliorate once the individual leaves the "sick" building. The most frequent SBS symptoms are mucous membrane irritation (of the nose, eyes and throat), neurotoxic effects (e. g. headaches, lethargy, fatigue, and irritability), and even irritated skin, nausea, chest tightness, and coughing.

Chemical Substances

Synonyms

Chemical agents

Definition

Chemical substances in ► drinking water are inorganic and organic constituents including pesticides, disinfectant and disinfectant by-products present in water at levels which do not cause adverse effects on health.

Chemoprevention

Definition

Chemoprevention involves the administration of natural or synthetic substances to reduce the risk of developing cancer or to retard the development or progression of cancer. Chemoprevention is a relatively new approach to cancer prevention that has a precedence in cardiology, in which cholesterol-lowering, antihypertensive, and antiplatelet agents are administered to prevent coronary heart disease in high-risk individuals. Agents that are discussed to be chemopreventive include pharmaceuticals (e. g. anti-inflammatory drugs), vitamins, minerals or other chemicals. Diet may carry chemopreventive agents that could reduce the cancer risk. The concept of chemoprevention is based on epidemiologic and experimental evidence suggesting that specific compounds may influence carcinogenesis at various sites of the body, e. g. the gastrointestinal tract, lungs, breast, and prostate.

Chemoprophylaxis of Tuberculosis

Synonyms

Medicinal prophylaxis of tuberculosis; Medicinal prevention of tuberculosis

Definition

Prophylaxis of tuberculosis is recommended for certain groups of people. Chemoprophylaxis should be given to people who have had direct contact with shedders of tubercle bacilli, people <35 years of age with a positive tuberculin skin tests, HIV-positive individuals and other persons at risk. The latter are homeless persons, prisoners, inhabitants of nursing homes and immunocompromised patients (for example, patients on long-term steroid therapy). Newborn babies whose mothers suffer from tuberculosis should receive isoniazid for 3 months; in Asia they should additionally be treated with rifampin. At the age of 6 months, a tuberculin skin test should be performed.

Chemotherapy-Effects and Palliative Care

► Cancer Palliative Care

Cherry-Picking

► Preferred Risk Selection

Chicken Pox

Synonyms

Varicella

Definition

The highly contagious chicken pox is transmitted by droplets or direct contact, and the developing spots are the first manifestation of the ► varicella virus infection. After an incubation period of 8–21 days fever occurs and red itchy bumps appear in phases over several days. At the beginning there is a red papule which develops into a vesicle with an initially clear and afterwards cloudy fluid. The vesicle breaks and leaves a crust. The intensity of the exanthem can vary considerably. It has to be assumed that contagion lasts from one to two days prior to the appearance of the rash until five days after the last appearance of vesicles. Complications mainly concern immunocompromised persons. Superinfections of scratched vesicles, pneumonia and central nervous system effects (in most cases an inflammation of the cerebellum) have to be mentioned. If a severe infection is expected, a virustatic drug (aciclovir) can be administered. The varicella-zoster-virus remains dormant in sensomotor ganglia and can be reactivated later in life as shingles (herpes zoster). The most important preventative measure of chicken pox is active varicella-vaccination (► immunization, active).

Chickenpox Immune Globulin

► Varicella Immunization, Passive

Chickenpox Immune Prophylaxis

► Varicella Immunization, Passive

Chiggers (Burrowing Fleas)

Synonyms

Chigoe; Harvest bug; Harvest mite; Jigger; Red bug

Definition

Chiggers represents parasites of the family *Trombiculidae*. Larves of this parasite live on insects, humans and other vertebrates. Its bite produces a wheal that is accompanied by severe itching.

Chigoe

► Chiggers (Burrowing Fleas)

Child Abuse

Definition

Child abuse refers to the physical, emotional and or sexual mistreatment of a child by a parent or guardian. Forms of child abuse include verbal insults, beating, neglect and sexual molestation.

Child Growth

► Child Health and Development

Child Health and Development

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Synonyms

Child growth; Infant health; Maturation; Pediatrics; also ► Adolescent health

Definition

Child health covers improvements in well-being and development from birth to young adulthood. It spans the complete care of the child's physical, mental, and ► social health, both in the presence and the absence of disease. Healthy children are able to improve their abilities to interact with their physical, biological, and social environments.

Basic Characteristics

Nutrition

Nutrition is necessary for children's growth, development, metabolism, health, and well-being. Early nutrition has a powerful effect on cognitive development and growth, particularly in the first 2–3 years (National Research Council 2000). Breastfeeding for the first 6 months of age best supports healthy growth and development; breastfeeding is recommended for at least 12 months and thereafter at the discretion of the mother (Stang, Story 2003). Breast milk provides the correct balance of nutrients, enzymes, immunoglobulin, hormones, anti-infective and anti-inflammatory substances, and ► growth factors for the infant (Stang, Story 2003). Breast feeding is especially effective in developing countries where access to sanitized water is limited. Children above the age of two should follow a balanced diet as defined by the American Dietetic Association (Gerber 2005) or individual countries' health ministries. Children who do not follow a balanced diet are at risk for lifetime healthcare problems such as obesity, high blood pressure, cardiovascular diseases, and diabetes. Malnutrition affects nearly 250 million children worldwide; effects of undernourishment can last a lifetime including blindness, stunted growth, disability, and death (Blair et al. 2003).

Developed Countries and Chronic Diseases

In developed countries, child mortality and morbidity have fallen to the lowest levels in recorded history. In the past, infectious diseases were the top cause of death in children (Blair et al. 2003; National Research Council 2004). Improvements are attributable to vaccinations, better nutrition, water and sewage management, lowered ► fertility rate, and housing (Blair et al. 2003). Despite these advances, children are developing signs of chronic diseases typically not seen until adulthood. Diseases such as Type II diabetes, obesity, asthma, and cancer are on the rise. These diseases often disrupt daily life physically, emotionally, and socially. Lifestyle change has played a large role in the rise and earlier onset of childhood diseases. Social and physical factors are equally responsible. Children in these countries are more likely to eat prepackaged foods, high in sugar and fat, rather than more nutritious alternatives (Stang, Story 2003). Community layout, such as residential distance from schools and availability of parks, and increased television and video game use has lead to decreased walking and outdoor activity (National Research Council 2004). The consequences of these diseases play out over the lifespan, as unhealthy children typically grow up to be unhealthy adults.

Developing Countries and Acute Infections

Approximately 85 percent of the world's children live in developing countries (Blair et al. 2003). There, infectious diseases remain the primary cause of childhood death. Diarrheal diseases and respiratory infections, from sanitation deficiencies, pollution, and lack of access to healthcare, remain the top infectious burdens in developing countries (Blair et al. 2003). While vaccines have made progress in reducing acute illnesses, supply and access are typically limited in more rural communities. As a result, nearly 15 percent of deaths in developing countries are attributable to vaccine-preventable infectious diseases (Blair et al. 2003). Children are particularly at risk due to their exploratory natures, lack of previous exposure and immune resistance, contact with other children, and ► lung to body ratio (Blair et al. 2003; National Research Council

2004). Over 95 percent of the AIDS cases are in the developing world (Blair et al. 2003). While childhood HIV infection is declining due to prevention efforts in mother to child transmission, antiretroviral therapy and safe antenatal facilities remain expensive and inaccessible. Children are commonly left to head the household after losing their parents to the disease (Blair et al. 2003).

Mental Health

Emotional and behavioral problems during childhood are common. As high as 10 to 27 percent of children have an impairing mental health condition (Morris 2003; National Research Council 2004), such as depression, ► attention deficit hyperactivity disorder (ADHD), and conduct disorders. Mental illnesses and behavioral problems are linked with developmental delay. Children with mental illnesses have difficulty focusing, making friends, and learning in school (National Research Council 2000; Morris 2003). Without the help of comprehensive mental health services, cognitive, educational, and social delays may continue into adolescence and adulthood (Blair et al 2003; Morris 2003). However, symptoms of these illnesses are sometimes exhibited by normal children – making it crucial to determine the frequency and duration at diagnosis (Blair et al. 2003). In developed countries, the over-diagnosis and medication of children with mental illnesses, particularly ADHD, is a concern that has yet to be addressed in child health.

Social Environment

Family influences are imperative to children's health and well being. Not all children who enter school are ready to learn. Parental participation in children's lives can enhance or diminish the development of language and reading skills; developing these skills before school predicts scholastic achievement and family ties (National Research Council 2004). Likewise, violence in the home and community is associated with negative developmental outcomes. Firsthand experience with ► child abuse or ► child neglect, as well as witnessing violence at home and in the community, can lead to developmental delays, learning problems, anxiety, depression, and aggression (National Research Council 2000; Aday 2001; Rosquist, Krugman 2003).

Physical Environment

The physical environment exposes children to external conditions, usually preventable, that affect their health. While advancements have been made in the reduction of infectious diseases worldwide, relatively little has been done to reduce childhood injuries. Injuries represent a growing proportion of childhood deaths and the most common cause of physical disability (Blair et al. 2003; National Research Council 2004). Worldwide, auto accidents comprise the majority of childhood injuries (Bolton et al. 2003). In addition to causing accidents, cars and trucks emit carbon monoxide, carbon dioxide, and hydrocarbons, among other hazardous chemicals (National Research Council 2004). Children are also affected by other common air pollutants such as smoking, extermination agents, toxic paint, fumes from cleaning supplies, molds, and asbestos in old school buildings. Children who live in high traffic areas, near industrial parks, and/or are in contact with indoor pollutants, such as cigarette smoke, are particularly at risk for respiratory infections, allergies, and asthma (National Research Council 2004). Lead poisoning from lead pipes and paint cause neurological damage (National Research Council 2004). Contaminants in food, water, and immediate environment are particularly harmful to children. Children eat less diverse diets and consume more calories and water for their weight than adults, potentially exposing them to greater levels of pesticides, parasites, and pollutants in the water (National Research Council 2004). Natural disasters, such as hurricanes, tsunamis, mud slides and earth quakes, ruin crops, homes, and stability in their wake. Children are particularly at risk from malnutrition and infectious diseases that often follow environmental events (Blair et al. 2003).

Vulnerable Populations

Children of low socioeconomic status (SES), immigrants, and those in war torn countries are more likely to have poor health outcomes (Aday 2001; National Research Council 2004). Families with low SES are less likely to have available resources to purchase nutritional food, heating, adequate shelter, and healthcare for themselves and their families. In the United States, mortality from infectious diseases is over two times more common in the bottom ten percent than the top ten percent SES (National Research Council 2004). Parents

living in poverty are more likely to exhibit feelings of depression, anxiety, and low self esteem, possibly leading to an unstable home (Blair et al. 2003; National Research Council 2004). The children of refugees and undocumented immigrants face similar issues. Access to care in war torn countries is limited due to blocked road access, limited supplies, and unsafe conditions. The prevalence of depression and posttraumatic stress syndrome is especially high among child refugees fleeing from war-torn countries (Aday 2001). The children of undocumented immigrants tend to have poor health outcomes due to lack of social capital, community networks, and access to affordable healthcare (Aday 2001). Currently there are no comprehensive analysis regarding racial disparities and children's health (National Research Council 2004). The majority of the research has focused on adult health outcomes that are not applicable to youth. More studies must be done to confirm ► minority-status' effect on child health outcomes.

Conclusion

A healthy childhood is a critical determinant for health in adolescence and beyond. Children rapidly develop from birth through age five, building upon emotional, social, regulatory, and moral abilities (National Research Council 2000). While advances have been made in the reduction of childhood infectious diseases, chronic diseases commonly found in adults are beginning to present in children. Moreover, challenges lay ahead for developing countries still overwhelmed with infectious diseases and beginning to show signs of chronic disease as well.

Cross-References

► Adolescent Health and Development
► Attention Deficit Hyperactivity Disorder (ADHD)
► Child Abuse
► Child Neglect
► Fertility Rate
► Growth Factor
► Hyperkinetic Disorder
► Lung to Body Ratio
► Menarche
► Minority-Status Effect
► Social Health

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Child Health Indicators of Life and Development (CHILD)

Definition

CHILD is a project funded by the European Commission that aims to seek a composite set of ► health indicators measuring all aspects of child health at the level of Member States. The proposed indicators of child health are divided into the following four groups: ► demographic indicators and ► socioeconomic indicators; indicators of child health status and well-being; health determinants, risk and protective factors; and indicators of child health systems and policy. Most of these indicators are available from civil registration data or hospital data. This project has also identified areas where further research is needed to identify new indicators, such as child abuse, childhood behavior disor-

ders, learning disorders, educational development, and family cohesion, etc.

Child Health Policy

► Family Health Policy

Childhood Autism

Definition

Childhood autism is a type of pervasive developmental disorder that is defined by: (a) the presence of abnormal or impaired development that is manifest before the age of three years, and (b) the characteristic type of abnormal functioning in all the three areas of psychopathology: reciprocal social interaction, communication, and restricted, stereotyped, repetitive behavior. In addition to these specific diagnostic features, a range of other nonspecific problems are common, such as phobias, sleeping and eating disturbances, temper tantrums, and (self-directed) aggression.

Childhood Diseases

► Infectious Diseases in Pediatrics

Childhood Hyperkinesis

► Attention Deficit / Hyperactivity Disorder (ADHD)

Childlessness

► Infertility
► Infertility, Primary

Child Neglect

Definition

Child neglect refers to the failure of a parent or guardian to provide emotional, physical, health, and nutritional care for a child.

Child-Rearing

► Parenting

Children and Adolescents From Migrant Families

► Migrant Children

Children's Diseases

► Infectious Diseases in Pediatrics

Chimaera

► Chimera

Chimera

Synonyms

Chimaera

Definition

A chimera is an organism which consists of cells that are not genetically identical. Chimeras can be produced by artificial fusion of two embryos after implantation of embryonic stem cells (ESC) into a blastocyst. If the implanted ESC replace the inner cell mass, the developing embryo consists only of ESC-derived cells. If they do not completely replace inner cell mass, the embryo is formed by ESC and embryoblast cells of the host blastocyst, resulting in a chimera. In the mid-80s, US scientists bred the "geep" – a chimera of a goat with a sheep.

Chiropodist

► Podiatrists

Chi-Square Test

Definition

A test that is frequently used to detect significant relationships between two variables measured on nominal scales, or to determine whether a distribution differs significantly from expectations. Chi-square tests belong to the class of statistical inferential procedures known as nonparametric or distribution-free tests.

The chi-square test is a significance test based on chi-square distribution. A chi-square test is most commonly used as a ► test of homogeneity or a ► test of independence for ► contingency table analysis, and as a ► goodness-of-fit test for analysis of observed ► frequency distribution. Chi-square test statistic can be calculated as the sum of the squared differences between observed and expected frequencies, $\sum (O-E)^2/E$, where O is the observed frequency and E is the expected frequency. Statistic produced by this test follow a chi-squared distribution, with $(r-1)\ (c-1)$ degrees of freedom for a contingency table analysis and $r-1$ degrees of freedom for a goodness-of-fit test. In these formulas, r and c are the number of rows and columns, respectively, i. e. number of categories of variables.

Chlamydia trachomatis Infection

Synonyms

Non-gonococcal urethritis (NGU); Non-specific urethritis (NSU); Urethritis Waelsch; Waelsch's disease

Definition

Chlamydia are obligatory intracellular bacteria. The most important species is *Chlamydia trachomatis* with 15 serotypes, which are responsible for various diseases. The serotypes A–C cause endemic trachoma, which is primarily found in tropical regions and often leads to blindness. The serotypes D-L cause genital infections and conjunctivitis as well as neonatal infections. Lymphogranuloma venereum is due to an infection with the serotypes L1–L3. Worldwide, *Chlamydia* associated urogenital infections, which belong to the non-gonococcal urethritis (NGU) group, are very common. The incubation period lasts 1–3 weeks. In 75% of the women and 25% of the men, the infection is asymptomatic. Possible symptoms are vaginal discharge and – especially in men – painful micturition. A complication of the infection is adhesions in the urogenital tract, which can cause infertility in both sexes. *Chlamydia trachomatis* infection can be cured by doxycycline and erythromycin.

Cross-References

► Sexually Transmitted Diseases

Chloroquine (Resochin®, Aralen®)

Definition

Chloroquine is a derivative of the alkaloids quinine and quinidine, which can be extracted from the bark of the South American cinchona tree. Its effect results from the impairment of the metabolic processes in plasmodia. Chloroquine is the basis of treatment and prophylaxis in cases of infections with *Plasmodia ovale*, *P. vivax* and *P. malariae*. In general, it is tolerated well, and can also be administered during pregnancy and breast feeding. Treatment is carried through at 0, 6, 24 and 48 hours. Possible side effects are gastrointestinal symptoms and visual defects. When used for long-term prophylaxis, chloroquine can cause alterations of the cornea and the retina.

Cholera Immunization, Active

► Cholera Vaccination

Cholera Vaccination

Synonyms

Cholera immunization

Definition

The first dead cholera ► vaccine was developed as far back as in 1896. A modified version of this vaccine is still in use today, and can be given to patients from 6 months of age onward. However, the protective effect

of the cholera vaccination is only 50%, and side effects are frequent at 20–50%. For these reasons, the use of this vaccine is limited. Another possibility is an orally administered living vaccine, which is permitted for use from the age of 2 years, and which is given as a single dose. The contraindication for the living vaccine is immunosuppression.

Christianity

Definition

All Christians believe in God as the creator of all men and who, through Jesus Christ, provided us with rules and guidelines for a Christian way of life. The church is the main place of worship, with other centers available for believers to come together in order to share their faith and way of life.

Christian (Neighborly Love)

Definition

The preaching of God expresses the need for neighborly love in that the individual shall show love and passion toward their fellow being, similar to their acceptance of God.

Chromatid

► Chromosome

Chromosomal Mutation

► Mutation

Chromosome

Synonyms

Chromatid; Linkage group (in some species)

Definition

A chromosome is a single continuous strand of DNA which encodes genes as well as functional sequences (segments of DNA that may play structural or regulatory roles) and non-functional sequences, and also may included a complicated physical structure or arrangement of genetic materials. In prokaryotes (single-celled organisms), DNA is organized as a large circularized chromosome containing all relevant genes of the microorganism. It forms additional structure through supercoiling, which is a coiling or looping of the double-helical strand to relieve torsional stresses on the molecule. In eukaryotes (some single-celled organisms, all multicellular organisms), DNA is contained in chromosomes each composed of one enormously long single linear strand. Throughout the majority of the cell cycle in eukaryotes, DNA is linearized, bound to some proteins in a complex called chromatin and contained within a sac called the nucleus. However, during the cell cycle, the DNA contracts, binds with additional proteins, and is organized into a far more complex physical structure. DNA is always bound to a cluster of proteins called histones, around which it is wound to form a nucleosome. Multiple nucleosomes are said to look like 'beads on a string.' When cells divide, chromosomes contract to form an additional chromatin structure by binding with more proteins and forming a 'protein scaffold.' When cell division is complete and the chromosome is present within a new nuclear envelope, the protein scaffold dissociates, allowing the DNA to once again linearize. It should be noted that chromosomes have two regions with distinct features, the centromere and telomeres. When a chromosome is copied, it remains bound to its copy by a centrally-located tight collection of DNA called the centromere, which resembles the knot of a bowtie. The telomeres are the ends of a chromosome; they are often composed of highly repetitive sequences, which are used to preserve the ends of the chromosome from decay after repeated rounds of ► replication. It is also important to note that different species have different numbers of chromosomes, and chromosomes of varying length. For instance, the fruit fly *Drosophila melanogaster* has 8 chromosomes, while the common dog *Canis lupus*, has 78 chromosomes. In humans, somatic cells carry 46 chromosomes (2 copies of 22 different chromosomes and 2 sex chromosomes) while gametes carry 23 chro-

mosome (1 copy of 22 different chromosomes and 1 sex chromosome).

Chronic Carriers of Pathogens

► Permanent Shedders

Chronic Diseases

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Definition

A chronic disease is a disease that lasts at least three months, it generally persists for a longer time and does not just disappear. Chronic diseases can typically not be prevented by vaccines or cured by medicine. The most observed chronic diseases in western industrialized countries are heart diseases, cancer and diabetes. Chronic diseases are costly for the health care systems and discussions on how to deal with these chronic conditions in the most efficient way, with respect to treatment and improvement in general health, are focused on giving up health damaging behavior.

Chronic diseases are characterized by a long latency period, a mixture of causal factors, a prolonged course of illness, a non-contiguous origin and functional impairment or disability. Chronic diseases are rarely completely cured. Typical examples of chronic diseases include ► cardiovascular diseases, ► cancer, ► chronic respiratory diseases, ► diabetes, and ► arthritis. Most of the chronic diseases are more common amongst elderly people. The global cost of these chronic conditions both in human and financial terms is tremendous. This is especially an issue for developing countries with limited economical strength. Going forward, public health has to face the challenge to reduce the burden, arrest or slow deterioration, and prevent disability from the chronic disease illnesses given the large chronic disease burden as well as the aging population.

Basic Characteristics

The Global Burden of Chronic Diseases

According to WHO out of the approximately 58 million deaths in 2005, about 35 million people or 60% died due to chronic diseases. This is double the number of the deaths due to infectious diseases, maternal and perinatal conditions and nutritional deficiencies combined. Around half of the people that died of chronic diseases were female. Almost 50% of the deaths were of people younger than 70 years and 80% of deaths came from low and middle income countries. When comparing the different chronic diseases, cardiovascular diseases are the main cause of death, accounting for 30% of all deaths in 2005. Cancer with 13% and chronic respiratory diseases with 7% are the other leading causes of death. According to the WHO, diabetes is only responsible for 2% of all deaths. This rather small percentage is driven by the fact that many patients live with diabetes for years and in many cases their official cause of death is recorded as cardiovascular disease or kidney failure. Chronic diseases are furthermore a crucial factor in the cause of disability.

The measurement of the burden of disease is often done by using the disability adjusted life years (or ► DALY) which was originally developed by the World Health Organization. DALY is increasingly used in the field of public health and health impact assessment. The DALY measurement quantifies the impact of premature death and disability on a population by combining mortality and morbidity statistics into a single, common metric. One DALY can be compared to one lost healthy year of life. Of the 725 million DALYs in 2005, almost 50% were caused by chronic diseases.

Causes of Chronic Diseases

The majority of chronic diseases can be explained by their modifiable risk factors in conjunction with the non-modifiable risk factors. The most relevant modifiable risk factors of chronic diseases, that are well-established in the medical scientific community and proven by various studies, are unhealthy diet/excessive energy intake, physical inactivity and tobacco use. This behavior often causes the intermediate risk factors like raised blood pressure, raised glucose levels, abnormal blood lipids, and overweight (► body mass index $\geq$25) and obesity (body mass index $\geq$30). The most important non-modifiable risk factors are age and heredity. There

are other risk factors that account for a smaller proportion of chronic disease like excessive alcohol use, infectious agents and environmental factors. Other causes that influence health in adult life are the conditions before birth and in early childhood. In most cases, these causes cannot be controlled by the person concerned as children cannot choose the environment in which they live. Each year there are at least 4.9 million people who die as a result of tobacco use, 1.9 million people who die as a result of physical inactivity, 2.7 million people who die as a result of low fruit and vegetable consumption, 2.6 million people who die as a result of being overweight or obese. Furthermore, there are 7.1 million people who die as a result of raised blood pressure and 4.4 million people who die as a result of raised total cholesterol levels.

Prevention of Chronic Disease

Just a small decrease in the average population levels of several risk factors can have a significant impact of the burden of chronic disease. Prevention strategies for chronic diseases should therefore aim at the whole population yet be combined with individual approaches where appropriate. There are several dimensions were prevention measures can be defined and applied. From a legal or regulatory point of view, those measures can be national and local legislation, regulations, ordinances, international laws and treaties and other legal frameworks. For example, laws have had a major impact on public health policy and practice like, for example, advertising bans for tobacco products. Although legislation and regulations are in place already, there is still potential to leverage them to more effectively reduce the burden of chronic disease. Another lever are tax and price interventions that can steer individuals towards the reduction of the consumption of tobacco and unhealthy foods or, on the other hand, can, through subsidies, promote healthy foods or physical activity. Other media for preventing chronic diseases are, for example, advocacy interventions that provide health education by means of communication methods (information campaigns, publications, web sites, press releases, lobbying and peer-to-peer communication).

Interventions can furthermore be community-based, school-based or occur at the workplace. Community programs aim at high-risk populations in schools, workplaces, recreation areas and other settings in the community. These programs usually include partnerships between community organizations, policy-makers, businesses, health providers and community residents. School-based interventions can be part of community programs and usually cover health policies, health education, supportive environments and health services. The programs themselves might, for example, include physical education or nutrition and food services (like providing only healthy drinks at vending machines). Workplace interventions can be driven by the community or by the employer or the workforce.

Medical screening is another important pillar of prevention. Screening tests are available for some chronic diseases like, for example, cardiovascular diseases or diabetes and, when medical screening is implemented effectively, it can prevent disability and death and improve the quality of life. Clinical prevention is aimed at people who are at risk of developing or who already live with a chronic disease and it is designed either to reduce the risk of disease onset or to reduce complications.

Conclusion

There existed, and in some countries still exists, a confusion and misunderstanding about the nature of chronic diseases, their prevalence, the people at risk, and the risk factors themselves. As a consequence, in the past, not enough focus and effort was put into progressing chronic disease treatment and prevention. This is changing with the realization that not only, as the population ages, more and more people are living long enough to develop chronic diseases, but also that, in today's socio-economic environments, more young people are developing chronic diseases. Futhermore, chronic diseases are the main cause of death in most countries and this fact has significant economic impact. Several examples of effective and cost-efficient intervention measures from different countries exist and these measures need to be applied on a global level to deal with the chronic disease threat and improve the quality and length of life for millions of people.

Cross-References

- ► Arthritis
- ► Body Mass Index (BMI)
- ► Cancer
- ► Cardiovascular Diseases

► Chronic Respiratory Diseases
► DALY
► Diabetes

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Chronic Effects

Definition

Symptoms of illnesses or diseases of long duration or frequent occurrence are called chronic effects. Chronic effects develop slowly, sometimes from repeated exposures to low concentrations of a health hazard. The time it takes for a health effect to develop after first exposure to a hazard is called the latency period.

Chronic Respiratory Diseases

Definition

Chronic respiratory diseases include disorders of the airways and other structures of the lung. Prolonged diseases and disorders of the respiratory systems in adults are present for months to years and although they are usually treatable, they are generally not curable. The most common chronic respiratory diseases are asthma, chronic obstructive pulmonary disease (COPD), respiratory allergies, occupational lung diseases and pulmonary hypertension. Around the world, there are hundreds of millions of people suffering from these diseases, for example about 300 million people in the world have asthma according to the WHO. Some risk factors for chronic respiratory diseases are preventable, particularly smoking, poor nutrition, frequent lower respiratory infections during childhood, and environmental air pollution (indoor, outdoor, and occupational). For a successful medical management of any chronic respiratory disease it is crucial to evaluate the patient as a whole and to assess the structure and function of the entire respiratory system.

Cigarette Smoking

► Tobacco Consumption

CIOMS Report

Definition

CIOMS is the abbreviation for council for international organizations of medical sciences, a sub-organization of the World Health Organization (WHO). Concerning the reporting of adverse reactions the CIOMS reached agreement on a standard form report for reporting adverse reactions to the competent authorities which is widely used (Fig. 1).

Cis-Acting Gene

Definition

In ► gene therapy, genetic elements are transferred into a patient. If the transferred gene is integrated into the patient's chromosomal DNA (► deoxyribonucleic acid) it is termed *"cis-acting"*.

CIOMS FORM

SUSPECT ADVERSE REACTION REPORT	

I. REACTION INFORMATION

1. PATIENT INITALS (first, last)	1a. COUNTRY	2. DATE OF BIRTH Day	Month	Year	2a. AGE Years	3. SEX	4-6 REACTION ONSET Day	Month	Year	8-12 CHECK ALL APPROPRIATE TO ADVERSE REACTION
7 + 13 DESCRIBE REACTIONS(S) (including relevant tests/lab data)										☐ PATIENT DIED ☐ INVOLVED OR PROLONGED INPATIENT HOSPITALISATION ☐ INVOLVED PERSISTENCE OR SIGNIFICANT DISABILITY OR INCAPACITY ☐ LIFE THREATENING

II. SUSPECT DRUG(S) INFORMATION

14. Suspect Drug(S) (include generic name)		20 DID REACTION ABBATE AFTER STOPPING DRUG? ☐ YES ☐ NO ☐ NA
15. DAILY DOSE(S)	16. ROUTE(S) OF ADMINISTRATION	21. DID REACTION REAPPEAR AFTER REINTRO-DUCTION ☐ YES ☐ NO ☐ NA
17. INDICATION(S) FOR USE		
18. THERAPY DATES (from/to)	19. THERAPY DURATION	

III. CONCOMITANT DRUG(S) AND HISTORY

22. CONCOMITANT DRUG(S) AND DATES OF ADMINISTRATION (exclude those used to treat reaction)
23. OTHER RELEVANT HISTORY (e.g. diagnostics, allergics, pregnancy with last month of period, etc.)

IV. MANUFACTURER INFORMATION

24a. NAME AND ADDRESS OF MANUFACTURER	
	24b. MFR CONTROL NO.
24c. DATE RECEIVED BY MANUFACTURER	24b. REPORT SOURCE ☐ STUDY ☐ LITERATURE ☐ HEALTH PROFESSIONAL
DATE OF THIS REPORT	25a. REPORT TYPE ☐ INITAL ☐ FOLLOWUP

CIOMS Report, Figure 1 CIOMS form for reporting suspected averse reactions.

Civilization

► Culture
► Ethics and Culture

Civil Law

► Private Law

Claims Data Analysis

Definition

One important methodological approach in health economics is the analysis of large routine datasets. Claims data are collected by sickness funds, public health care payer's such as the National Health Service in the United Kingdom, or private insurance companies. Claims data analysis directly reflect the health care payers' expenses (► payer's perspective) in a routine care real life setting, but they also have the disadvantages associated with retrospective study designs, such as the danger of confounding.

Classification

Definition

In statistics classification is a procedure in which individual items are placed into groups based on quantitative information on one or more variables inherent in the items and based on a training set of previously labeled items. All classification methods are solving one of three related problems: to find a map of a feature space (which is typically a multi-dimensional vector space) to a set of labels, to consider classification as an estimation problem and to estimate the class-conditional probabilities and then use Bayes' rule to produce the class probability as in the second problem. Examples of classification algorithms include: linear classifiers (Fisher's lineardiscriminant,Logistic regression, NaiveBayesclassifier, Perceptron), quadratic classifiers, k-nearest neighbor, decision trees, neural networks, Bayesian networks, etc. Statistical classification algorithms are typically used in pattern recognition systems.

Classification and Prediction Statistical Methods

C

Synonyms

Multivariate statistical methods; Multivariate statistical analysis; Multivariate data analysis; Multivariable statistics

Definition

Classification and prediction statistical methods examines the simultaneous effect of multiple variables. Traditional classification of multivariate statistical methods is based on the concept of dependency between variables. If an interest centers on the association between two sets of variables, where one set is the realization of a dependent variable (or variables) and the other set is the realization of a number of independent variables, then the appropriate class of techniques would be those designated as dependence multivariate methods. If interest centers on the mutual association across all variables with no distinction made among variable types, one uses interdependence multivariate methods. Examples of dependence multivariate methods are ► multiple regression, ► discriminant analysis, logistic regression (► logistic regression analysis), ► proportional hazards regression (Cox's regression), ► loglinear analysis, ► canonical correlation analysis, multivariate analysis of variance and covariance, path analysis, and structural equation modeling. Examples of interdependence methods include ► principal component analysis, ► factor analysis, ► cluster analysis, multidimensional scaling, and correspondence analysis.

Cross-References

► Multivariate Statistics

Clean Water

► Drinking Water

Client Interviews

Definition

Client interviews are the process of meeting with a client to gather information. Client interviews can have many purposes such as gaining an understanding of the client's business, discussing and addressing any client concerns or service related issues, and identifying and capitalizing on opportunities to generate additional business from the client. In contrast, client surveys are the process of assessing a client's satisfaction with the service they receive. The service provider, another member of the service provider's organization, or an outside consultant can conduct a client survey in writing, by telephone, or in person.

Climacteric Period

► Menopause

Climacterium

► Menopause

Climate Change

Synonyms

Global climate change

Definition

Climate change refers to the variation in the Earth's global climate or in regional climates over time. These changes may come from natural processes on the Earth, from changes of external factors (such as variations in solar radiation, the earth's orbit, and emission of greenhouse gases), or may be caused by human activities. The most important anthropogenic factors are CO_2 emissions from fossil fuel combustion, aerosols, land use, ozone depletion, and deforestation. The consequences of climate change on human health are related to changes in temperature, extreme ► weather conditions, air pollution (► air quality and pollution), shortages in water and food supply, changes in the biodiversity of vectors of infectious diseases, and increased risk of traumas, injuries, and related health effects (► climate and microclimate).

Climate and Microclimate

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Synonyms

Weather; Atmospheric condition; Indoor climate

Definition

Weather is the condition of the atmosphere at a certain point of time or in a short period of time. It is characterized by several meteorological elements, such as temperature, air pressure, air velocity, and air humidity, and their interactions. On the other hand, *climate* can be understood as the average state of the atmosphere and the associated characteristics of the underlying land or water in a particular region, usually spanning at least several years. The term ► microclimate can be used to describe an atmospheric zone indoors or an indoor climate, i. e. the condition of the air in a certain closed space.

Basic Characteristics

Climate Elements and Human Health

Atmospheric Pressure Atmospheric pressure is the pressure above any area in the Earth's atmosphere and is caused by the weight of air. Atmospheric pressure at sea level equals 760 mmHg (101.3 kPa or 1 atm), and it decreases with increasing altitude, by approximately 10 kPa per kilometer for the first few kilometers above the surface. Effects on humans occur due to the decrease in partial pressure of oxygen and the subsequent decrease in oxygen concentration in the blood.
Healthy persons do not usually feel smaller changes of atmospheric pressure (± 2 kPa or ± 20 mbar), but some sensitive persons experience mood changes. Up to an altitude of 2500 m, most people do not experience any problems. ► Altitude sickness or mountain sickness usually occurs at altitudes of 2500 – 3000 m,

with the following symptoms: headaches, sleeplessness, excitability, breading difficulties, regurgitation, and peripheral edema. Pulmonary edema occurs in mountain climbers exposed to extreme physical efforts and has high lethality. At higher altitudes, physiological functions are highly suppressed and loss of consciousness occurs; over 7000 m, survival is impossible.

Within an occupational setting, there is one medical condition related to extreme change of atmospheric pressure – ► caisson disease or decompression sickness. It may occur among caisson workers, miners, or professional divers when coming to the surface from atmospheric overpressure to normal pressure. This causes inert gases (mainly nitrogen), which are normally dissolved in body fluids and tissues, to come out of physical solution and form gas bubbles in blood and tissues. Symptoms are "the bends" (joint pain) in shoulders and knees, headache, visual disturbances, extreme fatigue, lack of strength, breathing difficulties ("the chokes"), and in some cases cardiovascular collapse, unconsciousness, and paralysis.

Air Temperature Individuals have their own zone of comfort regarding air temperature, which is strongly dependent on air humidity. Unprotected exposure to extremely high or low temperatures leads to certain conditions and even irreversible consequences.

Thermal comfort is a feeling of satisfaction with the indoor climate, either in an occupational or living setting. In the state of thermal comfort, the process of thermoregulation is balanced. Thermal comfort depends on all indoor climate parameters – air temperature, humidity and velocity, and heat radiation, as well as on individual characteristics, intensity of physical activity, and clothing – all of these being especially important in an occupational setting. In order to achieve thermal comfort, recommended values of microclimate parameters in an occupational setting were established. Despite differences between various countries, the recommended indoor temperature range from 20 – 24°C in winter to 23 – 26°C in summer; relative air humidity should be 40 – 65% and indoor air velocity < 0.2 m/s in winter or < 0.3 m/s in summer.

Excessive exposure to heat leads to several emergency states: ► heat cramps (caused by loss of salt from heavy sweating), ► heat exhaustion, which is a disorder of the small venous blood flow in the peripheral circulation that is caused by dehydration; this can further progress to heat stroke, the most serious of the three. ► Hyperthermia (hyperpyrexia), also referred to as heat stroke or sunstroke, is an acute condition which occurs when the body produces or absorbs more heat than it can dissipate. The process of thermoregulation is inhibited, which can cause shock, brain damage, organ failure, and even death. Symptoms include confusion, headaches, and low blood pressure, leading to possible fainting or dizziness. The skin is pale or bluish, and the subject complains of chills and trembling. Some victims, especially young children, may suffer convulsions.

Exposure to cold leads to ► frostbites – damage to the skin and underlying tissues of peripheral parts of the body (fingers, nose, and ears) due to impairment of circulation. ► Hypothermia is a medical condition in which the victim's core body temperature has dropped significantly below normal and normal metabolism begins to be impaired. Symptoms include ataxia, confusion, cold skin, gray complexion, peripheral cyanosis, shivering, tremor, weakness, and rapid breathing and heart rate, which slow and weaken as temperature decreases, leading to death.

Air Humidity Humidity is the concentration of water vapor in the air. Air humidity is strongly but inversely correlated to air temperature – with an increase of temperature, humidity decreases. When air temperature equals 20°C, air can maximally contain 17.3 g/m^3 of water – air is said to be saturated with water, and relative air humidity is 100%. Humidity of 50% means that the air contains only half of the maximum possible quantity of water vapor at a certain temperature. An optimal relative humidity of 40 – 60% is recommended indoors, similar to German standards, 30 – 65%.

Humidity that is too high hinders the thermoregulation process due to cessation of evaporation. High air humidity in combination with high ambient temperature leads to heat stroke. At that moment, the pressure of water vapor in the air becomes similar to the pressure of sweat on the skin (around 40 mmHg), so that the sweat cannot be evaporated, and it streams down the body. This is a physiologically useless process, leading to severe dehydration, but can be impaired if exposed to higher air velocity. High indoor humidity also impairs air quality, such air is usually described as "stale", or "sultry", and it stimulates fungal infestation on walls, ceilings, and floors.

Humidity that is too low leads to drying of the mucosa, impairment of pulmonary clearance and increase of electrostatic charge of some artificial fibers and materials. High air temperature in combination with low air humidity leads to dehydration and heat exhaustion.

Air Velocity As previously mentioned, air velocity is an important microclimate parameter, since it has a great influence on convection – a process involved in thermoregulation. At an air temperature of 20°C, heat dissipation is performed predominantly by heat radiation (61%), and convection (26%), and least by evaporation (13%). With a temperature increase (i. e. 36°C), convection and radiation stop and thermoregulation is maintained by evaporation. The evaporation rate reduces after a few hours, probably due to some kind of exhaustion of sweat glands, but their reactivation is possible by cleaning the body, exposure to wind, or additional physical activity. Physiologically, the parts of the body most sensitive to air spreading are the neck and lower back.

When the air temperature is high, draught occurs at stronger air velocities. However, when the temperature is low, the air cools on the cold windows and flows down the walls and along the floor, so that draught occurs even at lower air velocities.

Global Climate Change and its Public Health Importance

Today, human activities have led to alterations of the world's climate. Change in world climate influences the functioning of many ecosystems and their member species, and likewise, a great impact on human health would be expected.

One of the most disastrous consequences of human activities is the "► greenhouse effect" – a global warming effect caused by uncontrollable emission of energy-trapping gases, such as carbon dioxide (mostly from fossil fuel combustion and forest burning), methane (from irrigated agriculture, animal husbandry, and oil extraction), nitrous oxide, and various human-made halocarbons. Natural sources of these gases have a minimal influence on the occurrence of the problem, since they have been overwhelmed by emissions from human activities.

It is already well known that the global temperature on the Earth has increased by 0.6 ± 0.2°C since the first systematic meteorological measurements in 1861. The sea level has increased by 10 – 20 cm in the last century, as has the temperature of the tropical oceans. Furthermore, the snow layers on the North Pole and mountain glacial ice have decreased by 10%, and the average duration of ice layers on lakes and rivers has decreased by 14 days. Other evidence of ► climate change includes the fact that rainfalls over the North Pole have decreased by 0.5 – 1% per decade, but on the other hand have increased in subtropics latitudes, leading to devastating droughts in Africa and Asia. In the Pacific Ocean, the long-lasting and intensive temperature abnormalities have resulted in the occurrence of El Niño events, with adverse consequences on agriculture, forests, many ecosystems, and human health.

Another important issue that is not part of global climate change is stratospheric ► ozone depletion. There are, however, several recently described interactions between ozone depletion and greenhouse gas-induced warming. It is well known that depletion of the ozone layer leads to an increase in UV radiation on Earth, and, consequently, there is a significant increase in the incidence of skin cancer (melanoma and other types). However, ultraviolet radiation exposure also causes immunosuppression that, in combination with other factors, could influence patterns of infectious disease, and the occurrence and progression of various autoimmune diseases. Finally, there is a wider, ecological, dimension to consider. Since ultraviolet radiation impairs the molecular chemistry of photosynthesis both on land (terrestrial plants) and at sea (phytoplankton), this could affect world food production, and thus contribute to nutritional and health problems in food-insecure populations.

Consequences on human health cannot be easily predicted, since climatic influences on health are modulated by interactions with other ecological processes, social conditions, and adaptive policies. However, it is expected that climate change will lead to several effects:

- Temperature-related illness and death – episodes of extreme heat already pose a health threat around the world, and the Centers for Disease Control and Prevention have reported an increase in heat-related mortality rates in recent years in the United States. The populations at risk of temperature-related deaths are residents of urban areas, the elderly, young children, the poor, and people who are bedridden, on

certain medications, or who have certain underlying medical conditions;

- Extreme ► weather related health effects – direct health impacts of extreme weather events such as hurricanes and floods are injuries and deaths, but indirect impacts occur as a consequence of changes in ecosystems and/or changes in public health infrastructures – such as the availability of food, safe drinking water, and other hygienic issues such as waste disposition, insect and rodent invasion, unavailability of medical help, etc.;
- Air pollution-related health effects – climate change affects exposure to air pollutants by affecting weather and pollution concentrations; affecting both natural sources and human-caused emissions; and changing the distribution and types of airborne allergens;
- Vector-borne and rodent-borne diseases – global warming will affect the abundance and distribution of disease vectors. Some vector populations may expand into new geographic areas, such as malaria, dengue, plague, and viruses causing encephalitic syndromes;
- Effects of food and water shortages – climate change will affect food systems in several ways – a direct effect will be lower crop production, due to changes in rainfall leading to drought or flooding, or warmer or cooler temperatures leading to changes in the length of growing season; an indirect effect will be changes in markets, food prices, and supply chain infrastructure.

The analysis and forecasts made by the World Health Organization suggest that climate change will bring some health benefits, such as lower cold-related mortality and greater crop yields in temperate zones, but these will be greatly outweighed by increased rates of infectious diseases and malnutrition concentrated in poorer populations in tropical/subtropical countries where the most sensitive climate-related health outcomes (diarrhea, malaria, and malnutrition) are already common and where vulnerability to climate effects is greater. This means that Africa, with the lowest emission of greenhouse gases, could suffer the greatest health impact.

It is, however, possible that our predictions are too much terrifying. One must take into consideration the possible adaptation of humans and other ecological systems, which will moderate harmful consequences. From the public health point of view, health impacts will be strongly influenced by local environmental conditions and socio-economic circumstances, as well as by social, institutional, technological, and behavioral adaptations taken to reduce the full range of threats to health.

C

Cross-References

► Altitude Sickness
► Caisson Disease
► Climate Change
► Frostbites
► Greenhouse Effect
► Heat Cramps
► Heat Exhaustion
► Hyperthermia
► Hypothermia
► Microclimate
► Ozone Depletion
► Weather

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Climatic Bubo

► Lymphogranuloma Venereum (LGV)

Clinical Epidemiology

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Definition

The term clinical epidemiology is derived from its two parent disciplines: clinical medicine and epidemiology. In general, it could be defined as the application of the logical and quantitative concepts and methods of epidemiology to the practice of clinical medicine (Fletcher et al. 1996). Sackett et al. state that clinical epidemiology is "a basic science of clinical medicine" (Sackett et al. 1991).

Basic Characteristics

The main objective of clinical epidemiology is to develop and apply methods of clinical observation that will lead to the making of correct decisions about the care of patients. Fletcher et al. pointed out that clinical medicine and epidemiology began together, and that the founders of epidemiology were mainly clinicians (Fletcher et al. 1996).

Scope of Clinical Epidemiology

There are many questions addressed by clinical epidemiology: Is the patient sick or well? How accurate are the tests used to diagnose disease? How does treatment change the course of disease? How much will care cost? Keeping in mind these questions, the main scope of clinical epidemiology comprises definitions of normality and abnormality, accuracy of diagnostic tests, prognosis, treatment results, prevention in clinical practice, cost analysis, etc. (Sackett et al. 1991).

The clinical events of primary interest in clinical epidemiology are the different health outcomes, known as the five Ds: disease, death, disability, discomfort, and dissatisfaction. They are the events that clinicians try to understand, predict, interpret and change (Fletcher et al. 1996).

Normality vs. Abnormality

The first priority in any clinical consultation is to determine whether the patient's symptoms, signs or diagnostic test results are normal or abnormal. This is necessary before further action can be taken. It would be easy if there were always a clear distinction between the frequency distributions of observations on normal and abnormal people. This is very rarely, except in genetic disorders, determined by a single dominant gene.
Three types of criteria have been used to help clinicians make practical decisions:

a) Normal as common (the criterion usually used in clinical practice is to consider frequently occurring values as normal and those occurring infrequently as abnormal).
b) Abnormality associated with disease (the criterion is based on the distribution of observations for both healthy and affected people, and attempts to define a cut-off point that clearly separates the two groups).
c) Abnormal as treatable (the criterion is based on evidence from randomized controlled trials, which indicate the level which treatment does more good than harm).

Accuracy of Diagnostic Tests

The first objective in a clinical situation is to diagnose disease, i. e. the purpose of diagnostic testing is to help in confirming possible diagnoses suggested by, for example, demographic characteristics and clinical symptoms. A disease may be either present or absent and a test result either positive or negative. In two of these combinations a test will have given correct answers (true positive and true negative). On the other hand, the test has been misleading if it is positive when the disease is absent (false positive) or negative when the disease present (false negative) (Fletcher et al. 1996).
Of particular importance are a test's sensitivity and specificity, as well as positive and negative predictive values. ► Sensitivity is defined as the proportion of

patients with the disease who have a positive test for the disease. ► Specificity is the proportion of patients without the disease who have a negative test. All diagnostic tests must be compared to a ► gold standard for the disease. It is an ideal test when both sensitivity and specificity are 100%. Some typical gold standards include blood culture for bacteremia, biopsy for tumors, etc. ► Positive predictive value is the probability of disease in a patient with abnormal test results. ► Negative predictive value is the probability of a patient not having a disease when the test result is negative. Predictive value of a test is determined by both sensitivity and specificity, as well as by prevalence of disease in population being tested (Mayer 2004).

Natural History and Prognosis

The term ► natural history refers to stages of a disease, which include pathological onset, presymptomatic stage (from the onset of pathological changes to the first appearance of symptoms or signs), and finally, the stage when disease is clinically obvious. In other words, natural history is the evolution of disease without medical and paramedical interventions. Detection and treatment at any stage can alter the natural history of the disease.
► Prognosis is the prediction of the course of disease and is expressed as probability that a particular event will occur in the future. Knowledge of the likely prognosis is helpful in determining the most useful treatment. Prognosis of disease can be express as case fatality ratio (for acute diseases), and survival rate (or probability) (for chronic diseases). Characteristics that relate to the likelihood of survival are referred to as favorable and unfavorable prognostic factors. (Greenberg et al. 2004).

Treatment

An important question in clinical epidemiology is how treatment changes the course of disease. Usually, the effects of treatment are less obvious and most interventions require research to establish their effects. In this situation randomized controlled trial is the method of choice for measuring efficacy and effectiveness. ► Efficacy addresses the extent to which the intervention produces its effect under ideal conditions. ► Effectiveness addresses the extent to which the intervention produces its intended effect in a real-word setting. Finally, ► efficiency reflects a situation in which resources used to provide a specific intervention of known efficacy and effectiveness are minimized (van Gijin, Vermeulen 2001).

Clinical Decision Making

Recently, methods for quantitative decision making have been introduced in medicine. The most commonly used strategies include decision analysis, cost effectiveness analysis, and cost benefit analysis. These methods explicitly define important factors in decision making and the consequences; probabilities are assigned to events and numbers to value judgments, such as quality of life.
In ► decision analysis, "one sets out alternative courses of action and then calculates which choice is likely to result in the most valued outcome, based on estimates of probability for each branch in the sequences of events and judgments about the relative value of the possible outcomes" (Fletcher et al. 1996). The basic steps in decision analysis are: a) creation of a decision tree, b) assignment of probabilities to chance nodes, c) assignment of utilities to the outcomes, d) calculation of the expected utilities, e) selection of choice, and f) sensitivity analysis.
A ► cost-effectiveness analysis is a method of evaluation in which cost (i. e. inputs) and consequences (i. e. outputs) of treatment or a health care program are systematically assessed, with the aim of assigning explicit values to new and existing technologies and health care programs and to improve resource allocation. In ► cost-benefit analysis, both cost and benefits of alternative options of action are expressed in terms of money (Gold et al. 1996).

Cross-References

► Cost-Benefit Analysis
► Cost-Effectiveness Analysis
► Decision Analysis
► Effectiveness
► Efficacy
► Efficiency
► Gold Standard
► Natural History
► Prognosis
► Screening
► Sensitivity
► Specificity

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Clinical Guideline

Synonyms

Clinical practice guideline; Medical guideline

Definition

A clinical guideline is a document to guide decisions in specific areas of health care. They briefly identify and summarize the most current data about prevention, diagnosis and therapy of particular diseases and define all relevant decision options with their respective health outcomes including a risk-benefit and cost analysis. By helping health professionals in deciding which treatment to use, guidelines aim to improve the quality of care delivered as well as to standardize medical care, to reduce risks and to enhance ► cost-efficiency. This approach to decision making by using clinical guidelines entered the medical world in 1990. In almost all developed health care systems clinical guidelines are produced at a national or international level by medical associations or governmental bodies, based on the current state of knowledge and clinical experience. Many countries have a clearinghouse for clinical guidelines that maintains a reference catalog of all the high quality guidelines published by the different organizations.

Clinical Informatics

Definition

Clinical informatics is a branch of ► medical informatics. Clinical informatics use the methods of medical informatics to support the management of patients using an interdisciplinary approach, including clinical and information sciences.

Clinical Information

► Medical Information

Clinical Knowledge

► Medical Knowledge

Clinical Pathways

Synonyms

Critical pathways; Integrated care pathways

Definition

Clinical pathways systematically plan and follow up an integrated care program focussed on patients. Clinical pathways have entered the medical world in the 1990s during the introduction of the concept of ► integrated health care. They are designed to provide a standard treatment protocol in postoperative management with the aim to enhance the quality of care and optimize the use of resources. The definition of clinical pathways includes explicit statements of the key elements of care based on evidence, best practice of a multidisciplinary care team and patient expectations.

Clinical Practice Guideline

► Clinical Guideline

Clinical Protocol

► Treatment Protocol

Clinical Relevance

► Statistical vs. Clinical Significance

Clinical Research

► Health Research
► Health Research and Indigenous Health

Clinical Studies

Synonyms

Clinical trials; Medical research

Definition

A clinical trial is a type of research which studies diagnostic, preventive or therapeutic measures in large groups of people, designed to demonstrate a specific generalizable response against a background of individual biological variation (for example, new vaccines and medicinal drugs, before being approved for general use, must be tested on human subjects).

Cross-References

► Clinical Trials

Clinical Trials

Synonyms

Clinical studies; Medical research

Definition

A clinical trial is a type of research study. The most commonly performed clinical trials evaluate new drugs, medical devices, biologicals or other interventions on patients in strictly scientifically controlled settings, and are required for regulatory authority approval of new therapies. Trials may be designed to assess the safety and efficacy of an experimental therapy, to assess whether the new intervention is better than standard therapy, or to compare the efficacy of two standard or marketed interventions. The trial objectives and design are usually documented in a clinical trial protocol.

Cross-References

► Clinical Studies

Clinical Trials, Register

Definition

In September 2004, the members of the International Committee of Medical Journal Editors (ICMJE) published a joint editorial aimed at promoting registration of all clinical trials. Since 2005, a trial can only be considered for publication if it has been registered before enrollment of the first patient. The purpose of a clinical trials registry is to promote the public good by ensuring that everyone can find key information about every clinical trial, and it has the principal aim of shaping medical decision-making.

Clonogenic

► Clonogenicity

Clonogenicity

Synonyms

Clonogenic

Definition

Clonogenicity refers to the stem cell's characteristic of self-renewal. By replicating itself, a single stem cell can give rise to a colony of genetically identical cells. The confirmation of a cell's clonogenicity is generally assumed to be the verification of its stemness. In this respect, clonogenicity is a cell's property and does not refer to artificial genetic or cloning manufacturing.

Clostridium botulinum Infection

Synonyms

Botulism; Botox-Infection

Definition

The anaerob, spore-building bacterium *Clostridium botulinum* produces a dangerous toxin called botulintoxin or just botulin. Only 0,1µg of botulin is lethal. *Clostridium botulinum* can be found in decayed food, most often in cans which appear blown out. Spores of the bacterium can also be present in honey. After ingestion these spores are activated in the bowel. As the spores can be very dangerous for babies, honey should not be fed during the first year of life. Due to the fact that botulism is an intoxication, the infection cannot be transmitted from one individual to another. The toxin leads to paralyses of muscles; if the course is severe and the cardiac muscle and the breathing muscles are concerned, the outcome may be lethal. As long as the toxin is circulating freely in the blood stream, it can be neutralized by antitoxins.

Clostridium perfringens Infection, Enteral

Synonyms

Food intoxication by *Clostridium perfringens*; Food poisoning by *Clostridium perfringens*; Enteritis necroticans

Definition

Clostridium perfringens is an anaerobic, spore-building bacterium, which can be present in the soil, in water, dust, food or in the intestines of humans and animals. Food at risk of contamination is heated meat, oysters and other seafood. *Clostridium perfringens* produces toxins (exotoxins) of the serotypes A, B, C, D and E. Serotype C causes food poisoning, which is also called enteritis necroticans. The symptoms are stomach ache, nausea, vomiting and diarrhea. In most cases the course of the intoxication is moderate, with the symptoms vanishing within 24–48 hours.

Clothing Lice

► Body lice

Cluster Analysis

Definition

A cluster analysis (CA) is a multivariate unsupervised learning statistical technique that divides units of observations into similar groups, i. e. determines a classification or taxonomy from multiple measures of a set of objects or subjects. In CA, as opposed to other classification techniques (e. g., ► discriminant analysis or ► logistic regression analysis), groups are not *a priori* defined. CA is an exploratory data analysis tool that aims to sort different objects or subjects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. Given the above, CA can be used to discover structures in data without providing an explanation/interpretation. For example, the clustering of different signs and symptoms of diseases is done before a meaningful description of the differences between diseases is possible. Specific types of cluster analysis methods are Joining (Tree Clustering), Two-way Joining (Block Clustering), and K-means Clustering. The purpose of Tree Clustering is to join objects into successively larger clusters using some measure of similarity or distance. In Block Clustering, both cases and variables are joined together with the expectation that they both simultaneously contribute to the uncovering of meaningful patterns of clusters. The method of K-means Clustering, in contrast to the previous two methods, starts with a fixed number of (desired or hypothesized) *k* clusters, and its aim is to assign observations to those clusters so that the means across clusters (for all variables) are as different from each other as possible.

Cluster-Forming Cocci

► *Staphylococcus aureus*

Clustering Algorithms

Definition

An algorithm that groups genes that have similar expression profiles together and produces a cladogram for similarity. Often, genes that occur in the same clus-

ter are inferred to behave similarly, whether functionally or being controlled by similar processes.

Cochrane, Archibald

Definition

Professor Archibald Leman Cochrane (1908–1988) was born in Kirklands, Galashiels, Scotland. He qualified in 1938 at University College Hospital, London, and joined the Medical Research Council's Pneumoconiosis Unit at Llandough Hospital, a part of Cardiff University School of Medicine, in 1948. Here he began a series of studies on the health of the population of Rhondda Fach – studies which pioneered the use of randomized controlled trials (RCTs). His ideas eventually led to the development of the Cochrane Library database of systematic reviews, the establishment of the UK Cochrane Centre in Oxford, and the international Cochrane Collaboration.

Cochrane Central Register of Controlled Trials (CCTR or CENTRAL)

Definition

The CCTR (formerly Cochrane Controlled Trials Register) is a bibliographic database of definitive controlled trials. These controlled trials have been identified by the distinguished contributors to the Cochrane Collaboration. They and others, as part of an international effort to search the world's health care journals (and other sources of information) systematically, have combined results to create an unbiased source of data for systematic reviews. Because it has been shown that existing bibliographic databases are inadequate for the identification of all relevant studies, the Cochrane Collaboration embarked upon this formidable task in cooperation with the National Library of Medicine (NLM) in Washington, DC (USA) who produce MEDLINE, and Elsevier (Amsterdam, the Netherlands) who produce EMBASE. The CCTR contains over 300,000 bibliographic references to controlled trials in health care.

Cochrane Collaboration

Synonyms

Database of systematic reviews; Cochrane library

Definition

The Cochrane Collaboration is an international, independent, non-profit organization, dedicated to making up-to-date, accurate information about the effects of healthcare readily available worldwide. It produces and disseminates ► systematic reviews of healthcare interventions, and promotes the search for evidence in the form of clinical trials and other studies of interventions. The Cochrane Collaboration was founded in 1993 and named for the British epidemiologist, Professor Archibald Leman Cochrane.

Cochrane Database of Methodology Reviews (CDMR)

Definition

The broad intention of the CDMR is to include all published reports of empirical studies of methods used in reviews, as well as methodological studies that are directly relevant to reviews, such as empirical studies of the association between research methods and bias in randomized controlled trials. Details of ongoing methodological research are also included, together with books, conference proceedings, and special journal issues devoted to the topic of ► systematic reviews and ► meta-analysis.

Cochrane Database of Systematic Reviews

Definition

The Cochrane Database of Systematic Reviews includes the full text of the regularly updated systematic reviews of the effects of healthcare prepared by the Cochrane Collaboration. The reviews are presented in two forms: complete reviews (regularly updated Cochrane Reviews, prepared and maintained by Collaborative Review Groups) and Protocols (Protocols for reviews currently being prepared. Protocols are

the background, objectives, and methods of reviews in preparation). The database is produced by the Cochrane Collaboration – an international network of individuals and institutions committed to preparing, maintaining, and disseminating systematic reviews of the effects of health care. In pursuing its aims, the Cochrane Collaboration is guided by six principles: collaboration, building on people's existing enthusiasm and interests, minimizing duplication of effort, avoidance of bias, keeping up-to-date, and ensuring access.

Cochrane Library

Synonyms

Database of systematic reviews; Evidence based medicine database

Definition

The Cochrane Library consists of a regularly updated collection of EBM databases, including The Cochrane Database of Systematic Reviews – the major product of the Collaboration, which is published quarterly. Cochrane Review Groups are composed of healthcare professionals from around the world who share an interest in developing and maintaining systematic reviews relevant to a particular health area.

The major bibliographic databases cover less than half the world's literature and are biased towards English language publications. Of the evidence available in the major databases, only a fraction can be found by the average searcher. Textbooks, editorials, and reviews which have not been prepared systematically may be unreliable. Much evidence is unpublished, but unpublished evidence may be important. More easily accessible research reports tend to exaggerate the benefits of interventions. The Cochrane Library solves many of these problems and is published on a quarterly basis. Databases included in The Cochrane Library are The ► cochrane database of systematic reviews (as described above), The ► database of abstracts of reviews of effects, The ► cochrane central register of controlled trials (CENTRAL), The ► cochrane methodology register, The ► NHS economic evaluation database, The Health Technology Assessment Database and The ► cochrane database of methodology reviews (CDMR).

Cross-References

► Cochrane Collaboration

Cochrane Methodology Register

► Cochrane Database of Methodology Reviews (CDMR).

Cochrane Review Groups

Definition

Review Groups are composed of persons from around the world who share an interest in developing and maintaining systematic reviews relevant to a particular health area. Groups are coordinated by an editorial team who edit and assemble completed reviews into modules for inclusion in The Cochrane Library.

Cochran's Q Test

Definition

A nonparametric test examining change in a dichotomous variable across more than two observations.

Code of Conduct

Definition

The "Code of Conduct for medical and health web sites" is a voluntary code of conduct developed by an international organization, HON ("Health On the Net"). The owners of medical and health-related websites who sign this code are obliged to follow some basic guidelines for the distribution of reliable ► medical information.

Coded Data

Definition

An individual is given a number and all that individual's data is encoded under that number so that the individual cannot be recognized. Data are then collated, analyzed and reported on without the specific individual being

identified. Usually there is only one person who can link the code to the person to whom the data belongs. This system is used to keep a high level of ► confidentiality.

Code of Ethics

Definition

A code of ethics clarifies the ► ethical principles that are followed in a specific field. In this context we refer to the *Code of Ethics for Public Health*, formally adopted by the American Public Health Association in 2002. It is the first broadly accepted document of its kind. It lists the 12 principles of the ethical practice of public health, 11 values which inspired the principles, and includes some notes to better understand them. The code is not meant to provide clear solutions to convoluted ethical issues. It does, however, provide a list of values (► ethical values) and principles that should be considered in discussions and it makes clear to populations and communities the ideals of the public health institutions that serve them.

Coding Sheet

Definition

The coding sheet is used to collect information from the primary research reports. Information about primary research included on research synthesis coding sheets can be classified into seven categories: *1) Report identification*: in this part, the synthesist retrieves information concerning the background characteristics of the research report itself. *2) Setting of the study*: place were the study was conducted. *3) Subjects*: characteristics of the participants included in the primary research. *4) Methodology*: in this part, the synthesist retrieves information concerning study design used in the primary research. *5) Treatment characteristics*: the synthesist will need to describe carefully the details of how the independent variables were manipulated or measured. *6) Statistical outcomes or effect sizes*: relevant outcomes should be retrieved, which should be measured to determine ► effectiveness. *7) Coding process*: the coding sheet should be standardized to accommodate information about the main comparison of interest.

Co-Existing Diseases

Synonyms

Co-morbidities

Definition

Co-morbidities in medicine describe all other diseases or disorders of an individual suffering from one primary disease. Co-morbidities are in this sense all illnesses associated with the primary illness. Hypertension is for example a co-morbidity of many primary conditions such as diabetes, ischemic heart disease, and end-stage renal disease.

Cross-References

► Co-morbidity

Cognitive Development

Synonyms

Cognitive transition; Cognitive maturation

Definition

Cognitive development during childhood and adolescence includes the development of increased knowledge, multi-dimensional thinking, and the ability for hypothetical reasoning (in adolescents).

Cognitive Learning Theory

► Cognitive Social Learning
► Social Learning Theory

Cognitive Maturation

► Cognitive Development

Cognitive Pre-Testing

Definition

A cognitive pre-test is a qualitative research method used to improve the validity of survey questions before

field work. Cognitive pre-testing comprises different techniques to test the comprehensibility of questions designed to translate scientific concepts into the everyday language of the respondents. For this purpose, the respondents can be prompted to explain (by probing), circumscribe (by paraphrasing) or discuss (e. g. in focus groups) their interpretation of the questionnaire content. In contrast to standard pre-testing, cognitive pretests are not conducted under field conditions but in more or less experimental settings. The results lead to an improved wording of questions and thereby to more valid and/or precise measurements. In cross-cultural surveys (e. g. international or migrant surveys), cognitive pre-testing can also be applied to evaluate the translation of questionnaires from source to target languages.

Cognitive Social Learning

Synonyms

Cognitive learning theory

Definition

Cognitive social-learning theory proposes that reinforcements are not the sole determinants of behavior, but that behavior changes with observation of others. According to the cognitive social-learning theory, the most important prerequisite for behavior change is a person's sense of self-efficacy or the conviction that one is able successfully to execute the behavior required to produce the desired outcome.

Cross-References

► Social Learning Theory

Cognitive Transition

► Cognitive Development

Cohort

Definition

A cohort (from the Latin *cohors*, plural *cohorts;* large military unit) is a group of people from a given population who share a common characteristic or experience within a defined time period (e. g., are born, leave school, are exposed to a drug or a vaccine, etc.). For example, a group of people who were born in the year 1970 would form a birth cohort.
A prospective cohort study often tracks a cohort over an extended period of time.

Cohort Studies

Synonyms

Observational studies

Definition

A cohort study is a form of longitudinal study used in medicine and social science.
In medicine, a cohort study is usually undertaken to obtain additional evidence to refute or support the existence of an association between a suspected cause and disease. The cohorts are identified prior to the appearance of the disease under investigation. The study groups, so defined, are observed over a period of time to determine the frequency of disease among them. The main characteristic is that the study proceeds from cause to effect. A cohort is a group of people who share a common characteristic or experience within a defined time period (e. g. are born, lose their job, or are exposed to a drug or a vaccine, etc.).

Co-Insurance Rate

Definition

Co-insurance refers to the share of total medical spending which is borne by the beneficiary of health insurance. The higher the co-insurance rate, the lower the incentive problems due to ► moral hazard – and the higher the financial risk to the beneficiary of health insurance.

Collaborative Initiatives

► Governmental Regulations

Collective Bargaining Autonomy

► Tariff Autonomy

Collinearity

Definition

Collinearity is a high level of correlation within the set of explanatory variables and is of special note in the regression modeling situation. The collinearity (multicollinearity) existence affects the independence of explanatory variables, and the precision of regression coefficients estimates, as well. With multicollinearity, the regression coefficient does not reflect any underlying effect of the variable on outcome, but rather a marginal effect that depends on what other variables are included in the model. The identification of collinearity could be done by computation of the variance inflation factor, by noting extremely large variance of the regression coefficient estimate, and by substantial difference between coefficient estimates from fitting simple and a multiple regression models.

Colonization

Synonyms

Settlement

Definition

Colonization represents establishment of political control by one country over another. It also may be defined as a settlement in a new country, formed by certain ethnic group, which is either fully or partly subject to the state from which the settlers emigrated.

Colonization of Microorganisms

► Presence of Microorganisms

Combination Vaccination

Synonyms

Combined immunization; Combined vaccination

Definition

Immunization can be achieved by administering single ► vaccines – known as monovalent – or by a combination of different vaccines. Living vaccines may be administered simultaneously without compromising the success of the immunization. When living vaccines are given over time, it is necessary to adhere to minimum time intervals. The advantage of combined vaccinations – particularly in the case of basic immunization – is that the number of injections is kept to a minimum, which increases its acceptance by the public. The implementation of vaccination programs is greatly facilitated by the availability of combination vaccinations, especially in developing countries. The most common combination vaccinations are the measles-mumps-rubella (MMR) vaccine, the combination of diphtheria and tetanus vaccines (TD or Td), and the 6-fold combination of vaccines, most commonly administered to infants, against tetanus, diphtheria, polio, pertussis (whooping cough), *Haemophilus influenza* B and hepatitis B.

Commercial Regulation

► Legal Regulation of Professions, Businesses, and Products

Commitment

► Health Promotion Engagement
► Participation

Common Risk/Health Factor Approach

Definition

An approach that can be characterized by not being focused on a single disease but on the improvement

of health conditions for the whole population. A variety of common chronic diseases including oral diseases have risk and health factors in common. An example is smoking that affects heart disease, cancer and oral diseases. On the other hand, a healthy diet promotes both general and oral health.

Common Source Outbreak

Definition

This type of epidemic occurs when many people are suddenly exposed to the same source of infection, leading to a clear increase in the incidence of disease. The outbreak can be due to a point source, where people are exposed to the same source over a relatively brief period of time, so that all cases occur within one ► incubation period. This is the typical pattern of an outbreak of food poisoning. If the duration of exposure is prolonged (over a period of days, weeks, or longer), the epidemic is called a "continuous common source epidemic", and the epidemic curve will have a plateau instead of a peak.

Communal and Industrial Waste

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Synonyms

Waste management; Recycling; Composting; Disposal in landfills; Waste combustion; Rubbish; Trash; Garbage

Definition

Waste is something that is left over or that it is no longer needed, unwanted or undesired material which has lost its apparent value to its owner.

Waste is defined by the Environment Protection Act 1970 as any matter prescribed to be waste and any matter, whether liquid, solid, gaseous, or radioactive, which is discharged, emitted, or deposited in the environment in such volume or manner as to cause an alteration of the environment.

Basic Characteristics

Population growth, urbanization and industrialization result in the formation and accumulation of various types of wastes. Americans generate almost 208 million tons of solid waste each year. Today, each one of us generates about 4.3 pounds (2 kg) of waste per day. Although many different methods of disposing of garbage have been developed, there is really no absolutely safe way to do the job.

Waste can cause pollution and impact upon our environment if not properly managed. ► Disposing of waste that cannot be otherwise avoided, reused or recycled (► recycling) also represents a waste of resources, a lost opportunity and is a waste of money.

Now that the problem of illegal waste disposal, such as illegal dumping, is becoming more and more serious, the achievement of appropriate disposal is beyond the reach of a single local government.

As our social economic activities become more and more characterized by mass-production, mass-consumption and mass-disposal, the increased volume and diversification of wastes being disposed of raised the nation's concern about the burden they exert on the environment and the environmental ► pollution relating to landfill wastes.

Waste can be divided into many different types. The most common methods of classification is by their *physical, chemical* and *biological* characteristics. One important classification is by their *consistency*.

Solid wastes are waste materials that contain less than 70% water. This class includes such materials as household garbage, some industrial wastes, some mining wastes, and oilfield wastes such as drill cuttings.

Liquid wastes are usually wastewaters that contain less than 1% solids. Such wastes may contain high concentrations of dissolved salts and metals.

Sludge is a class of waste between liquid and solid. Such wastes usually contain between 3% and 25% solids, while the rest of the material is water dissolved materials.

Federal regulations classify wastes into three different categories. *Non-hazardous* are those that pose no immediate threat to human health and the environment.

Household garbage is included into this category. *Hazardous* wastes are of two types: those that have common hazardous properties such as ignitability or reactivity and those that contain liquid toxic components. The last type of waste is entitled *Special Wastes* and is very specific in nature. They are regulated by specific guidelines. Some examples would be ► radioactive wastes and ► medical wastes.

Commercial and institutional, or industrial, waste is often a significant portion of municipal solid waste, even in small cities and suburbs. In contrast to most residential waste, commercial material is usually collected by the private sector, and municipalities have been slow to target this area of recovery.

Across the country, many communities, businesses, and individuals have found creative ways to reduce and better manage Municipal Solid Waste (MSW) – more commonly known as trash or garbage – through a coordinated mix of practices that include source reduction, recycling (including ► composting), and disposal. The most environmentally sound management of MSW is achieved when these approaches are implemented according to the EPA's preferred order: source reduction first, recycling and composting second, and disposal in ► landfills or waste combustors last.

Nearly everything we do leaves behind some kind of waste. Households create ordinary garbage. Industrial and manufacturing processes create solid and hazardous waste. The Office of Solid Waste (OSW) regulates all this waste under the Resource Conservation and Recovery Act (RCRA).

RCRA's goals are to:

1. Protect us from the hazards of waste disposal
2. Conserve energy and natural resources by recycling and recovery
3. Reduce or eliminate waste, and
4. Clean up waste, which may have spilled, leaked, or been improperly disposed of.

Hazardous waste comes in many shapes and forms. Chemical, metal, and furniture manufacturing are some examples of processes that create hazardous waste. RCRA tightly regulates all hazardous waste from "cradle to grave." RCRA also controls garbage and industrial waste. Common garbage is municipal waste, which consists mainly of paper, yard trimmings, glass, and other materials. Industrial waste is process waste that comes from a broad range of operations. Some wastes are managed by other federal agencies or state laws. Examples of such wastes are animal waste, radioactive waste, and medical waste.

► Waste management has become a constant preoccupation, as it occurs throughout the living environment and affects public health. Households, business centers, industries, etc., are all confronted with waste problems. Many countries all over the world in their various departments of waste management and environmental protection prepare projects and ecological surveys on communal and industrial waste yards, report on their influence on the environment, work out methods of safe storage and transport of waste (including dangerous ones), and prepare feasibility studies for infrastructure investment.

Current laws direct polluters and municipalities on the proper methods of waste disposal. Responsible authorities are requested to set up management schemes adapted to given field conditions.

Cross-References

► Composting
► Disposing
► Landfill
► Medical Wastes
► Pollution
► Radioactive Wastes
► Recycling
► Waste Management

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Communicable Diseases

Synonyms

Contagious diseases; Infectious diseases; Transmissible diseases

Definition

Communicable diseases are diseases caused by biological agents (e. g. bacterium, virus, parasite) that can be communicated from an infected person or animal to another person or animal, meaning that they can easily spread through direct or indirect contact. Direct contact means person-to-person or animal-to-person contact or close proximity. Indirect contact includes shared use of contaminated instruments or materials. Communicable diseases may be controlled through the use of protective measures against the many ways of transmission. These measures include isolation of patients with certain diseases, use of antisepsis, vaccination, safe water and food supply, sterile blood supply, waste disposal and education of the population.

Communicable Diseases Control Law

► Infectious Diseases Control Law

Communication

Synonyms

Transmission; Transfer; Expression; Contact

Definition

Communication represents the exchange of thoughts, messages, or information by speech, signals, writing, or behavior. The act of communicating may be direct and face-to-face (interpersonal communication) or indirect and at a distance, using technical means such as television, radio, cinema, books, newspapers, or magazines (mass communication). The aim may be to inform someone, or to warn, persuade, or give pleasure with immediate effect. Communication also may be used for long term purposes, such as the maintenance of cultural identity. Usually we think of communication as intentional process. However, it may occur unintentionally and be as important. For example, sweating may be a sign of embarrassment, fear, or simply being overheated. Interpretation depends on the context in which information is produced and received. The central role that communication plays in all human life is indicated by the fact that it is a major area of interest in psychology, sociology, anthropology, linguistics, and several other disciplines.

Cross-References

► Interchange
► Social Relations

Communication Between Cultures

► Intercultural Communication

Communitarians

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Communitarians are those who would stress social order and social connectedness where individuals are parts of a community. A basic question for communitarians is who decides what is good for that community. One view is that every community defines its own norms which should, then, be respected. Things become complex when we try to define “community”, since, at times, the term refers to the majority within a group, leaving behind the interests of the minority groups.

Community

Definition

A “community” may be a town or county in sparsely populated areas; or it may be a neighborhood, worksite, or school in more populous metropolitan areas. It can also apply to groups of people not sharing a specific geographic association, but sharing social, cultural,

political, or economic interests that link them together. Community represents, ideally, a level of collective decision making appropriate to the urgency and magnitude of a health-related issue, the cost and complexity of the solutions implied, the local culture and traditions of shared decision making, and the sensitivity and consequences of the actions required of people after the decision is made.

Community Based Rehabilitation

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Definition

According to a Joint Position Paper of the International Labour Organization, the United Nations Educational, Scientific and Cultural Organization and the World Health Organization, "Community based rehabilitation (CBR) is a strategy within general community development for the rehabilitation, equalization of opportunities and social inclusion of all people with disabilities. CBR is implemented through the combined efforts of people with disabilities themselves, their families, organizations and communities, and the relevant governmental and non-governmental health, education, vocational, social and other services." This is a multisectoral approach which comprises all governmental and non-governmental services that provide assistance to communities.

Basic Characteristics

Initiation of CRB

As stated by the WHO, there are about 600 million people in the world with disabilities of various types and degrees. It is estimated that 80% of those disabled people live in low income countries with the majority of the disabled people being poor. One of the greatest challenges of disabled people therefore is basic survival, especially for those who live in low-income countries and suffer severe and multiple disabilities. In consequence of the declaration of Alma-Ata in 1978, it was realized that there is a need for and benefit of an emphasis shift from primarily city-based institutions to the community. Although there already existed different forms of non-institutional rehabilitation, CBR gained its formal recognition and acceptance with the promotion by the World Health Organization and other UN agencies in the early eighties. CBR was promoted as a suitable method to rehabilitate disabled people living in rural areas in developing countries, who so far had had no access to the relevant services. The emphasis was on evolving a method that would provide wide coverage, at costs that were affordable to the governments of these countries.

CBR Evolution

In its early days, CBR was conceptualized primarily as a service delivery method with a medical focus, since WHO had recommended that it should be integrated into a primary health care system that was already well established in many developing countries. Early CBR programs therefore tended to focus on prevention of impairments and restoring functional ability in disabled individuals in order to fit them into their community. During the eighties and nineties the number of CBR programs in various developing countries grew significantly mainly funded by international donors. A large share of these programs were minor projects with only limited overall impact. Most of these micro projects, therefore, could not be replicated or grow into viable national programs. With the growing number of CBR programs, the way of conceptualizing those programs changed. Based on the realization that medical interventions alone did not complete the rehabilitation process, one of the first changes that was implemented was the shift from a mere medical focus to a more comprehensive approach. This resulted in CBR programs also addressing comprehensive interventions such as education, social rehabilitation and prevention (► prevention and health promotion). It was recognized that people with ► disability should have access to all services which are available to other people in the community, such as community health services, child health programs, social welfare and education. Besides the shift towards a comprehensive approach, it was furthermore realized that rehabilitation should not be limited to restoring the ► functional ability in an individual but instead addressing and changing community atti-

tudes and contextual factors. This was in line with the realization that CBR also should not exclusively focus on rehabilitation but include different issues related to disabled people's lives at all times. All those changes were reflected in the definition of CBR as published in the Joint Position Paper of WHO, ILO and UNESCO. A result of these changes is the growing number of organizations of people with disability in many developing countries that covered, for example, areas like service provision, information dissemination and advocacy. Several of those organizations have been lobbying with governments to push legislation to not only protect their rights but also effect changes in existing laws to prevent discrimination against disabled people.

The following points summarize the evolution of the CBR concept:

- As all communities are different due to socio-economic conditions, terrain, culture and political systems, there will never be one model of CBR that is applicable cross-nation wide.
- CBR is an integral part of the community development and aims at empowering the whole community. This approach is crucial for establishing successful and sustainable CBR programs.
- CBR has shifted its focus from ► medical rehabilitation towards a more comprehensive approach that covers multiple sectors. Another shift was the change from a focus on service delivery to managerial issues influencing both service effectiveness and service quality.
- CBR can be a means to enforce the human rights and equal opportunities of people with disabilities as stated in intentional legal instruments.

CBR Programs

CBR programs target primarily at the improvement of the quality of life of people with disabilities. Within the CBR program activities, one focus is put on working together with the community. This should result in positive attitudes towards people with disabilities and thus motivate community members to support and participate in CBR activities. It is important for the success of these programs, that people with disabilities are part of the programs from the start which includes both initial program design and subsequent implementation. It has to be ensured that disabled people involved in the CBR programs have distinct decision-making roles that highlight their importance for the program. It is highly recommended that CBR programs are as flexible as possible to ensure that they can successfully operate at the local level. These flexible, local programs ensure the involvement of the community and generate different program models that are appropriate for diverse situations. The components of a CBR program should include:

- Ways of creating a positive attitude towards people with disabilities to ensure equalization of opportunities within their own community.
- Provision of functional rehabilitation services to overcome or minimize the effects of the disabilities.
- Provision of education and training opportunities to enable people with disabilities to make the best use of the opportunities that occur in their lives.
- Ways of creating micro and macro income-generating opportunities including obtaining financial credit through existing systems, wherever possible.
- Provision of care facilities in the community where people with disabilities can get the assistance that they need.
- Ways of preventing the causes of disability.
- Processes that cogently manage, monitor and evaluate the effectiveness and efficiency of all CBR program components, both in the community and in the area of service delivery outside the community.

Today, ► disabled people's organizations (DPOs) increasingly take a substantial role in the development, implementation and evaluation of CBR programs. They aim at reaching more people with disabilities and being more active in representing them. In many countries, DPOs and organizations of parents of children with disabilities have been established and expanded. Their role includes educating all people with disabilities about their rights, advocating for action to ensure these rights, and working together with partners to exercise rights to access services and opportunities. One of the key tasks of DPOs is the identification of the needs of the disabled people, the communication of those needs and the development and promotion of appropriate measures to address those needs.

Conclusion

CBR has achieved much in the last decades, but challenges remain. In some countries, the multi-sector collaboration of health, education, social welfare and labor

is difficult to achieve. There will always be social groups within communities that may not work together easily. Community work itself often has a lower status which impacts on the career development of physical therapists and CBR workers. In settings where physical therapists are few, it may be hard to attain and develop core physical therapy skills compared to the potentially more diverse roles within CBR. As the evidence base for CBR is still weak arguing for funds may be compromised. These challenges have to be addressed in the upcoming years by the organizations involved to ensure the success and sustainability of community based rehabilitation programs.

Cross-References

- ► Disability
- ► Disabled People's Organizations
- ► Functional Ability
- ► Medical Rehabilitation
- ► Prevention and Health Promotion

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Community Care

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C

Synonyms

Home care; Informal care

Definition

There is no common definition of community care and the term has long been contested and used by different people in different ways at different points in time. In practice, the term community care (like its parent, community) has come to be used in several ways. In a broader view, community care can be defined as the blend of health and social services provided to individuals or families at home or in the community for the purpose of promoting, maintaining or restoring health or minimizing the effects of illness and disability and thus achieving maximum independence and control over their own lives. To ensure this, a wide range of services is crucial. The traditional main users of community care services are people that have a continuing need for care on a longer-term basis as a result of the effects of old age, mental illness, mental handicap or physical disability. Other potential users of community care are people that need extra help and support at some stage in their lives due to illness or temporary disability as well as people with drug and alcohol related disorders or those with progressive illnesses like multiple sclerosis. The spectrum of community care ranges from domiciliary support provided at home (if required supported by ► respite care and ► day care) through sheltered housing and group homes within the community with increasing levels of care. In the past, community care was always defined as ► informal care but this has changed with the blurring of boundaries between informal and paid care. Community care services have been promoted as an effective alternative to long-term institutional care as it may attain better outcomes at lower cost than institutional services and be preferred especially by older people. It has been one of the fastest growing segments in the health care industry in the US

and in many European Countries like the UK, where community care is explicit government policy.

Basic Characteristics

Housing and Community Care

Suitable good quality and affordable housing is essential to social care packages as it is one of the cornerstones of well being and thus an essential element of community care. Community care policy is based on the belief that most people prefer to live in ordinary housing than in institutions that often lack the capacity to be a home. The word home is rather complex and there is extensive literature on the term, e. g. responses to the question "what does home mean for you?": differ according to gender, class, ethnicity, country and age of respondents and ideas about home constantly change and evolve within a given society. Research suggests that many older people continue to retain a strong bond with the homes which they own or the accommodation they rent. Nevertheless, home can be associated with negative experiences as well, for example, house-repairs can be a major worry for elderly owners and people living in rented accommodation may experience harassment from landlords if they wish them to leave. There is also evidence that many older people manage to re-establish a sense of home when moving into good-quality sheltered housing as long as they tend to be self-contained units with some communal support facilities. However, willingness to move among elderly people does not extend to the more institutional environments like residential or nursing homes.

European Perspectives on Community Care

It can be observed that community care, especially for older people, has dramatically increased in most European countries as a preferred option to hospital and long-term care. This is primarily driven by the fact that the costs for long-term institutional care increases significantly amongst the elderly. Although several countries explicitly foster community care programs, there is still little information and research about the characteristics of older people enrolled in community care programs. In addition, there is no shared knowledge regarding models of efficient home care in Europe.

The exchange of information on good practice in individual member states is one of the central characteristics of EU social care policy. There are four different models of welfare regime within European Welfare States. The *rudimentary welfare state* is represented by the Latin Rim countries like Spain, Portugal or Greece. Welfare is provided by traditional institutions such as the church, family and private charity but only limited public welfare institutions and policies are available. The *residual welfare state* is mainly associated with the UK and is characterized by public services being contracted out to the independent sector with the state being a safety net and regulator instead of being a primary provider. The *institutional welfare state* is particularly linked to Germany where the focus is put on labor market solutions to social issues with those outside of the labor market often being dependent on local charity. The *modern welfare state*, as associated with Scandinavian countries, is characterized by a wide provision of good-quality publicly provided services with private and voluntary sectors being increasingly involved.

In all four models, there is an overall increased emphasis within community care on the non-state sector, with the possible exception of rudimentary welfare states. Given this information, it is still the family that has remained the main supporter of those needing care across the EU. Nevertheless, the role of the family in caring differs between the countries and systems. The spectrum ranges from systems where the family provides virtually all the support to systems where family care is an optional extra to state services. There is no trend towards a common pattern of provision of care by the family. A future scenario for all four models of welfare might be that the distinction between formal and informal care will be of less relevance since informal carers will receive training and become more professional. This might result in that they will even be paid for their work to some extent. There is a common understanding that there is still a need for better collaboration and cooperation between health services and community social services in all European countries. A coordinated community care has not been achieved yet. The difficulties appear to be less acute in countries applying the modern welfare state principle where coordination is assisted by the development of multidisciplinary teams, decentralization of service responsibility to small areas, common training programs and the conversion of nursing homes into health centers.

It can be concluded that there is still a high degree of diversity in approach to community care in countries

with different welfare traditions. The EU institutions should increasingly use this rich variety of community care approaches to evaluate a potential transferability.

Conclusion

The future challenge of community care, especially in many European countries, will be the generation of additional insights about the characteristics of the recipients of community care services and the organizations of services that produce the best outcomes for them and their informal carers. It is therefore necessary to conduct studies that compare the outcomes of different models of community care across countries. The development of evidence based on the structures, quantity and targeting of community care will then have major policy implications. This increased transparency will enable appropriate selection of the best elements of community care and will furthermore help to overcome the gap between acute care, institutional care and community care that still exists in many countries.

Cross-References

► Day Care
► Informal Care
► Respite Care

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Community Dentistry

► Outline of Dental Public Health

Community Health Management Information System (CHMIS)

Definition

The community health management information system is a type of ► health information system that links all community stakeholders—healthcare providers, consumers, providers, purchasers, payers, and researchers—in a given community. The purpose of this system is to provide better exchange of information across the community and thus enable better performance in the health sector.

Community Hospitals

Definition

Community hospitals are defined as local hospitals, units, or centers that provide an appropriate array of accessible health care facilities and resources to fulfill the needs of the people living in the respective community. Community hospitals normally offer ► inpatient beds, ► outpatient units, diagnostics, ► day care, minor injuries service, and other mainly primary care services. The medical care is mainly provided by ► general practitioners who consult ► secondary care specialists if necessary. The services provided may include rehabilitation, acute medical care, ► palliative care, terminal care, and ► respite care. Such services are offered by multidisciplinary teams.

Community Medicine

► Public Health

Community Psychiatry

Definition

Community psychiatry shows an approach to psychiatric care that reflects an inclusive public health perspective and recognizes the diverse settings and continuum of service needs of patients with mental disorders. Patients may be of any age, diagnosis, or economic circumstances. Community psychiatry is practice in any

mental health care setting that delivers a range of services to all patients in the community.

Cross-References

► Social Psychiatry

Community-Rated Premiums

Definition

In contrast to actuarially fair premiums, community-rated premiums are based on the utilization of a broad population in a specific region. Thus, community-rated premiums reflect average health risks instead of individual health risks.

Community Reinforcement Programs

Definition

Community reinforcement approach (CRA) in the context of substance dependence stands for a concept to utilise the natural social environment for maintaining positive treatment effects (e. g., alcohol abstinence). Social influence factors like the behaviour of family members, friends, employers, but also the work situation, can increase or decrease the risk for relapses, and therefore are systematically targeted in CRA. The CRA has good scientific evidence of effectiveness, but is rarely used by clinicians.

Commuting Accident

Definition

A commuting accident is an accident occurring on the usual route between a worker's residence and place of work or work-related training location, and vice versa, which results in personal injury or death. Also, an accident occurring on the usual route to the place where the worker usually takes his/her meal or remuneration (in both directions) is considered as a commuting accident.

Co-Morbidity

Synonyms

Co-existing diseases; Co-occurrence of disease

Definition

Co-morbidity is defined as co-occurrence of disease in the same individual. Co-morbidity describes the effect of all other diseases. A patient might have other than the primary disease of interest. Diseases usually co-exist as a result of the same risk or cause factors.

Company Doctor

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Synonyms

Company physician; Plant doctor; Plant physician; Occupational health doctor; Occupational physician

Definition

A company doctor is a person (or a medical service, or an ► occupational health care team) appointed by an employer, usually as a legal obligation, to take care of the health and welfare of company employees. The duties of company doctors are aimed at improving ► working conditions and ► working environments, preventing occupational health risks and consequently preventing injuries at work, occupational and work related diseases, protecting and promoting the health of employees, as well as providing advice, information and guidance to employers, employees and other stakeholders in the matters related to health in the workplace. The company doctor has two main clients with their own needs and demands and with divergent and sometimes conflicting interests – the employee and the company. Company doctors should perform their duties with full professional independence and according to the highest professional standards and ethical principles.

Basic Characteristics

History

Diseases arising from the working environment were recognized even in Hippocratic medicine (Hippocrates, c400 BC). Exceptionally precise descriptions of occupational diseases can be found in Ramazzini's book "De Morbis Artificum Diatriba", published in 1700 (Raffle et al. 1987). Probably the first company doctor in modern times was J.A. Scopoli (Goschfeld 2005). Scopoli was assigned as the physician in the mercury mine of Idria (Slovenia) to provide medical services to miners for sixteen years. Intensive socio-economic changes from the eighteenth century to the modern times, as well as establishment of a number of international bodies (International Labor Organization – ILO, Work Health Organization – WHO), stimulated and facilitated research in the field of ► workplace health and the development of ► occupational health and safety services (Stellman 1998). The ILO Occupational Safety and Health Convention No 155 (1981), and Occupational Health Service Convention No 161 (1985), with accompanying recommendations, No 164 and No 171 respectively, set a framework for core activities in the field of health and safety. Since that time the legislative basis for ► occupational health and safety in various countries, that naturally has a profound effect on practical arrangements of company doctors, started to bring about conformity. However, there are notable differences between countries and regions, even within the European Union, in spite of all directives and other regulations (Gericke et al. 2004).

However, there are common principles and issues within the ambit of the company doctor that are valid in all countries and cultures. The scope and practice of the company doctor have undergone important changes – from the complete curative activities or from the so called "compensation doctor" activities at the beginning of the twentieth century (Raffle et al. 1987) to the mostly preventive and health promotion activities of the modern occupational health service.

Main Goals and Practice

It should be underlined that there are considerable variations in the approaches and practices of company doctors over the world. This is influenced by many factors that include the level of socio-economical development and political system, as well as national tradition and culture. However, recent rapid globalization of national economies, technical, social and economic changes along with demographic changes have impacted on the duties and organization of the work of company doctors.

Today, in most countries, employers are forced by law to provide company doctor services for their employees, or to organize occupational health service. In some cases this obligation is strictly enforced by law, in others only partially with exemptions for companies of a certain size or operating in specified sectors, and sometimes it works only as a recommendation. The main goals of services provided by company doctors should be as follows: establishment and maintenance of safe and healthy working environment, protection and promotion of workers health and maintenance and promotion of employees' ► working capacity, as well as adoption of work and working environments to the workers.

To reach the above mentioned goals company doctors should undertake activities to:

1. assess ► occupational health needs of the company;
2. participate in ► workplace health risk assessment;
3. participate and conduct preventive and control activities in the workplace through ► surveillance of working environment (workplace visit, ► exposure assessments), by informing employers and employees about health hazards and risks arising from work;
4. conduct preventive activities oriented to employees by ► health surveillance (► pre-employment, ► pre-placement and ► periodical health examinations, health examinations after prolonged absence from work due to health reasons, health assessments after termination of work assignments); ► assessment of work ability and assessment of any health impairment which may be related to the job;
5. train and prepare ► first-aid services and to assess emergency preparedness for individual or serious accidents in the company;
6. conduct ► workplace health promotion activity;
7. provide (depending on national legislation and national health system organization) some curative services (diagnosis, treatment and rehabilitation of occupational and work-related diseases);
8. collect and keep relevant data related to employees' health;

9. provide information, education and advice to employers, employees and other stakeholders related to workplace health and safety issues;
10. communicate and cooperate with important external partners such as primary health care units, hospital-based specialized services, emergency units, social security and health insurance organizations, authorities, ► labor inspectorate; and
11. participate in professional associations and societies.

Organization and Competence

To carry out the above cited functions requires appropriate organization, facilities, financing and competence of company doctors, or ► occupational health care services. There are considerable differences in the models of organization of company doctors, depending on the size and economic power of companies. Large and international companies usually organize an ► in-plant health service that provides all preventive and mainly curative activities for their employees. Employers cover costs for all providing services, and treat company doctors as their employees. However, recently, large companies, and almost all medium size companies, have given up their in-plant health service organizations replacing them with public, private or hospital-based health services. These companies make contracts with occupational health service providers to take on the majority of company doctors' functions, and retain only a few doctors as employees, mainly for supervision and counseling activities. Medium- and small-sized companies frequently employ a full-time or part-time company doctor or get together and share occupational health services on a group basis. They cover all expenses of the provided services.

Besides the above mentioned models there are several other models of organization including a private or public health center with an ► occupational health unit, an out-patient clinic with an occupational health care service, or a social security organization ► occupational health department.

To reach the main goal, which is to cover all employees by competent and effective occupational health care services, some countries provide a social security subsidy that covers up to 50% of the costs of company doctor services, although the establishment of these services are the complete responsibility of the employers. In that way they successfully facilitate prevention of ► occupational health risks, promote workplace health and increase the investment of small- and medium-sized companies in employees' health.

The basic prerequisite of good and effective company doctor practice, in accordance with set standards and ethical principles, is appropriate education and gained competences (Palmer et al. 2002). In general, it is necessary that the company doctor be an ► occupational health physician – a medical doctor with postgraduate specialization in occupational medicine. An ► occupational medicine specialist may have to work within a well-defined and sometimes rigorously coded system of company rules requiring knowledge and abilities that are not always relevant to the medical domain (Franco 2001). At the same time company doctors are bound by two conflicting ideals – serving the medical needs of company employees whilst protecting the company's interests (Draper 2003).

Therefore, the quality control and evaluation of work practice of the company doctor should be a core strategy for determining the long-term success of ► occupational health care. Improvement in professional practice and cost limitation will inevitably influence both the present and future direction of the company doctor's activities.

Cross-References

► Assessment of Work Ability
► Exposure Assessment
► First-Aid Services
► Health Surveillance
► In-plant Health Service
► Labor Inspectorate
► Occupational Health Care
► Occupational Health Care Service
► Occupational Health Department
► Occupational Health Needs
► Occupational Health Physician
► Occupational Health Risk
► Occupational Health and Safety
► Occupational Health and Safety Service
► Occupational Health Unit
► Occupational Medicine Specialist
► Periodical Health Examination
► Pre-employment Health Examinations
► Pre-placement Health Examinations
► Surveillance of Working Environment

- ▶ Working Capacity
- ▶ Working Conditions
- ▶ Working Environment
- ▶ Workplace Health
- ▶ Workplace Health Promotion Activity
- ▶ Workplace Health Risk Assessment

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Company Nurse

▶ Occupational Health Nurse

Company Physician

▶ Company Doctor

Compensation

▶ Damages

Competition, Health Care

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Synonyms

Managed competition; Regulated competition

Definition

Due to a number of market failures, competition is rather severely restricted in health care markets. However, according to economic theory, competition is the principal mechanism by which to coordinate demand and supply and to obtain efficient market outcomes. Regulated competition models strive to overcome market failures in order to reap the benefits of competition in health care markets. This is achieved by establishing competitive pressure for health insurers and health care providers and by creating a set of regulatory mechanisms to prevent undesirable consequences of competition. Regulated competition is an attractive concept for designers of health care systems, and health care reforms in a number of countries have been based on it.

Basic Characteristics

Competition in Economic Theory

In economic theory, competition coordinates demand and supply in order to obtain efficient market outcomes. Efficiency has three important dimensions. First, ▶ pareto efficiency is equivalent to a situation where resources are allocated efficiently. Second, technical efficiency (▶ efficiency, technical) describes a situation where consumers are getting optimal value for money – either by reducing costs at a given quality or by improving quality at given costs. Third, dynamic efficiency (▶ efficiency, dynamic) refers to a high rate of technical innovation and the elimination of non-efficient producers.

Competition in health care markets is, however, usually severely restricted. The most important reasons for this are ▶ information asymmetries and agency problems (▶ agency theory) in the relationship between health care professionals and patients. Moreover, ▶ adverse selection problems lead to market failures in competitive health insurance markets.

Regulated Competition

▶ Regulated competition models aspire to overcome market failures in order to reap the benefits of competitive forces in health care markets – i. e. to improve the allocative, technical, and dynamic efficiency of

health care services. A comprehensive set of regulatory mechanisms is supposed to ensure that market failures are avoided. Regulated competition relies implicitly on three central assumptions with regard to the behavior of health insurers, health care providers, and consumers. First, insurers compete with each other via price and quality of health care services. Second, consumers have free choice between insurers and exercise their right to choose. Third, non-effective and/or non-efficient providers are induced to work more effectively and efficiently and to provide good quality or they are not contracted by insurers.

With the managed competition model in place, health insurers, providers of health care services, and consumers have incentives to behave as if they were in a perfectly competitive environment (Enthoven 1978; Enthoven 1988; Enthoven 1993). Price signals and competitive pressures are designed to let cost-conscious consumers, health insurers, and profit-seeking providers interact. In this concept, the so-called ► sponsor defines the ground rules for regulated competition, supplies consumers with information, and monitors the behavior of health insurers in order to prevent ► risk selection. Ideally, the sponsor collects premiums and distributes these premiums to individual health insurers on a risk-adjusted basis. Consumers are free to switch between health insurers periodically. Health insurers are free to contract selectively with health care providers or even to integrate with them.

Thus, health insurers are induced to monitor the quality of health care services as they compete for consumers. At the same time, health care providers are forced to increase technical efficiency as they compete for contracts with health insurers. Health insurers compete for consumers by offering an attractive ratio between price (premium) and quality of health care services. Competition is enhanced by free market access for providers and insurers. Effective competition policy makes sure that there is a high degree of competition in both the health insurer market and the health care provider market.

The attraction of regulated competition models is at least twofold. First, regulated competition strives to increase efficiency. At the same time, it maintains ► risk solidarity. Moreover, regulated competition reduces asymmetric information by providing additional information for consumers. Health insurers are supposed to act as an additional agent for consumers, which, in turn, is supposed to counteract agency problems in the physician-patient relationship (Schut and van Doorslaer 1999). Finally, adverse selection is counteracted by premium rate restrictions and the standardization of benefits. Second, the model shifts the responsibility for cost control from government to market actors to a large degree:

"... The competitive market would generate cost controls, but they would be private market controls based on individual and group judgments about cost versus value and not public controls based on arbitrary numerical standards, insensitive to the quality or the value of the services (Enthoven 1978, p. 715)."

The attraction of regulated competition models is reflected by the fact that health care reforms in a number of countries in the 1990s were based – explicitly or implicitly – on regulated competition approaches (► health systems reforms). It is rather peculiar that the regulated competition approach has been developed in the US but has never been put into place in the US. Most of the regulatory framework which is required by the regulated competition model is still missing in the US (Robinson 2003). A number of European health care systems – primarily the Dutch, German, and Swiss systems – show a number of key features of regulated competition models (Zweifel 2000; Greß et al. 2002; Schut and van de Ven 2005). However, the success of application of regulated competition has so far been limited in these countries. This is mostly due to the fact that health insurers lack instruments to induce providers to work more effectively and more efficiently. Moreover, risk selection is more profitable than managing care in Germany and Switzerland. Therefore, efficiency in the provision of health care services has not yet improved considerably as a consequence of the introduction of regulated competition (Greß 2006).

Cross-References

► Adverse Selection
► Agency Theory
► Efficiency, Dynamic
► Efficiency, Technical
► Health Systems Reforms
► Information Asymmetry
► Pareto Efficiency
► Preferred Risk Selection
► Regulated Competition

► Risk Solidarity
► Sponsor

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Complementary Medicine

Synonyms

Holistic medicine; Alternative medicine; Traditional medicine

Definition

Complementary medicine includes various procedures that differ form those recommended by orthodox medical science in the treatment of disease. There are more than 600 different approaches used and there is an evident increased demand for such techniques since individuals who have not been relieved of their complaints by orthodox methods have become more inclined to look elsewhere for treatment.

Cross-References

► Holistic Medicine

Complete Denture

► Complete Removable Dental Prosthesis

Complete Elimination of Germs

► Sterilization

Complete Removable Dental Prosthesis

Synonyms

Complete denture; Denture

Definition

A removable dental prosthesis that replaces teeth in an edentate arch.

Complication

► Adverse Effect

Composite Filling

Definition

A direct intracoronal restoration made from a highly cross-linked polymeric material reinforced by a dispersion of filler particles bonded to the tooth by a coupling agent.

Composting

Synonyms

Solid-phase soil treatment; Ex situ treatment

Definition

Composting is a way of ► recycling. By composting organic material can be used as a soil amendment or as a medium to grow plants. The decomposition of plant remains and other once-living materials break down

into an earthy, dark, crumbly substance that is excellent for adding to houseplants or enriching garden soil. It is a way to recycle yard and kitchen wastes, and is a critical step in reducing the volume of garbage needlessly sent to ► landfills for disposal. Waste materials that are organic in nature, such as plant material, food scraps, and paper products, are increasingly being recycled. These materials are put through a composting and/or digestion system that controls the biological decomposing process of the organic matter and kills pathogens. The resulting stabilized organic material is then recycled as mulch or compost for agricultural or landscaping purposes.

Cross-References

► Communal and Industrial Waste
► Landfill

Compression of Morbidity

Definition

A hypothesis that assumes an increase in longevity will lead to a shorter share of life lived in bad health. In other words, ► health care costs are concentrated at the end of life.

Computational Biology

► Bioinformatics

Computer-Based Patient Record

► Electronic Patient Record (EPR)

Conception

Definition

A successful conception – the beginning point of a pregnancy – occurs when a fertilized egg implants in a woman's uterus. Conception is the culmination of two earlier steps, ovulation and fertilization. Women ovulate (release eggs) about 14 days into their menstrual cycle and fertilization by a male sperm must occur shortly thereafter, within about 24 hours. Consequently, practitioners typically estimate that a conception occurred two weeks after the start of the last menstrual period.

Conditional Probability

Definition

Conditional probability allows new information to be used to update the conditional probability of an event, i. e. a formula for revising *a priori* probabilities after receiving new information. The revised probabilities are called *posterior* probabilities. The formula for Bayes' Theorem is as follows: $P(A_i/B) = \frac{P(A_i)\cdot P(B/A_i)}{\sum_{i=1}^{k} P(A_i)*P(B/A_i)}$. For example, consider the probability that someone will develop an intestinal cancer in the next year. An estimate of this probability based on general population data would be *a priori* estimate; a revised (*posterior*) estimate would be based on both the population data and the results of a specific test for this cancer. Let A_1 = the event tumor present, A_2 = the event tumor not present and B = the event screening test positive. If somebody has a tumor the screening test has an 85% chance of detecting it, i. e. $P(B/A_1) = 0.85$. However, it also has a chance of falsely indicating tumor present when there is no tumor, i. e. $P(B/A_2) = 0.10$. The probability of person having a tumor is 0.02, i. e. $P(A_1) = 0.02$. If the screening test is positive, the probability of having tumor is $\frac{0.02\cdot 0.85}{0.02\cdot 0.85+0.98\cdot 0.10} = \frac{0.017}{0.017+0.098} = 0.148$.

Cross-References

► Bayes' Theorem

Conditioning Model

Synonyms

Learning theory; Associative or classical and operant conditioning

Definition

Classical conditioning introduced concepts that have been particularly important in the design of health related interventions such as reinforcement. Although learn-

ing theory has been criticized for treating behavior in simplistic and mechanistic stimulus response systems, modern learning theory addresses complex components, including environmental cues and context, memory, expectancies, and underlying neurological processes related to learning. The concept of learning and conditioning provides support for preventive interventions that promote health-enhancing behaviors, as opposed to interventions designed to treat or change health-comprising behaviors.

Condom

Synonyms

Pariser; Durex; French letter; Rubber Johnny; Sheath; Wellington boot; Rubber; Raincoat

Definition

A condom is a cover which is rolled over the erect penis before sexual intercourse. It does not only prevent pregnancy but also protects against sexually transmitted diseases. The condom was invented in the 17th century and was made of sheep-gut. Initially, condoms were not too successful. On the one hand, they were not really reliable, and on the other hand, the government and the Catholic Church rejected contraception. The most decisive improvement concerning the security and reliability of condoms was the introduction of latex in the year 1843. Today, for people with latex allergy, latex-free condoms, which are made of polyurethane or polyethylene, are available. Instructions for use, in text and pictures, are found within the packaging. Successful use depends on acquiring the right size and using before the expiration date. If the condom is too small, it can tear or it can cause pain or impairment of blood circulation during sexual intercourse; if it is too large, it can slip off. Of course, in both cases, the preventive effect is lost.

► Sexually Transmitted Diseases

Conduct Disorders

Definition

Conduct disorders are characterized by a repetitive and persistent pattern of dissocial, aggressive, or defiant conduct. Such behavior should amount to major violations of age-appropriate social expectations (e. g., excessive levels of fighting or bullying, cruelty to other people or animals, severe destructiveness to property, fire-setting, stealing, repeated lying, truancy from school and running away from home, unusually frequent and severe temper tantrums, and disobedience). Conduct disorders are therefore more severe than ordinary childish mischief or adolescent rebelliousness and imply an enduring pattern of behavior (six months or longer).

Condyloma

Synonyms

Condyloma accuminata; Venereal warts; Genital warts; Infection with HPvirus; Infection with human papilloma virus

Definition

Genital warts are caused by the human papilloma virus (HPV). They are a very common and highly contagious sexually transmitted disease, which is spread worldwide. There are more than 80 different types of the virus. In most cases, infections are asymptomatic or only cause minor symptoms. The incubation period varies considerably, it lies between 4 weeks and several months. For local therapy, cytostatic agents or trichloroacetic acid can be used. Moreover, cryo-, electro- or lasertherapy or surgical removal are possible. A feared complication of an infection with HPV is the development of cervical cancer.

Since 2006, a HPV vaccine has been available that targets those HPV strains predominantly responsible for cervical cancer and genital warts. Vaccination is recommended for girls and young woman (between the age of 9 and 26 years), preferably prior to their first sexual intercourses.

Condyloma accuminata

► Condyloma

Confidence Interval

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Synonyms

Interval estimation

Definition

The confidence interval of sample statistics represents an expected range of values that encompasses the real population value of the investigated parameter for the assigned level of confidence or probability. The span itself is determined in order to include the real value of the observed statistic with the previously assigned probability. The defined probability is termed confidence level, while the determining points are confidence boundaries.

Basic Characteristics

In the majority of cases, medical research seeks to estimate an unknown population quantity or quality. For instance, when a random sample from the pool of all insured patients in a given insurance company is taken, the average in-hospital stay, number of days of sick leave, systolic blood pressure, levels of various blood or urine-analysis parameters, or the opinion of the treated on the quality of provided health care could be determined At the same time, the aim is to estimate the same values in the whole population, meaning in all the insured people with the same company.

A good estimate must be unbiased or lack a systematic error with a low sample-to-sample variability – meaning minimal variance (consequently, the mean and median of the population sample are unbiased estimates of the mean when the distribution of observations follows normal distribution, but the standard error of the median is 25% higher than the standard error of the mean).

► Estimation can be point or interval. A point estimate is a specific number and at the same time the best "guess" of the real value of the parameter in the population. Interval estimates, which contain a point estimate and variability of the estimate in another sample, are termed confidence intervals and their perimeters are confidence boundaries. The most commonly used are 95% confidence intervals (meaning that it can be claimed that the interval will contain the real value of the population parameter with a 0.95 probability) or 99% confidence intervals (meaning that it can be claimed that the interval will contain the real value of the population parameter with a 0.99 probability).

The principle behind the confidence interval construction is – as in hypotheses testing – the sample statistic distribution.

Equation

$$P(-1.96 \leq z \leq 1.96) = 0.95$$

shows that probability – the standard normal curve that lies between −1.96 and +1.96 – is 0.95; for any other normal distribution, any other critical value z can be replaced.

If the sample distribution of means is chosen, for instance (normal distribution with mean μ and standard deviation $\sigma/\sqrt{n}$ – ► standard error), the result is:

$$P(-1.96 \leq x - \mu/(\sigma/\sqrt{n}) \leq 1.96) = 0.95\,.$$

The previous equation can be also written as:

$$P(x - 1.96\sigma/\sqrt{n} \leq \mu \leq x + 1.96\sigma/\sqrt{n}) = 0.95\,.$$

Estimation shows a probable presentation of confidence intervals of the population mean. The perimeters of this interval (the left and right sides of the equation) are 95% confidence intervals and show the accuracy (the proximity of the given estimate to the real or actual population value) and precision (the probability of any other repeated measure, i. e. repeated procedure, estimating the same quantity). At the same time, precision represents half of the confidence intervals' width. It is always expressed either using the same units as the variable that is statistically estimated (i. e. 2 g to the left or to the right starting from the mean, the entire interval width is 4 g; 0.05 to the left and to the right from the proportion, the entire interval width is 0.1) or using a percentage of the estimate (i. e., 5% of the sample's mean).

Confidence intervals are interpreted in the function of repeating the same experiment and procedure estimation many times in a row. The obtained estimate means that in 19 out of 20 times that a procedure is repeated,

Confidence Interval, Table 1 Most common confidence intervals

Chosen descriptive statistics	Sample statistic (S)	Population parameter (P)	Lower border Confidence Interval $S - k_{1-\alpha/2}SE$	Upper border Confidence Interval $S + k_{1-\alpha/2}SE$
Mean; ($n \geq 30$) or known population variance	$\overline{x}$	μ	$\overline{x} - z_{1-\frac{\alpha}{2}} \times \frac{\sigma}{\sqrt{n}}$	$\overline{x} + z_{1-\frac{\alpha}{2}} \times \frac{\sigma}{\sqrt{n}}$
Mean; ($n < 30$) or unknown population variance	$\overline{x}$	μ	$\overline{x} - t_{n-1;1-\frac{\alpha}{2}} \times \frac{SD}{\sqrt{n}}$	$\overline{x} + t_{n-1;1-\frac{\alpha}{2}} \times \frac{SD}{\sqrt{n}}$
Difference between two means with known population variances	$\overline{x}_1 - \overline{x}_2$	$\mu_1 - \mu_2$	$(\overline{x}_1 - \overline{x}_2) - z_{1-\frac{\alpha}{2}} \times \left(\frac{\sigma_1^2}{\sqrt{n_1}} + \frac{\sigma_2^2}{\sqrt{n_2}}\right)$	$(\overline{x}_1 - \overline{x}_2) + z_{1-\frac{\alpha}{2}} \times \left(\frac{\sigma_1^2}{\sqrt{n_1}} + \frac{\sigma_2^2}{\sqrt{n_2}}\right)$
Difference between two means with unknown but similar population variances	$\overline{x}_1 - \overline{x}_2$	$\mu_1 - \mu_2$	$(\overline{x}_1 - \overline{x}_2) - t_{n_1+n_2-2;1-\frac{\alpha}{2}} \times \sqrt{SD^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$	$(\overline{x}_1 - \overline{x}_2) + t_{n_1+n_2-2;1-\frac{\alpha}{2}} \times \sqrt{SD^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$
Mean difference, known difference variance	d	δ	$d - z_{1-\frac{\alpha}{2}} \times \frac{\sigma_d}{\sqrt{n}}$	$d + z_{1-\frac{\alpha}{2}} \times \frac{\sigma_d}{\sqrt{n}}$
Mean difference, known difference variance	d	δ	$d - t_{n-1;1-\frac{\alpha}{2}} \times \frac{SD_d}{\sqrt{n}}$	$d + t_{n-1;1-\frac{\alpha}{2}} \times \frac{SD_d}{\sqrt{n}}$
Standard deviation	SD	σ	$\sqrt{\frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}}$	$\sqrt{\frac{(n-1)s^2}{\chi^2_{\alpha/2}}}$
Variances ratio two Gaussian population	SD_1^2/SD_2^2	σ_1^2/σ_2^2	$\left(\frac{SD_1^2}{SD_2^2}\right) \times \left(\frac{1}{F_{\frac{\alpha}{2};DF_1;DF_2}}\right)$	$\left(\frac{SD_1^2}{SD_2^2}\right) \times \left(\frac{1}{F_{1-\frac{\alpha}{2};DF_1;DF_2}}\right)$
Number of favorable outcomes	X	$n\pi^*$	$\frac{x - n\pi - 1/2}{\sqrt{n\pi(1-\pi}}$	$\frac{x - n\pi + 1/2}{\sqrt{n\pi(1-\pi}}$
Proportion of success	$p = x/n$	π^*	$\frac{p - \pi - 1/(2n)}{\sqrt{\pi(1-\pi)/n}}$	$\frac{p - \pi + 1/(2n)}{\sqrt{\pi(1-\pi)/n}}$
Percentage of success	$100p$	$100\pi^*$	$\frac{100p - 100\pi - 100/(2n)}{100\sqrt{\pi(1-\pi)/n}}$	$\frac{100p - 100\pi + 100/(2n)}{100\sqrt{\pi(1-\pi)/n}}$
Difference between two proportions	$p_1 - p_2$	$\pi_1 - \pi_2$	$(p_1 - p_2) - z_{1-\frac{\alpha}{2}} \times \sqrt{\frac{p_1 q_q}{n_1} + \frac{p_2 q_2}{n_2}}$	$(p_1 - p_2) + z_{1-\frac{\alpha}{2}} \times \sqrt{\frac{p_1 q_q}{n_1} + \frac{p_2 q_2}{n_2}}$
Transformed Pearson correlation coefficient	$t_r = 0.5 \ln \frac{1+r}{1-r}$	ρ	$t_r - z_{1-\frac{\alpha}{2}} \times \sqrt{\frac{1}{n-3}}$	$t_r + z_{1-\frac{\alpha}{2}} \times \sqrt{\frac{1}{n-3}}$
Intercept	a	α	$a - t_{n-2;1-\frac{\alpha}{2}} \times SD_{yx}\sqrt{(1/n) + \frac{\overline{x}}{\Sigma(x-\overline{x})^2}}$	$a + t_{n-2;1-\frac{\alpha}{2}} \times SD_{yx}\sqrt{(1/n) + \frac{\overline{x}}{\Sigma(x-\overline{x})^2}}$
Slope of the regression line	b	β	$b - t_{n-2;1-\frac{\alpha}{2}} \times \sqrt{SD_{yx}^2/\Sigma(x-\overline{x})^2}$	$b + t_{n-2;1-\frac{\alpha}{2}} \times \sqrt{SD_{yx}^2/\Sigma(x-\overline{x})^2}$
Relative risk	RR		$RR^1 - z_{1-\frac{\alpha}{2}} \times \sqrt{x2}$	$RR^1 + z_{1-\frac{\alpha}{2}} \times \sqrt{x2}$
Odds ratio	OR		$OR^1 - z_{1-\frac{\alpha}{2}} \times \sqrt{x2}$	$OR^1 + z_{1-\frac{\alpha}{2}} \times \sqrt{x2}$

*normal distribution can be applied only if $n\pi \geq 5$ i $n(1-\pi) \geq 5$

the defined confidence perimeters will really contain the population's mean (1 in 20 times, they will not).
Confidence intervals can be constructed for any population parameter or their linear combination. Table 1 shows confidence intervals for calculation of estimates for most frequently used population parameters, based on known sample distributions. As shown in the footer, S is sample statistic; P, population parameter; SE, standard error; and $k_{1-\alpha/2}$, confidence coefficient.

Example

The researcher sought to determine values of diastolic pressure in one population. The average diastolic blood pressure in 65 people was 85 mm Hg. These 65 people were a random sample of a population with a standard deviation of diastolic blood pressure of 15 mm Hg. The mean value of diastolic blood pressure in a population was tested with a confidence level $(1 - \alpha)$ of 95% and 99%.
Using the previous formula, the 95% confidence level $(Z_{1-\alpha/2} = 1.96)$ is $81 \leq \mu \geq 89$ mm Hg, meaning the 99% confidence level $(Z_{1-\alpha/2} = 2.58)$ is $80 \leq \mu \geq 90$ mm Hg.

Cross-References

► Estimation
► Standard Error

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Confidentiality

Synonyms

Health data protection; Privacy; Secrecy

Definition

Confidentiality in this context refers to the code of conduct of a health worker. It originated in the ► hippocratic oath which stated: "Whatsoever I shall see or hear in the course of my profession … I will never divulge, holding such things to be holy secrets." It has evolved over the decades, and now modern clinical practice is not based on a person-to-person doctor–patient relationship, but often involves a multidisciplinary team. However, once the first health worker involved in the patient's consultation needs to pass on some information to other health professionals belonging to a different team, he would have to ask for a formal ► informed consent from the patient.

Cross-References

► Health Data
► Health Data Protection

Confirmed Case

Definition

In an outbreak, a case classified as confirmed must usually have laboratory verification.

Conflicts of Interests

Definition

A conflict of interest exists when an employee's financial or other interests interfere (or appear to interfere) with their obligation to act in the best interest of the University without improper bias. The mere appearance of a conflict may be as serious and potentially damaging

to public trust as an actual conflict. Therefore, potential conflicts must be disclosed, evaluated, and managed with the same thoroughness as actual conflicts.

Confounding: Bias Due to Confounding

► Bias, Confounding and Interaction

Confounding by Indication

Definition

Confounding by indication is a bias that occurs when the drug of interest is selectively used or not used by those who developed the outcome of interest; a causal relationship between the drug and its effect on disease outcome cannot be established. This situation frequently occurs when, within a study group, some of the patients with the given illness have other health problems requiring the prescription of several available treatments. It is not always possible to control for this type of confounding, although randomized control trials are considered as a method of choice for the assessment of drug-disease relationships in these circumstances.

Confounding and Interaction

Synonyms

One-sideness; Inclination; Favoritism; Bias

Definition

Bias is a deviation of a measurement from the "true" value. Bias can originate from many different sources, such as literature review bias, allocation bias, design bias, selection bias, data collection bias, analysis bias, interpretation bias, or publication bias. *Literature review bias* includes foreign language exclusion bias, literature search bias, one-sided reference bias, and rhetoric bias. *Allocation bias* is when there is a systematic difference between the experimental and control groups in a clinical trial. *Selection bias* is one part of design bias that occurs when studies included in a review are not a random sample of all relevant studies that fit the inclusion criteria. *Design bias* also includes sampling frame bias, nonrandom sampling bias, noncoverage bias, and noncomparability bias. *Data collection bias* refers to defects in measuring exposure or outcome that result in differential accuracy of information between groups. *Analysis bias* results from errors in analyzing the data. *Interpretation bias* includes conceptual bias, cognitive dissonance bias, correlation bias, and generalization bias. *Publication bias* is a form of selection bias where the publication of research depends on the nature and direction of the study findings. We can investigate publication bias by using a *funnel plot*: a graphical display of sample size plotted against effect size for the studies included in a systematic review. In the absence of bias, the plot will resemble a symmetrical inverted funnel. If there is bias, funnel plots will often be skewed and asymmetrical.

Bias is a term that relates to how far the average statistic lies from the parameter it is estimating, that is, the error which can arise when estimating a quantity. Errors arising by chance will cancel each other out in the long run, those from bias will not. Biases are the result of human choices, or any other factor other than the treatment that is being tested, that affect study results. Clinical trials use many methods to avoid bias, because biased results may not be correct. There are many forms of bias such as selection bias, measurement bias, recall bias, investigator bias, and confounding bias, etc.

Cross-References

► Bias
► Prejudice

Congelatio

► Frostbites

Congenital Chicken Pox

► Congenital Varicella

Congenital Clap

► Congenital Gonorrhea

Congenital CMV

► Congenital Cytomegaly (CMV)

Congenital Cytomegalovirus Infection

► Congenital Cytomegaly (CMV)

Congenital Cytomegaly (CMV)

Synonyms

Congenital cytomegalovirus infection; Congenital CMV

Definition

Cytomegalovirus infection is the most common congenital infection. Primary infections during pregnancy are the cause of 10–15% of infections in the fetus. Directly after birth more than 90% of the newborn seem to be unaffected, but 5–15% develop impairments later on, like a loss of hearing or mental retardation. Babies, who are symptomatic at birth, can show a low birth weight, microcephaly and intracerebral calcifications. Moreover, pneumonia or chorioretinitis can be present. During the further course of the disease, impairments develop in 90% of the patients. The children show, for example, psychomental retardation. Severe congenital infections can be treated with ganciclovir. As benefits and risks of the therapy have to be weighed up, ganciclovir is only used in rare cases.

Congenital Drip

► Congenital Gonorrhea

Congenital Erythema infectiosum

Synonyms

Congenital parvo B 19 infection; Congenital fifth disease; Congenital slapped cheek syndrome

Definition

When there is a primary infection with parvo B19-virus during pregnancy, the highest risk for the unborn child is between the 13th and 30th week of gestation. Anemia and inflammation of the heart muscle (myocarditis) can result. In severe cases, hydrops fetalis can develop. The latter is characterized by an abnormal accumulation of serous fluids in the tissues and in the body cavities (generalized edema, ascites, pleural effusion). To treat a hydrops fetalis, an intrauterine transfusion may be necessary.

Congenital Fifth Disease

► Congenital Erythema Infectiosum

Congenital Gonogoccal Infection

► Congenital Gonorrhea

Congenital Gonorrhea

Synonyms

Congenital gonogoccal infection; Congenital clap; Congenital drip

Definition

If the woman's genitals are contaminated with gonococci, the child can be infected on its way through the birth canal. In earlier times, congenital gonnorhea was the most common reason for blindness in children. In 1881, Karl Sigismund Franz Credé introduced the application of a drop of silver nitrate into the eye of the newborn baby immediately after birth. Thanks to this procedure, pathogens are killed and an inflammation of the eyes is prevented. Crede's prophylaxis is still used today.

► Sexually Transmitted Diseases

Congenital Herpes simplex Infection

Definition

In primary infection with herpes genitalis (HSV 2) during pregnancy, there is a 30–50% risk of transmitting

the virus to the child on its way through the birth canal. By hematogenic spread the viruses reach the central nervous system of the newborn child and cause an encephalitis. The best therapeutics available are the virustatics aciclovir and vidarabin. Prognosis depends on the extent of the impairment of consciousness at the beginning of therapy; lethality reaches up to 50% and there is a high rate of neurological defects (60–75%) in the survivors.

Congenital Infection with Treponema pallidum

► Congenital Syphilis

Congenital Listeriosis

Synonyms

Congenital infection with *Listeria* monocytogenes

Definition

When a pregnant woman is infected with *Listeria*, the bacteria can pass through the placenta and reach the unborn child. Different organs of the fetus can be affected (liver, lungs, brain, skin). The child may also die in the womb with resultant stillbirth. Moreover, congenital listeriosis can lead to premature birth. If the woman's genitals are contaminated with *Listeria*, the child can be infected on its way through the birth canal. This being the case, the baby may develop listeriosis in the first weeks or months of life (► food safety and fecal-orally transmitted diseases).

Cross-References

► Infectious Diseases in Pediatrics

Congenital Lues

► Congenital Syphilis

Congenital Parvo B 19 Infection

► Congenital Erythema Infectiosum

Congenital Rubella Syndrome (CRS)

Synonyms

Gregg's syndrome

Definition

When a primary rubella infection takes place between the second and the sixth week of gestation, there is a high risk of congenital rubella syndrome (>60%) in the unborn child. The classical triad of anomalies of the heart, the eyes and the central nervous system is called Gregg's syndrome. Further characteristic findings in newborns are immaturity, microcephaly, pneumonia, blue-red efflorescences of the skin (blueberry muffins), decalcification of long bones (celery stalks) and low platelet counts (thrombocytopenia). The most common monosymptom is impaired hearing or deafness (80–90%). The diagnosis can be confirmed by detecting the virus by Polymerase chain reaction (PCR) or culture.

Congenital Slapped Cheek Syndrome

► Congenital Erythema Infectiosum

Congenital Syphilis

Synonyms

Congenital lues; Lues connata; Congenital infection with *Treponema pallidum*

Definition

During pregnancy, an intrauterine transmission of syphilis is possible. Congenital syphilis can cause abortion, stillbirth or premature birth. Moreover, the transmission of *Treponema* can lead to an infection of the unborn child with possible development of congenital anomalies. The disease can be symptomatic at the time of birth, but the development of the late stage lues is also possible after an interval of several years. In industrial nations, a routine test for syphilis is performed in all pregnant women.

► Sexually Transmitted Diseases

Congenital Varicella

Synonyms

Congenital chicken pox; Congenital varicella syndrome

Definition

When a primary varicella infection takes place between the 8th and 21st week of gestation, congenital varicella syndrome can be induced in the unborn child. This is characterized by skin defects, impairment of development of the muscular and skeletal systems as well as of the eyes and the central nervous system. Congentital varicella can show a severe course in newborn babies whose mothers fall ill from chicken pox between two days before and five days after delivery.

Congenital Varicella Syndrome

► Congenital Varicella

Conjunctivitis

Synonyms

Inflammation of conjuctiva

Definition

Conjunctivitis, inflammation or infection of the mucosal membrane that covers the eyeball and lines the eyelid. It may be caused by infections, foreign bodies, or chemicals. It results in a feeling of grittiness in the eyes, and is associated with stickiness of the eyelids and a discharge. The whites of the eyes are red and bloodshot. Conjunctivitis may also be associated with upper respiratory infection or with childhood diseases such as measles. Trachoma is a severe conjunctivitis that can cause loss of vision.

Consanguineal Marriage

Definition

The marriage between close relatives is called consanguineal marriage (consanguinity is the quality of being descendent from the same ancestor). In most cultures, marriages between close blood relatives are illegal. Most countries according to civil law accept marriages between cousins. Consanguineal marriages are presumed to be contributing to the often high incidence of congenital diseases (e. g. congenital metabolic diseases) amongst migrants.

Consensus Conference

Definition

The purpose of a Consensus Conference is to produce an informed debate on a limited subject presented in the form of a number of main questions, with the aim of evaluating available scientific information and advancing understanding of the issue in question. It normally consists of a two-day conference, during which experts from different disciplines and/or different schools make short presentations aimed at answering the questions previously defined by the scientific advisors. Prior to the conference, the jury, made up of non-experts in the field, is provided with background documentation about the presentations to be made by the experts. After attending the Conference, the jury meets up in order to prepare a Consensus statement on the issues raised. The Consensus text may then be published by the organizing societies.

Consequences

► Outcome

Consequentialism

► Utilitarianism

CONSORT-Statement

Definition

In response to overwhelming evidence and the consequences of poor-quality reporting of randomized controlled trials (RCTs), many medical journals and editorial groups have now endorsed the CONSORT (Consolidated Standards of Reporting Trials) statement. The

CONSORT statement, a checklist flow diagram first published in 1996 and revised 5 years later, is an effort to standardize, and thereby improve, published reports of RCTs. One of the additions to the 2001 revision was an item about reporting adverse events.

Constitution

Definition

The constitution is the basic and foundational legal document of a state. It derives from the people. Via the constitution, the people in the state set forth the state organization and structure and nominate the state organs. Constitutions arrange the legal system of a state. The constitutions assign powers to the state institutions and arrange the legal responsibilities, authorities, duties and the scope of the powers granted to the respective state institutions. Conversely, the constitution provides for the people's rights (constitutional or basic rights) and their legal status vis-à-vis the state and the political system. The exercise of all powers in a state must comply with the underlying constitution.

Consulter in Genetic Counseling

Synonyms

Propositus = client

Definition

Individual primarily seeking advice. ► Genetic counseling is open to individuals or families who are concerned about a disorder that may be hereditary.

Consumer

Synonyms

Patient

Definition

Consumer is a term used to describe a person who purchases or receives goods or services for personal needs or use and not for resale. In health care, patients and other users of health services are usually referred to as consumers.

Consumer Choice

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C

Synonyms

Consumer sovereignty; Consumer theory

Definition

Consumer Choice refers to the economic axiom that ultimately consumers are the best judges of their own individual welfare. Due to several severe market failures, consumer choice plays only a limited role in health care markets. In health economics, consumer choice is primarily analyzed in the context of health insurance.

Basic Characteristics

Choice in Economics

In economics, consumer choice is an important prerequisite for competitive markets (Rice 2002; Folland et al. 2007). According to microeconomic economic theory, consumers seek to maximize their individual ► utility. The choice made by consumers is based on their individual preferences and on their individual budgets. If consumers are free to choose, the outcome of the competitive process will be efficient: nobody can be made better off without making somebody else worse off (► pare-to efficiency). As a consequence, the amount of goods and services that are produced and consumed is determined by the preferences of consumers. In the long run, supply adjusts to demand.

Consumer Choice in Health Care Markets

Consumer choice in health care markets is usually restricted severely. This is due to severe market failures on the demand side as well as on the supply side of health care markets. Most market failures originate from ► information asymmetries between individual consumers of health care services and the producers of health care services: patients are often unable to

make informed decisions because they do not have sufficient information to make good choices. Moreover, consumers in health care markets are often unable to determine the consequences of their consumption decisions. Furthermore, consumers often do not act rationally on health care markets; as a consequence, the consumer choice of individual patients is restricted in many countries. It is assumed that health care professionals – mostly physicians and nurses – are better informed than patients are and will help the patient to make informed decisions. However, health care professionals are not perfect agents of their patients (► agency theory). Moreover, health care professionals might have imperfect information as well.

Consumer Choice in Health Insurance Markets

Designers of health insurance schemes in many countries rely on competition as a means to stimulate innovation and – at least to some degree – to enhance consumer choice as a way to meet individual preferences (Laske-Aldershof et al. 2004). As a consequence, consumers who are shopping around for the lowest price and the best product – at least theoretically – will stimulate price competition and the development of new products (► competition, health care). The benefits of competing health insurers will be similar to the benefits of competition in other markets (Cutler and Zeckhauser 2000).

Unfortunately, health insurance is different. In contrast to other markets, some characteristics of the consumer of health insurance will most probably affect the price of the product. If health insurance calculates ► risk-related premiums, sick individuals will pay more for an identical product than healthy individuals will. Moreover, sick individuals prefer health insurers with generous benefits and low ► co-insurance rates. Since individuals also tend to have more information about their health status than the health insurers, the latter are unable to calculate actuarially fair premiums (► risk-related premiums). As a consequence, health insurers will charge some kind of average price. However, more generous health plans will attract a high share of sick individuals and less generous health plans will attract a high share of healthy individuals. As a result of this process of ► adverse selection, premiums of more generous health insurers will go up – which drives out the remaining healthy individuals – which in turn will increase premiums even further. The empirical evidence for adverse selection is rather strong and unambiguous (Cutler and Zeckhauser 2000; Geoffard 2006).

Adverse selection makes it extremely difficult – if not impossible – to reach market equilibrium, which leads to spreading of risk for both groups – sick individuals as well as healthy individuals. Moreover, health plans will have incentives to distort benefits in order to make themselves unattractive to sick individuals. What is more, they will face disincentives to develop product innovations that are likely to attract sick individuals. This outcome is rather undesirable from a societal point of view.

Designers of health insurance schemes in many countries strive to prevent the consequences of adverse selection. They do so by introducing mandatory coverage, standardizing benefits and premium rate restrictions. However, the trade-off between competition and selection remains an important issue in these health insurance schemes as well, because some kind of ► risk adjustment system will need to neutralize incentives for risk selection (van de Ven et al. 2003).

Risk selection (► preferred risk selection) in competitive health insurance markets with premium rate restrictions is undesirable from a societal point of view. Three adverse effects of incentives to select risks can be identified (van de Ven et al. 2004). First, health insurers face a disincentive to react to the preferences of bad risks. It is rational for health insurers to provide good service for profitable i. e. favorable risks. Moreover, it also rational for health insurers to provide bad service for unprofitable i. e. unfavorable risks since investments in preferred risk selection (“cream skimming”) have higher returns than investments in improving the efficiency of medical services. From a public health point of view, these disincentives are fatal, since unfavorable risks are usually patients that are chronically ill and need services that are better than average. Neither health insurers nor health care providers have incentives to gain a reputation for treating the chronically ill efficiently and effectively (van de Ven and Ellis 2000).

Second, if cream skimming is successful, it will eventually lead to market segmentation. Unfavorable risks (high-risk patients) will be enrollees of health insurers with high premiums. Conversely, favorable risks (low-risk patients) will be enrollees of health insurers with low premiums. This situation is not compatible with the idea of ► risk solidarity in ► social health insurance

since, in fact, it paves the way for risk-related premiums.

Third, preferred risk selection strategies that are highly rational from an individual health insurer point of view create welfare losses for society. Investments for the identification of favorable risks (e. g. information technology) and investments for the attraction of favorable risks and the deterrence of unfavorable risks (e. g. resources used for developing effective marketing strategies) do not create any societal gains. Therefore, resources spent on preferred risk selection represent a welfare loss (van de Ven and Ellis 2000). Moreover, preferred risk selection strategies may create an unstable market if some health insurers refrain from selecting risks. These funds may be forced to declare bankruptcy due to adverse selection of risks. This consequence also represents a welfare loss to society.

Cross-References

- ► Adverse Selection
- ► Agency Theory
- ► Co-insurance Rate
- ► Competition, Health Care
- ► Information Asymmetry
- ► Pareto Efficiency
- ► Preferred Risk Selection
- ► Risk Adjustment
- ► Risk-Related Premiums
- ► Risk Solidarity
- ► Social Health Insurance
- ► Utility

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Consumer Confidentiality

Synonyms

Patient confidentiality

Definition

Patient confidentiality is the assurance that information about identifiable persons, the release of which would constitute an invasion of privacy for any individual, will not be disclosed without consent (except as allowed by law). Confidentiality refers to policies restricting access to personal data to those whom the patient agrees need access to them, except rarely in emergency and for the public good (i. e. to contain epidemics, to help solve crime etc.). In addition, other regulatory and institutional approval may be needed, such as consent from medical ethics committees or relevant national authorities.

Consumer Health Informatics

Definition

Consumer health informatics is the branch of ► medical informatics that analyzes consumers' need for information, studies and implements methods of making information accessible to consumers, and models and integrates consumers' preferences into medical information systems. The tasks of consumer health informatics include: educating consumers in how to use various information technologies, developing new methods for obtaining and using health information, estimating the effectiveness of information technologies, evaluating the quality of health information, and surveying the application of laws related to health information.

Consumer Privacy

Synonyms

Patient privacy

Definition

Patient privacy is the right and desire of a person to control the disclosure of personal health information.

Consumer Protection

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Synonyms

Patient protection; Consumer security

Definition

Consumer protection describes privacy, confidentiality and security measures that protect the personal health data of users of health services. Both the European Union (EU) and the US Government have recognized the need for protection of patients' health information, and have passed legislation giving consumers rights over their health information and setting limits on who can access it.

Basic Characteristics

Understanding Consumers' Concerns

The foundation of the traditional doctor–patient relationship is absolute confidence. Most people believe that they have a duty to share their personal medical information with their doctor, even with physicians not directly involved in their care, in exchange for better coordination of their medical treatment. This expectation is based on a principle of the Hippocratic Oath, established more than 2,000 years ago. However, in the electronic era we are witnessing a dramatic change in this relationship. Patients are being referred to as ► consumers, and as such, they are obliged to play a greater role in their own health care than in the past (Chhanabhai 2006). Consumers today feel that their health information should be private and protected, and they want to know who has access to personal information. There is increasing public concern over the potential for release of personal data, especially regarding computer-based systems. These concerns are based primarily on a lack of understanding of the privacy protection laws and regulations that exist, or on mistrust toward the health care system. Surveys show that patients are willing to put their health at risk by avoiding their regular doctor or asking their doctor to fudge a diagnosis, in order to protect their privacy (California HealthCare Foundation 2005).

Consumers can only be fully empowered when they are allowed to be full participants in the health care system. It is therefore advisable to inform them about their health care privacy rights (Chhanabhai 2006).

Privacy, Confidentiality and Security Concerns Regarding Health Information

Concerns over the privacy and security of electronic health information stem from inappropriate releases of information from individual organizations and/or the systemic flow of information throughout the health care and related industries (National Research Council 1997). In short, privacy refers to control over personal health information (► consumer privacy), confidentiality to the disclosure of health information (► consumer confidentiality), and security to policies implemented to maintain both privacy and confidentiality (► consumer security) (Rindfleisch 1997; Yasnoff 2003).

Several types of threats to the release of health information can be defined (National Research Council 1997):

Threat 1: Insiders who make "innocent" mistakes and cause accidental disclosures. This is the most common type of inappropriate release of health information. Examples include overheard conversations between care providers, test results given to people other than the patient, paper medical records left where passersby can see them, misaddressed e-mail or fax messages, and misfiled or misclassified data.

Threat 2: Insiders who abuse their data access privileges. Some health care providers with authorized access to health data willingly violate confidentiality. It is often by this means that potentially embarrassing health information (e. g. regarding psychiatric care episodes, substance abuse, physical abuse, abortions, HIV status, and sexually transmitted diseases)

about politicians, entertainers, sports figures, and other prominent people finds its way into the media.

Threat 3: Insiders who knowingly access unauthorized information for spite or for profit. This type of threat arises when an attacker with authorization to some part of the system but not to the desired data gains unauthorized access to data through technical or other means; for example, a billing clerk who exploits a system vulnerability to obtain access to data on a patient's medical condition.

Threat 4: Unauthorized physical intruders. In this case, the attacker has access to data, but has no authorization for use of the system or data. Examples include intruders who put on a lab coat and a fake badge, walk into a facility, and start using a workstation or asking employees for health information, or someone who maintains the information system exploiting their access rights for unauthorized purposes.

Threat 5: Vengeful intruders, such as vindictive patients, who mount attacks to access unauthorized information, damage systems, and disrupt operations. In this case, an attacker with no authorization breaks into a health information system from an external network. The aim may not necessarily be to extract patient records, but possibly to insert a computer virus in order to cause damage to the system.

Mechanisms of Protection of Health Information

There is a lot that can be done to prevent release of health information. Health care providers are most frequently responsible for inappropriate release of personal data, and are referred to as "internal agents". They abuse their privileges by accessing information for inappropriate reasons or uses, contravening the confidentiality policies that are essential for all health organizations, as mentioned above.

- Confidentiality policies must reinforce the ethical behavior of health care providers. Education of health care providers is of prime importance in order to ensure proper data collection and generation, and to avoid errors in data storage in the health information system. However, this is not enough and it may be appropriate to implement reminders and alerts for health care providers in order to avoid accidental or curiosity-driven disclosure of confidential information.
- Data systems must be protected against inappropriate access and release of information. Technical measures to protect systems include user authentication and authorization on every access, and audit trails which record the identities, times, and circumstances of access for all users accessing the information system. If such records are reviewed regularly, ethical users may think twice about abusing their privileges.
- System management precautions are crucial and include software management by using antivirus programs, firewall systems, encrypted contents, limit modes/protocols for access etc.

Once information is stored in the health information system, access of unsupervised secondary users must be prevented, and in such circumstances, ethical controls are absolutely inappropriate. Outsiders who are not authorized to use an information system or access its data, but who nevertheless attempt to access or manipulate data, or to render the system inoperable are called "external agents". Unauthorized secondary use of data can be controlled by technical measures such as denying access to unauthorized users, and installing adequate computer security software (antivirus, firewall, system backup, disconnection of users who repeatedly attack the system), which in turn must be supported by strict legal restraints (National Research Council 1997; Rindfleisch 1997; Yasnoff 2003).

Legislation on Consumer Protection

The basis for confidentiality policy in public health is "fair information practice", which was incorporated into the US Federal Privacy Act of 1974. "► fair information practice" dictates that confidential information collected by public health organizations should be relevant to public health, must have a written purpose, and may only be used strictly according to the stated purpose. Once information is in the system, measures must be taken to prevent loss, interception or misuse (alteration, destruction) of the information. Access to confidential information must be made on a "need-to-know" basis (only those who need to know it may be allowed to access it) and consent of the individual from whom the information is obtained is required before the use of their information. According to this practice, consumers are guaranteed the right to have access to information about themselves and the ability to correct

this information to the extent allowed by law (Yasnoff 2003).

The US Government has passed several federal laws to give consumers rights over their health information and set limits on who can access it (Department of Health and Human Services 2003). In short, consumers have the right to access their medical records, get a copy, and add corrections; they can also decide if they want to give permission before their health information can be used or shared for certain purposes. If a health care facility intends to use health information, either for health care purposes such as treatment, payment or administrative functions, or for non-health care purposes such as releasing information to financial institutions, interested parties such as life insurers, or for marketing purposes, consumers must be notified and receive a report on when and why their health information was shared. This protection extends to all types of personal health information, including oral communications and paper records that have not existed in electronic form.

The EU have also recognized the need for protection of patient health information, and issued the EU data protection directive (Directive 95/46/EC 1995), requiring all member countries to pass legislation enabling patients to have access to their medical records.

Consumer Protection in Research Area

The research area has become a dangerous zone regarding patient rights due to rising public concern about the privacy of individuals' personal information and because of the implementation of new legislative and regulatory frameworks for the conduct of research using such personal information. Epidemiologists are facing obstacles due to the complex and confusing rules regarding privacy, confidentiality, and consent (Centre for Health Services and Policy Research 2005; Walley 2006).

In general, patients are unwilling to have their personal information distributed other than for the purpose of clinical care and are very concerned when it comes to release of their health information. Studies suggest that the public does not support free access to their records by medical researchers, but want to be fully informed about information sharing, and consulted before their information is released (Whiddett et al. 2006). However, there is considerable debate over the circumstances when explicit consent is needed for the secondary use of personal information for research purposes. An important organization for the protection of patients' rights in clinical research is the ► ethics committee, a competent and independent group that should review all research proposals to assess the trade-off between the risk to individual privacy and the societal benefit of the research, and to ensure all possible steps are taken to maintain confidentiality. Researchers obtain consent from the ethical board and not directly from their patients, but must ensure protection of health data (Centre for Health Services and Policy Research 2005). (► ethics, aspects of public health research)

Consumer Protection and the Internet

Many consumers are using e-mail and the Internet to search for medical advice, whereby disclosure of personal information can occur without consumers' knowledge or consent. Furthermore, any electronic communication may lead to TGI (transaction generated information or access markers) that can make tracking of the origin (the patient) easy, violating privacy. Another problem is the quality of health information found on Internet sites (► e-health).

Consumer Health Informatics

Since patients are becoming active participants in health care, they are searching for all available health information in order to find help, advice, or to make more reasonable, informed choices regarding their health needs. ► Consumer health informatics empowers consumers by putting health information into their hands, including data on their own health. Consumer health informatics is the branch of medical informatics that analyzes consumers' need for information, studies and implements methods of making information accessible to consumers, and models and integrates consumers' preferences into medical information systems. Recognizing the use of and need for health information by those who need it the most – the consumers – the tasks of consumer health informatics are to educate the consumer and to encourage the use of various technologies (including telecommunication and network systems for consumers) to obtain information. Consumer health informatics must also play a proactive role in the development of methods for obtaining and using health information, studying the effectiveness of infor-

mation technologies, evaluating the quality of available health information, and surveying the application of laws related to health information (Eysenbach 2000).

Conclusion

Consumers are concerned about personal health information privacy, but are generally unaware of their privacy rights; both may lead to undesirable consequences. Consumers who are over-anxious about their privacy may put their health at risk by protecting their privacy too much, while those who are misinformed may take no action to protect their own information. The role of health professionals, policymakers and law enforcers is to educate consumers about existing regulations and protection, and to make every effort to preserve the trust they are given.

Cross-References

- ▶ Consumer
- ▶ Consumer Confidentiality
- ▶ Consumer Health Informatics
- ▶ Consumer Privacy
- ▶ Consumer Safety
- ▶ Consumer Security
- ▶ e-Health
- ▶ Ethics, Aspects of Public Health Research
- ▶ Ethics Committee
- ▶ Fair Information Practice

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Consumer Safety

Synonyms

Patient safety

Definition

Patient safety is a patient's freedom from accidental injury during treatment. Ensuring patient safety involves the establishment of operational systems and processes that minimize the likelihood of errors and maximize the likelihood of intercepting them when they occur.

Consumer Security

Synonyms

Patient security

Definition

Security refers to the technical methods by which confidentiality is achieved. Patient security is a collection of policies, procedures, and safeguards that help maintain the integrity and availability of information systems and control access to their contents.

Cross-References

► Consumer Protection

Consumer Sovereignty

► Consumer Choice

Consumer Theory

► Consumer Choice

Consumption

► Morbus Koch (Koch's Disease)
► Tuberculosis
► Tuberculosis and Other Mycobacterioses

Contact

Definition

Contact is one of the most common modes of transmission of infectious diseases. It can be direct or indirect. Direct contact involves physical transfer of microorganisms to a susceptible host from an infected or colonized person. Direct contact includes large droplet spread of infectious agents. Other examples of direct contact transmission are kissing, shaking hands or other skin contact, sexual contact, and contact with soil. Indirect contact occurs when organisms from an infected host or other reservoir are transmitted to a susceptible host via a contaminated intermediate object. Indirect contact transmission may be airborne, vector-borne, or vehicle-borne.
Contact is the most important and frequent mode of transmission of hospital infections.

Cross-References

► Communication

Contact Tracing

Definition

Contact tracing consists in identifying, by taking the history of an individual affected by an infectious disease, all those people with whom the individual has been in contact and to whom the disease could have been transmitted. Of course, the meaning of "contact" depends on the disease and its transmission modality. Contact tracing is used in infectious disease control programs mainly to trace contacts during the ► incubation period and, therefore, with proper treatment full blown clinical symptoms are avoided.

Contagious Diseases

► Communicable Diseases

Contagious Diseases Acquired On Travels

► Tropical Diseases and Travel Medicine

Contagious Diseases Control Law

► Infectious Diseases Control Law

Contaminated Drinking Water

Synonyms

Polluted water; Water containing infectious agents; Water containing germs

Cross-References

► Water Quality and Waterborne Infectious Diseases

Contamination

► Pollution

Content Management

Definition

The term content management includes the systematic and structured production, generation, preparation, management, presentation, publication and utilization of ► information content.

Contingency Tables Analysis

Definition

Contingency tables analysis is a central branch of categorical data analysis, and is focused on the analysis of data represented as contingency tables. This sort of analysis includes hypothesis testing as well as estimation of model parameters, e. g. applying loglinear regression methods to fit loglinear models to the data. The major classes of questions addressed by contingency tables analysis are: (a) a hypothesis testing question of whether there is association among the variables or whether the variables are independent and (b) which model provides the best explanation for the data.

Contingent Valuation

Definition

Contingent valuation is the direct determination of the ► willingness to pay by measuring the stated preferences of individuals. Contingent valuation is a methodological approach to simulate a missing market through hypothetical survey questions. Contingent valuation is the most widespread approach to measure the outcome in cost-benefit analysis.

Cross-References

► Willingness-to-Pay Analyses

Continuity of Care

Synonyms

Continuum of care; Seamless care

Definition

Continuity of care relates to the degree to which several health care services are delivered coherently and which are consistent with the patient's medical need and personal context. Continuity of care may be threefold: Informational continuity means that information on past events and personal circumstances is used to deliver appropriate care for each patient. Management continuity describes the coherent approach to manage the patient's health conditions over time according to changing needs. Relational continuity refers to an ongoing therapeutic relationship between the patient and the provider of health care. According to the type of disease and care the definition of continuity may vary. Continuity in ► primary care for example implies a relationship between the general practitioner and the patient based on trust, loyalty and responsibility over time. In the context of ► chronic diseases continuity of care emphasizes the delivery and coordination of the different health care services in a coherent and efficient way over time.

Continuous Control

► Public Health Surveillance

Continuum of Care

► Continuity of Care

Contraception

Synonyms

Birth control

Definition

Contraception, also called birth control, is the deliberate prevention of pregnancy. Contraceptive methods are numerous and include barrier methods that physically prevent the man's sperm and the woman's egg from meeting, hormonal methods that prevent ovulation, and behavioral, such as abstinence around the time of ovulation. Contraception can be used both to limit family size and space births.

Contract

Synonyms

Agreement

Definition

A contract is a binding agreement between two or more parties. A contract can be concluded either in writing or orally. Contracts may also result from implied conduct of the parties without explicit documentation. They provide the contract parties with contractual claims and obligations vis-à-vis the other party. A contract can be concluded between private persons (i. e., individuals, companies) as well as between administrative agencies and private persons.

Controlling

► Evaluation, Models
► Standardization

Conventional Treatment

Synonyms

Orthodox medicine treatment; Western medicine treatment

Definition

Conventional treatment is defined as set of procedures and medicines aimed at treatment of different illnesses and prevention of complications.

Convergence of Systems

Definition

The basis of convergence theory is the hypothesis that industrial states with different forms of organization face comparable challenges and must accordingly develop similar solutions. The pressure of comparable problems, it is held, gives rise to similar requirements of adaptation and thereby results in an approximation of institutional, political and economic structures and strategies. A comparative study of health policies in the OECD member states concluded that "the most remarkable feature of the health care systems reform is the degree of emerging convergence". Transnational problems and trends in healthcare can be attributed to, for example, economic causes (mass unemployment or globalization), technical factors (innovative medical technology and consequent new treatment methods) and issues of population structure (demography and epidemiology).

Cross-References

► Health System in Dentistry

Co-Occurrence of Disease

► Co-morbidity

Cooperation

► Alliance

Coordination of Care

► Managed Care

Co-Payments

Synonyms

Direct payments; Out-of-pocket payments

Definition

Co-payments are payments by patients that occur directly with the purchase of a drug (e. g. prescription charge) or a medical service. According to the ► health insurance in place and the personal situation of the patient, there can be exemption from co-payments or not. In most developed health care systems exemptions are made for the young (generally people under 18) and people without sufficient revenues. Co-payments are either defined as a percentage of the price of a drug or medical service or as a fixed amount per prescription or medical service. The purpose of co-payments is to

strengthen individual responsibility for the use of medical services, but in most health care systems financing problems lead the health insurers to cut the provision of health care services and to open more and more services to co-payments.

Coping Mechanisms

Synonyms

Adaptation

Definition

Coping mechanisms are a set of behavioral and psychological strategies used to tolerate, reduce, or master stressful events. Two broad categories or coping mechanisms include active coping and avoidant coping. Active coping is characterized by problem solving through various plans and actions such as seeking information and support and/or thinking of the stressful event in a more adaptive way. Avoidant coping is characterized by the failure to address stressful events by participating in other activities (e. g., drug and alcohol use) and/or thinking of the stressful event in a less adaptive way. Active coping mechanisms are thought to be the "ideal" way in which to handle stressful events.

Core Legal Public Health Competencies

Definition

Core legal public health competencies encompass a set of individual law-specific skills and knowledge desirable for the practice of public health. These competencies serve as guides to the development of the ► workforce in public health – both for public health leaders (policy makers) who have specialized roles related to public health law, and for front-line staff who need a basic understanding of the role of law in protecting the public's health.

Core Public Health Competencies

Definition

The core public health competencies encompass the individual skills desirable for the delivery of ► essential public health services. The competencies are divided into the following eight domains: analytic assessment skills, basic public health sciences skills, cultural competency skills, communication skills, community dimensions of practice skills, financial planning and management skills, leadership and systems thinking skills, and policy development/program planning skills. Intended levels of mastery, and therefore learning objectives for public health workers within each competency, will differ depending upon their backgrounds and job duties.

Coronary Artery Disease

Definition

Coronary Artery Disease (CAD) is a condition of the coronary artery associated commonly with chest pain which may be dull and radiates to the arm, neck and jaw. It can be associated with shortness of breath, diaphoresis, and nausea or vomiting. This entire condition is referred to as angina pectoris. When chest pain occurs with exertion and is stable over a long period of time, it is called stable angina and when it occurs at rest, it is called unstable angina. If the chest pain persists for a long period of time without interruption, and an irreversible damage of cardiac cell has occurred, it is called myocardial infarction (MI). CAD is most commonly caused by deposition of atherosclerotic plaques in the walls of large coronary arteries leading to obstruction of epicardial vessels. Spasms of coronary arteries may occur due to release of mediators such as histamine. Inflammatory changes and rarely, congenital anomalies can also cause CAD.

Coronary Heart Disease

► Coronary Artery Disease

Correlation

► Association

Correlation Study

► Ecological Study

Cost-Benefit Analysis

Definition

A cost-benefit analysis is an analytical procedure for determining the economic ► efficiency of intervention, expressed as the relationship between costs and outcomes, usually measured in monetary terms. In other words, both costs and benefits of alternative courses of intervention are expressed in the same units of value, i. e. money. The output of the analysis is a cost/benefit ratio. This type of analysis is useful mostly for guiding policy decisions. It also can be used for clinical decision making.

Cost-Consequence Analysis

Definition

Cost-consequence analysis is a form of health economic evaluation study in which all direct and indirect costs and a catalog of different outcomes of all alternatives are listed separately. No specific preference for one costing approach or one outcome measure (as is the case for cost-effectiveness analysis or cost-utility analysis) is made. Consequently, the result is not a definite cost-outcome ratio. The reader or the decision maker has to form their own opinion concerning the relative importance of costs and outcomes.

Cost Containment

Definition

Cost containment in health care involves a wide variety of strategies and measures to reduce overall health care expenditure, the growth rate of expenditure or certain costs of health care services. These measures include, for example, enhanced government regulation of the price of health care services through changes in the payment method of providers, co-payments, managed care programs, patient education, etc. The reasons for increased cost containment measures in health care are: the upward spiral of medical expenses in all health care systems due to medical progress and improvements in technology, the expansion of coverage by public health systems and aging populations in the industrial world with higher levels of ► chronic diseases and ► disability.

Cost of Disease

Synonyms

Burden of disease

Definition

Cost of disease refers to the cumulative effect of a broad range of disease consequences on a community, including the health, social, and economic costs to the individual and to society. It implies the impact of a health problem in an area measured by financial cost, mortality, morbidity, or other indicators. It is often quantified in terms of Disability-Adjusted Life Year (DALY), which combines the burden due to both death and disability into one index. This allows for the comparison of the disease burden due to various risk factors or diseases. It also makes it possible to predict the possible impact of health interventions.

Cross-References

► Cost of Illness – Costing

Cost-Effectiveness

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Definition

A cost-effectiveness analysis is one type of analysis undertaken in health economic evaluation. It compares two or more health technologies by measuring the additional costs and the additional consequences of each alternative, and dividing the incremental costs by the incremental outcomes. The result of a cost-effectiveness analysis is the incremental cost-effectiveness ratio. The feature that distinguishes a cost-effectiveness analysis from other forms of economic evaluation, such as

a cost-utility or cost-benefit analysis, is that the outcomes of all alternatives are measured in identical natural units related to the specific clinical objective of the alternatives.

Basic Characteristics

The major methodological approaches of health economic analyses are cost-minimization analysis, cost-effectiveness analysis, cost-utility analysis, and cost-benefit analysis (Drummond et al. 2005; CADTH 2006). Cost-effectiveness analysis is the most prominent and wide-spread form of health economic evaluation study and is possibly the most important methodological approach in ► pharmacoeconomics. Although some authors describe cost-utility analysis as a special form of cost-effectiveness analysis, this essay follows the majority of the scientific literature on health economics, and the two forms of health economic evaluation are described separately in different chapters (Berger et al. 2003). For details on cost-utility analysis, refer to the description of utilities (► value, human life – utilities). The other methodological approaches of health economic evaluation and their common underlying principles are described in the chapter ► health economic evaluation.

Cost-effectiveness analysis was first described in the 1970s (Weinstein et al. 1977). Originally, cost-effectiveness analysis was conceived and designed as a methodological approach in the framework of ► medical decision analysis and is therefore not comparable to or an extension of clinical trials. The basic principle of medical decision analysis is to support health-care decision makers in making the best choices under conditions of conflicting objectives, ► uncertainty, and scarce resources. Unlike in clinical trials, which are more like a scientific experiment, a decision analytic cost-effectiveness analysis intends to give a conclusion based on the best available evidence in a real-life scenario. It is always, therefore, an estimation and can never express the complete scientific truth. Furthermore, it is always incomplete but cannot fail to reach a conclusion (Weinstein 2006).

Over the last decades, an increasing number of cost-effectiveness studies have been conducted and published worldwide. This rapid development made it necessary to establish some common methodological principles to allow comparison of the results of different cost-effectiveness studies. The US Panel on Cost-Effectiveness in Health and Medicine (Gold et al. 1996) recommended including a so-called reference case in every cost-effectiveness analysis, for which some standard approaches are prescribed (e. g. concerning the ► costing process, ► discounting, and ► sensitivity analysis).

In a cost-effectiveness analysis, one definite specific ► outcome measure must be selected for all alternatives. This outcome measure is typically the primary clinical outcome parameter for the disease or health state that is treated, e. g. number of events or complications avoided, degree of improvement of blood pressure, symptom-free time, or life years gained. For diagnostic procedures or screening programs, the outcome measure can also be a specific number such as the number of cases detected. Like for clinical trials, greater scientific evidence is associated with more definite final outcome measures, such as life years gained, rather than intermediate clinical measures or surrogate parameters, such as percent serum cholesterol reduction or reduction of HbA1c-level. If intermediate outcomes have to be used, it is important to demonstrate a causal link to hard endpoints from other studies.

The design of cost-effectiveness studies can be prospective and include collection of empirical clinical and cost data. The patients are randomized to the alternative programs and the cost and outcome data are collected over the follow-up period of the study. The selection of the patients, the choice of outcome, and cost parameter, as well as the setting, should ideally represent pragmatic real world effectiveness without the artificial framework and limitations of clinical trials. To demonstrate this difference, some authors also use the term cost-efficacy analysis. Due to the resource-consuming nature of randomized pragmatic health economic trials (► pragmatic trial), such a design can rarely be realized, although some reimbursement institutions increasingly proclaim their necessity for decision making in health care.

In the overwhelming majority of cost-effectiveness studies, the outcomes are taken from existing clinical trials. If the cost-effectiveness study is added onto part of a clinical trial focusing on clinical endpoints, the economic analysis is called a piggy-back study (► piggy-back analysis). The results of clinical trials focusing on efficacy and therefore usually having lower external validity can, to a certain extent, be adjusted (e. g. concerning compliance) to be more representative for the

real world. In modeling studies, the outcomes are usually taken from several clinical studies, meta-analyses, and systematic reviews; in cases of a total lack of valid data, expert statements may also be included. The costs are taken from different health care system specific sources (► costing process).

For a cost-effectiveness analysis, different perspectives can be chosen, reflecting the needs of the decision makers. The perspective that includes the most cost and outcome components is the societal perspective. From a ► societal perspective, all relevant direct (► direct cost) and ► indirect costs are included. More restricted and narrow perspectives are the ► perspective of the health care system, the ► payer's perspective, the institutional perspective (e. g. of a hospital), and the patient's perspective.

An essential element of cost-effectiveness analysis is the inclusion of sensitivity analyses and non-parametric statistical methods as ways to deal with uncertainty. Implementing specific ways to deal with the uncertainty that is an unavoidable consequence of the decision analytic approach of cost-effectiveness analysis, the assumed lack of internal validity is counteracted.

The result of a cost-effectiveness analysis is the ► incremental cost-effectiveness ratio (ICER). The estimated additional costs of a health care technology compared with an alternative are divided by the additional outcomes (for a more detailed description of the ICER, refer to the chapter about health economic evaluation). By this means, measures of cost-effectiveness, such as the costs per event avoided or the costs per live year gained, are constructed (Drummond et al. 2001).

Interpretation and Use of the Results of Cost-Effectiveness Analysis

Cost-effectiveness analysis is, by definition, comparative. If a choice between two new alternatives has to be made and one alternative shows better cost-effectiveness in a study comparing two new alternative options with the same standard alternative, a clear decision for the more cost-effective new alternative can be made. However, in most cases the situation is more complex because usually the question is whether it is good value for money to choose a new alternative at all, in other words, are the additional costs for the outcome gained acceptable? To answer this question it is necessary to set a more or less explicit ► threshold. The threshold is the amount of additional costs that is acceptable in order to gain a definite additional outcome.

There is no commonly agreed threshold for cost-effectiveness, although vague categories can be observed. Technologies with a cost-effectiveness of more than 50.000 USD or 50.000 EUR per life year gained are more likely to be classified as not cost-effective. A common source for a cost-effectiveness threshold is the decisions of the National Institute for Clinical Excellence (► NICE) in the United Kingdom. Most technologies with an ICER of less than 20.000 BPS were recommended for reimbursement and most technologies with an ICER above 30.000 BPS were not recommended (Rawlins et al. 2004).

The results of cost-effectiveness analyses are intended to support health care decision makers e. g. in defining the catalog of reimbursed items or setting appropriate prices for defined health care technologies. To answer these questions, not only two alternatives for a single health problem, but the whole catalog of reimbursed items have to be taken into consideration. Decisions about resource allocation in health care should certainly never be based on health economic measures such as cost-effectiveness or cost-utility alone, without taking ethical and medical aspects into consideration, but the results of cost-effectiveness analysis can give clear hints about the value for money of the use of a defined technology. If the same outcome measure and a comparable methodological framework, e. g. calculation of a reference case, are used, the cost-effectiveness of several different health care technologies can be compared. In so-called ► league-tables, technologies are listed according to their ICER (► incremental cost-effectiveness ratio). A league table listing can be used for setting priorities in health care resource allocation, either by supporting more cost-effective alternatives and limiting the use of less cost-effective alternatives or by setting an explicit or implicit threshold up to which technologies are reimbursed (Gerard et al. 1993).

Cross-References

► Costing Process
► Costs for Health Gain
► Direct Costs
► Discounting
► Health Economic Evaluation
► Incremental Cost-Effectiveness Ratio

- ► Indirect Costs
- ► League Table
- ► Medical Decision Analysis
- ► NICE
- ► Outcome (Health Economics)
- ► Payer's Perspective
- ► Perspective
- ► Pharmacoeconomics
- ► Piggy-Back Analysis
- ► Pragmatic Trial
- ► Sensitivity Analysis
- ► Societal Perspective
- ► Threshold
- ► Uncertainty
- ► Value, Human Life – Utilities

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Cost-Effectiveness Analysis

Synonyms

Costs for health gain analysis

Definition

In general, a cost-effectiveness analysis (CEA) compares the relative expenditures (costs) and outcomes (effects) of two or more options. In health care, the objective of a CEA is the comparison of costs and values of different health care interventions in creating better health and longer life. The CEA helps to evaluate if improved outcomes of an intervention justify the related expenditures compared with other options. These interventions can be new medical devices, procedures, diagnostic tests, or prescription drugs. This transparency about the costs and outcomes of comparative interventions is of high importance for public- and private-sector decision-making on how to use health care resources efficiently. The cost-effectiveness is calculated by determining the ratio of the cost of the intervention to the effect this action has on health. The costs are normally measured in monetary terms. On the outcome side, the measure applied depends on the intervention. Potential outcome indicators are the number of people cured of a disease or the number of symptom free days experienced. In the case of cost-utility analysis, the effects are measured in years of full health lived, which may be measured by ► QUALYs, for example.

Cross-References

► Costs for Health Gain

Cost-Effectiveness Calculation

Synonyms

Costs for Health Gain

Definition

A cost-effectiveness calculation is an analytical procedure for determining the ► efficiency of intervention in achieving a given outcome, in which the measurement of the outcome may be defined in any of several different ways. This analysis may be considered as using a schematic model – a branching tree – in which each of the branch points represents alternative possible pathways with different probabilities and independent outcomes. Each branch of the tree is associated with a given set of costs and health outcomes.

Cost-Effectiveness Ratio

Definition

The cost-effectiveness ratio (CER) is a calculation that summarizes the intervention's net cost and effectiveness. The three types of CER are: the average cost-effectiveness ratio (ACER), the marginal cost-effectiveness ratio (MCER), and the incremental cost-effectiveness ratio (ICER).

Cost-Efficiency

Definition

Cost-efficiency is a goal that has been integrated by policy makers into all modern health care systems to control the expansion of medical costs over time. It relates to maximizing the quality of a comparable unit of health care delivered or unit of health benefit achieved for a given unit of health care resources used. The implementation of this concept into the practice of health care provision is rather complex and involves difficult evaluation processes. The definition of health benefit and the quality of health care are always subject to great discussion. The attempt to create an objective basis for cost-efficient health care led more and more health care systems to apply ► clinical guidelines to measure ► health care quality and cost-efficiency.

Cost of Illness – Costing

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Synonyms

Burden of illness; Cost of disease

Definition

Cost of illness studies estimate the economic burden of a defined disease or health condition in a defined population. In cost of illness studies, the total economic impact of a disease or health condition is estimated by identification, measurement, and valuation of all direct (► direct cost) and indirect costs (► indirect cost). This form of study does not focus on a particular intervention and does not address any questions regarding treatment efficacy or efficiency. Therefore, cost of illness studies should not be categorized as economic evaluation.
Cost of illness studies usually adopt a ► societal perspective, measuring the financial burden incurred to different sectors of society such as the state or government, health insurers, and individuals.

Basic Characteristics

In this essay, cost of illness studies and the costing process itself are described. The calculation of costs in cost of illness studies is performed in a relatively detailed and comprehensive way. The description of the costing process is therefore combined with the description of cost of illness analysis, although the description of the costing process is also valid for other forms of health economic studies.

Cost of Illness Studies

In cost of illness studies, in which sector of the health care system the major expenses occur can be demonstrated in detail. The costing is usually differentiated at least into acute inpatient care, non-acute inpatient care such as rehabilitation clinic costs, ambulatory care by general practitioners or specialists, drugs, informal care, and ► indirect costs due to productivity loss. Different stages or grades of severity of a disease, gender, and age classes could also be calculated separately.
The costs of illness can be estimated by taking into account the costs of all patients with a defined health state in a specific limited time period (prevalence method) or by calculating the long-term costs of those patients whose illness is newly diagnosed during a specific limited time period (incidence method) (Akobundu et al. 2006; Berger et al. 2003; Drummond et al. 2005; Kobelt 2002).

Prevalence Based Studies

In cost of illness studies based on the prevalence of a disease, all costs for a defined patient population (e. g. patients with a specific disease) over a defined time period (e. g. one year) in a defined geographical area (e. g. a specific country or health care system) are estimated. Examples for prevalence based cost of illness

studies are the costs for treating all patients with diabetes mellitus type II in a given year in the USA, or the costs of dementia in the elderly in Germany over a defined time period. If data for several years are available, it is possible to describe the development over time and to give a prognosis of future costs.

Incidence Based Studies

In incidence-based cost of illness studies, it is attempted to estimate the lifetime costs for a patient with a defined disease from diagnosis to cure or death in chronic or life-threatening diseases, respectively. Incidence-based studies are more appropriate if the long-term costs of patients and the effect of a treatment or a preventive intervention on future costs are the focus of the study. For chronic diseases with a duration of many years, purely incidence-based approaches are more difficult to conduct and more resource-consuming compared with a prevalence-based approach. If a detailed prevalence-based cost of illness study is available which differentiates all relevant stages of the disease, the whole course of the disease and the long-time costs of illness can also be modeled based on prevalence-based data.

A special and more advanced form of cost of illness study is the estimation of the costs of a specific risk factor, such as tobacco smoking or alcohol abuse, which can lead to several different health problems or diseases, which themselves could also be caused by several other risk factors. Using the example of the costs of tobacco smoking, the various smoking-attributable risk fractions (► attributable risk fraction) of all relevant diseases that could be caused by smoking have to be estimated. In a further step, the lifetime costs have to be estimated for all these diseases and must individually be attributed to smoking according to the extent the risk factor is responsible for the disease.

Costs of illness studies create information about the amount of resources spent on the treatment of a disease. This information can be helpful in generating hypotheses for later ► health economic evaluation studies comparing different intervention strategies. Furthermore, the results can be used to set priorities for research activities for diseases with a larger potential of cost savings if more cost-effective alternatives would be preferred (CADTH 2006).

In situations of limited resources for health care, this information could be misunderstood as a signal to cut down resources primarily in the treatment of the most expensive diseases. However, ► rationing should be the second choice in ► resource allocation decisions. It should be taken into account that reducing the actual amount of money spent on a specific disease is certainly lowering the total outcome (► outcome measure) for the patients (assuming that healthcare interventions in this disease are doing more good than harm overall). A rational decision for more cost-effective alternatives not only considers the costs but also includes factors related to the medical benefit and can therefore produce more value for money in health care (Rice et al. 1994).

Costing Process

The costing with respect to the estimation of the costs is the main characteristic feature of all health economic studies. In cost of illness studies, the costing process is performed in the most detailed manner. Therefore, the description of the costing process is included in this chapter, although it is also valid for economic evaluation studies.

In general, all costs related to the use of a technology should be identified (► costing process: identification of relevant costs) and considered to be relevant. These costs are the monetary equivalent to resources such as goods or professionals' time. The resources are measured (► costing process: measurement of resources used) in quantifiable physical units, e. g. inpatient days or GP contacts, as detailed as necessary for the analysis, and should be differentiated into categories that are appropriate to the decision makers. In a further step, the measured resources are valued to express them in monetary units (Gold et al. 1996). For valuing (► costing process: valuation), standard reimbursement or pricing catalogs are mainly used (CCOHTA 1996). It has to be kept in mind that these charges are not necessarily identical to the ► opportunity costs according to the economic theory. With rare exceptions, the opportunity costs of health care resources can only be approximated assuming also that charges are the result of a societal process, like the price of any other good in a functioning economy.

Top-down or Bottom-up Approach

Different data sources can be used for estimation of the cost of an illness or the cost of a health care interven-

tion. Using a so-called bottom-up approach, the individual data from patients, patients' charts, epidemiological registries, or cohort studies can be aggregated to a population level. In a top-down approach, highly aggregated sources such as routinely collected national statistics or sickness fund databases can be used directly or can be disaggregated to a more detailed level. The choice of the costing approach depends on the availability and quality of the aggregated data and the level of detail that is necessary to achieve a valid estimation. Both approaches can be combined.

The major problem of retrospective analysis of large routine datasets (► claim's data analysis) is that, usually, not all pieces of information necessary to answer the study question, e. g. all health care sectors or comorbidity, are included in the original data set. On the other hand, a bottom-up data collection is limited to a smaller sample of patients, mainly for reasons of limited resources for the study, which makes it more complicated to ensure that the sample is unbiased and representative of the overall population.

Perspective

The perspective of an economic analysis of a health care technology describes the point of view that is taken. The choice of the perspective is a basic decision to be made for every analysis and can crucially affect the result of the calculation. It especially influences the determination of costs, but can also be relevant for outcomes.

From a ► societal perspective, all costs and benefits, including the productivity loss due to a health state, treatment, or diagnostic procedure, are taken into account (see also "Labor costs"). From the narrower perspective of a health insurance or sickness fund (often called ► payer's perspective), only their own expenses, expressed as reimbursement rates, in different sectors of the health care system are relevant. From the perspective of an institution like a hospital, only the costs for the institution itself, which are incurred during the inpatient stay, are considered. The most important perspectives are the societal, the payer's, and the institutional perspective. Further perspectives are the patient's perspective and the employer's perspective. According to most recommendations for economic evaluations in health care, a societal perspective should be taken at least in addition to other perspectives (Gold et al. 1996; Drummond et al. 2005; Canadian Agency for Drugs and Technologies in Health (CADTH) 2006).

Direct Costs

The costs related to the provision of the health care intervention itself, including all side effects and also all future consequences on health care diagnosis and treatment in different health care settings, are defined as direct medical costs (e. g. inpatient hospital treatment, ambulatory care, drugs, rehabilitation). In some diseases, direct non-medical costs e. g. for transportation or childcare during a medical intervention of the parent, can be incurred.

Indirect Costs

The so-called indirect costs express the loss of productivity to the national economy. Indirect costs can be due to decreased efficiency or total absence from work through an illness – for a limited number of days of absence or early retirement – or due to premature death. There are two ways of calculating the indirect costs: the ► human capital approach and the ► friction cost method. Both approaches are based on the assumption that the lost productivity can be valued by the achievable gross income of the employed population, thus giving the labor a defined value (► labor market).

The human capital approach is considered to be the simpler and more frequently used approach and is therefore recommended by a number of recommendations for economic evaluation studies, although it is also recommended that the friction cost approach should be calculated in an additional scenario, or at least that a sensitivity analysis using the friction cost method should be carried out (Gold et al. 1996).

Cross-References

► Attributable Risk Fraction
► Claims Data Analysis
► Costing Process: Identification of Relevant Costs
► Costing Process: Measurement of Resources Use
► Costing Process: Valuation
► Direct Costs
► Friction Cost Method
► Health Economic Evaluation

- ► Human Capital Approach
- ► Indirect Costs
- ► Labor Market
- ► Opportunity Costs
- ► Outcome Measure
- ► Payer's Perspective
- ► Rationing
- ► Resource Allocation
- ► Societal Perspective

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Costing Process

Definition

Costs in health economic analysis are monetary units referring to resource used in the context of the provision of health care. The costing process is the measurement of the cost. Besides the general subdivision of costs (e. g. fixed cost, variable cost, total cost, marginal cost), ► direct costs and ► indirect costs are differentiated in health economic evaluation studies.

Costing Process: Identification of Relevant Costs

Definition

The first step in estimating the cost of a health care intervention (► labor market) is the identification of parts or consequences of the intervention that are responsible for any cost. Identification of the relevant cost components is determined by the perspective of the health economic analysis.

Costing Process: Measurement of Resources Use

Definition

The second step in estimating the cost of a health care intervention (► costing process) is the measurement of the natural units of health care (e. g. GP visits, inpatient days) that are connected with the identified relevant cost components. The measurement of resource use is mainly determined by the availability of data and the methodological approach of the analysis, e. g. bottom-up or top-down.

Costing Process: Valuation

Definition

The third step in estimating the cost of a health care intervention (► costing process) is valuation of the measured resource use in monetary units. For valuing, standardized costs per unit, e. g. GP visit, specific for a country or health care system and specific for the chosen perspective, are usually used.

Costs for Health Gain

Synonyms

Cost-Effectiveness

Definition

Health economic term which weighs the effectiveness of a health procedure, service or programme against its

expenses and potential savings. The consequences of an intervention are measured by natural or physical units, e. g. as infections averted, cases detected or years of life gained. It assumes that these consequences have value in themselves. It allows the comparison of the effectiveness of an intervention with respect to costs and with respect to a defined consequence, e. g. the costs in € per case detected, *without* making an attempt to compare the value of different consequences with each other.

Costs for Health Gain Analysis

► Cost-Effectiveness Analysis

Cost-Utility Analysis, Preferences

► Value, Human Life – Utilities

Cot Death

► Sudden Infant Death Syndrome (SIDS)

Country

Synonyms

Land; State

Definition

Country denominates a geographical territory, while state expresses administrative and decision-making institution constituted by law.

Covariance Models

► ANCOVA

Cox Proportional Hazards Model

► Cox Proportional Hazards Regression

Cox Proportional Hazards Regression

Synonyms

Cox proportional hazards model; Cox regression; Proportional hazard regression

Definition

The Cox or proportional hazards regression model is used to analyze survival or ► failure time data. The technique may also be used when survival is influenced by a large number of factors, some of which may be correlated, and the aim is to identify those features of the patient or the disease that are of independent prognostic significance. This model is a regression method for survival data, and provides an estimate of the ► hazard ratio and its confidence interval. The Cox proportional hazards model is an appealing analytic method that is powerful and flexible. The Cox model itself makes three assumptions: first, that the ratio of the hazards of two individuals is the same at all times; secondly, that the explanatory variables act multiplicatively on the hazard; and thirdly, that the failure times of individuals are independent.

Cox Regression

► Cox Proportional Hazards Regression

CPI (Community Periodontal Index)

Definition

Severity and degree of ► periodontal diseases (► gingivitis, ► periodontitis) in an individual (or in a section of a population) are assessed, according to a WHO-recommendation, by the CPI (Community Periodontal Index) taking as its basis the three features bleeding, dental calculus, and gingival sulcus. A special dental CPI-probe (WHO-probe) is used for the relevant examination. Periodontal diseases are classified into five degrees according to their severity ranging from 0 (healthy, inflammation-free gingiva and periodontium) to 4 (most severe form of periodontitis with loss of function of the teeth). Periodontal diseases of degree 1 may be cured by an improved domestic oral

hygiene, degree 2 and 3 must be looked after and treated by a dentist. Degree 4 require additional periodontal surgery.

Cream-Skimming

► Preferred Risk Selection

Crib Death

► Sudden Infant Death Syndrome (SIDS)

Crime

Synonyms

Criminal offence

Cross-References

► Criminal Law

Criminal Capacity

► Criminal Responsibility

Criminal Law

Synonyms

Penal law

Definition

Criminal law stands for the legal rules defining and prohibiting, on pain of penalties, such acts which are regarded as socially detrimental and punishable (crimes). Criminal law also provides for penalties and other sanctions of crimes, including the mode of punishment. Criminal penalties include monetary fines, imprisonments and in some jurisdictions death penalties. Criminal law is enforced by the state, particularly by prosecutors, police, courts, prisons and other enforcement institutions.

Criminal Law and Public Health

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C

Synonyms

Penal law

Definition

Criminal law stands for the legal rules defining and prohibiting, on pain of penalties, those acts which are regarded as socially detrimental and punishable (crimes). Criminal law also provides for penalties and other sanctions of criminal offenses, including the mode of punishment. Criminal penalties include monetary fines, imprisonments and in some jurisdictions death penalties. Criminal law is enforced by the state, particularly by prosecutors, police, courts, prisons and other enforcement institutions.

Basis Characteristics

Background and Function

Criminal law is based on the state's penal power. In a constitutional state, only the state has the power to punish people. By enacting criminal law, the states have created a legal order for the people's coexistence in the community. Criminal law defines crimes and threatens everyone with penalties if found guilty of having committed such detrimental and forbidden acts. Criminal law protects the goods and legitimate interests of the community, which include life, health and safety of the people as well as compliance with existing laws.

The function of criminal law is – in contrast with those of most public health activities – not solely to prevent harm. Criminal law also pursues a repressive approach as it intends to uncover crimes and punish delinquents. In criminal law, both prevention and repression (i. e. punishment) are of the same rank. Criminal law pursues several objectives:

1. By threatening unlawful acts with penalties and enforcing penalties, criminal law has a deterrent effect on potential delinquents (general prevention).

2. Punishment, for example by imprisonment, protects the society from known offenders. The penalty also aims to deter the offender from future offences.
3. The punishment shall also educate the offender in order to promote lawful behavior and support his rehabilitation in society.
4. Finally, delinquents are also sentenced to penalties to retaliate them for their criminal offences (retaliation).

Pursuant to these objectives, criminal punishment has several functions, which complement each other (*See* also Tröndle and Fischer 2007; Lazzarini et al. 2007; Gostin 2000). Criminal law is regarded as the last resort (*ultima ratio*) to protect the legal order and the community as it is associated with personal sanctions.

Principles of Criminal Law

Two basic principles of criminal law are embodied in the Latin doctrines *nullum crimen sine lege* ("no crime without law") and *nulla poena sine lege* ("no penalty without law"). Thus, before a behavior can be classified and punished as criminal, the respective criminal offence must be defined by criminal laws so that each individual can determine whether a certain act is criminal or not.

Criminal laws codify crimes and define the elements of these crimes. These elements must be evidenced by the prosecutor to convince the judge or the jury that the accused has committed a crime. Typical crimes involving personal injuries include murder, battery and poisoning. Criminal offences against property rights include fraud, burglary, robbery, blackmail and corruption. In addition, in many other specialized fields of law certain acts are, on pain of penalties, forbidden and represent criminal offences. For example, environmental laws and occupational safety laws define specific criminal offences so that violations of these rules (which are primarily public health law offences) are at the same time crimes chargeable under criminal law.

For criminal punishment, the offender's act must have fulfilled the elements of the respective crime and they must have acted at fault (i. e., intent or negligence). Some criminal offences require that violators have acted with intent (e. g., murder) whereas others are fulfilled if the offense was committed involuntarily but negligently (e. g., negligent homicide). Additionally, the offender must have acted with personal criminal responsibility – a fundamental requirement of criminal law, which refers to the principle *nulla poena sine culpa* ("no penalty without responsibility"). Some persons lack criminal responsibility (e. g. children) or may have acted in a state of reduced or missing criminal responsibility, like mentally ill or drunk persons (Koyuncu 2000).

The practice of criminal law is governed by specific criminal procedure rules and specialized actors, which include the prosecutors who charge violators at court and criminal investigation departments. Criminal investigations are also governed by criminal procedure laws, which provide the actors with a flexible set of tools (e. g., searches, seizures, telephone surveillance). Criminal investigations are initiated if the prosecutors or police departments become aware of acts that fall under the scope of criminal law. Such awareness can result from any type of information, e. g., private complaints. In addition, if facts are unearthed in the course of public health investigations that indicate committed crimes, the public health agency will regularly involve the prosecutor's office. Then, the original public health investigation would lead into criminal investigations.

If criminal offences are charged before courts, specialized courts regularly handle such cases. In addition, the criminal law procedure rules differ from those that apply in civil litigation. For example, before criminal courts, the accused may claim the "benefit of the doubt" rule, which provides that when facts are in doubt, the court must assume the facts that would be beneficial to the accused person (*in dubio pro reo*).

If the court (or jury) finds that the offender was guilty, they will impose penalties depending on the crime, the gravity and all relevant case circumstances. The type and range of penalties for a crime is provided by law. Most criminal laws provide for monetary penalties and imprisonments; some allow death penalties. Crimes may also entail other sanctions imposed by criminal courts, such as a ban from professions, disciplinary sanctions, the forfeit of gain and the order to compensate the victim. Companies convicted of criminal offences may additionally be sanctioned by exclusion from public procurement contracts. In some jurisdictions, such companies are listed in public registers and are excluded from governmental assignments (*See* Grad 1990, for the U.S.).

Criminal Law and Public Health

Criminal law and public health practice have a number of points of contact. There, criminal law unfolds its various (direct and indirect) effects in the interest of the public's health:

- *First*, nearly all specialized fields of public health law define special crimes. In such cases, the public health offence simultaneously is a crime and may, in addition to administrative sanctions, lead to punishment of the violator under criminal law. Further, the potential of criminal punishment has a deterrent effect. Here, public health practice and criminal law proceed hand in hand. Against this background, investigations of the cause of public health issues may shift into criminal investigations.
- General criminal laws are also determined to protect individuals and the public from harm. When forbidding personal injuries, criminal law has behavior-influencing effects in the interest of the community's health. Here is a contact point between criminal law and public health based on an indirect effect. The effects are even bigger when addressed to particular persons close to the public's health: medical doctors, nurses and other health professionals particularly may be subject to prosecution because of patient injuries, and the awareness of criminal law risks has an additional deterrent effect. Criminal law also applies against employers who fail to provide their workers with appropriate workplace safety means. Public health officers may also be prosecuted if they fail to provide accurate services and negligently do not prevent a public health harm or inadequately violate personal rights.
- Criminal law also applies to individuals or companies causing harm to public health. Such cases involve persons with infectious diseases who disregard protection measures and transmit the infection to others. In this realm, a particular concern of criminal law is the intentional or negligent transmission of HIV by infected persons through unprotected intercourse (*See* Lazzarini et al. 2007 (for the U.S.); Tröndle and Fischer 2007; Wisuschil 1998 (for Germany)). These persons obviously pose a public health threat and simultaneously fulfill the elements of battery or at least negligent bodily injury. In a number of criminal proceedings, several such persons have been prosecuted and convicted.
- Criminal laws that penalize traffic offences (e. g., drunk driving) have contributed to the community's health and safety. Correspondingly, "motor vehicle safety" is among the ten great public health achievements of the 20th century, as published by the Centers for Disease Control and Prevention (CDC 1999).
- In the aftermath of the terrorist attacks in the U.S., "forensic epidemiology" emerged as a method that builds a new contact point between criminal law and public health. Forensic epidemiology is defined as "the use of epidemiologic methods as part of an ongoing criminal investigation of a health problem for which there is suspicion or evidence regarding possible intentional acts or criminal behavior as factors contributing to the health problem" (Lazzarini et al. 2007). The definition reveals that forensic epidemiology supports criminal investigations and, thus, is at the "intersection" between the practice of criminal law and public health (Goodman et al. 2003).
- Another intersection between criminal law and public health is formed by public health "standards" set by the administration. These standards often provide guidance for particular activities and, as such, describe the present "state of the art" for the pursuit of the respective activities. As negligence in criminal law must be determined based on the "state of the art", the public health standards can be used as evidence for the "state of the art". In summary, such standards regularly stand for "due care" (Koyuncu and Kamann 2007). Therefore, a breach of the standard may implicate a lack of the necessary "due care" when causing an injury. Disregard of a standard may also indicate an organizational failure, e. g., if an employer failed to provide the employees with the protective means prescribed in a standard for occupational safety (Koyuncu and Kamann 2007). Therefore, the interplay between these standards and criminal law is another relevant intersection between public health and criminal law.

There are substantial contact points between criminal law and public health law. To a certain extent, public health laws encompass criminal law rules. In addition, the interplay between criminal law and public health is based on several indirect effects of criminal law in the interest of the public's health.

Cross-References

- ► Environmental Law and Public Health
- ► Infectious Diseases
- ► Infectious Diseases Control Law
- ► Labor and Occupational Safety Law
- ► Legal Basis of Public Health
- ► Occupational and Environmental Health
- ► Public Health Law, Legal Means
- ► Tort Law and Public Health

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Criminal Responsibility

Synonyms

Criminal capacity; Guilt

Definition

Criminal responsibility is defined as the capability of a person to be culpable for his acts under criminal law. Criminal responsibility requires that the person have the intellectual capacity to understand that his action is a criminal offence and the ability to control his actions. Criminal responsibility is the prerequisite for prosecution and the criminal punishment of a person. This is why children and many mentally ill persons or persons with certain blood alcohol levels are not, or only to a limited extent, criminally responsible.

Cripple Disease

- ► Polio
- ► Poliomyelitis

Critical Appraisal

Definition

Critical appraisal is one step in the process of evidence-based clinical practice. It is the process of systematically examining research evidence to assess its validity, results, and usefulness before using it to inform a decision. Together with skills in finding research evidence and changing practice as a result of research, critical appraisal is the route to closing the gap between research and practice and as such makes an essential contribution to improving healthcare quality. Critical appraisal allows us to make sense of research evidence.

Critical Pathways

- ► Clinical Pathways

Cross-Cultural Communication

Synonyms

Intercultural communication

Definition

Cross-cultural ► communication refers to network of information exchange, dealing with or comparing two or more cultures.

Cross-Cultural Psychiatry

► Social Psychiatry

Crossing-Over

► Recombination

Cross-Product Ratio

► Odds Ratio (OR)
► Relative Odds

Cross-Sector Efforts

Synonyms

Social regulation; Regulation

Definition

A legal restriction promulgated by government through official rulemaking processes. Regulations often represent attempts by government to modify prices, wages, pollution, industry practices, and standards of production for goods and services in the free market by limiting the discretion of individuals and companies to make decisions freely.

Cross-Sector Reallocation

► Governmental Regulations

Crown

Definition

With regard to the anatomical areas of the tooth, the crown is the visible part that extends in the mouth. The invisible part is the root of the tooth, which anchors the tooth in the jaw.
With regard to dental treatment, a crown is an artificial replacement that restores missing tooth structure by surrounding part or all of the remaining structure with a material such as cast metal, porcelain, or a combination of these materials.

Crude Birth Rate (CBR)

Definition

Crude birth rate (CBR) is calculated as the number of live births per 1000 population in a given year. It represents only a crude estimate of ► fertility – not all the population included in the denominator is exposed to the risk of ► pregnancy. CBR is not a good measure for comparing fertility across populations, as variations in age distribution of the populations being compared will affect the birth rate.

Crude Rate

Definition

The crude rate is a summary measure based on the total number of events (e. g. diseases, births, deaths) occurring in the total observed population over a given time. The standard reference period is one year. Because the size of population changes over a period of a year, the number of people in the population in the middle of the year (the mid-interval population) can be used as the denominator. Depending on the data available, this may be calculated as the average of the size of the population at the beginning and at the end of the one-year period, or estimated from census data. This rate should not be used for making comparisons between different populations when the age, race, and/or sex distributions of the populations are different.

Cryptosporidiasis

► Cryptosporidiosis

Cryptosporidiosis

Synonyms

Infection with cryptosporidia; Cryptosporidiasis

Definition

Cryptosporidia are single-cell eukaryotes, which are spread worldwide and which can be found in humans and in a couple of vertebrates. They are transmitted by contaminated water and food or as a smear infection. Young children (6–24 months) and immunocompromised persons face a special risk of cryptosporidiosis. Following an incubation period of 3–7 (up to 12) days diarrhea develops, which is accompanied by nausea, stomach ache and mild fever. The disease lasts for 7–14 days; in general, therapy can be restricted to the replacement of fluid losses. Severe courses are observed in immunodeficient persons. The most important means of prophylaxis of cryptosporidiasis is compliance with hygienic rules.

Cross-References

► Infection with Cryptosporidi

Cultural Awareness

Synonyms

Cultural identity

Definition

Cultural awareness is defined as recognition, acceptance and expression of cultural beliefs and system of values as part of cultural, social, ethnic and national identity.

Cross-References

► Cultural Identity

Cultural Beliefs

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Definition

► Culture is essentially a convenient way of describing how members of a group understand each other and communicate that understanding. The nuances of meaning are generated by behavior as much as words and the interactions between members are often determined by shared values operating at an unconscious or 'taken for granted' level. ► Cultural beliefs are products of the world views held by collectives and underpin the ways in which members of the group view the human life-cycle, the environment, and the organization of society. Although the focus in this essay is on culture associated with particular ethnic groups who are indigenous, ethnic culture is only one cultural affiliation alongside others. Many groups have their own distinctive cultures – the elderly, the poor, professional groups, youth and the sick – and they have corresponding belief systems that arise from their particular circumstances. In this respect, a single individual, such as a young woman, may hold beliefs that are part of a universal culture (such as the culture of youth), and at the same time have cultural beliefs that are localized by ethnicity and indigeneity.

Basic Characteristics

Cultural Beliefs and Indigeneity

Indigenous peoples have experienced contact with other cultures and civilizations in vastly different ways, and have often suffered a range of unfortunate consequences including alienation from traditional lands and properties. But despite the adversity, a unifying characteristic has emerged. It is a sense of unity with the environment. Common to indigenous peoples is a world view that locates people within the context of the natural environment, rather than apart from the environment. 'We are the river, the river is us'. 'We are the land the land is us'. A bond with the land and the natural environment is the fundamental feature of indigeneity

and often land is an extension of ► tribal identity and personal ► identity.

Cultural Beliefs and Indigenous Knowledge

Arising from this close link between people and the environment are a number of cultural markers that are integral to indigenous cultural beliefs including the organization of indigenous knowledge, the categorization of life experiences, and the shaping of attitudes and patterns of thinking. The individual is a part of all creation and the idea that the world or creation exists for the purpose of human domination and exploitation is absent from indigenous world-views. A spiritual link between the physical and social environments also emphasizes the significance of resources as collective and intergenerational, and the importance of land for health and wellbeing. Similarly the basis for knowledge creation is the dynamic relationships that arise from the interaction of people with the environment, generations with each other, and social and physical relationships. Relationships form the substrate for indigenous knowledge. While it is often valued because of its traditional qualities, a creative and inventive capacity forms the core of an indigenous knowledge system and the emerging cultural beliefs. The perception of indigenous knowledge and culture as applicable only to the distant past misses the thrust for development that is part of the indigenous journey; the three most distinguishing features of indigenous knowledge are said to be that it is a product of a dynamic system, it is an integral part of the physical and social environment of communities, and it is a collective good.

Cultural Beliefs Around Birth and Death

For many indigenous peoples, birth is a celebrated event largely because it is a step towards survival of the tribe. Tribal cultures all over the world place high value on the wellbeing of future generations, partly because endurance has so often been threatened in the past – by harsh climates, natural catastrophes, inter-tribal warfare, ► colonization, and introduced diseases for which there was no natural immunity. Birth is important for the immediate family but there is also a strong belief that every child belongs to the wider network of extended family members and the community as a whole. That belief is often reflected in patterns of child-rearing and in later years can be manifest as a commitment to reciprocity, mutual benefits, and social inclusion. Some indigenous groups emphasize birth as an opportunity to reinforce the link with the natural environment by burying the new-born's placenta under a special tree or in another site that is of spiritual importance.

Indigenous beliefs about death and dying tend to be philosophical. Death is a normal part of the life cycle and even though grief may be unconstrained there is a sense of inevitability. As well, death represents a connection between present generations and generations who have long since died and may also be celebrated as an event that reinforces continuity with the natural environment, a reminder that human existence is contextualized by a wider environmental ethic.

Typically funeral rituals reflect cultural beliefs about spiritual links with ancestors and grief is openly expressed as elders offer farewell laments, encouraging the hovering spirit of the deceased to join deceased family members. A sense of union with the wider world of the departed is established, diminishing the impact of loss and establishing a place for the recently deceased within the realms of the departed. As a final tribute, children born around the time of death are often named for that person. Continuity has been restored to the family life cycle.

Cultural Beliefs and Health

Indigenous populations are likely to subscribe to values and attitudes that are distinctly different from the cultural experiences of western-trained clinicians. When confronted with poor health, for example, indigenous peoples may not accept conventional explanations nor differentiate between physical and mental disorders. Instead the event may be explained as a loss of balance between spiritual, mental, physical and family dimensions. Sometimes a health problem is seen as evidence of transgression against the social code, either by the individual or the family and can be manifest in a variety of ways. Physical disorders for example may not be regarded as bodily ailments but as reflections of mental processes, social circumstances and spiritual experiences. Similarly, mental disorders are deemed to have physical, as well as spiritual and family components.

The relative weightings attached to symptoms also have ► cultural determinants. Between cultures there are different symptom hierarchies and different interpretations of both severity and importance. A case in point is

depression. Patients in euro-centric cultures are more likely to complain about the emotional and psychological aspects of the illness while many indigenous populations are more worried about the physical aspects: lack of energy, debilitation, weight loss, abdominal pains, poor appetite, sensitivity to cold. In non-western cultures depression will not necessarily be regarded as a mental disorder but as a disorder of energy, or gastro-intestinal malfunction, or sleep disturbance. In any event, while depression may be a universal ailment, its presentation is largely colored by cultural beliefs and variations in the way symptoms are ranked.

Cultural Beliefs and Health Interventions

Clinical programs will be more readily accepted and outcomes will be improved when treatment process makes sense in cultural terms. Incorporating cultural beliefs and values into treatment and healing has been a goal in many countries since the early 1980s and at least four approaches have been used. First, there has been an increase in the utilization of traditional healing services, sometimes as an alternative to mainstream services though more often as a supplementary activity. Traditional healing incorporates a number of remedies largely based on the use of leaves, berries, bark, derived from native plants. They are usually dispensed by healers who also employ incantations, spiritual strengthening, and sometimes rituals to remove malevolent influences. Second, conventional health and medical services have increasingly added ethnic values and customary practices to treatment programs, creating a bicultural formula. Third, in respect of psychological therapies a number of ethnic centered techniques have been developed either independent of other processes or alongside them. Usually they aim to strengthen ► cultural identity. Fourth, indigenous health services have been established to provide more accessible services for their people by recognizing cultural beliefs and customs, employing indigenous health workers, and offering a mix of scientifically based treatments as well as traditional healing.

Cultural Beliefs and Human Diversity

Although cultural beliefs can shape perspectives on health and disease, it can be misleading to draw conclusions about an individual simply because of ethnicity or cultural affiliation. There may be similar histories, commonly held cultural views, and equivalent socio-economic living conditions, but no two human journeys are the same. Concluding that any condition can be explained entirely on the basis of cultural beliefs can be misleading. This does not mean that cultural beliefs are irrelevant but it does sound a note of caution about seeking explanations derived solely from cultural 'norms'. At the same time, the recognition of cultural beliefs as foundations for understanding health, provides a basis for engagement with families, communities, and populations so that interventions can be more effective and health planning can be an inclusive process.

Cross-References

- ► Bias
- ► Colonization
- ► Country
- ► Cultural Awareness
- ► Cultural Determinants
- ► Cultural Identity
- ► Cultural Value
- ► Culture
- ► Identity
- ► Lifestyle
- ► Self-Identity
- ► Social Identity
- ► Transition Country
- ► Tribal Identity

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Cultural Competence

Definition

In this context, cultural competence refers to public health professionals' recognition and understanding of the importance of culture in health-related activities and the history, beliefs, values (► ethical values), and practices of members of the communities they serve. Educational programs are at times needed in order to achieve or improve cultural competence.

Cultural Determinants

Synonyms

Cultural features; Characteristics

Definition

Cultural determinants represent features by which basic differentiation of cultures is possible. Cultural determinants include ethnicity, race, ► country of origin, language, non verbal communication, acculturation, gender, age, sexual orientation, values, behavior norms, rules, manners, social grouping and relationships, religious and spiritual beliefs, socioeconomic class and education.

Cultural Ethnicity

Synonyms

Ethnicity; Ethnic Identity

Definition

► Ethnic identity indicates identification with a particular group which is often descended from common ancestors. Members of the group share nationality, tribal affiliation, genealogy, religious faith, language, or cultural and traditional origins and are an identifiable minority within the larger ► nation-state. In Latin America for example it often refers to Indians and Africans, although perhaps everyone has some type of ethnic identity.

Cross-References

► Ethnic Identity
► Ethnicity

Cultural Features

► Cultural Determinants
► Cultural Ethnicity

Cultural Identity

Synonyms

Ethnic identity; Social identity; National identity; Cultural awareness

Definition

The cultural identity refers to the distinguishing cultural features of the group, as well as to the individual's sense of belonging to it. It is often used as synonym for social, ethnic or national identity both due to shared distinctive spiritual, material, intellectual and emotional features and to value systems, traditions and beliefs.

Cross-References

► Cultural Awareness

Cultural Preservation

Synonyms

Cultural protection

Definition

Cultural preservation refers to activities aimed at protecting ► cultural awareness, ► cultural identity, ► cul-

tural beliefs and cultural features from loss or disappearance.

Cultural Preservation and Protection

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Synonyms

Cultural sustainability

Definition

► Cultural preservation and protection is a major concern for indigenous peoples who have become minorities in their own lands. Dispossession of material resources such as land and forests has often been accompanied by loss of cultural resources including language, histories, art forms and intellectual knowledge. Retaining and safeguarding culture for future generations has therefore become an urgent matter especially in the face of globalization and the inevitable attrition of older generations who have served as the carriers of culture.

While the preservation and protection of indigenous culture is largely a function of indigenous peoples themselves, there are also implications for states and public agencies, including those within the health sector. Cultural restoration and transmission is not only justified for reasons of heritage, aesthetics and history, but also because cultural methodologies provide a basis for the acquisition and elaboration of knowledge, as well as creating platforms for the understanding and promotion of health, education, and justice.

Basic Characteristics

Sustaining Indigenous Knowledge

The manifestations of culture that are most obvious include the performing arts, visual arts and language. However, culture is underpinned by a knowledge base that provides a substrate for the parameters of culture including distinctiveness, consistency and cohesiveness. For indigenous peoples knowledge creation is bound into the dynamic relationships that arise from the interaction of people with the environment, generations with each other, and social and physical relationships. Relationships form a catalyst for the codification of indigenous knowledge which recognizes the interrelatedness of all things, draws on observations from the natural environment, and is imbued with an organic life force and spirituality. During contests for territory, much of the old knowledge was either lost or forced into a dormant mode. Although some knowledge has been lost forever, many countries have set out to reinvigorate indigenous methodologies and indigenous understandings of the natural world, not only to maintain a sense of tradition but also to provide parallel perspectives that have relevance to modern times – indigenous approaches to environmental management, health research, dispute resolution, psychological interventions and education.

The traditional knowledge resource is often valued because it has remained constant. However, many indigenous leaders consider that the notion of an unchanging body of knowledge is inconsistent with progress and threatens adaptation to changing environments and changing requirements. They argue that so called traditional knowledge actually developed in response to particular challenges and was subject to modification in light of new experiences and new discoveries. While values might have timeless relevance, knowledge is always changing; only in relatively recent times has 'old knowledge' been declared to be the only form of legitimate indigenous knowledge. Indigenous development did not stop with colonization and efforts to confine indigenous knowledge to a pre-colonial past do little to promote a climate of growth, development, and relevance.

Similar arguments have been heard in relationship to carving and art. Traditionalists maintain that carvers should follow established patterns in order to be true to form; there is a fear that departures from a classical tradition could betray the art. Contemporary indigenous artists, however, are more concerned with exploring new shapes, materials, and outlines, retaining elements of an older art form and perhaps continuing to follow an underlying cultural rhythm though not in a slavish way.

Language Revitalization

Dominated by the language of majorities, many indigenous languages have become extinct and many more

are under threat. Language revitalization has become a major exercise for indigenous populations including those in the USA, Canada, Australia, Wales, Ireland, the Nordic states, Taiwan, Spain, and New Zealand. A number of approaches have been helpful including the establishment of early childhood immersion centers where young (under six years) children are totally immersed in their native tongue. Introducing native languages into the wider school curriculum has also addressed some of the aspirations of indigenous peoples and has led to a new generation of school teachers who have additional language competencies. But particularly germane to indigenous youth has been the establishment of radio and television programs that broadcast in native languages using contemporary music, youthful models, topical issues, and sports commentaries as vehicles for the revitalization of language. Modern technologies have also assisted in the retention of language and other cultural resources. Despite some initial hesitancy, videos, DVDs and electronic archiving have found places in revitalization strategies.

Cultural preservation and protection is unlikely to occur if states are positively opposed to the recognition of cultural heritage or are simply disinterested. State support can occur through several avenues including the formal recognition of an indigenous language as an 'official' language, funding support for educational initiatives, and opportunities for indigenous languages to be seen and heard on public radio and television as well as in state publications and departments of state.

Heritage Protection

Frequently in the past cultural preservation and protection was regarded as the province of museums. However, museum curators are increasingly aware that an artefact, a museum exhibit, is not just a work of art or an historic relic, but an object that has a set of relationships with human beings; the value of the object cannot be separated from those associations. The tangible value resides in the object itself. But the intangible qualities come from the associations the object has with people. As a result, the object is imbued with spiritual meaning derived from the people who created it.

For that reason the value attaching to heritage, whether environmental heritage, sacred sites, artefacts, historic objects, or religious representations, cannot be adequately considered without also recognizing the associated human relationships. Heritage comes alive when the time-honored relationships with people are factored into the equation. In that respect heritage has a spiritual dimension which depends less on the beauty, aesthetics, or history of a site and more on notions of relationship and inter-dependence. It is relatively easy to appreciate the tangible. Indigenous peoples also have a way of also appreciating the intangible and their full involvement in the management and guardianship of national and local heritage sites, especially those that have special links to indigenous populations is crucial to their ongoing protection for future generations.

Culture and the Delivery of Health Programs

Although the significance of culture to health has long been recognized, the study of culture tended to be euro-centric, viewing ethnicities from the perspective of western philosophies, nomenclature and practices. Over the past two or three decades, however, the significance of culture to health and to the delivery of health services has been considered from ethno-centric perspectives. Indigenous peoples have emphasized the importance of their own explanations of behavior based on distinctive world-views, and have drawn attention to the different understandings that they bring to health and to health services. Indigenous health perspectives and access to indigenous networks have been important tools for health promotion and health education and have recognized that cultural expertise is a pre-requisite for effective engagement with communities. Often there has been collaboration between cultural advisors and health professionals and in some countries partnerships between medical practitioners and traditional healers have been formed.

The place of cultural approaches to healing alongside conventional medical practices has been a matter of some controversy. Because each approach is based on different bodies of knowledge and uses evidence in quite different ways, assumptions have been made that one is inherently superior to the other. However, cultural healing focuses on a spiritual element while modern health care focuses on corporeal dimensions. There is no reason why the two cannot be used in parallel provided that the criteria for best practice in one situation are not arbitrarily imposed on the other. The validation

of competence is one area where there is significance difference. Unlike processes for certifying health professionals, not all traditional healers undergo a formal accreditation process. Instead their reputations hinge on community acceptance and the use of methods consistent with the groups cultural values.

The wisdom held by cultural healers can have valuable benefits for indigenous populations, if not for wider audiences. As part of the process of cultural protection and preservation the health sector can assist by creating space where healers can enhance their skills and at the same time contribute to a cultural renaissance.

Cross-References

- ► Cultural Awareness
- ► Cultural Beliefs
- ► Cultural Determinants
- ► Cultural Identity

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Cultural Protection

► Cultural Preservation

Cultural Relativism

Definition

Cultural relativism refers to the notion that because human, social and psychological characteristics are culturally produced, the diverse representation of these characteristics across human groups is relative to cultural variability. From this perspective, the moral values of different cultures cannot be compared. As a consequence, an outside critique on the basis of universal human standards – such as human rights – is not possible, because culturally different moral standards are all of equal worth. Thus, transcultural standards for the ethical assessment of cultural practices or human conduct are not objective or rationally valid, but always represent the imposition of one set of cultural values on another.

Cultural Sustainability

► Cultural Preservation and Protection

Cultural Universalism

Definition

Cultural universalism implies the existence of overarching principles (such as human rights) that are applicable cross-culturally and, therefore, could be used to determine the rightness or wrongness of specific cultural beliefs and practices.

Cultural Value

Synonyms

Cultural belief

Definition

Cultural value denotes values accepted by certain culture as true or real and as such as prominent feature

of social group. Cultural belief systems reflect our values and perspectives and at the same time can close our minds to accepting other ways of thinking and doing.

Culture

Synonyms

Civilization; Customs; Ethnology; Folklore; Lifestyle

Definition

Culture represents human behavior as integration pattern that includes thoughts, communications, actions, customs, beliefs, values and institutions of a race, ethnic, religious or social group.
Culture denotes way of life for an entire society and as such, it includes codes of manners, dress, language, religion, rituals, norms of behavior such as morality and law, and system of belief.
Culture influences behavior through customs such as use of or abstention from meat, alcohol, and tobacco; the practice of rituals such as circumcision; marital customs such as the prevailing age at which women marry; attitudes toward family size, childbearing, and child rearing; personal hygiene; disposal of the dead; and much else. People's values may be the most significant component of culture that affects behavior and through behavior, health.

Culture: Customs

► Ethics and Culture

Cumulative Incidence Ratio

► Relative Risk

Cure

► Healing

Customs

► Culture

Cutoff Level

Definition

In order to separate persons who probably have disease from those who probably do not have disease, a cutoff level must be set. If the human characteristic of interest has a bimodal distribution (curve with two peaks), a cutoff level is relatively easy to set up. In general, most human characteristics, such as blood pressure, are distributed unimodally (curve with single peak). For these continuous variables, a cutoff level using statistical considerations and/or biological information can be chosen. Unfortunately, such data is not available for many human characteristics but a decision must be made to establish a cutoff level above which a test result is considered positive and below which a test result is considered negative. For any disease, the optimum level has to be selected depending on the consequences of missing a few positives if the cutoff level is set higher or falsely classifying more negatives as positive if the cutoff level is set lower.

Cycloid Personality

► Cyclothymia

Cyclothymia

Synonyms

Affective personality disorder; Cycloid personality; Cyclothymic personality

Definition

Individuals with cyclothymia show a persistent instability of mood involving numerous periods of depression and mild elation. None of those depressive and manic episodes is sufficiently severe or prolonged to justify a diagnosis of ► bipolar affective disorder or

► recurrent depressive disorder. Cyclothymia is frequently found in the relatives of patients with bipolar affective disorder. Some patients with cyclothymia eventually develop bipolar affective disorder.

Cyclothymic Personality

► Cyclothymia

Cysticercosis

Synonyms

Infection with larvae of the pork tapeworm

Definition

Cysticercosis is caused by the larvae of the pork tapeworm (*Taenia solium*). The symptoms vary depending upon which organs are involved. If the skin or the muscles are only involved, then only mild symptoms appear, whereas if the eyes are involved then visual defects or even blindness can result. An infection of the central nervous system can cause meningitis.

Cytomegaly (CMV)

Synonyms

Cytomegalovirus infection

Definition

The cytomegalovirus belongs to the herpes virus group. Most infections are asymptomatic. CMV is spread by saliva or other infectious body fluids. Symptoms of the infection can be similar to mononucleosis, like pharyngitis, swelling of lymph nodes and an enlargement of the liver (hepatomegaly). Premature infants can develop CMV sepsis with a lethality of 20% if they receive a CMV positive blood transfusion. For this reason, these patients should only receive blood conserves that are CMV-negative.

DAHTA

Definition

DAHTA is the German Agency for Health Technology Assessment (DAHTA@DIMDI) at the German Institute for Medical Documentation and Information (► DIMDI). DAHTA@DIMDI offers the benefits of electronic publication with the goal of publishing timely, current research results that are affordable, quality assured, and peer reviewed for health policy decision making. Thus, the Agency can offer interested parties a publication platform for the systematic evaluation of medical processes, Health Technology Assessment (HTA).

DALY

Synonyms

Disability adjusted life year

Definition

Disability adjusted life years (DALY) is a health gap measure developed by the World Health Organization. DALYs represent the sum of years of life lost due to premature mortality (YLL) in the population and the years lost due to disability (YLD) for incident cases of health condition. The DALY concept goes beyond the concept of potential years of life lost due to premature death (PYLL) as it considers equivalent years of healthy life lost in disability states or poor health. One DALY stands for one lost year of healthy life and the burden of disease measured by the gap between the current health status and the ideal status of a life free of disease and disability. The years of life lost (YLL) are calculated by multiplying the number of deaths by the standard life expectancy at the age at which death occurs. The years lost to disability (YLD) for a specific cause in a specific time period are calculated by multiplying the number of incident cases in that period by the average duration of the disease and a weight factor reflecting the severity of the disease on a scale from 0 (perfect health) to 1 (death).

Damages

Synonyms

Compensation

Definition

Damages are designed to compensate violations of personal or property rights resulting from actions or omissions of a person or organization that led to their liability under private law. Damage payments particularly result from tort liability and liabilities resulting from breaches of contracts. Most jurisdictions differentiate between compensatory (economic) damages, which are aimed at restoring the injured person/organization in kind, and damages for (noneconomic) pain and suffering. Some jurisdictions, particularly the USA, are additionally known for awarding so-called punitive damages.

Danger Defense Powers

► Police Powers

Daoism

Definition

Synonym: 'teaching the way'. A Chinese philosophical religion that attracts some 60 million followers and which is accepted as an authentic representation.

Data

Definition

In general, the term data refers to factual material used as a basis for discussion and decision making, while in biostatistics it refers to the material available for analysis and interpretation. By definition, data are facts, observations, realizations of one or more underlying variables recorded on one or more observational units. Data can be either categorical or numerical (otherwise known as qualitative or quantitative). Data are categorized according to the type of values used to quantify observations as discrete or continuous data. Data may be subdivided also according to the scale on which these data are measured (nominal, ordinal, interval, ratio) or by the process by which they were gathered (longitudinal data, time-series data, repeated measured data, paired data, cross-sectional data, etc.). Data are often thought of as statistical or quantitative, but they may take many other forms as well – such as transcripts of interviews or videotapes of social interactions. Non-quantitative data are often coded or translated into numbers to make them easier to analyze.

Data Access

Definition

Data access is access to collected and compiled data for the purposes of analysis and reporting. Data access can be allowed to different persons, depending on their nature: access to fundamental data for statistical analysis can be provided to statisticians, access to pre-interpreted data to provide decision support can be provided to health professionals, and access to presentations based on data can be provided to the public for educational purposes.

Data Accessibility

Definition

Data accessibility is a criterion of ► data quality, and is met when authorized health professionals are provided with the means to find, obtain, or make use of the data for various purposes. Considering the rising need to ensure confidentiality of ► patient data, access to patient data and other health information must be legally controlled.

Data Accuracy

Definition

Data accuracy is a criterion for ► data quality. Data are accurate if they meet characteristics proposed by "gold standards". This criterion includes data validity—the capability of a data item to measure what it is meant to; and reliability—the capability of a data item to measure what it is meant to when the measurement is repeated.

Data Acquisition

► Data Acquisition and Protection
► Data Collecting

Data Acquisition and Protection

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Synonyms

Data acquisition; Data collection; Data aggregation

Definition

Acquisition and use of health personal data are done in different ways. It is a necessary condition for the government to organize, within the reasonable limits of its resources, its most cost-effective health services, and its activities in ways that best prevent illness and disability,

and promote health among its population. "*Data protection*" refers to laws designed to protect the data of individuals or organizations from improper disclosure or use.

Basic Characteristics

Data Acquisition

Collection, aggregation and interpretation of personal data has become part of our computerized society. Personal data are regularly acquired from many sources, bringing about an increasing number and size of datasets. It is so even with health data, since collection, storage and dissemination of health information is partially automated. Each of the health *data acquisition* processes (surveillance, registries, evaluation, emergency data collection, comprehensive surveillance initiatives, secondary analysis of administrative data) requires high quality data in order to help provide more effective clinical care, to assess the quality and cost effectiveness of health services, to monitor fraud and abuse, to track and evaluate access to health services and patterns of morbidity and mortality, to research the ► social determinants, prevention (► prevention and health promotion), and treatment of diseases.

One of the main methods used in public health for health data acquisition is ► surveillance, which implies reporting to health authorities notifiable diseases. Surveillance history goes back to the seventeenth century, when Graunt analyzed London death records and drew inferences on the changing shape of mortality over a 70-year period. But it was not until the late 19th century that systematic reporting of infectious diseases began and continues to this day with many infectious diseases, like the sexually transmitted diseases and tuberculosis, being notifiable, thus allowing a society to monitor, plan and intervene to counteract any threats.

A surveillance system requires a physician to report certain diseases, when they are diagnosed, by filling out a form with information on the patient (name, age, sex, race and residential address), the diagnosed disease, the date of diagnosis, and the name of the reporting physician. This is called "► passive surveillance" in that the local health department relies on physicians to report. In some instances, a health department will proactively call physicians' offices to ask if they have identified any cases of a particular condition; in this instance, the information required is more detailed because the disease is often not well understood and the surveillance system is utilized as a means of collecting the information that may help identify its causes or risk factors. This "► active surveillance" is more expensive than passive surveillance and it is typically reserved for relatively infrequent but important infections or events. "► Sentinel surveillance" is a type of active surveillance in which a sample of physicians are contacted regularly to learn about any diagnosed cases of a particular disease.

Public health surveillance poses some ethical questions: when does the state have the right to require physicians and health care institutions to report, by name, those with certain conditions? Do such requirements violate the confidentiality that serves as a foundation of the clinical relationship? As for other fields of public health activities, the conflict is between individual ► privacy and ► confidentiality and the public good.

These ethical dilemmas become more prominent when surveillance is undertaken not only to track patterns of morbidity and mortality but also to initiate restrictive measures, e. g. compulsory treatment, and ► quarantine. The accepted practice of identifying individuals by name was questioned once HIV/AIDS came along since there was a strong social stigma attached to the condition. In examining the possibility of alternatives to the use of name based reporting, it was necessary to consider the appropriateness of earlier practices. It had to be evaluated whether or not the use of ► coded data, which imposed additional costs, was justified in the name of privacy, keeping in mind that data that relied on coded identifiers was less valuable than data that relied on name identifiers. In the USA it took almost 20 years for the Centres for Disease Control (CDC), in 1999, to reluctantly accept that coded data could be used in case reporting.

Data can be acquired systematically in a public health system through disease registries, program evaluations, and recorded emergency responses. A ► disease registry usually aims to collect information on every individual with a particular condition (for example a cancer registry would include information on the primary site and morphology of the cancer) within a given geographical area. In such circumstances diagnosing physicians are not required by law to report diagnoses to registries; instead, the registry personnel identify cases

through hospital record reviews. The purpose of a registry is to gather information that may advance the scientific understanding of a disease and provide ► incidence and ► prevalence data.

Data acquisition for disease registries poses critical ethical dilemmas when they include some behaviors or characteristics (injection drug use, some sexual practices, race, reproductive history, etc.) which may play a role in the ► etiology of the disease (therefore they need to be investigated) but are, at the same time, subject to social stigmatization. When case registries require ► informed consent for acquisition of personal data, then there is a high level of non-participation through selective non-enrollment of specific sub-population groups that affects the accurate recording of disease incidence, prevalence, trends in morbidity and mortality and even etiology. However, case registries that do not require consent raise important concerns about the issue of data protection.

When a public health program has been implemented, such as the promotion of the wearing of car seat belts or an anti-smoking campaign, data are often collected to evaluate the ► efficacy (whether the program can work in a single instance), ► effectiveness (whether the program works more generally in many settings), ► efficiency (whether the program is economical), and other characteristics of the program.

Public health programs are typically implemented in non-emergency situations. In an emergency, such as an acute disease outbreak, data may be collected on each case in order to guide the emergency response.

More and more datasets are in an electronic format which, on the positive side, facilitates record linking, but, on the negative side, requires the inclusion of names and other identifying information to make linkages both possible and accurate.

Data Protection

Electronic data collection contributes to a general mistrust of people about privacy protection, however, legal, ethical, and ► human rights principles provide some level of individual control over the circumstances in which their identifiable health data are acquired, used, disclosed, or stored. A new concept has developed from these arrangements of systematic surveillance and datasets: the "► data image". Each name entered in a database becomes the sum of all information available in all datasets linked to that name; to all those who have access to databases that name is actually the data image of the real person. The data image is essentially linked to the individual in a reflexive relationship: the individual contributes additional data to the data image, and the data image is used to form impressions and take decisions about the individual; incongruities can arise when the data image and not the actual patient becomes the basis for therapeutic decisions.

The concept of "data image" is motivating data protection advocates. In addition, public uncertainty about the dissemination and use of personal data has grown, and there have been calls for laws to be introduced to protect data and assure their appropriate use.

A very sensitive area where data acquisition and protection come into conflict is in the field of ► genetics. Surveillance data can determine:

- the population frequency of genetic variants that predispose people to specific diseases, both common and rare;
- the population frequency of morbidity and mortality associated with such diseases;
- the prevalence and effects of environmental factors known to interact with given genotypes to produce certain diseases.

At times, genetic interventions involve specific ethnic groups or individual conditions that may be objects of social stigmatization. In any case, genetic information is the most sensitive and personal data an individual possesses.

When registries or surveillance data are to be used for ► research purposes confidentiality becomes a very important issue; disclosure could harm the individual in various areas (psychological, employment, family, insurance, housing, and social). However, it appears to be more and more necessary for epidemiologists and researchers to have access to nominal data that has been collected without consent.

Health data acquisition and protection are strongly interlinked. On the one hand, the ability to share high quality data to accomplish the communal values or goals of public health practice is justified under the ethical theory of ► utilitarianism and the moral principle of ► paternalism; on the other hand, restricting access to health information and respecting the right to privacy has been assimilated into law under the ethical principle of confidentiality by producing legal norms for data protection.

"Guidelines for the protection of privacy and transborder data flows of personal data" is an official document on data protection issued by the Organization for Economic Co-operation and Development (OECD) in 1981. It defines some principles (► ethical principles) for data protection, including collection limitations, data quality, purpose specification, use limitations, security safeguards, openness, individual participation and accountability.

Several legislative measures on data protection have been taken since then in the USA, the EU, the UK and other countries.

However, the value of individual privacy regarding health information in public health practice is not absolute. Sharing identifiable health data may be justified when needed to promote communal good and uphold values (e. g. public health, human research), or when necessary to prevent harm to others (e. g. duty to warn requirements).

Advanced databases designs on the one hand, and transparent and strict guidelines on the use of databases by public health personnel subject to professional secrecy on the other hand, could provide possible solutions to the problems presented by the conflicts between the issue of health data acquisition and the issue of protection of privacy.

Cross-References

► Active Surveillance
► Coded Data
► Confidentiality
► Data Image
► Disease Registry
► Effectiveness
► Efficacy
► Efficiency
► Ethical Principles
► Etiology
► Genetics
► Human Rights
► Incidence
► Informed Consent
► Passive Surveillance
► Paternalism
► Prevalence
► Prevention and Health Promotion
► Privacy
► Public Health Surveillance
► Quarantine
► Research
► Sentinel Surveillance
► Social Factors
► Utilitarianism

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Data Aggregation

► Data Acquisition and Protection

Data Application

► Data Dissemination and Utilization

Data Authentication

► Data Verification

Database

Definition

A database is a structured repository for data, consisting of a collection of data and their associated data model (a schema by which data are organized), organized in a machine-readable format and usually stored on a computer system. The existence of a regular and formal

indexing structure permits rapid retrieval of individual elements of the database. A flat file database is organized like a card file, with many records (cards), each including one or more fields (data items). A relational database is organized as one or more related tables, each containing columns and rows.

Database of Abstracts of Reviews of Effects (DARE)

Definition

DARE contains summaries of systematic reviews that have met strict quality criteria. The reviews included are about the effects of interventions. Each summary also provides a critical commentary on the quality of the review. The database covers a broad range of health and social care topics and can be used for answering questions about the effects of interventions, as well as for developing guidelines and policy making.

Database Error Rate

Definition

Database error rate is a measure of data quality. It is defined as the number of errors divided by the total number of ► data. In practice, estimate of this rate can be obtained by counting the number of errors and dividing it by the total number of verified data, i. e. data sample size. The precision of the estimate of database error rate is associated with data sample size; increasing the sample size will raise the precision. An acceptable database error rate should be defined prior to the study beginning, and must be considerably below 1%. Finally, any decision about the error rate depends on the aims of the study. It is often defined at 0.1% level. Database error rate can be reduced through the process of ► data validation.

Databases, Full-Text

Definition

A full-text database is a compilation of documents or other information in the form of a database in which the complete text of each referenced document is available for online viewing, printing, or downloading. In addition to text documents, images are often included, such as graphs, maps, photos, and diagrams. A full-text database is searchable by keyword, phrase, or both. Important full-text databases in HTA are MEDLINE, EMBASE, and the Cochrane Library.

Database of Systematic Reviews

► Cochrane Collaboration
► Cochrane Library

Data Classification

Definition

Data classification is a critical function for increasing the efficiency of the system because it helps users in the retrieval of significant data. Computer programs can effectively order or sort data in different ways – in numerical or alphabetical order, or according to specific criteria: disease, gender, and age.

Data Coding

Definition

Data coding is the classification of data and assignment of a representation for that data, or the assignment of a specific code to a narrative statement of diagnoses and procedures.

Data Collecting

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Synonyms

Data acquisition; Data gathering; Data generation

Definition

Data collecting is the process of gathering data from various sources. Data acquisition includes both data collection and data generation that refers to the input of standard code formats.

Basic Characteristics

What Data are Collected?

Health data are important because they measure a wide range of health indicators for a community, provide comparisons for clinical studies, can be used to assess costs of health care and help identify needed prevention targets. They are also important for program planning and evaluation as they can be used to find a baseline against which to measure in the evaluation phase (► data, information, knowledge). (Allee et al. 2004)
Standard data elements collected in health care include: (Abdelhak et al. 1996; Smith 1996)

1. Patient characteristics: patient identifier, name, address, date of birth, gender, marital status;
2. Provider characteristics: unique hospital identifier, unique physician identifier, diagnostic and treatment information, admission date and status, admitting diagnosis code, condition code, diagnosis code, service date, service unit, description of service, principal and other diagnoses and procedures, date of procedure, emergency code;
3. Insurance/payment information: insurance number, insured name, relationship to insured, employer name and location, covered period of insurance, payer, total charges, non-covered charges, prior payments, amount due from patient, revenue codes, treatment authorization codes.
4. Secondary health care data: derived from the primary by statistical analysis – incidence and prevalence rates, mortality rates, vital statistics, registries for certain diseases.
5. Medical knowledge: the sources of medical knowledge can be medical textbooks or journals, the Internet or other colleagues, but the problem is to find data that can be adapted to the present medical situation.
6. Other data: other scientific, legal, political, social, ethical and public data obtained from various sources, which are relevant and important for decision-making.

In general, when patient data is collected, one must keep in mind that data can become information only if three aspects of the information are respected: the ► syntactic aspect, the ► semantic aspect and the ► pragmatic aspect, and if the content of the information is known (► health information).

Who Collects Data?

Data are not only collected by health professionals. Of course, physicians are in charge of collecting data such as patients' complaints, history of past illnesses, family and social information and results of physical examinations; therefore, they acquire data in several forms and decide what additional data should be collected. Nurses collect data from their care plans and during follow up of patients (observation, examination and history data in various forms). Other professionals involved in health care are responsible for the collection of specific data: laboratory personnel, radiology technicians and administrative personnel, who collect demographic and insurance data etc. (Dinca-Panaitescu 2003)

How are Data Collected?

The mode of data collection depends on its source. If people are involved (physicians, nurses, technicians, administrative workers or patients), data are collected manually, either on paper or entered into a computer (questionnaires or data collection forms), but if the medical device produces data (laboratory or medical apparatus, images, ECG readings etc.), data is collected automatically through built-in interfaces to computer systems.

Causes and Sources of Poor Data Collecting

Some causes and sources of poor data collection include the following: (van Bemmel 1997; WHO 2003)

- Poorly designed data collection forms with no logical sequence – health staff may find it difficult to use these forms or may collect data using other forms, such as previous versions of the forms that they find more appropriate.
- Inefficient staff, lack of training in interviewing patients and recording details, and lack of understanding of the need for accurate data collection. Although trained in procedures, staff may not collect all of the required information at the time of first

attendance due to lack of time, pressure of work, and lack of understanding of the consequences of such action.
- Lack of professional judgment by health care providers when recording data about a patient and his or her treatment. This refers to the possibility of absent-mindedly recording objectively false data.
- Delay in recording data – when data are not recorded at the point of contact with a patient the possibility of incurring errors increases dramatically.
- Data redundancy – the presence of a great amount of data impairs the physician's ability to find appropriate data to be used.
- Lack of understanding of data quality by health care professionals. Data collection must be understood to be the prime step for obtaining information that will be used in the process of decision-making regarding the patient's health or regarding the community as a whole. Professionals must recognize that all these actions serve only one purpose – obtaining high quality data (► data quality).

Data Verification

As data collection is highly dependent on humans, the data are often imperfect, and the collection process can be the origin of various errors. Validation of gathered data in the early phases of data processing reduces costs in the system ► data errors.

Typical errors in data collection include missing data (lost or miscoded data), inconsistent data (value out of range or false data), errors during measurements, and other sources of bias (incorrect answers from the patient, noise on biosignals, or errors in biochemical analyzes).

The process of ► data verification must be performed early in the process of data collection. It can be carried out manually, preferably by the person who knows the correct information, or automatically, when the software is designed to check for possible ► syntactic errors (errors in the format in which data is stored) and ► semantic errors (errors in the meaning of data).

Standards for Data Collecting

Standards (► data standards) that need to be established for optimal data collection have been proposed by the World Health Organization and the EUCOMP-project financed by the Commission of European Communities: (WHO 2003; van Mosseveld 2000)

- Standards regarding data collection – data must be collected in specific data forms, in a logical sequence, the process of data entry in the collection form must be as simple as possible, and each entry must be dated;
- Health professionals must be educated on the importance of timely and accurate documentation of patient care data; staff must be trained to control the validity of data, avoid mistakes, sign and date each entry, and avoid alterations or deletions of data;
- Standards and checks – data must be collected in standard forms, guidelines for the collection of data must be developed, a basic template for a data collection system that allows for input and basic analysis of the data must be developed. Routine checks on data for accuracy, validity, reliability, legibility, completeness and accessibility in both manual and computerized systems are advisable.

Conclusion

All health care activities involve gathering, analyzing and using data. Adequate and good quality data are the precursors of good quality health information that can be used for decision-making regarding the patient, as well as for research, national and international comparisons, and support to national health policies when appropriate. As it is the first step in providing information, data collection must meet the required quality standards and the requirements of the patient, health care provider, health care facility and government. It is important that all health care professionals and administrative staff understand the standards regarding data collection and apply them in their work.

Cross-References

► Content Management
► Data Errors
► Data, Information, Knowledge
► Data Quality
► Data Standards
► Data Verification
► Health Information
► Information Content
► Pragmatic Aspect of the Information
► Semantic Aspect of Data/Information

- ► Semantic Errors
- ► Syntactic Aspect of Data/Information
- ► Syntactic Errors

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Data Collection

► Data Acquisition and Protection

Data Completeness

Definition

Data completeness is one of the most important criteria of ► data quality. It is defined as the percentage of data missing at a given point. In order to achieve completeness, users must have access to multiple sources of information.

Data Computation

Definition

Data computation is the application of mathematical or statistical models for the transformation of ► primary patient data, and analysis, synthesis, or evaluation of ► secondary patient data.

Cross-References

► Data Processing and Storage

Data Confirmation

► Data Verification

Data Dissemination and Utilization

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Synonyms

Data dissemination:

Data sharing; Data exchange; Data distribution; Data transfer

Data utilization:

Data usage; Data application

Definition

Data dissemination is the process of transfer of data between users. In health care, data dissemination includes the distribution of general data and data from the patient's medical record. Data utilization refers to the application of information for decision-making in health care, statistical analysis, education, policy development and development of health care services, etc.

Basic Characteristics

Data Dissemination

Advances in information and communication technologies have made the global distribution of information and knowledge effortless and have made data available to multiple users the instant they are produced. More importantly, users have become more demanding in their need for information, requiring high quality data for producing new information or knowledge themselves (Edejer 2000).

Data to be distributed can be general – data that is not related to medical records or which originates

from books, journals, databases, collections or records, which are used for education; or case-oriented – data from the medical record, where the purpose is decision-making in patient care.

An important issue in the retrieval and distribution of data is security, referring both to access to data (► data access) and possible changes or damage to data.

Since the beginning of electronic data processing, users have invested effort to store information and to make it available again. The process of ► information retrieval can be performed by several techniques (Gardner 1997).

- Information retrieval systems based on the Boolean model (after George Boole, a 19th century English logician) are most widely used; relevant information is found by creating an expression consisting of the desired terms and operators with the meanings "AND", "OR", and "NOT". These information retrieval systems offer a list of all documents that contain the information of interest and show in which position. The Boolean system is fast, the principle is conceptually simple and it is easy for users to see why documents do or do not match the query. The disadvantages are that the user must learn the syntax for expressing queries, the all-or-none nature of the matching, the list of matching documents is too long, and the results are not ordered according to their relevance.
- Information retrieval systems based on the ranking model deal with documents as objects described by the value of properties related to the words they contain. The search is performed by creating a list of terms (without the need for operators), and the documents in the collection can be ranked in order of their similarity to it. These systems are computationally more demanding, but still commercially available. The only problem is short ambiguous terms, like "arms" – either a part of human body or a weapon, etc.

In many cases, information retrieval alone is not sufficient to find the requested document by search criteria. This is why documents contain the so-called "► metadata", or data about data, which, alongside the typical bibliographic information, contain key words related to the content of the document (Beier 2004).

Systems which involve information retrieval include Index Medicus, commercial interfaces to Medline (such as Ovid and SilverPlatter), and search engines for the ► World Wide Web, such as AltaVista or Lycos. Systems that do not involve information retrieval include age and sex registers, and most electronic medical records – these might rather be referred to as database systems.

Many studies have determined that the successful use of retrieval systems or computer systems in general depends on the operator's cognitive characteristics and general knowledge, rather than on age, gender or personality characteristics (Hersh et al. 2000).

Data Utilization

Generally speaking, the purpose of data is to create information (► data, information, knowledge). Data may be used for various purposes (► health information):

- Decision-making in health care, directly related to the patient or population that the data were obtained from;
- Statistical analysis and computation of health indicators for national or international comparisons;
- Education of health professionals and performance of scientific surveys;
- Public policy development and funding of health care services, etc.

Information can be used only if it is useful, which is determined as proportional to the relevance and validity of the information, but inversely related to the work involved to access the information (Smith 1996). The relevance of any information is based on the frequency of exposure to the problem being addressed and the type of evidence being presented. The validity of the information is the likelihood of it being true, and the work to access the information is the time and effort that must be spent extracting the information. The ideal information source will be directly relevant, contain valid information, and accessible with a minimal amount of work.

Dissemination of Information on the Internet

The ► Internet is a mode of ► communication that crosses the boundaries of all countries, and it is estimated that almost every sixth to seventh person worldwide is using it. Regarding health issues, health consumers are using the Internet to find information on diseases, healthy lifestyles, nutrition, fitness, and pharmaceuticals.

Health information on the Internet ranges from personal accounts of illnesses, virtual communities that support people with specific health problems and e-mail communication between physicians and patients, to journal articles, fact sheets and press releases from leading health organizations. The Internet is increasingly being used for health care delivery, not only in terms of telemedicine for remote diagnosis, but also for health promotion and education interventions (Powell 2003).

Nevertheless, the Internet is having a profound impact on health and health care. It has the potential to improve the effectiveness and efficiency of health care delivery, empower and educate consumers, support decision-making, enable interaction between consumers and professionals, support the training and revalidation of professionals, and reduce inequalities in health. On the other hand, a wide range of false information can be found on the Internet, created and represented by individuals, commercial organizations or research groups. The impact of the distribution of poor health information on the public is still unclear, but the quality of information has become a prime concern (► e-health) (Eysenbach et al. 2002).

Criteria for determining quality can be made by applying standards for all data quality. Information must be accurate and true, complete, relevant, adequately presented so that consumers can understand it, and, most of all, the privacy of the user must be protected (► data quality) (Calabretta 2002; Purcell 2002).

Several organizations have developed criteria to guide and evaluate health-related website content. The Health on the Net Foundation has published the ► Code of Conduct to help standardize the reliability of medical and health information available on the Internet (HON 1997). The eight basic principles that medical and health websites must fulfill are outlined below:

1. **Authority** requires a clear and fair statement to distinguish whether the medical or health advice on the site is given by medical professionals or by non-medically qualified individuals or organizations;
2. **Complementarity** means that the information is designed to support, not replace, the patient-physician relationship;
3. **Confidentiality** of data relating to individual patients and visitors is guaranteed;
4. **Attribution to clear references** means that source data must be supported with a html link to that data;
5. **Justifiability** requires support for any claims relating to the benefits/performance of a specific treatment, commercial product or service;
6. **Transparency of authorship** is assured by providing contact addresses of authors so that visitors can seek further information;
7. **Transparency of sponsorship** is assured by identifying commercial and non-commercial organizations that have contributed funding, services or material for the site;
8. **Honesty in advertising and editorial policy** refers to avoiding confusion for the visitors by distinguishing between original material, and that created for advertising on the website.

Problems related to access to information on the Internet could be due to:

- Retrieval of inaccurate and irrelevant information – consumers are concerned about the quality of health information. The best way to overcome this problem is to search sites run by government agencies, medical journals, or evidence-based groups.
- Language barrier – since most Internet postings are in English, it is important that local intermediaries read, translate, and convert the information into content that is relevant to the local context.
- Literacy barrier – refers to barriers in the use of new technologies. An initial passive behavior of consumers can easily be transformed into active participation with adequate training (Edejer 2000).

Conclusion

Information can be used for various purposes. The implementation of new communication technologies, such as the Internet, has increased the dissemination and application of information worldwide. Beneficial consequences are expected for health professionals, who will have increased access to evidence, policy and guidelines, and training and professional development; health consumers, who will be provided with good health information; and health systems, which will benefit from research and implementation of evidence-based health policies.

Cross-References

► Code of Conduct
► Data Access

- ► Data, Information, Knowledge
- ► Data Quality
- ► Data Synthesis
- ► e-Health
- ► Electronic Data Interchange
- ► Health Communication
- ► Health Information
- ► Information Presentation
- ► Information Retrieval (IR)
- ► Interchange
- ► Internet
- ► Intranet
- ► Metadata
- ► Telecommunication
- ► World Wide Web (WWW)

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Data Distribution

► Data Dissemination and Utilization

Data Entry

Definition

Data entry is the process of entering data into a computerized database or spreadsheet. Data entry can be performed by an individual typing at a keyboard or by a machine entering data electronically.

Data Errors

Synonyms

Incorrect data

Definition

Data errors are incorrect results produced during data collection. Typical errors in data collection (► data collecting) include missing data (lost or miscoded data), inconsistent data (value out of range, false data), and errors during measurements (incorrect answers from the patient, noise on biosignals, or errors in biochemical analyzes).

Data Exchange

► Data Dissemination and Utilization

Data Gathering

► Data Collecting

Data Generation

► Data Collecting

Data Image

Definition

Data image refers to the sum of all information 74/100,000 available in all datasets linked to a spe-

cific name; to all those who have access to databases that name is actually the data image of the real person. The data image is linked to the individual in a reflexive relationship: the individual contributes additional data to the data image each time more personal information is given through any electronic database, and the data image is used to gain more knowledge about the individual; one of the contradictions is that the data image and not the person becomes the basis for some decisions. The concept of "data image" and the public uncertainty about the dissemination and use of personal data are motivating the call for laws to protect data and assure their appropriate use.

Data, Information, Knowledge

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Definition

Data are measurements of some characteristics of either a person or a thing. In the information system, data are given facts from which others may be inferred, a message that does not evolve, the carrier of information. In isolation, i. e. without context and analysis, data have little meaning.

Information is data organized into meaningful unions, data placed in context with relevance, purpose and meaning. Unlike data, information has various purposes in creating knowledge, decision making and guiding further actions.

Knowledge is the collection of all that is known; the awareness or familiarity gained by experience, a person's range of information, a theoretical or practical understanding of a subject, language etc. In an information system, knowledge is the application of information by the use of rules.

Wisdom is far beyond the accumulation of knowledge; it is the union of experience and knowledge with the power of applying them. Wisdom is the ability to think and act utilizing knowledge, experience, common sense and insight (The Knowledge College 2001; Lumpkin 2003).

Basic Characteristics

Data – Origin of Information

The starting points for health care information are data and the collection of data. In the context of health care, data refers to ► patient data. There are two types of data – primary data and secondary data: (Abdelhak et al. 1996)

- ► Primary patient data are obtained from the original data source – all documentation in the patient's health record, as well as hospital reports, daily ward census etc. Primary data are usually detailed, poorly structured, incomplete and inaccurate.
- ► Secondary patient data are derived from primary data – disease and procedure indexes, health care statistics, disease registries. Secondary data are created in a highly standardized way, making information derived from them comparable to other sources.

In order to interpret data – to make sense of the facts and use them – the data items need to be organized. Once organized, data become information. The process of data collection, storage, coding, transmission utilization and presentation is discussed in other sections.

Creation of Information

The process of producing ► medical information is very complicated and demands various skills from the physician. The physician must apply clinical knowledge and skills to acquire the relevant data from the patient. This data is recorded as a medical history. Then, before taking action, the physician collects relevant data from other medical sources, such as textbooks, the internet or other physicians, and compares them to the data stored in the patient's record. By using all the above-mentioned knowledge sources, the physician interprets the given facts, organizes them, structures them and creates information (Wyatt 2005).

The information generated in this way is highly dependant on its context for three reasons: (Berg 2004)

1. Data are produced for a purpose, and their specificity is directly tailored to that purpose. For example, when a patient's health state is stable and all signs are normal, a physician need record only vital functions. Failing to record all functions cannot be interpreted as incompetence or negligence because it will be deduced that empty fields imply that the patient's signs are normal in those fields.

2. Information is not a simple aggregation of isolated facts, but a mutual interaction and elaboration of data from various sources. This process depends on a specific situation or context, and evolves over time. For example, two patients who were treated with the same antihypertensive drug were found to have the same blood pressure 130/90 mmHg. Taking the contexts into consideration (e. g. different sex, or age or medical history) a physician will create different types of information and probably take different actions in the two cases (cease the therapy, continue with therapy, replace therapy, demand weight control or restrict sodium intake etc.).
3. Physicians assess the adequacy of medical information in the light of the credibility of its source. For example, medical information obtained from an experienced senior resident is usually considered more reliable than that generated by an inexperienced physician; or the results obtained from one laboratory are considered more specific than those obtained from another, simply because one is equipped with modern, highly specific technology and the other is not.

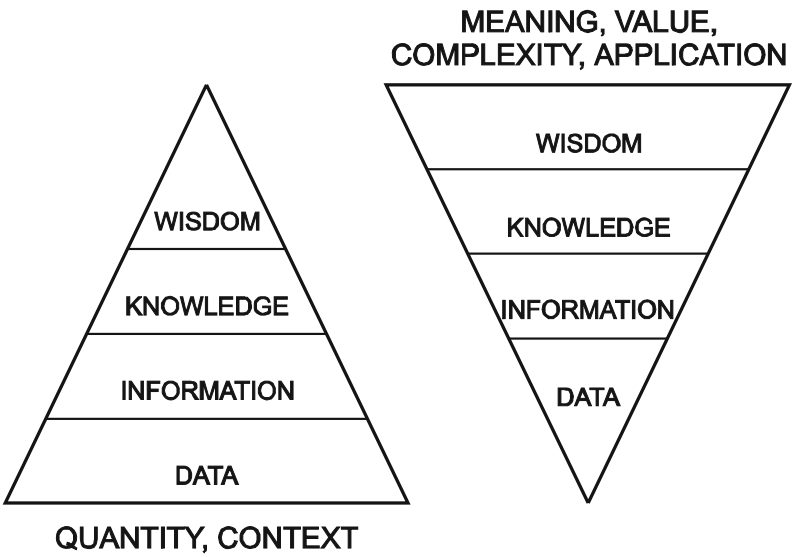
Thus information must not be used for other purposes outwith its context. This is formulated as the **"First Law of Medical Informatics"** (► law of medical informatics, ► medical informatics, ► health information). Two **"laws" of medical information** support this law:

1. The first "law": "The further information has to be able to circulate, the more work is required to disentangle the information from the context of its production." The disentangling of the information from its primary context requires work. Information that was understandable within its direct context of production has to be "made" transportable, understandable and recognizable outside of the conditions of its production.
2. Since work is required to make data suitable for accumulation, the second "law" is: "The more active the accumulation will be (sic), the more work needs to be invested." This "work" usually includes data storage (on paper, on a film or in a computer), data coding or structuring, or breaking down into simple elements, analyzing or modeling; all performed by health care professionals in order to make information usable for other purposes (Berg 2004).

Access to Information

Users of health information are facing some challenges regarding the access to health information in the development, maintenance and use of population-based health and health services (Centre for Health Services and Policy Research 2005). The proposed dimensions of information access are:

1. **Availability** is the relationship of volume and type of existing information resources to volume and types of information needs (as in economy, relationship between supply and demand). When looking for information, the user must: find out if the data or information exists in the first place, where it is stored, recognize the format in which it is stored and recognize its adequacy for use in research etc.
2. **Accessibility** is the relationship between the location of information supply and the location of users. This means that users must take into account: the means by which they obtain information (by internet, in the bookstore, in the library, by e-mail), the "physical convenience" of the data and the need to have license to access data. Furthermore, users' time and costs in obtaining information must be taken into consideration (e. g. price of a book, access by internet, specific software, time needed to obtain it, etc.).
3. **Accommodation** is the relationship between the manner in which the supply resources are organized to accept users and the users' ability to accommodate to these factors and the users' perception of their appropriateness. This refers to the appropriateness of the policies or procedures needed to access data, such as the requirement for identification of the user, the requirement to pay for information and time-limited access, etc.
4. **Affordability** refers to the relationship of prices of services to users' ability to pay. This is a pure question on information costs. Some users recommend that all public data should be free of charge, but in some situations, a certain cost for information seems reasonable. Information costs are especially high for data captured by health professionals in the structured, coded representation. The implementation of technologies such as the electronic health record has decreased the work of data technicians in updating and structuring data records and consequently decreased the costs of information.



Data, Information, Knowledge, Figure 1
Process of creation: data-information-knowledge-wisdom

5. **Acceptability** is the relationship of clients' attitudes about providers and providers' attitudes about clients. This raises the essential question of information privacy and security and consumers' protection from the misuse of medical information. The conflict may occur if a health care provider wants to use patients' health data for research, publishing or commercial purposes without patients' consent, or in spite of their disapproval (► consumer protection).
6. **Adequacy** is the suitability of data for users' needs. This is a question of data quality. Users require that data quality should be a priority. Standardization of data collection and processing, training of personnel, education of data users, the development of better data documentation, and the introduction of information technologies such as telephone-assisted surveys and electronic health records would all greatly improve ► data quality.

Knowledge

Human knowledge is a collection of individual theories elicited from scientific observations. In health care, knowledge refers to ► medical knowledge. The process of creating knowledge, from data organized into information, is sometimes referred to as the "Data-Information-Knowledge Ladder" (The Knowledge College 2001) or "Knowledge Spectrum" (Pantazi 2004), however, in the "Data-to-Wisdom-Continuum" (Godbout 1999) a further step is taken to the creation of wisdom. This process is represented on Fig. 1.

The process of creation has two dimensions: one refers to the quantity and context, the other to meaning, value, complexity and application. As represented in Fig. 1, during the process of creation, the dimension of quantity and context is constantly decreasing, while the level of complexity, meaning, application and purpose is increasing.

The creation starts from data – plain, simple facts, recordings or transactions or events gathered from observations and measurements. As such, data does not carry meaning, has little value and is understandable only in connection to the context of its production. Data is a means of processing transactions, and it is therefore only the raw material for the production of information. A large quantity of data, with many connections and interrelations, is needed to produce information. Information is less connected to its context, and is certainly more generally applicable than data. The purpose of information is to enable decision making, and it becomes further refined through communication and utilization (Sender 2004).

Information becomes knowledge when an individual (or a group of people) accept it as being a proper understanding of what is true and a valid interpretation of reality (Godbout 1999). Finally, combining knowledge and experience, by getting a deep insight into reality, one developes the ability to discern or judge what is true, right, or lasting, which is wisdom. Knowledge

enables one to identify boundaries and directions while wisdom enables one to offer advice. Unlike data and information originating from complex reality, knowledge and wisdom transcend reality and cross to the level of abstraction.

There are various classifications of knowledge. Knowledge is traditionally categorized into implicit and explicit (Hussain 2004; Pantazi 2004; Sender 2004).

► Implicit knowledge is the cumulative store of experiences, insights, expertise, know-how, trade secrets, understanding and learning. It also integrates wishes and hopes with views, opinions and ideologies. Sometimes referred to as embedded knowledge, it is unstructured and intangible and is thus hard to codify.

► Explicit knowledge is the abstract, symbolic type of knowledge presented explicitly in documents such as textbooks or guidelines, procedural guides, reports, strategies etc. It may be applied to both specific and generic problems and relies on an explicit reasoning mechanisms. It forms the base of a given value system. Since knowledge is a product of the human brain, all knowledge is originally individual. **Individual knowledge** can match solutions to problems in a personal, unique context. **General knowledge**, however, is the explicit, abstract, propositional type of knowledge, suitably applicable to context-independent, generic problems. General knowledge is more difficult to use in specific contexts because of the gap between the general knowledge itself and a particular application context.

The globalization of the digital world has led to an increasing complexity in the **management of health information** (► Health Information Management) and ► knowledge management. In the global economy, where capital is mobile, technology spreads quickly and goods are produced at lower costs, the most important resource becomes the knowledge. This knowledge-based economy will affect culture; social and economic dynamics, social classes and social problems, and changes in health systems and health services are to be expected.

Conclusion

Data, information and knowledge form a complex continuum, a dynamic state of interactions where data become information, information is used to create knowledge, and knowledge is applied to gather new data. These interrelations are of prime importance in health, because they are the bases of everything that health professionals think, learn and do.

Cross-References

► Clinical Informatics
► Consumer Protection
► Data Quality
► Explicit Knowledge
► Health Information
► Health Information Management
► Implicit Knowledge
► Knowledge-Based Information
► Knowledge Management
► Law of Medical Informatics
► Medical Informatics
► Medical Information
► Medical Knowledge
► Patient Data
► Primary Patient Data
► Secondary Patient Data

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Data Legibility

Definition

Data legibility is a criterion of ► data quality that refers to appropriate representation of data such that it improves the readability and understanding of data. This can be applied to all forms of data—written text, standard coding, standard images, and biosignals, etc.

Data Management

Synonyms

Data preparation

Definition

Data preparation for analysis precedes data description (► descriptive statistics) and statistical estimation and hypothesis testing (inferential statistics). Data preparation consists of several phases. The first phase of data preparation is developing and documenting the database structure. This phase includes the choice of ► variable order, unique identification of each unit of observation in the research, choice between numeric and alphanumeric codes for variables measured on nominal or ordinal levels, determination of the number of digit places for numerical variables, and codes for missing values. The second phase of data preparation consists of data entry and ► data validation. The purpose of data validation is the reduction of errors that may occur during data entry into a computer. The third phase of data preparation is data screening, where ► missing data and ► outliers (unusual values) are detected. The last phase of data preparation is ► data recoding and/or data ► transformation (► data preparation).

Data Management Packages

Definition

Data management packages software facilitates development of data processing systems with user-convenient interfaces. Facilities offered by these packages include data creation, manipulation, processing, organization, query processing and report generation.

Data Mining

Definition

Data mining, also called Knowledge-Discovery in Databases, is the process of automatically searching large volumes of data for patterns such as association rules. It is a fairly recent topic in computer science but applies many older computational techniques from statistics, information retrieval, machine learning, and pattern recognition. Although data mining is a relatively new term, the technology is not. For a long time companies have used powerful computers to sift through volumes of data such as supermarket scanner data, and produce market research reports. Continuous innovations in computer processing power, disk storage, and statistical software are dramatically increasing the accuracy and usefulness of such analysis.

Data Preparation

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Synonyms

Data management; Data quality assurance

Definition

Data preparation for analysis includes developing and documenting a database structure, entering data into the database and ► data validation, data screening and eventual recoding and/or transformation of data.

Basic Characteristics

Development and Documentation of a Database Structure

Data preparation for analysis precedes data description (descriptive statistics) and statistical estimation and hypothesis testing (inferential statistics). The first phase of data preparation for analysis includes development and documentation of the database structure.

The database, either in hard copy or in electronic form, is configurated into a matrix record, where in each new line data referring to a new unit of observation are recorded, and in each column data about a new variable in the research are set. Thus, the dimensions of such a matrix depend on the number of units of observations and their characteristics that are the subject of the research (Eric-Marinkovic et al. 2001).

The fist decision to make on the database structure is related to the choice of variable order. The unique identification of each unit of observation in the research (ID) is presented before any other variables. For that purpose, a unique numeric identification (personal identification number, ordinal number of entry in database, etc.) is usually used rather then an alphanumeric identification, such as name and date of birth, as this kind of identification is not necessarily unique. The unique identification is usually followed by demographic and socioeconomic variables, such as gender, age, economic status, profession, marital status, area where he/she lives, etc. Next are variables that are not of direct interest to the research (confounding variables, extraneous variables), and variables that are of direct interest to the research (factors and outcome variables).

The second decision refers to the choice between two existing ways of coding for variables measured on nominal or ordinal levels of measurement. This is a matter of choice between numeric and alphanumeric codes. Thus, for example, gender can be coded with M and F or 1 and 2, where 1 is code for males and 2 for females.

The third decision refers to the determination of the number of digit places that each variable will take in the database, depending on the accuracy with which the variable values are measured.

The fourth decision refers to the code that will be used for the missing values. The most commonly used is an empty field, dot (.) or some other value that is otherwise impossible as a variable value (–9999, for example).

The research database is followed by a codex that contains information about variable order and names, variable description, measurement units and level of measurement. Apart from the above, for categorical variables the information on the number of category and categories codes are included in the codex.

Data Entry into the Database and Data Validation

The second phase of data preparation entails the entry of data into the computer and ► data validation. Errors may occur during the process of data acquisition and final date entry. The errors might be the result of faulty reading or faulty copying of the original data, typing mistakes during data entry, or caused by a fault in the electronic equipment that is being used for automatic data acquisition and entry into the database.

Before carrying out any statistical analysis and drawing conclusions it is important to quantify the quality of the data and identify any sources of error. The data quality can be measured by the ► database error rate. Data quality evaluation is relevant to all variables, or group of variables, that crucially form the base on which final conclusions are drawn (Fong 2001). It is very hard to obtain absolutely correct data for the database. This is not necessary as high-quality data are just as effective a base on which to draw conclusions as are perfect data (Rasmussen 2000). There is no defined acceptable quality level for data, and thus a "fairly good" level can be considered appropriate.

The ► database error rate can be reduced through the process of ► data validation. There are several data validation procedures. One of them is visual inspection of printed or computer screen data. Higher consistency and lower error rate can be achieved by using such validation (Chow 2003). Thus alphanumeric characters (for example, data referring to a person's name only uses letters) are checked by the simple data validation method of visual inspection. Logical methods are also used, for example, checking that data lies within a certain range (number of teeth range from 0 to 32), or identifying data showing conflicting variables (a male has given birth).

Double data entry is another validation procedure. It is useful if errors occur frequently because of typing mistakes. It is possible to apply two types of double data entry: (a) two people separately carry out the same data entry, while a third person checks their entries and identifies possible differences, and (b) one person

carries out data entry in a first pass, and another person does the same in a second pass and at the same time identifies/corrects possible differences (Prokscha 2006). After the second entry, data quality in the resulting database is in inverse proportion to the probability that two people make the same mistake in the same field, so the error rate in the database can be very low (McFadden 1998). Instead of double data entry the following can be applied: (a) single data entry with extensive data check, or (b) the process of optical character recognition (OCR) in the first pass repeated, maybe several times, in later passes (Chow 2003). As double data entry is a drain on human resources, one alternative is to have data entry carried out by only one person with the quality of the work being checked by random data sampling of the database.

Any change made during the data validation procedure must be recorded and documented, along with the new data, the time of change, and the identity of the person who performed the change and the reason for the change (Chow 2003).

Data Screening

The third phase of data preparation is data screening, in which ► missing data and ► outliers (unusual values) are identified.

The analysis of missing data will show missing value patterns that appear in the database and identify their frequency as well as variable pairs that have the appearance of missing values. Proper treatment of missing values is important for all statistical analysis. The researcher must assume that missing values can influence the results of analysis and conclusions, and that the problem is not a resultant reduced sample size but the possibility of bias in the remaining data.

When data is missing completely at random, the ► missing data is independent from the value of that or some other variable. For example, information about a person's age is not dependent on that person's age, gender or education.

Sometimes missing data are not completely random, as they are dependent on some variable value. In that case they can be marked as data missing at random if their distribution is random after controlling for the variable on which their appearance is dependent (Allison 2002; Little and Rubin 2002). For example, a person's age is dependent on gender, but the data on gender is missing completely at random; this is a case of age data missing at random.

Non–ignorable missingness exists when missing data are not distributed at random, and when their appearance cannot be predicted according to a given model.

The treatment of ► missing data embraces several procedures. One procedure is deletion – casewise or pairwise deletion. Another is mean substitution – replacement by the arithmetic mean of the related variable. This procedure is not recommended since it reduces variations and it has influence on the value of correlation and regression coefficients. Multiple regression is another method of missing data treatment, where prediction of missing values is reached on the bases of existing data and their relation with other variables. A variation of this method is the adding of a random component to the values that are predicted from a regression model. This method is known as stochastic substitution (Afifi et al. 2004).

Some procedures of ► data reduction such as frequency distribution, analysis of minimum and maximum and variability range, are an integral part of data screening and enables detection of unusual values – ► outliers. As a general rule, if outliers are the result of error, such data must be corrected. A problem occurs when it is unclear whether outliers have wrong values – the values are unusually large or small, but not impossible. In such cases, the decision on eliminating outliers from further analysis must be taken carefully.

Data Recoding and Transformation

► Data recoding and ► data transformation are the last phase of data preparation. ► Data recoding involves missing values replacement, continuous data conversion into categories or combining categories of qualitative variables to reduce the overall number of categories. Identification of values with small frequencies can allow researchers to drop and/or combine certain values of category data. If a researcher decides to convert certain variables and recode data, a new variable can be introduced into the database by this combination process. This prevents the loss of the original information.

Many statistical tests include assumptions about normal distribution and/or equality of variance in the examined population. In order to achieve a normal distribution or a realization of some other assumption, ► data

transformation is often applied, which involves converting observed values to another scale. In this way characteristics of distribution and the influence of outliners is altered (Eric-Marinkovic et al. 2001). The most common transformations are logarithmic, square root, reciprocal, square and logistic (Petrie and Sabin 2005).

Cross-References

- ► Database Error Rate
- ► Data Recoding
- ► Data Reduction
- ► Data Transformation
- ► Data Validation
- ► Missing Data
- ► Outliers

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Data Processing and Storage

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Synonyms

Data processing; Data computation; Data storage; Data reposition; Data recording

Definitions

Data processing is the process of data management, which enables creation of valid, useful information from the collected data. Data processing includes classification, computation, coding and updating.
Data storage refers to keeping data in the best suitable format and in the best available medium. Documents containing health data are referred to as records.

Basic Characteristics

Crude, unprocessed, direct data collected from patients are not always represented in a way that enables information production. Once data are collected, they must be managed through classification, coding, computation and updating. ► Data classification is a critical function for increasing the efficiency of the system because it helps users in the retrieval of significant data. Computer programs can effectively order or sort data in different ways – in numerical or alphabetical order, or according to specific criteria: disease, gender, and age. ► Data computation is the application of mathematical or statistical models for the transformation of primary data, and analysis, synthesis or evaluation of secondary data. ► Data coding is the classification of data and assignment of a representation for that data. Data update refers to changing of old data and generating new data in terms of new knowledge (► data updating, ► health data management) (Van Bemmel 1997; WHO 2003).

Data Standards

Since data are used to create information that is needed for a variety of functions of health institutions, the quality of data is of prime importance, implying that, among other criteria, data must be understandable. In order to satisfy quality demands, data must be standardized. A standardized approach is needed in the whole process of data management, from data collecting, data analyzing and data verifying, to data representing and exchanging, and communication and usage of information (Jernigan 2003).
The components of data standards are: vocabulary, format and information architecture. *Vocabulary* refers to the coded terms used to represent data that are being exchanged or stored – one can use either a local vocabulary (a specific set of terms) or a universal vocabulary

(a nationally recognized set of terms). Health staff find it easier to use local codes because they are more easily updated or changed, but they are not suitable for sharing information with others who are not familiar with the codes. Universal codes are useful for communication and data sharing, but training of staff is required and the codes may not be adaptable for representation of all information on a local level.

Format is the order and structure of data for the purpose of storing or messaging (► information design). There are two ways in which data can be stored: in a ► database format, in which data are structured according to their similarity or their affiliation to the same group; and in an electronic record format, in which data can be accessed from various places and from different viewpoints.

► Information architecture is the designated infrastructure for supporting data exchange – software, hardware, resources, staff needed for communication, data security, confidentiality requirements, and policy and regulatory requirements (Jernigan 2003).

Paper-Based Patient Record

Patient ► records contain data on patients' health status, stored in the formats in which they are collected (as text, numbers, images, biosignals and codes) (Van Bemmel 1997). The functions of health records are to document patient care, provide communication among health care team members, provide a medico-legal archival record of what has happened to the patient, and enable research.

Traditionally used ► paper-based patient records can not support all the needs of modern medicine. At the time they were created (in the 19th century), they were used as a reminder of patient details, but were inefficient in obtaining relevant information since they contained little information, and they did not serve to aid communication between health providers, like they do nowadays (Shortliffe 1999).

Generally speaking, paper-based records are the base point of health management in many countries, and have many advantages. They are fast for current practice activities, portable, unbreakable, allow great freedom for health professionals in writing data and entering various types of data, and are easy to use, retrieve and scan. However, paper-based medical records are being criticized for being vulnerable to error; data can be lost, incomplete, illegible, or sometimes duplicated because they are chronologically oriented and consequently it is difficult to retrieve data and carry out research, etc (Van Bemmel 1997; Grimson 2000).

In today's health care, most organizations in the developed world are moving to computer-based medical records.

D

Electronic Patient/Health Record

Electronic patient, health or medical records are terms that are used as synonyms. More strictly speaking, ► electronic patient record describes the medical record of periodic medical care, provided mainly by one institution, whereas ► electronic health record describes a longitudinal (lifetime) record of a patient's health and health care.

The advantages of the electronic health record over its paper-based counterpart are that it is always available, information can be retrieved almost instantaneously and transferred to a great distance, and it supports customized views for different specialists (physicians, nurses, pharmacists, and administrative staff). It allows providers to access health information from a variety of locations and to share that information more easily with other potential users. Multiple users may access the information simultaneously. The storage itself does not require much space, and records can be retained for a much longer time. The primary benefit of using electronic records is improved security, since access is limited to authorized and authenticated users, and can also be restricted to just one portion of the record that is important for the user. In principle, the electronic record can also be linked to evidence-based, best-practice guidelines, and literature databases, pharmaceutical information and other databases of health knowledge, to provide decision support.

Contrary to the chronological arrangement or time-orientation of paper records, electronic records offer various types of organization and presentation of data; by problem – data are time-oriented, but further grouped based on problem (e. g. acute bronchitis – problem 1, shortness of breath – problem 2, etc.), or by source of data – within each source (visits or laboratory tests), data are organized chronologically.

Electronic health information can be manipulated by computer-based tools so that knowledge about standards of care can be used to generate alerts, warnings,

and suggestions. These types of capabilities are known variously as real-time quality assurance, decision support systems, critiquing engines, and event monitors (Van Bemmel 1997; Grimson 2000; National Research Council 1997).

Electronic health records enhance productivity of health care professionals, increase patient satisfaction with health services, and facilitate clinical, epidemiological and health administration research (Canadian Institute of Health Information 2006).

Finally, cost-benefit studies show that the implementation of an ► electronic medical record system in primary care results in a positive financial return on the investment to the health care organization. Benefits are primarily due to savings in drug expenditures, improved utilization of radiology tests, better capture of charges, and decreased billing errors (Wang et al. 2003).

The disadvantages of electronic health records include considerable start-up costs, primarily for hardware, software, and their upgrade. Personnel also need to be well trained to use the records appropriately, but the question remains, who will enter data? Furthermore, who will have access to the data for verification, update, change or dissemination and how will this be achieved? More information technology staff would be needed for system maintenance. In order to be useful, the record must also provide simple mechanisms for displaying the required data, analyzing them, and sharing them among different kinds of individuals (including secondary users of the record who are not involved in direct patient care).

Challenges for the implementation of electronic ► health records include:

- Standards for implementation, and policies on consumer protection
- Technological developments – less expensive technology that is simpler and more accepted for use
- Integration of existing electronic data sources, e. g. laboratory systems, pharmacy systems, and physician dictation systems
- Data-related problems: collection, processing, coding, and access, etc.
- Changes in the work of health care providers, training, and responsibility for data quality
- Social acceptance. (Dinca-Panaitescu 2003; McDonald 1997)

Conclusion

The 20th century has been characterized by a revolution in the provision of health care services. Advances in medical science and management have created an entirely new system of health care. Health data are used for various purposes; they are no longer treated as the sole property of a health care facility, and they are transferred through the health information system and used by public health departments, governments, researchers, the media, and commercial organizations. Information technology can and must be implemented in health care, bearing in mind that its purpose is to serve, sustain and support health activities, rather than to create obstacles to them, and deteriorate the health system like an unwanted intruder.

Cross-References

► Database
► Data Classification
► Data Coding
► Data Computation
► Data Updating
► Data Warehouse
► Electronic Health Record (EHR)
► Electronic Medical Record (EMR)
► Electronic Patient Record (EPR)
► Health Data Management
► Health Record
► Information Architecture
► Information Design
► Paper-Based Patient Record
► Record
► Registry

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Data Protection

► Health Data
► Privacy

Data Quality

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Definition

Quality can be defined as the ability to achieve desirable objectives using legitimate means (Donabedian 1988). Quality in general terms refers to achievement of excellence in the objective. Data quality is therefore a characteristic that describes data of excellence. The quality of data depends on its use and on the criteria being applied to it.

Basic Characteristics

Data are collected throughout health systems—by professionals in primary care, in hospitals, by public health departments, by community, and by state. Within this larger context, data are collected from multiple data sources and stored in databases. From this stored data, useful information is generated for organizational decision-making. Since data are used for various purposes, generally related to health promotion, disease prevention, or both, the quality of the data is crucial, not only for use in patient care, but also for monitoring the performance of the health service. Data collected and presented must be accurate, complete, reliable, legible, and accessible to authorized users if they are to meet the requirements of the patient, doctor and other health professionals, health care facility, legal authorities, and the state, province and national government health authorities (WHO 2003). The responsibility for ensuring data quality rests on health professionals.

Criteria for Data Quality

Data quality is a relative concept, because it depends on the use of the data. Data with quality considered appropriate for one use may not possess sufficient quality for another use as the quality of an object depends on the criteria being applied to it. Several criteria have been suggested to define quality in patient data (Iezzoni 1997; WHO 2003; Wyatt 2005; Canadian Institute for Health Information 2005).

1. **Accuracy**—data should be accurate when compared with a gold standard source of data (► data accuracy). Technically, accuracy includes:
   a. validity—the capability of a data item to measure what it is meant to. For example, codes used to classify diseases and procedures must conform to predetermined standards (it is impossible to use a diagnostic code that does not exist), all parameters must be within an acceptable value range (weight can not be equal to 100 kg for a 10 year old), and must be expressed with an adequate national or internationally accepted measurement unit.
   b. reliability—the capability of a data item to measure what it is meant to when the measurement is repeated. In other words, the diagnosis recorded on the front sheet of the hospital medical record must be consistent with the diagnosis recorded in the progress notes and other relevant parts of the medical record.
2. **Completeness**—defined as the percentage of data missing at a given point (► data completeness). In the process of decision making, it is essential that

all required data are present, but this is often difficult to achieve without access to multiple sources of information. For example, a medical record must contain all data identifying the patient, all data from all attending doctors, all nursing notes, and all of these data must be dated and signed.

3. **Timeliness**—refers to the delay from the event the data describes to its availability for use on the information system (► data timeliness). Timeliness is of prime importance for decision making; if data are not timely, all other criteria are useless. This means that all data must be documented as an event occurs, e. g. the operative report must be written immediately following surgery; and physician's orders, specialist reports, laboratory results, etc. must be documented and authenticated immediately, or usually within 24 hours.
4. **Relevance**—data relevance is measured by the impact of specific data on the decisions or actions of the user (► data relevance). Collecting irrelevant data contributes to information overload, which in turn complicates the processes of creation of information and decision making. For example, recording the birth weight of an 80-year old patient is usually irrelevant, and of no or little use in health care.
5. **Legibility/Appropriate representation**—defined as a degree of structuring and coding of items (► data legibility). This means that data should be concise, readable and understandable. This does not only apply to written text, which must be readable in terms of semantics, it also applies to the use of standardized abbreviations and avoidance of undecipherable codes or symbols.
6. **Accessibility**—data should be available to authorized persons when and where it is needed for patient care and for all other official purposes (► data accessibility). The difficult question is who should have access to patient health data? Many health providers, including researchers, administrative workers, insurance agencies, and public health, etc. claim to have the right to access information for various purposes. However, access to information must be controlled because disclosure of private information may cause social embarrassment, or limit the patient's opportunity to get a job. Patients are becoming more aware of the need to protect their data, and therefore access is now governed by consumer protection laws (► consumer protection).
7. **Usefulness**—information should be pertinent and useful (► data usefulness): this is usually defined as:
   a. inclusion of relevant details—data should be detailed enough to support decisions. This is highly dependent on the purpose and confidentiality of the information;
   b. inclusion of relevant context—data should also include enough detail on the context to support appropriate interpretation of the data.
8. **Confidentiality and security**—data should be confidential and secure (► consumer protection).

The above-mentioned criteria or dimensions may be further grouped into four categories: intrinsic data quality, accessibility, contextual data quality, and representational data quality (Strong 1997).

The **intrinsic** category refers to the accuracy, objectivity, believability and reputation of data. It is independent of the context in which data is produced and used. If data are observed as dysfunctional, without known cause, then the quality of the data is diminished because it can not be trusted. Furthermore, during evaluation of the accuracy of data, the sources of poor quality become evident and get the reputation of being less accurate, less reliable, or having little value for use.

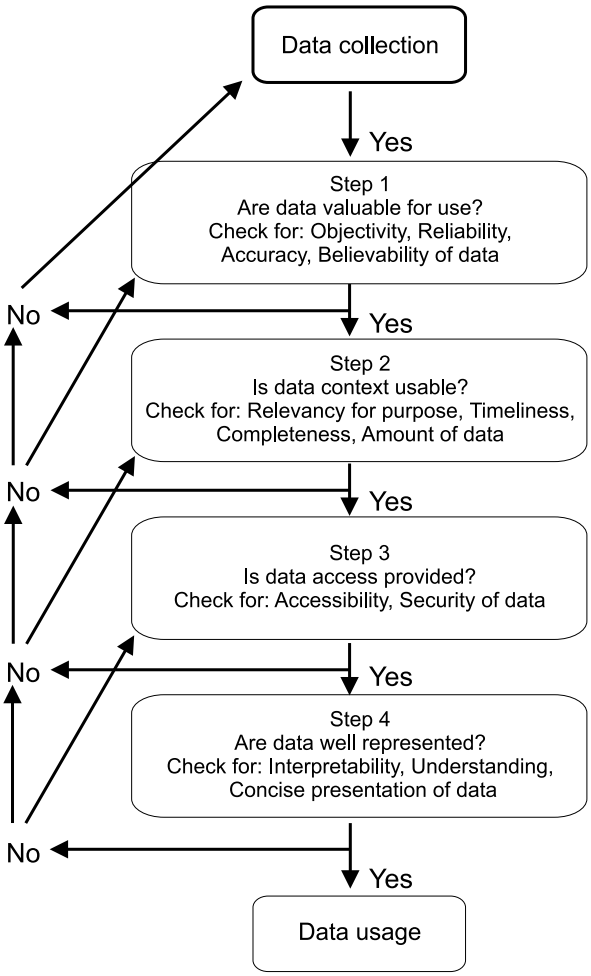
Accessibility problems are related to technical accessibility, data characteristics that may interfere with accessibility, and security for access.

Contextual data quality refers to the dimensions that define whether the data match the context of their production and use: relevancy, timeliness, completeness, and amount of data. If data are missing (incomplete), inadequately defined, measured, or aggregated, they can not be appropriately used.

Several dimensions—interpretability, ease of understanding, concise representation and consistent representation—define **representational data quality**. All dimensions are needed in order to ensure that the meaning of the data has not been lost in the communication process. The process of obtaining data quality is represented in Fig. 1.

Routine Data Quality Monitoring

The two most important monitoring procedures for inpatients, which have been undertaken for many years, are quantitative and qualitative analysis of medical records (WHO 2003; Green 2005).



Data Quality, Figure 1 Stepwise process of obtaining high quality data

1. Quantitative analysis of medical records
   To evaluate the quality of documentation, and subsequently patient care, the medical record must be complete. In a quantitative analysis, medical records should be reviewed to check that all documentation has been included. In some instances, a reviewer of medical records can complete the "deficiency form", indicating what data are missing (if all necessary reports are present, completely documented, and authenticated by the physician responsible). According to this deficiency form, all physicians involved in patient care can easily be instructed what corrections to make in a given medical record.
2. Qualitative analysis of medical records
   In a qualitative analysis of medical records, information pertaining to patient care is reviewed for accuracy, validity and timeliness. This means that medical records are reviewed to ensure that all clinically pertinent data have been accurately recorded and were recorded on time, and to ensure that the diagnosis and treatment recorded on the front sheet are supported by documentation in the body of the medical record.

D

Problems Related to Data Quality

Ensuring quality is much more difficult for data than manufactured goods. In theory, everybody agrees that quality is important, but in practice few people list it as a top priority. The problem of ensuring data quality is exacerbated by the multiplicity of potential problems with data and by the constant possibility that the integrity of data will be compromised. Similarly, sometimes it is difficult to determine the nature of data inadequacies, especially in multi-user environments, because users may have differing data quality requirements.
Data quality can be hampered by a number of issues, including the following (Kumar Tayi 1998; van Mosseveld 2000; WHO 2003).

- Lack of uniformity of data—the quality of data must be assessed early in the processes of data collection, storage, analysis, and distribution, using strict predetermined standards and uniform data sets. Lack of uniformity may be the consequence of poorly designed data collection forms, a poorly defined method for data coding, using non-standardized statistical methods for data analysis, or representing data in a non-standardized form. Another problem could arise from the fact that sometimes multiple medical records on one patient exist, which also limits the overall collection of meaningful data about an individual patient. Finally, errors occurring during the process of data collection and lack of data verification cause great data discrepancies and poor quality.
- Limited education of professionals—if the staff are unaware of the need for accuracy and completeness of data, then quality is threatened. Furthermore, some physicians may find it difficult to record data in a clear and concise manner, often using non-standard abbreviations, or are so oppressed by clinical work that they do not want to put any more effort into something that they do not find important.

- Limitations to information transfer from different parts of the facility—sometimes information transferred from one unit to another may be missing important data, such as the patient's name or medical record number. Such errors make it difficult to ensure that all data are filed in that patient's medical record. The transfer of information from one department to another or from a hospital to a clinic is also connected with problems in timeliness, loss of data in part or in whole during transmission, and especially with security and privacy.

The problems related to data quality suggest establishing a consensus about data content, and standards for data collection, coding, storage, transmission, and use, may be beneficial. In order to achieve this, an in-depth investigation on quality problems must be performed and areas to be targeted clearly defined.

Conclusion

Achievement of high quality health data is not an easy task within health services. When coupled with many other obstacles, such as an atmosphere of hard work, stress and anxiety, the need for obtaining quality may seem like another burden on the shoulders of health professionals. However, once accepted, it becomes obvious that the advantages of quality data overcome the time and work invested in its achievement. Health systems, public health, and other stakeholders in health also rely on comparable health data because they enable an adequate insight into the current situation in the system, as well as pose constraints for future investments and improvements.

Cross-References

- ► Consumer Protection
- ► Data Accessibility
- ► Data Accuracy
- ► Data Completeness
- ► Data Legibility
- ► Data Relevance
- ► Data Timeliness
- ► Data Usefulness

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Data Quality Assurance

► Data Preparation

Data Recoding

Definition

Data recoding is an important step in ► data preparation. Data recoding involves the modification of data depending on analytical aims. This may include procedures such as ► missing values replacement, conversion of a continuous ► variable into a categorical variable (e. g. dichotomization based on cut-off values), recoding a categorical variable (e. g. collapsing the categories of categorical variable into a smaller number of logical categories), conversion of the original text format into a numerical format, combining two or more variables to create a new variable, or modification of negatively worded scale items. Data recoding can use the same or a different variable. Recoding into the same variable involves replacing an old value with a recoded value with the consequent loss of the original values. Recoding into a different variable is done by creating a new variable but keeping the original data intact. Some operations include creating a new variable, such as combining of two or more variables or recoding categorical variables with more than two categories into a series of binary variables (dummy variables).

Data Recording

► Data Processing and Storage

Data Reduction

Definition

Data reduction has two meanings. Firstly, in univariate analysis, it is the process of reducing large masses of data to produce a few summary statistics. This process involves grouping data into tables, visualizing them in a ► graphical representation, and calculating statistics such as mean, ► standard deviation, quartile and correlation coefficient.
Secondly, in multivariate analysis, it is the process of reducing the dimensionality of multivariate data and simplifying its representation by principal components analysis or factor analysis.

Data Relevance

Definition

Data relevance is a measure of the impact of specific data on decisions or actions by the user. Collecting irrelevant data contributes to information "overload" and complicates decision-making in health care.

Data Reposition

► Data Processing and Storage

Data Sharing

► Data Dissemination and Utilization

Data Standards

Definition

Data standards are common terms and methods for sharing data and exchange of information, which are used uniformly. The World Health Organization has proposed standards for data collection: collection in specific data forms, in a logical sequence, as simple as possible; and with routine checks for ► data errors, in order to improve data quality. The responsibility for ensuring data quality in the process of data collection, management and use rests primarily on health professionals.

Data Storage

► Data Processing and Storage

Data Synthesis

Definition

Data synthesis is the computation of data in order to make sense of them and to use them for deriving conclusions, making suggestions and supporting decisions in health care.

Data Timeliness

Definition

Data timeliness is the time passed from the moment the event happened to when the data representing that event is available. The quality of data is improved if the event is documented by data at the moment it happens.

Data Transfer

► Data Dissemination and Utilization

Data Transformation

Definition

Data transformation is applied when there is a need to achieve a ► normal distribution or realize some other assumption about the distribution prior to carrying out certain statistical tests. Data transformation changes the scale of observed values. In this way characteristics of distribution and the influence of outliners is altered. The most common transformations are: (a) logarithmic transformation, which is applied in the presence of right skewed distributions, (b) square root transformation, for

data which follow Poisson distribution, (c) reciprocal, often applied when the standard deviation is proportional to the square of the mean, (d) square, when data are skewed to the left, (e) logistic transformation or logit, and (f) arc sine transformation applied for proportion.

Data Updating

Definition

Data update refers to change of old data and generation of new data by applying new experiences and knowledge.

Data Usage

► Data Dissemination and Utilization

Data Usefulness

Definition

Data usefulness is a criterion of ► data quality. This is met only if data contain relevant details and enough detail on the context of production to support decision-making in health care. The closest to this criterion is data relevance.

Data Validation

Definition

Data validation is a process which ensures the correctness of data, reduces ► database error rate and ensures an acceptable level of data quality. Data validation is the key to the quality of the database. It is carried out during or after a data entry and before any statistical analysis. Data validation checks out, for example, that the ► variable values within a range are possible, that there is consistency between data in the computer data file and the original data, that there are no ► missing values for variables which require completeness of data, and that there are uniqueness identifiers for data (e. g. identification number). There are several data validation procedures, such as visual inspection of printed or on screen data, program validation, logical methods and double data entry (► data preparation).

Data Verification

Synonyms

Data confirmation; Data authentication

Definition

Data verification is the process of proving that the data that were collected are correct. If performed on time and by trained professionals, data verification reduces costs in the system ► data errors.

Data Warehouse

Definition

A data warehouse is an integrated repository of data collected from various sources, with data available for integration and analysis. At the warehouse, data analysis can be performed quickly and efficiently since the information is directly available, regardless of the availability of the data sources. Furthermore, access to warehouse data does not tie up the information sources, and does not incur costs that may be associated with accessing data at the information sources. Furthermore, warehouse data is available even when the original information sources are inaccessible.

Day Care

Definition

Day care for adults includes programs, services and facilities that enable physically or mentally impaired adults to remain in their communities; otherwise they might require institutional ► long-term care or rehabilitation services. In general, day care programs are either based on the medical model or the social model. From a medical point of view, day care offers comprehensive medical, therapeutic and rehabilitation day treatment. Within the social model, day care comprises, as well as supervised activities, peer support, companionship and recreation. Both models are targeted at enabling older adults and patients with chronic conditions to remain independent as long as possible. Day care centers are facilities that provide activities for older people during the day to promote independence and enhance living skills.

Days Lost by Economic Activity

Definition

Days lost by economic activity are the number of days lost by cases of ► occupational injury with temporary incapacity for work. In cases of permanent disability for work, estimates of days lost are used instead of original data. Calculation of days lost by economic activities in most countries is based on the calendar days during which the injured ► worker was temporarily unable to work, excluding the day of the accident, up to a maximum of one year. In countries where the source of the statistics is an accident compensation scheme, calculation is based on workdays. Temporary absences from work of less than one day for medical treatment are not included.

Decision Analysis

Definition

Decision analysis is a theory of decision making under conditions of uncertainty, used for normative purposes. In clinical terms, decision analysis addresses the inevitable uncertainties in a clinical problem and combines these with preferences for health outcomes in a consistent framework that obeys the laws of probability calculus and the theory of subjective expected utility. The following basic steps are included in the decision analysis: defining and structuring the clinical problem in a decision tree, assigning probabilities to chance nodes, assessing utilities to outcomes, calculating the expected utilities, and selecting the choice and sensitivity analysis.

Decision Making

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Definition

Decision making in health policy describes the process of consultation of all groups involved in health policy related issues which leads to a legal framework generally applied on a national level. The main bodies responsible for health policy formation in all countries with developed healthcare systems are the government, the medical professionals' associations, the hospitals and the health insurance companies. The particular process of decision making as well as the degree to which the different ► stakeholders are involved vary from country to country.

Basis Characteristics

Key Factors of the Decision Making Process

As healthcare systems grow out of the historical, cultural and social context of each country, the decision making process established for health policy is also directly influenced by the national policy environment. Greenhalgh and Russel describe the decision making process in health policy as the "messy unfolding of collective action, achieved mostly through dialogue, argument, influence and conflict". Indeed, the interaction between the different actors within the decision making process are mainly influenced by the power they exercise. However, some key factors determining a fruitful health policy decision making process can be found across all developed healthcare systems:

- The government exercises leadership in setting out policy proposals and reform scenarios which ideally increase the public interest in participating in a debate process. This leadership role may be enhanced by the creation of a transparent and accountable policy making process through a national database for all stakeholders.
- The decision making process comprises a mechanism for reflecting the view of the different interest groups and particularly the view of the patients. Country examples demonstrate that the adoption of a corporatist approach privileging a patient-centered perspective rather than a competition of interest groups has a greater chance to lead to consensus.
- Health professionals, i.e. doctors, hospitals and other medical institutions are involved in the decision making process through their professional organizations. If they consider patients as consumers and collect information directly from the interaction with

their patients, they are able to effectively contribute to the decision making process with respect to the improvement of the content and administration of healthcare services.

To sum up, the national context and the power of the actors as well as the interaction between the actors are the key elements of the decision making process in health policy.

The Role of Research in Health Decision Making

In order to deepen the health policy process, there is a crucial need to involve academics that specialize in health policy research and are capable of objective and comprehensive analysis of medical care and health policy issues. However, the involvement of research in the decision making process evokes the question whether research contributes objective knowledge support or rather subjective decision support. Researchers are typically expected to provide research evidence for public policy benefit or harm. But on the other hand, researchers' ideas may also reflect their lifetime experience which is influenced by their professional or personal interest. Therefore, researchers may contribute to the decision making process on two levels. The actual policy making process in many countries shows, however, that academics are often not even mentioned by policy makers. Policy makers usually turn to special advisers from the political scene, think tanks, lobbyist and pressure groups as well as professional associations and the media.

Country Examples

The comparison of several national decision making processes regarding the adoption of healthcare reforms provides insight into the multitude of drafting and consensus formation processes underlying health policy making.

The United States Policy ideas are typically provided by government bodies, think tanks and other professional associations doing active lobbying. The American Medical Association (AMA), for example, promotes and advocates its policy positions in order to guide decision making and actions in American Health Policy. The core purpose of the AMA is "to promote the science and art of medicine and the betterment of public health". Policy statements are established to provide the information and guidance that physicians and others seek from the AMA about health care issues. The right to propose bills is restricted to members of the Congress, but the submission of bills may also occur across party lines. The information on health policy is shared through various medical databases that are publicly accessible. American health policy is shaped by the perception of health care as an engine for economic growth. Therefore, the simultaneous improvement of efficiency and quality are of major importance.

The United Kingdom The policy planning process is led by senior government figures and experts consulting political parties, think tanks, interest groups as well as academics for the promotion of ideas. The policy proposals are published as so – called Green Papers that are discussed in the various interest groups. The results of this consulting process are published in so – called White Papers which are then turned into bills that are amended and enacted by the Parliament. Information on health policy is shared through the release of official data on the ► National Health Service (NHS). However, due to the complex budgetary system of the NHS, data on cost is insufficiently available. Although industrial ► stakeholders such as pharmaceutical companies and private insurances are part of the health policy concept, there is little recognition of health policy as part of industrial policy.

Germany The decision making process in health care is led by the governing parties which determine policy proposals based on basic proposals of party members and the plans of the Ministry of Health. Bills are deliberated by the Bundestag and then special committees hear the opinion of the several interest groups. In the decentralized political system of Germany some topics such as hospital administration are under the authority of the Länder and require the approval of the Bundesrat. Information on health policy is available to the government and the related organizations via various databases. The political debate takes into account the different ideologies of the parties as well as other interests, e.g. patients, and can be therefore classified as a 'corporatist approach'. Although health policy is not seen as an instrument of industrial policy, there is an accepted need for limitation of the burden of insurance premiums on companies in order to promote domestic investment.

France Decision making is led by the administrative elite in the presidential, prime ministerial and cabinet offices. Legislation primarily comes from the administrational bodies and less from members of the parliament. The medical profession is organized into associations that influence the different areas of party politics. As the whole spectrum of opposing views is represented by interest groups, the power of the leading government figures is playing a major role in the decision making process. Information on health policy is shared via regional agencies and databases. The priority in French health policy is to contain medical costs and to improve quality. Therefore, health policy is not seen as an instrument of industrial policy.

Development of Decision Making

To complement the overview of different national decision making processes with regard to the development of a more global approach to decision making, the activity of the Society for Medical Decision Making (SMDM) based in the United States is worth being mentioned as an example for the future trend in decision making.

SMDM aims to improve ► health outcomes through proactive systematic approaches to clinical decision making and policy-formation in health care. The Society provides a scholarly forum connecting and educating researchers, health care providers, policy-makers, and the public.

The main goals are:

- To promote the use of systematic methods to deal with the uncertainties of health care decisions.
- To advance the scientific basis for and foster synergies between multiple areas relevant to medical decision making including for example decision analysis, predictive modeling, health outcome assessment, ► cost-efficiency analysis, ► evidence-based medicine (also ► evidence based medicine, in HTA).
- To develop and evaluate tools for shared decision-making with patients and the public.
- To develop and evaluate techniques for assisting clinicians' decision making under uncertainty.
- To foster and promote international exchange and synergies between health care decision making scholars from different countries.

To fulfill these goals, members come from a variety of countries and academic disciplines and work in hospitals, universities, corporations, foundations, and government agencies across the globe. Interdisciplinary scholarship and a global perspective on health care together with methodological excellence are major factors of the Society's work. In this sense, the Society promotes an integrated approach to health care decision making based on multiple perspectives and expertise from multiple disciplines.

Cross-References

► Cost-Efficiency
► Evidence Based Medicine
► Evidence Based Medicine, in HTA
► Health Outcomes
► National Health Service (NHS), United Kingdom
► Stakeholders

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Decision Making Process

Definition

Decision making is the cognitive process leading to the selection of a course of action among alternatives. Every decision-making process produces a final choice, which can be an action or an opinion. It begins when we need to do something but we do not know what. Therefore, decision making is a reasoning process which can be rational or irrational, and can be based on explicit assumptions or tacit assumptions. In healthcare, consensus decision-making is common. Consensus decision-making is a decision-making process that not only

seeks the agreement of most participants, but also aims to resolve or mitigate the objections of the minority in order to achieve the most agreeable decision. Consensus is usually defined as meaning both general agreement, and the process of getting to such an agreement. Consensus decision-making is thus concerned primarily with that process.

Decision Making Under Uncertainty

Definition

Decision making under uncertainty is a procedure for making logical decisions based on sample data. Due to variations, the outcomes of decisions cannot be predicted exactly – they are always accompanied by an amount of uncertainty. The uncertainties can be measured in terms of probabilities. For example, testing hypotheses is actually making a decision between two hypotheses H_0 and H_1. In decision-making, we can calculate two kinds of errors in decision (i. e., probabilities): accept H_1 when H_0 is correct (α, or accept H_0 when H_1 is correct (β).

Declaration of Helsinki

Definition

The Declaration of Helsinki was produced by the World Medical Association (WMA) as a statement of ethical principles for the guidance of physicians and other participants in medical research involving human subjects and identifiable human material or data. It is the first global statement on medical ethics.
The Declaration of Helsinki was adopted by the WMA 1964 in Helsinki, Finland. It has been modified over the years; the last change (clarification) was added in 2004 in Tokyo, Japan.

Decompression Sickness

► Caisson Disease

Deductible

Definition

A deductible is equivalent to the amount of health care expenditures for which the beneficiary is responsible before the insurer starts paying.

Deficiency of Erythrocytes

Synonyms

Anemia

Definition

Anemia is a decrease in the number of red blood cells, hematocrit (Hct), or hemoglobin (Hb) content, usually measured by a decrease in the amount of hemoglobin. Normal hemoglobin levels vary from 13.8 to 17.2 gm/dl (Male) respectively 12.1 to 15.1 gm/dl (Female). Anemia can result from blood loss and/or deficient erythropoiesis, and/or excessive hemolysis.

Definition of Public Health

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Introduction

Public Health is an empiric and multidisciplinary field whose goal is to assure conditions in which people can be healthy. While medicine mainly focuses on treating illness in separate individuals, it is the central goal of public health activities to increase health at the population level. The ruling principle of public health is to deal with the health of the population in its totality. Health interventions on the population level include community hygiene, sanitation, health education, immunization, and promotion of nutrition. Public health covers preventive, curative, and rehabilitative actions. The success of public health depends on adhering to the basic rules of equity, partnerships, and social justice, as well

as the mobilization of local, national, and international resources.

In the preamble to the Constitution of the World Health Organization (WHO), *health* is defined as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"*. This definition of health was adopted by the International Health Conference in June 1946, and entered into force on 7 April 1948 (UN 1946). The mission of public health includes both promotion of physical and mental health and prevention of disease, disease-produced decreased quality of life, injury, disability, and premature death.

Development of the Field of Public Health

Both the idea that many diseases are contagious and the concept of the environment having an impact on disease occurrence have their origins in antiquity (Tellnes 2004).

Up to three centuries ago, major parts of the population suffered from chronic pain, periodic famines, and epidemics of deadly infectious diseases. Major changes in human history often followed transformations in health. In developed countries, public health arose as a reaction to epidemic crises. The belief in the possibility of effective action as a prerequisite for public health emerged slowly. Supernatural ("Will of God") and natural (e. g. smallpox as a normal process of fermentation in the growing body) explanations of disease causation persisted tenaciously. The medieval Christian Latin culture, for example, mainly explained disease as punishment of sin.

For most of history, prevention of epidemic disease was intended to control disease among the masses primarily to protect the military and to assure the continuation of commerce. In contrast, protection of the health of individuals was not seen as an obligation (Hamlin 2004).

It has only been in early modern times that health and disease prevention have been regarded as part of broader issues of social welfare.

In the Middle Ages, two different theories concerning disease causation evolved. The germ theory competed with the widely accepted ancient miasma theory that promoted poisonous vapors as the major cause of illness. The miasma theory led to improvements in sanitation as it made the connection between dirtiness and disease. The germ theory refers to transferable microorganisms as the cause of illness and was supported by observations regarding microbiology (17th century). An intervention associated with the germ theory and already recorded in the Bible was the custom of isolating people with contagious diseases. Lepers, for example, were expelled from ecclesiastical and civil society. In addition, the germ theory seemed to be the scientific basis for the initiation of water sanitation by filtration of parts of the London water supply in 1829 as a consequence of cholera outbreaks. During this time, the era of epidemiology, the major discipline of public health began. The influence of John Snow's studies of cholera, especially his quantitative approach in analyzing the occurrence of a disease in a human population, was widespread; for example, only two years after publication of his report, all of the water companies in London had to filter their water by law. The collaboration between epidemiological science and public health policy and practice is still critically important today (Tellnes 2004).

Improvements in personal hygiene and environmental sanitation in the 18th and 19th centuries helped to prevent and control the spread of communicable diseases. Safe water supply and adequate sanitation facilities were particularly lacking in rural areas (Sein 2004). Social reforms and the hygienist movement in the 19th century provided the infrastructure necessary to achieve promised results in public health, e. g. in maternal and child health (Gunning-Schepers 2004).

Today, unfortunately, an estimated 1.7 million people still die annually from diseases linked to unsafe water, sanitation, and hygiene. Within this context, disease prevention requires constant efforts (WHO 2002).

Plague caused the first reported, widely fatal European epidemic, beginning in Athens in 430 BC. The wave of plague which spread across Europe from 1347 to 1351 was called the "Black Death". This disease, with case-fatality rates from 30% to almost 100%, returned to most European areas once every 20 years until the 17th century. High mortality disrupted society, interrupted commerce and industry, and challenged civil and ecclesiastical authorities. The impact of plague on all parts of society challenged the first institutional response to an epidemic in history and public health consequently emerged as a public authority. Preventive measures included the 40-day hold (quarantine) on ships coming from potentially infected places, isolation of victims and their families, as well as means of decontamination.

The public's health was monitored and prevention procedures were controlled and organized.

One of the greatest public health successes was the eradication of the smallpox virus. Inoculation against smallpox was introduced in Western Europe in 1721. At that time, smallpox accounted for 10% to 15% of childhood deaths. In 1796, Edward Jenner, a rural general practitioner, modified the technique of immunization. He observed that farm girls who milked cows never got infected with smallpox. Therefore, he supposed that the maids' contact with cowpox was responsible for the protection. This led to a historical experiment with tremendous public health impact: a young boy was first injected with cowpox pus and later exposed to smallpox virus. He did not fall ill – the experiment was successful. Jenner then introduced the term "vaccination", derived from "vacca", the Latin word for "cow". Soon afterwards, smallpox prevention became an increasing state concern. In the mid-19th century, implementation of mandatory vaccination in England and in the German Empire should have ensured universal vaccination against smallpox. However, vaccination had not yet been organized on an international level. Even a century after the discovery of smallpox vaccination, the disease continued to do mischief in the developing world, mainly because of the lack of methods of vaccine preservation. In the 1950s, millions of people worldwide still died because of smallpox infection. Consequently, the WHO aimed for the eradication of smallpox and launched a successful worldwide smallpox vaccination campaign. Intensified mass vaccination was the major strategy of the program, which also consisted of village-to-village searches for cases, providing rewards for reporting and educating people; this strategy was particularly applied in Asia. In Western and Central Africa, eradication was achieved by the surveillance-containment strategy, based on active case detection and mass vaccination only around cases.

The last naturally acquired human case of smallpox was reported in Somalia in 1977. Since then, the world has been free from natural transmission of smallpox. This is the most important public health achievement in the 20th century and resulted in wider acceptance of mass vaccination (Hamlin 2004; Sein 2004).

In modern times, international public health efforts also aimed at preventing the importation of epidemic diseases by trading ships. The first attempt to reach a consensus on international quarantine regulations was made at the First International Sanitary Conference in Paris in 1851. In 1907, the first international health office, called L'Office International d'Hygiène Publique (OIHP), was founded for the prevention and control of cholera, plague, and yellow fever epidemics. The League of Nations Health Organization, founded in 1923, undertook basic clinical and field research studies on medicine and public health and provided technical assistance, as well as international medical and public health education, to developing countries. After the Second World War, intergovernmental organizations like the United Nations were created. The World Health Organization (WHO) officially came into being in 1948 as a specialized agency of the United Nations. Since then, the WHO has been directing and coordinating international health work, providing advice on international health development, and adopting international regulations, conventions, and agreements (Sein 2004).

Public health's next mission was to regulate behavior and maintain a communal environment (Hamlin 2004). Preventive and curative interventions, i. e. drug treatment, especially antibiotic treatment, surgery, and rehabilitation, significantly improved the population's health in both developed and developing countries in the 20th century. Attention switched from environmental control to infectious disease monitoring, especially concerning tuberculosis and sexually transmitted diseases. Since the 1970s, public health departments have mainly focused on prevention of cardiovascular disease and cancer, which had become major causes of death in developed countries after the decline of infectious disease mortality (Gunning-Schepers 2004).

As health and economic development are mutually dependent, particularly citizens in developing countries frequently do not have access to a minimum level of health care. In many developing countries, total spending on health proportionate to the gross domestic product is still below 5 percent in addition, allocation of these limited funds is not efficient. In Western countries, health spending is about 8.5% of the gross domestic product on average. It has been shown that major improvements in health outcomes can be achieved while keeping spending at modest levels. Consistent development policies as well as programs for reaching the poor with the most effective and appropriate health interventions are critical in improving health in the population (Sein 2004).

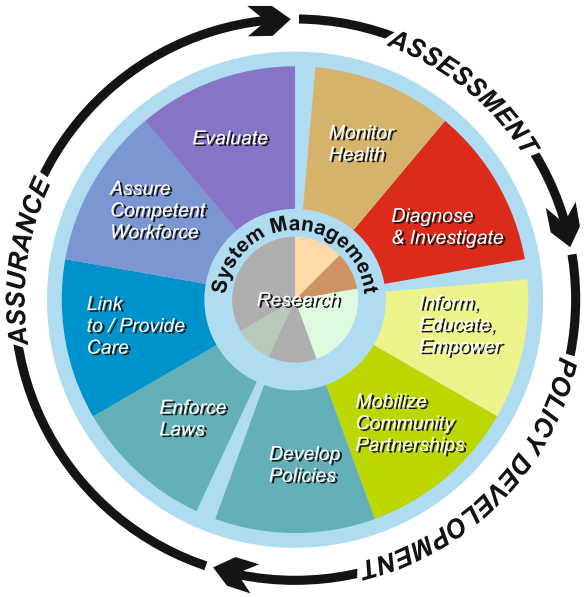
Key Concepts

Public health is a multidisciplinary field that combines and applies techniques from both social and natural science to assess the health state of a population, to promote health, and to prevent diseases. Additionally, public health policy is central for adequate reactions to current and predicted future health threats.

To define the core functions of public health, the Public Health Functions Steering Committee was established in the US in 1995. The Committee defined "*Healthy People in Healthy Communities*" as the public health vision, and its mission was to "*Promote Physical and Mental Health and Prevent Disease, Injury, and Disability*".

In order to accomplish these goals, the Committee listed the following ten "Essential Public Health Services" (USDHHS 1995) (Fig. 1):

1. Monitor health status to identify community health problems
2. Diagnose and investigate health problems and health hazards in the community
3. Inform, educate, and empower people about health issues
4. Mobilize community partnerships to identify and solve health problems
5. Develop policies and plans that support individual and community health efforts
6. Enforce laws and regulations that protect health and ensure safety
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable
8. Assure a competent public health and personal health care workforce
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services
10. Research for new insights and innovative solutions to health problems.



Definition of Public Health, Figure 1 Interdependence of Essential Public Health Services
SOURCE Public Health Functions Committee, Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services, Washington, DC. http://www.health.gov/phfunctions/public.htm (accessed October 2nd 2006)
Nelson et al. 2002

These core functions are generally very well applicable to both national and international public health services, as they emphasize a proactive strategy for health protection and disease prevention with a focus on the community (Nelson et al. 2002).

Additional selected public health tasks / goals and corresponding subdisciplines of the field addressing these issues are listed in Table 1.

Priorities for research and expenditures should be set with regard to the magnitude of the problem and the effectiveness of available interventions, as well as potential social, legal, and ethical issues regarding public health problems and/or interventions.

While injuries were the leading cause of death in the 18th and 19th centuries, infections were the major health threats in the late 19th and early 20th centuries. Since then, chronic diseases have become more and more important (Yach et al. 2004). With about 12 million deaths, cardiovascular diseases (mainly ischemic heart disease and stroke) were the largest cause of death in the world in 2001, followed by lower respiratory infections (almost 4 million deaths attributable worldwide), HIV/AIDS (3 million), chronic obstructive pulmonary diseases (2.5 million), and perinatal conditions (2.4 million). Ischemic heart disease was the leading cause of death both in developing (proportionate mortality ratio 9.2%) and developed countries (proportionate mortality ratio 23.3%) (WHO 2003).

These leading causes of death share key behavioral risk factors like tobacco abuse, unhealthy diet, lack of physical activity, and alcohol abuse (WHO 2002). Addi-

Definition of Public Health, Table 1 Selected public health tasks / goals and subdisciplines of public health addressing these issues

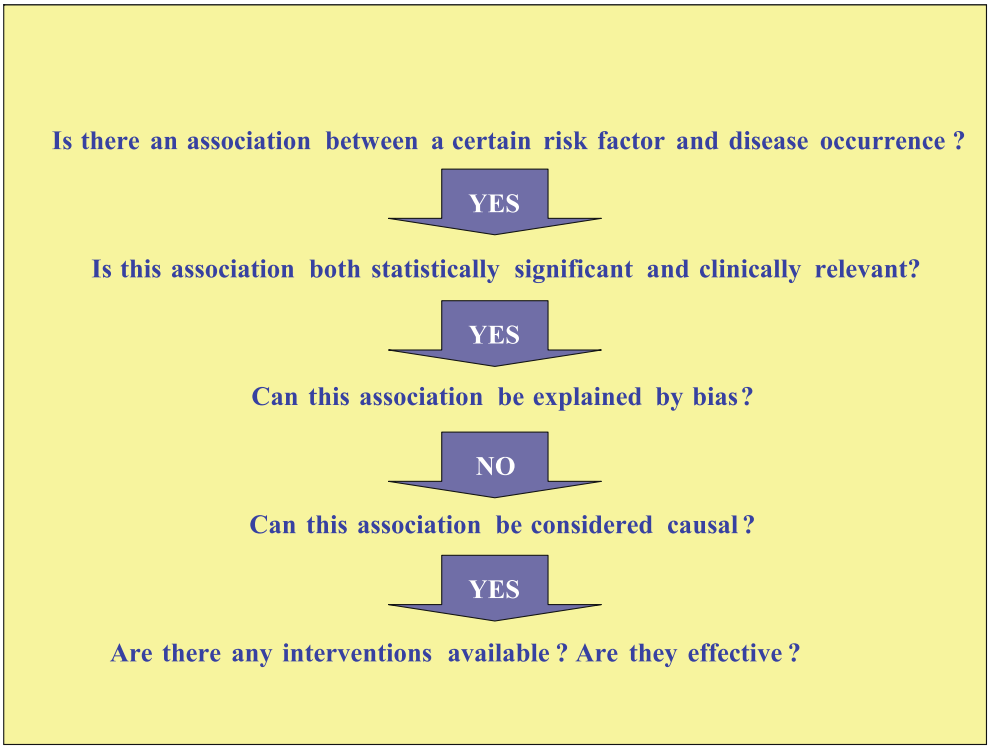
Public Health Task / Goal	Subdiscipline of Public Health
To identify risk factors for diseases	Epidemiology
To assure the accessibility of health services	Health Policy and Management
To educate people about health issues	Behavioral Sciences, Health Policy and Management
To protect people against environmental / occupational hazards	Environmental / Occupational Health, Health Policy and Management
To identify causal relationships between exposure and disease	Epidemiology
To monitor the health status in order to identify community health problems	Surveillance, Epidemiology
To evaluate the efficacy of medical treatments	Biostatistics, Evidence-Based Medicine
To evaluate the effectiveness, accessibility, and quality of health services	Health Services Research
To evaluate the efficiency of health care interventions	Health Economy
To encourage healthy behavior / lifestyle	Behavioral Sciences, Health Policy and Management
To investigate epidemics	Surveillance, Epidemiology
To overcome health inequalities	Health Policy and Management
To respond to disasters	Surveillance, Health Policy and Management

tional important examples of unhealthy behavioral and lifestyle factors that have a tremendous negative health impact on the population level are unsafe sex, illicit drug use, and unsafe injections within the health care system. Because of the increasing impact of behavioral factors, health promotion activities are becoming more and more important. Such activities typically seek to improve the population's health by inducing a shift towards healthier behavior and lifestyle patterns. In order to effectively reach the target population, health promotion activities often involve the community. In order to be successful, interventions to reinforce healthy behavior and to remove hindering behavioral factors need to apply a multilevel strategy including intrapersonal, interpersonal, organizational, societal, and political concerns. In designing such multilevel interventions, public health professionals frequently cooperate closely with social scientists.

The central public health activities, health promotion and disease prevention, are closely interrelated. It is important to distinguish three types of prevention: primary prevention aims to prevent disease occurrence, secondary prevention aims to detect diseases in an early (subclinical) stage in which curative treatment is still possible (e. g. screening programs), and tertiary prevention aims to limit disease complications and disability. Public health interventions typically apply to primary and secondary prevention strategies, while clinical medicine deals with tertiary prevention.

Frequently, there is uncertainty about the exact health risk of chemical, environmental, or other exposures. It is an important public health principle that in such cases the burden of proof of harmlessness should generally be shifted to the proponents of the activity. In face of uncertainty, preventive action as well as exploration of a wide range of alternatives to possibly harmful substances is suggested. In order to plan future health services it is essential to recognize that the current burden of disease reflects past exposure to risk factors, while the future burden will largely be determined by current exposures (Yach et al. 2004). This fact suggests that surveillance of both exposures and health outcomes on the population level are essential in order to detect and react to new health threats as early as possible. Additionally, surveillance of the health state of a population can also help to effectively identify health disparities. Surveillance of the health state may be accomplished by population-based surveys, population censuses, and vital registration systems. Ideally, data systems for public health surveillance should assess and process data in a timely manner, generate valid and reliable data that is comparable over time, and (only) collect all data that is really essential for the purpose of the system (Teutsch 2000).

Public health has evolved into a subdivision of medicine including disciplines of engineering and social sciences. Other non-medical factors which have been shown to influence public health are architecture, economic prosperity, religion, organization of labor, and political changes. Today people are preoccupied with health and expect health that may be translated into life, liberty, and the pursuit of happiness (Hamlin 2004).



Definition of Public Health, Figure 2 Hierarchy of Epidemiologic Research Questions. (Subsequent questions are only relevant if prior questions can be answered as indicated by the arrows)

Epidemiology is the most central public health discipline. Epidemiology studies the causes, distribution, and control of disease at the population level, and investigates disease outbreaks. When the distribution of disease occurrence is not uniform according to person, time, or place, hypotheses about causal relationships based on the agent-host-environment paradigm may be generated and tested. Epidemiologists employ a wide range of study designs and statistical methods with the purpose of revealing unbiased relationships between exposures and outcomes. After establishment of causal relationships, the effectiveness and efficiency of interventions and preventive measures can be assessed in subsequent studies (Szklo 2000; Gordis 2004) (Fig. 2).

Other public health disciplines include family health, maternal and child health, mental health, occupational and environmental health, biostatistics, molecular biology and microbiology, health policy and management, international health, health behavior and promotion, ethics, and health care services.

Public health genetics is among the most rapidly emerging disciplines. Due to the development of new DNA sequencing technologies, it is now possible to not only study effects of single genes, but the functions and interactions of all the genes in the genome. Therefore, genomic research and potential interventions from it are applicable not only to rare monogenetic disorders, but also to common disorders, which are typically caused by interactions of multiple genes and environmental factors (Guttmacher 2002). In key public health tasks and disciplines, such as prevention, risk assessment, epidemiology, and environmental health, issues related to genetics already play a central role and are likely to gain even more impact in the next decades.

Population Health Indicators and Measurement of Burden of Disease

Basic Indicators to Quantitatively Measure and Monitor the Health State of a Population over Time are:

- Life expectancy at birth,
- Crude / age-specific / age-adjusted mortality rate,

- Infant mortality ratio / neonatal mortality ratio, and
- Maternal mortality ratio.

Life expectancy at birth is the average number of years a newborn is expected to live if current mortality trends were to continue for the rest of his/her life (Haupt 2000).

Life expectancy at birth reflects the overall mortality level of a population. Until about 400 years ago, life expectancy at birth averaged between 20 and 30 years. In Western Europe, life expectancy averaged between 30 and 40 years until about 1850. Since then, there has been a sharp and sustained increase in life expectancy at birth. Life expectancy rapidly increased throughout the world in past centuries. However, there is a huge health gap between industrialized and developing countries, with life expectancies of about 35 to 50 years in most African countries compared with about 75 to 80 years in Europe, Japan, Australia, and other developed countries (WHO 2005). Differences in life expectancy between different ethnic groups within a country are good indicators for persistent health inequalities. In the US, for example, the average life expectancy at birth in 2003 was 72.8 years for African Americans compared with 78.0 years for Whites (Hoyert et al. 2005). Riskier behavior patterns and higher smoking rates in males, as well as wars, are some of the reasons why life expectancy at birth (and at any other age) is generally lower for men. Today, females in Japan, Australia, Canada, and some other countries have a life expectancy well over 80 years (Teutsch 2000).

The **crude mortality rate** (CDR; synonyms: crude death rate, total mortality rate) is the total number of deaths in a year / person-years lived in that year per 1000 population. The crude death rate measures the effect of mortality on population size. As a rule of thumb, a crude death rate of 10 implies that mortality is working to reduce population size by 1% per year. However, the crude death rate is very sensitive to age structure: populations with high proportions of elderly people tend to have high crude death rates, whereas young populations tend to have low crude death rates.

Age-specific mortality rates are very little affected by age distribution and are therefore very useful to monitor the health state of a population over time or to compare different populations in a longitudinal or cross-sectional setting.

In the context of comparison,**age-adjusted mortality rates** are particularly useful. Increasing age is a major cause of death. Thus, unadjusted mortality rates are likely to be confounded by age. Age standardization offers a more realistic view of other variables that might be causally related to mortality. When interpreting age-standardized mortality rates, one should bear in mind that the numbers do not necessarily represent the experience of any real population. The choice of the standard population is arbitrary. To be meaningful, it should be similar to the populations being compared (Teutsch 2000).

The **infant mortality ratio** (synonyms: infant mortality rate, infant death rate) is the number of children less than one year old who die in a year per 1000 live births during that year.

The **neonatal mortality ratio** (synonyms: neonatal mortality rate, neonatal death rate) is the number of deaths during the first 28 completed days of life per 1000 live births in a given year. Neonatal deaths account for a large proportion of child deaths. Mortality during the neonatal period is considered to be a good indicator of both maternal and newborn health and care. In developed countries, about two thirds of infant deaths occur in the first month after birth and are due mostly to health problems of the infant or the pregnancy, such as preterm delivery or birth defects. About one third of infant deaths occurs after the first month and is influenced greatly by social or environmental factors, such as exposure to cigarette smoke or problems with access to health care. Most European countries have infant mortality ratios < 5, indicating that the risk of death within the first year of life is below 0.5 percent. In contrast, more than 20 percent of all infants born in Angola, Congo, Niger, or other African countries die within their first year of life (WHO 2005). Whereas the infant mortality rate was between 5.7 and 5.8 in Whites and Hispanics, 13.8 out of 1000 children of African American mothers died within their first year of life in the US in 1998–2000. (NCHS, 2002)

The **maternal mortality ratio** (synonym: maternal mortality rate) is defined as the number of maternal deaths per 100,000 live births. Because the number of pregnancies is not regularly assessed in many developing countries, the number of live births is used as a denominator as a proxy for the population of pregnant women who are at risk of maternal death. The maternal mortality rate is a measure of the likelihood that a pregnant woman will die from maternal causes. Thus, the maternal mortality ratio is a good measure of

the quality of a health care system. High maternal mortality rates combined with high infant mortality rates usually reflect poor nutrition and medical care. According to the World Health Report (WHO 2005), Sierra Leone has the highest and Afghanistan the second highest maternal mortality ratio, with 2,000 and 1,900 maternal deaths per 100,000 live births, respectively. Rates < 5 were reported from Iceland and Ireland.

In addition to those direct (quantifiable) indicators of population health, decision makers in public health policy and management should also consider indirect indicators (surrogates) like childhood poverty, tobacco abuse, level of physical activity, trends in overweight and obesity, immunization rate, access to health care by socio economic position, suicide rate, etc. Critical appraisal of those factors and other indirect indicators of population health may be particularly valuable for anticipation of future needs.

Important Indicators to Quantify, Monitor, and Compare the Public Health Burden of Specific Diseases are:

- Disease-specific mortality rate,
- Years of potential life lost (YPLL),
- Health-related quality of life (HRQL) impact, and
- Disability adjusted life years (DALYs) / quality adjusted life years (QALYs)

The **disease-specific mortality rate** (synonyms: cause-specific mortality rate, cause-specific death rate) is the number of deaths attributable to a specific disease in a given population in a given year, usually expressed per 100,000 persons. The conditions with the highest disease-specific mortality rates are referred to as the leading causes of death. Comparisons of disease-specific mortality rates by geographical region, occupation, or time period, for example, may be useful in the identification of causal factors of these diseases and prompt preventive and/or political action. Confounding by age may be eliminated by applying age-standardized disease-specific mortality rates.

Disease-specific mortality rates do not contain information on the lifetime lost because of the condition of interest. However, for both individual and society this information is critically important, e. g. HIV/AIDS frequently affects young adults and their children, whereas most cancers manifest in older people. The indicator **years of potential life lost (YPLL)** (synonym: Years Life Lost (YLL)) accounts for the impact of premature mortality on a population. It is calculated as the sum of the differences between age 65 (sometimes average life expectancy is used instead) and the ages of death for those who died before that endpoint.

It has been recognized that not only mortality but also the level of morbidity caused by specific conditions is critically important for planning public health programs and services. **Health-related quality of life (HRQL)** is a multidimensional construct, including physical, mental, and social function, which measures the impact of a person's health status on that person's overall wellbeing. The concept of HRQL as a parameter of morbidity and disease severity allows the comparison of otherwise heterogeneous disorders. In health economy, the construct HRQL is also used to refer to the value of a health state. Usually, the state of perfect health (maximum HRQL) is assigned the value "1", whereas the value "0" corresponds to a health state judged equivalent to death (Gold et al. 1996).

As measurements of mortality and morbidity both only capture certain aspects of disease burden, so-called composite measures combining mortality and non-fatal outcomes were introduced in the early 1970s (Sullivan 1971). **Quality adjusted life years (QALYs)** and **disability adjusted life years (DALYs)** are the most widely used composite health outcome measures.

QALYs are calculated by integrating quality of life with length of life using a multiplicative formula. Thus, the QALY is a measure of health rather than ill-health. The QALY is the central outcome in health economic analyses, where the cost per QALY gained of different interventions is compared. Such cost-utility studies are increasingly used to assist health policy and management decisions (Haddix et al. 2003).

The DALY was developed to assess the global burden of diseases. It allows comparisons among different diseases and different populations. It is considered to be a simpler and more objective measure than the QALY, as it is concerned with the severity of disability rather than HRQL. As a measure of the health gap, the DALY combines years of healthy life lost from disability with those lost from premature death. Within the past decade, the DALY-approach has been used increasingly to aid health research prioritization (Gold et al. 1996; Haddix et al. 2003).

Table 2 lists a comparison of cause-specific mortality rates and DALYs lost due to selected conditions.

Definition of Public Health, Table 2 Comparison of mortality rates and burden of disease as measured by disability adjusted life years (DALYs) for selected conditions*

Condition	Mortality Rate		Disability Adjusted Life Years (DALYs)	
	n (000)	% total	n (000)	% total
Ischemic heart disease	7,181	12.7	58,725	4.0
Cerebrovascular disease	5,454	9.6	45,870	3.1
HIV/AIDS	2,866	5.1	88,429	6.0
Chronic obstructive pulmonary diseases	2,672	4.7	29,917	2.0
Tuberculosis	1,644	2.9	36,040	2.5
Road traffic accidents	1,194	2.1	37,719	2.6
Trachea/bronchus/lung cancers	1,213	2.1	11,258	0.8
Malaria	1,124	2.0	42,280	2.9
Diabetes mellitus	895	1.6	15,446	1.1
Measles	745	1.3	26,495	1.8
Breast cancer	479	0.8	6,317	0.4
Iron deficiency anemia	138	0.2	12,039	0.8
Unipolar depressive disorders	12	0.0	65,911	4.5
Migraine	0	0.0	7,565	0.5

* in WHO member states, estimates for 2001 (WHO 2002)

Although depression caused less than 0.1% of all deaths in 2001 it was a major cause of disability, accounting for 4.5 percent of the total burden of disease as measured in DALYs. On the other hand, ischemic heart disease caused 12.7 percent of all deaths in 2001, but was only responsible for 4.0 percent of the DALYs in the same year (Table 2) (WHO 2002).

Public Health in the 21st Century: New Challenges and Threats

In the past and present, health care systems have mainly focused on pathogenic (illness causing) factors in medical treatment. In the future, focus on health promotion, i. e. salutogenic (health causing) factors, needs to be emphasized as well (Tellnes 2004). Important future public health goals are to increase the duration of *healthy* life and to eliminate health disparities. Socioeconomic factors cause significant disparities in health outcomes. In the future, health policy interventions are needed to respond to those and other health disparities. Examples of public health policy interventions that should be prioritized in the near future include: improving access to education and job training; promoting healthier workplaces, homes, and cities; reducing threats posed by environmental hazards; and promoting social safety nets and other protections against impoverishment.

Threats Related to Tobacco Abuse

While the rate of smoking among adults has significantly decreased in the US, and bans on smoking in enclosed public places and at the workplace have recently been adopted in several European countries, the global impact of tobacco smoke on the population's health is still increasing. In the Western World, expanding workplace restrictions now protect the majority of adults, but homes remain the most important source of exposure for children. Involuntary exposure to secondhand smoke remains a serious public health hazard throughout the world, but particularly in China and India where the prevalence of smoking is still increasing.

The growing scientific evidence on the health risks of involuntary exposure to secondhand smoke even lead to the hypothesis that the lung cancer risk related to exposure to secondhand smoke in non-smokers is consistent with the dose-response relationship for active smokers. Global efforts against smoking need to be strengthened and focused towards countries in which the prevalence of smokers is skyrocketing. Many developing countries are not adequately prepared to tackle the burden of disease related to tobacco smoke, e. g. respiratory and cardiovascular disorders, malignancies, and sudden infant death syndrome. Sustained progress toward a society free of involuntary exposure to secondhand smoke should remain a public health priority (USDHHS 2006).

The HIV/AIDS Challenge

Since the explosive HIV epidemic in the 1980s, HIV/AIDS continues to be the most devastating disease worldwide. The HIV/AIDS epidemic creates a new challenge for societies and, in particular, for already disadvantaged families and children. Today, there is still a lack of knowledge on how to effectively provide services to affected families, how to best allo-

cate funds, and how to integrate family members into prevention programs. This devastating epidemic even reversed the progress in improving life expectancy over the past decades in many developing countries. Further declines in life expectancy are anticipated, especially in the most severely affected countries in Asia and sub-Saharan Africa. Reinforced national and international efforts in primary, secondary, and tertiary prevention are critical in order to defeat the pandemic.

Obesity Pandemic

Overweight and obesity are some of the most significant contributors to ill health. Globally, there are more than 1 billion overweight adults, 300 million of whom are obese. Obesity is prevalent in both developing and developed countries, affects children and adults alike, and is associated with significant mortality, morbidity, and economic costs. In some developing countries, under-nutrition remains a significant problem even while obesity is emerging.

In overweight and obese persons, the biological capacity to maintain energy balance is mainly overstrained by the lack of physical activity (spontaneous, at the workplace, or as part of leisure activities) and the over consumption of high-fat, energy-dense foods.

Chronic diseases resulting from obesity include cardiovascular diseases, cancer (especially hormonally related cancers and colon cancer), diabetes, and gallbladder disease. Less life-threatening conditions associated with obesity are musculoskeletal and skin problems, infertility, and respiratory difficulties. Public health action and societal changes are urgently required to stop the obesity epidemic and its medical burden (WHO 2002).

Mental Health

Worldwide, disability due to neuropsychiatric conditions is second only to infectious diseases. The significance of mental health in public health is increasing. Depression is the leading cause of disability in terms of years lost due to disability (YLD). Although depression can be reliably diagnosed and treated, only a small proportion of affected persons receive treatment. Major barriers to care may be the social stigma associated with mental disorders and the lack of resources. Acute psychiatric day hospitals may be an alternative to expensive inpatient treatment in times of raising health care costs and limited financial resources. Balancing community-based and hospital-based mental health care may improve patients' health outcomes, such as health-related quality of life. More uniform standards in the treatment of mentally ill persons need to be established (WHO 2002).

D

Demographic Challenge

A major future challenge to public health is related to the growing population of elderly people, combined with the epidemiologic transition in the leading causes of death from acute illness to chronic disease.

The world has experienced a gradual demographic transition from patterns of high fertility and mortality rates to low fertility and delayed mortality. By 1990, proportions of younger and older persons in developed countries were similar. For developing countries, age distribution is projected to have similar proportions by 2030. The largest increases in absolute numbers of older persons will occur in developing countries.

Developed countries in North America, Europe, and the Western Pacific have already undergone the epidemiologic transition in the leading causes of death from infectious disease and acute illness (HIV/AIDS, malaria, childhood diseases, diarrheal disease, respiratory infections, etc.) to chronic disease and degenerative illness (cardiovascular diseases, cancer, diabetes, respiratory disease, Alzheimer's disease, etc.). Other countries, particularly in Africa and Asia, are at different stages of progression (WHO 2002). Chronic diseases disproportionately affect older adults. The prevalence of Alzheimer's disease, for example, doubles every 5 years after age 65. In developed countries, health and long-term care spending is skyrocketing because of the rapid growth in the number of older persons, and the high health care cost per capita for elderly persons coupled with continued advances in medical technology and increased public expectations. The declining number of working taxpayers relative to the number of older individuals results in inadequate public resources and fewer adults available to provide informal care to older, disabled family members and friends. The demands associated with long-term care (nursing home and home health care) expenditures might pose the greatest challenge for both personal/family resources and public resources. However, medical and social costs will be less if public health interventions decrease disability

among older persons, helping them to live independently. Severe disability as a result of chronic conditions can be postponed through healthier lifestyles which need to be promoted in order to limit dramatically rising health care costs. Healthy behaviors must be supported throughout a person's lifetime, however, as behaviors that place persons at risk for disease often originate early in life.

Increases in the elderly population and chronic disease will place further strain on resources, particularly in countries where basic public health concerns such as control of infectious diseases and maternal/child health are yet to be fully addressed. In addition, in some developing countries population aging has occurred before these societies have reached the wealth necessary to build welfare states for supporting the elderly.

Summary

The multidisciplinary field of public health aims at increasing health and preventing disease and injury at the population level. Success in improving the population's health mainly depends on effective cooperation between epidemiology, a major discipline of public health, and public health policy and public health practice.

Early public health actions emerged as a response to fatal epidemics of diseases such as plague, cholera, leprosy, and smallpox, and were aimed mainly at isolating victims and their families. Improvements in personal hygiene and sanitation in the 18th and 19th centuries further reduced the burden of communicable disease. Steps in international public health efforts in terms of worldwide health promotion campaigns, such as the successful program for the eradication of smallpox, have only been taken since the 20th century.

Basic indicators to measure the health of the population are life expectancy at birth, mortality rate, infant and neonatal mortality ratio, and the maternal mortality ratio. Disease-specific mortality rate, years of potential life lost, health-related quality of life, and disability and quality adjusted life years are measures of the public health burden of different diseases.

In the 21st century, public health aims to increase the duration of healthy life, as well as eliminating health disparities. Threats related to tobacco abuse, obesity, and HIV/AIDS are persisting and increasing. Mental disorders represent a growing burden on population health. Today, depression is the leading cause of disability and is projected to be the 2nd leading contributor to the global burden of disease in the near future. A major future challenge to public health is related to the growing population of elderly people and the epidemiologic transition in the leading causes of death from infectious disease and acute illness to chronic disease and degenerative illness.

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Degar

► Indigenous Health, Asian

Degenerative Diseases

Synonyms

Chronic morbidity

Definition

Degenerative diseases are such diseases where the function or structure of the affected tissue or organ progressively deteriorates over time. This can be caused either by normal bodily wear or by lifestyle factors like exercise or eating habits. Degenerative diseases are often contrasted with infectious diseases. Examples of degenerative diseases are Alzheimer's disease, Osteoarthritis, Osteoporosis, and Parkinson's Disease.

Degrees of Freedom

Definition

Degrees of freedom (df) represents the number of values in a set of data that are free to vary after certain restrictions have been placed upon the data. In the simplest example of a 2×2 table, if the marginal totals are fixed, only one of the four cell frequencies is free to vary and the others will be dependent on this value not to alter the marginal totals. Thus, the df is only 1. Similarly, in a contingency table with r rows and c columns, the $df = (r-1)(c-1)$. In parametric tests, the idea is slightly different in that the n of data have n degrees of freedom before any statistical calculations are carried out. As soon as a parameter, such as the mean, is estimated, there is one less df than was initially present. This is why in most formulas the df is $(n-1)$. In the case of a two-sample t-test with n_1 and n_2 observations, both means are calculated. Thus, the $df = (n_1 + n_2 - 2)$. In linear regression, when the linear equation $y = \alpha g + \beta x$ is calculated, two parameters are estimated (the intercept and the slope). The number of df is then reduced by 2: $df = (n_1 + n_2 - 2)$.

Dehydration

► Heat Exhaustion

Deinstitutionalization

Definition

Deinstitutionalization is the practice of moving individuals with mental disorders (especially those with severe and persistent mental illness) from mental institutions into community-based or family-based environments.

Delhi Boil

► Leishmaniasis, Cutaneous

Delirium tremens

Synonyms

Alcohol induced delirium

Definition

A delirium is an organic cerebral syndrome characterized by concurrent disturbances of consciousness and attention, perception, thinking, memory, psychomotor behavior, emotion, and the sleep-wake schedule. Convulsions may also occur. The duration is variable and the degree of severity ranges from mild to very severe.

Delivery of Dental Care

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Synonyms

Provision of dental care/oral health care; Providing of dental care/oral health care

Definition

Dental care delivery is the process of providing oral health care. The most common way of providing oral health care is face-to-face delivery between care provider and patient. Oral health care is provided in dental practices, in universities, in hospitals, in multi-dentist centers or by public dental services. Dental care providers are dentists (dental practitioners, dental doctors) and dental auxiliaries (e. g. dental chairside assistants, dental nurses). Dentistry is practiced within the oral health care system of a country. The characteristics of a health care system have an important influence on the quality and structure of the delivery of dental care. Transparency of information is also a factor influencing the care delivery.

Basic Characteristics

Oral Health Care Systems of the EU

Dental Remuneration System in the EU An important item of oral health care delivery is the *dental remuneration system*, i. e. the means of paying dentists to deliver patient-oriented, adequate, and efficient care which also takes local needs into account. Funding conditions have a great influence on health care delivery, as they define who pays the costs and how dentists are compensated. The most significant differentiation in developed countries is the one between *salaried public health care* and *market-based health care* (as practiced in the US).

No matter whether paid ultimately by a government body, a sick fund or directly by the patient, *fee-for-service* (or fee-per-item) is the major form of payment for *private dental practitioners* all over Europe. The level of fees, how they are fixed and how much the patient pays, varies considerably.

The oral health care systems of the EU-countries can be divided into five broad categories (Widstrom and Eaton 1999):

1. The *Nordic system* (Denmark, Finland, Norway, Sweden) is characterized by a significant government involvement, a well-developed salaried service and a widespread use of clinical auxiliaries. A high proportion of dentists work in the public sector; some 30% in Denmark, 50% in Finland, 40% in Norway and more than half of the totality of the dental manpower in Sweden. Services are financed by taxes and organized within municipalities or counties. Dental care for children under 19 years is free and usually provided in municipal school clinics with a salaried staff. Adults use private or public dental services. The care is financed partly by the public health insurance and partly by payment in cash or by a private public insurance (Downer et al. 2006).
2. The *Bismarckian model*, valid in most central European countries (e. g. Germany, Austria, France, Belgium), is mostly financed by mandatory contributions of employees and/or employers who are paid in universal sickness insurances. In Germany, for example, there is a statutory health insurance system where health care depends on a membership in a state-approved sick fund (Tiemann et al. 2003). The majority (88.5%) of the German population are members of a sick fund which provides a legally prescribed standard package of oral health care that is managed jointly by the sick funds and the dentists' organizations. Most dentists (98%) have a contract with the statutory health insurance and work independently in their private practice. In principle, membership in a statutory sick fund entitles all

adults and children to receive oral care within the statutory health insurance system. In a normal year approximately 80% of the adults and 60–70% of children make use of the system (Kravitz and Treasure 2004). For more detailed information please look at the Encyclopedia-contribution "Health System in Dentistry" by David Klingenberger.

3. The *Beveridgian model* of a National Health Service is unique in the UK. It is mostly financed by the state and there is a state-delivery of health services and benefits.
4. The *Southern European model* is an oral health care system, predominantly private and without any government involvement; some public services are free of costs for children and also in emergency cases; a limited employment of clinical auxiliaries is allowed (e. g. in Spain).
5. Another group of countries has mixed systems with elements from the categories above (e. g. Ireland, the Netherlands) (Downer et al. 2006).

Dental Practice in the EU In the majority of the EU-countries dental care is mostly provided by *non-salaried, independent practitioners* established in their own dental surgeries (private -, liberal - or general practitioners). In most EU-countries, more than 83% of the practicing dentists have chosen this form of the dental practice (Table 1). Only in countries with a large, *salaried public dental service* is the liberal general practitioner of less importance and prevalence (e. g. in the Nordic countries). In addition to the general practitioners most countries have dentists who work in *public dental services*, *dental wards of hospitals*, *universities* or the A*rmed Forces*.

Both the countries with a developed *salaried public dental service* and the countries with *non-salaried practitioners* have a positive 12-year-old ► DMFT-index (caries index), i. e. generally low levels of dental caries. There is no discernible association between DMFT at 12 years and the provision of dental care. However, since the public dental services are usually orientated towards the provision of dental care to special groups, such as children, private practitioners are the major and often the only providers of care for the adult population in the EU (excluding the Nordic countries).

Dental Manpower Dental manpower provides oral health care and includes dentists and dental auxiliaries.

Delivery of Dental Care, Table 1 Percentage of oral health care provided in general/private practice in relation to economic data (► GNP) and to the caries index in selected EU-countries

Country	% of oral health care provided in general practice*	% of GNP spent on oral health care**	DMFT 12 years**
Sweden	44%	0.8%	1.1
Slovenia	50%	0.62%	1.8
Finland	54%	0.45%	1.2
Ireland	57%	0.33%	1.2
Norway	65%	0.39%	1.5
Denmark	70%	0.33%	0.8
Netherlands	77%	0.37%	0.8
Austria	78%	0.65%	1.0
Poland	80%	0.18%	3.8
Czech Rep	84%	n. a.	2.5
UK	84%	0.39%	0.7
Italy	87%	0.82%	1.2
Greece	89%	1.1%	2.2
Switzerland	89%	n. a.	0.9
France	90%	0.6%	1.9
Hungary	92%	0.2%	3.8
Cyprus	94%	1.0%	2.1
Germany	95%	0.9%	0.7
Spain	95%	n. a.	1.12
Portugal	98%	0.4%	1.5
Belgium	99%	0.3%	1.1
Luxembourg	99%	02%	3.0

Sources: * Kravitz and Treasure 2004; ** CAPP 2006 (last available data)

Dental care delivery is classified into primary, secondary and tertiary dental care. ► Primary dental care is provided by dentists or dental auxiliaries who have the first contact with a patient demanding dental treatment or care. ► Secondary dental care is provided by dental specialists. Specialist hospitals, clinics or regional centers provide ► tertiary dental care services.

In all countries, most oral health care is provided by *dentists*. The EU-Dental Directive gives a definition and description of the field of activities of a dentist. Dentists are generally capable of giving instructions on measures of prevention, diagnosing and treating anomalies and diseases affecting the teeth, mouth, jaws and

adjoining tissue (EU 2005). In 2003, the total number of registered dentists in the EU, including Romania, was about 365 000.

Orthodontics and Oral Surgery/Oral Maxillo-Facial Surgery are the two specialties which are grosso modo recognized formally in almost all of the 25 European countries. Many other specialties have national recognition to a varying extent. In most countries, patients may see *specialists* directly, without needing to go to a primary care dentist first, but in Sweden and the UK, for instance, a referral from a primary care dentist is absolutely necessary.

Dental Auxiliaries: In all countries, dentists have staff of different denominations, e. g. "dental surgery assistants", "dental nurses" or "dental chairside assistants", who may assist with chairside activities and tasks, including advising and motivating patients concerning prevention and therapeutic preventive measures. In some countries (e. g. Belgium, Portugal), most dentists work without any auxiliary assistance; in France and Poland less than one third of the dentists work with an assistant. In Germany, auxiliary staff can only work under the supervision of a dentist who is always responsible for the whole treatment of the patient. The range of auxiliaries is rather complex and include (with the relevant training) the Dental Chairside Assistant, the Specialized Dental Chairside Assistant, the Dental Administrative Assistant, the Dental Prophylaxis Assistant and the Dental Hygienist. These registered qualifications are co-ordinated by the German Dental Association (Bundeszahnärztekammer – BZÄK). Dental Technicians provide technical laboratory services for the dentists; however, in most countries they are entitled to repair dental appliances directly for patients, provided they do not need to take impressions or to do other interventions in the mouth of the patients.

Transparency

Transparency of information is also a factor defining a care delivery system. Information on practice conditions, treatment measures, quality standards, as well as on fees and tariffs have a great impact on patient choice and consequently on the motivation and therefore the incentive of the health professionals. Increased efficiency and improvement and transparency concerning the range of the services provided are necessary if a reliable and adequate health care for the whole population is to be assured. The quality of the patient–doctor relationship is dependent on the participants having mutual respect for each other and sharing knowledge and values which, in turn, promotes confidence, and relies on free access by patients to honest professional information about diseases, treatments and future prospects.

Conclusion

Permanent topics in the worldwide debate on public health policy are, on the one hand, medical, including social medicine and health care provision, and, on the other hand, economic. The delivery of dental care is an important factor in dental public health research because most countries are confronted with increasing expenditures in health care systems due to the increasing demands of aging populations and medico-technical progress. The level of dentistry practiced depends on the oral health care system of a country. The characteristics of a given health care system have a significant impact on the nature and structure of its dental care system. Although it is essential that the oral health care resources are allocated correctly and adequately, medical criteria should be of priority and in the forefront if a good health care system for all is to be guaranteed.

The paper is based on: Kravitz AS, Treasure ET (2004) Dental Liaison Committee in the EU: Manual of Dental Practice (Part 7 and 8)

Cross-References

- ▶ DMFT-Index
- ▶ GNP (Gross National Product)
- ▶ Primary Dental Care
- ▶ Secondary Dental Care
- ▶ Tertiary Dental Care

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Delusion

Definition

A false belief based on incorrect inference about external reality that is firmly sustained despite what almost everybody else believes and despite what constitutes incontrovertible and obvious proof or evidence to the contrary.

Delusional Disorder

Definition

A disorder characterized by the development of either a single ► delusion or of a set of related delusions that are usually persistent and sometimes lifelong. The content of the delusion or delusions is very variable. Clear and persistent auditory ► hallucinations (voices), schizophrenic symptoms such as delusions of control and marked blunting of affect, and definite evidence of brain disease are all incompatible with this diagnosis.

Demand of Health Care

► Health Determinants, Economic

Demand Reduction

Definition

Demand reduction is a strategy to reduce the incidence of ► substance related disorders. It achieves to educate the population at risk (e. g. adolescents, drivers, pregnant women) to use substances adequately or to stay abstinent. Interventions include risk information, motivation enhancement and skills training.

Dementia

Definition

Criteria for dementia include demonstrable evidence of impairment in memory (according to ICD-10 a decline of memory as well) and either impairment in one other intellectual function (i. e., judgment, abstract thinking or higher cortical functions) or a personality change. These disturbances must be sufficient to interfere with work, social activities or relationships. There are several forms of dementia: vascular dementia occurs as a result of brain damage secondary to stroke. Other 'progressive' forms of dementia are associated with particular brain diseases such as Alzheimer's disease. Alzheimer's type dementia gradually and progressively compromises brain tissues, causing them to weaken and function erratically.

Dementia Praecox

► Psychotic Disorders

Democratization of Sport

Definition

The term Democratization of Sport means that societal and economic access barriers to sport participation become increasingly irrelevant and consequently every social group irrespective of parameters like age or sex is able to participate in sports activities.

Demographic Imperative

Definition

The term 'demographic imperative' refers to both the demographic changes and the corresponding pressure

on the Public Sector and Public Health. Demographic changes comprise different dimensions, e. g. rising life expectancy, aging work force, ongoing migration, increasing diversity. The Public Sector and Public Health are responsible for managing demographic and emerging social and health challenges in a proactive way. Moreover, the term 'demographic imperative' has the function to highlight the pressure on Public Sector and Public Health to respond with forward-looking and population-oriented strategies and to mirror the diversity of the population in the workforce in order to enhance the capability to fulfill the changing and diverse needs.

Demographic Indicators

Definition

Demographic characteristics related to health include measures of total population as well as the percentage of the total population by age group, gender, race and ethnicity; and the rate of change in population density over time, due to births, deaths, and migration patterns.

Demographic Perspectives on Family Health

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Synonyms

Population trends and family health

Definition

Demography is the study of ► population change: entrances into and exits from populations through fertility, mortality, and migration, and the impact of these processes on the size, growth, and composition of populations (Preston et al. 2001). Family demographers investigate the processes of entrances and exits from families, as well as resultant changes in family composition. These population and family processes are deeply intertwined with family health.

Basic Characteristics

Introduction

Overall, children and adults are leading longer and healthier lives worldwide. Contributing factors include improvements in mortality (► mortality rate) and health, improved availability of ► family planning, and falling fertility levels. At the same, however, the HIV/AIDS epidemic, population aging and changing family structures are creating new challenges for societies and, in particular, for already disadvantaged families and children.

Changes in Mortality and Life Expectancy

In wealthy countries, life expectancy has now surpassed 75 years, increasing from 66 years in the early 1950s (UN 2005). Japan boasts the long average lifespan at 82 years. The fight against cardiovascular disease among adults and especially the elderly population has increased both the length and quality of life in most developed countries. Because mortality decline began in the early 20th and late 19th centuries, ► infant and child mortality and deaths to infectious disease were already low by mid-century. (Vallin, Meslé 2004)

In developing countries, the increase in life expectancy has been rapid by historical standards. In the *least developed countries* (including sub-Saharan Africa, Cambodia, Bangladesh), life expectancy has risen from 36 to 51 years over the past five decades. (UN 2005) Declining mortality was concentrated among infants and children, and occurred as a result of vaccination campaigns and other measures implemented to combat infectious disease. Yet, infectious diseases – largely eradicated elsewhere – remain a crucial contributor to mortality in these populations. The HIV/AIDS epidemic in Sub-Saharan Africa has slowed progress in child health; 17% percent of the children in this region die before their fifth birthday (UN 2005). *Less developed countries* (including population giants India and China), show the most rapid improvements in life expectancy over the latter half of the twentieth century: from 42 years to 66 years by 2000–2005 (UN 2005). Here most of the gains have come from the successful fight against infectious disease and, in particular, dramatic improvements in infant and child survival.

Despite this dramatic overall progress in life expectancy, new and re-emerging health threats have the potential to reverse this progress. Most devastating is the

HIV/AIDS epidemic. In Southern Africa, life expectancy fell to just 48 years by 2000–2005, a 14-year decline in a single decade, and further life expectancy declines are anticipated (UN 2005). The combination of HIV/AIDS and the existing tuberculosis (TB) epidemic has been particularly deadly. Mortality reversals have also occurred in Eastern Europe and the former Soviet Union, where male life expectancy has fallen to levels below many less developed countries. A deteriorating health system combined with the hardships of the transition to a market economy has hampered the fight against adult cardiovascular disease, alcohol- and tobacco-related mortality, and drug-resistant TB. The rapid spread of obesity and diabetes in developed and developing countries also has the potential to reduce life expectancy gains.

Fertility and Family Planning

The second major demographic trend of the twentieth century has been the dramatic decline in fertility rates throughout the world, from 5 children per woman in 1950–1955 to just 2.65 children by 2000–2005 (UN 2005). Remarkably, this worldwide decline in fertility has occurred at all levels of development and across a wide range of cultural settings. Fertility decline started first in Europe in the late 19th and early 20th centuries, and fell rapidly to replacement or below replacement levels (a total fertility rate of 2.1). According to the UN woman in the most developed countries now have, on average, just 1.6 children, down from 2.1 in the early 1970s. Fertility levels in less developed countries remained high through the early 1960s, but have been falling rapidly since then, from slightly more than 5 children per women in 1970–75 to around 2.5 children just 30 years later. Fertility levels in the least developed countries began to decline later and have fallen more slowly over the past 30 years, to 5 children per woman (UN 2005).

The expansion of ► family planning programs throughout the developing world has been credited, in part, for rapidly falling family sizes. The primary justification for international family planning efforts was the concern that rapid population growth would halt economic development and further improvements in living standards in developing countries. Additional program motivation developed from concerns about the health consequences of high fertility for women, infants and children – in particular, high rates of maternal mortality among women giving birth at young and older ages or who have many pregnancies (Seltzer 2002). Despite overall fertility declines, desired fertility and unwanted fertility (► desired and unwanted fertility) remain high in many poor countries and women continue to have limited access to family planning (Seltzer 2002; Bongaarts 2003).

In developed countries and increasingly in developing countries, policy concerns have shifted from preventing unwanted births to increasing fertility rates. Total fertility rates have fallen well below replacement levels throughout Europe and in parts of Asia. In many countries (notably Taiwan, Japan, Italy, Germany and throughout Eastern Europe), fertility levels have fallen to levels at or below 1.3 children per woman. Low fertility may create economic problems by hastening the process of population aging, and typically results from women having fewer children than they desire (Morgan 2003).

New Challenges for Families and Populations

The HIV/AIDS epidemic is today's most important population and family health crisis. More than 40 million people were living with HIV in 2005, and three million people died of HIV-related disease during the same year. Although two-thirds of the HIV-infected population lives in Sub-Saharan Africa, the number of people infected is increasing in all regions of the world (UNAIDS/WHO 2005). Because AIDS mortality typically strikes men and women of reproductive and working ages, the impact of HIV/AIDS extends far beyond the infected. Children are at risk of contracting the virus themselves (from infected mothers), and of becoming orphaned through the loss of their parents. Orphans experience high rates of poverty and receive less schooling, both of which can have life-long implications for health and well-being. The burden of caring for orphaned children and sick adults typically falls to the extended family, especially to grandparents who may expect or need assistance themselves. The vast scale of this epidemic, combined with its age-pattern of mortality, places enormous burdens on an often-impoverished extended family system.

Population aging poses an additional demographic challenge. Declining mortality and fertility rates

(► mortality rates) have shifted age distributions (► population age distribution) towards older ages in both wealthy and developing countries. The ► dependency ratio (the ratio of children and retirement-age adults to working-age adults) has increased as a result, and will continue to grow in the decades to come. Wealthy countries debate how to fund generous pension and health programs as there are fewer working-age adults to support the elderly. In developing countries, like Latin American and Caribbean nations, the problem is potentially more troubling. Population aging has occurred before these societies have accrued the wealth necessary to build welfare states that can support the elderly (Palloni et al. 2002). This responsibility falls instead to families. How societies and families will adjudicate between the needs of dependent children and the needs of the growing elderly population remains uncertain (Preston 1984).

These demographic challenges place new burdens on families at a time when rising rates of divorce and ► nonmarital fertility are changing and potentially weakening families. Children are increasingly living in single-parent families and, consequently, receiving less investment of parental time and money. These family structure changes may have lifelong impacts on children's health and well-being and appear to disproportionately impact already socio-economically disadvantaged children (McLanahan 2004).

Mortality and fertility declines have in most cases improved the quality of life for children and families. In all likelihood, improvement in family and child health will continue in the decades to come. However, as these new population challenges persist and others emerge, some children and families, the most disadvantaged, may be left behind.

Cross-References

► Conception
► Contraception
► Dependency Ratio
► Desired and Unwanted Fertility
► Family Planning
► Infant and Child Mortality
► Mortality Rate
► Nonmarital Fertility
► Population
► Population Age Distribution

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Demographic Transition

Definition

Demographic transition theory describes ► population change over time as a change from high to low birth and death rates corresponding to the development of a country from a traditional, non-industrial to an industrialized economy. The demographic transition model was proposed in the first half of the twentieth century and is based largely on population changes in industrialized countries in Western Europe and North America. Starting from a pre-industrial state where birth and death rates are high and the population is relatively young, the model describes a decline in death rates due to improvements in food supply and sanitation, healthcare, technology, and education, which altogether increase life spans and reduce disease. Next, ► fertility rates decline due to increased access to contraception, education, economic development, urbanization, and other social and economic changes. In the last stage, fertility and ► mortality rates are low, and the population is older. The degree to which this multi-stage demographic

transition model can be applied to currently developing countries is still the subject of much debate.

Demography

Synonyms

Trends in population changes

Definition

Demography is science related to human population. Its primary aim is to ascertain the number of people in a given area, to determine what change that number represents from a previous census, to explain the change, and to estimate the future trends of population changes. Also, demography investigates in origins of population changes and its impact on many aspects of life including changes in health status, health needs and organization of ► health care services.

Dengue Fever

Synonyms

Dengue hemorrhagic fever (DHF); Dengue shock syndrome (DSS); Breakbone-fever; Dandy; Duengero; Ki denga pepo; Seven-day fever

Definition

Dengue fever is transmitted by mosquitoes, which are also day-active. It appears in the tropical and subtropical regions of Southeast Asia, South Pacific, Africa, Central and South America as well as in the Caribbean. Besides a mild course, Dengue hemorrhagic fever (DHF) or Dengue shock syndrome (DSS) can appear, lethality of which is 6–30%. Typical symptoms, the so-called "Dengue-Trias," are fever, a scarlatiniform rash and severe muscular and joint pain. A vaccination is not available.

Cross-References

► Tropical Diseases and Travel Medicine

Dengue Hemorrhagic Fever (DHF)

► Dengue Fever

Dengue Shock Syndrome (DSS)

► Dengue Fever

Dental Care Delivery System

► Health System in Dentistry

Dental Caries

Synonyms

Caries; Tooth decay

Definition

Dental caries is a disease which – through interacting with food, ► dental plaque (biofilm) and microorganisms over a long period of time – leads to an irreversible destruction of the proper substance of the tooth, including dental enamel, dentin and tooth cement.

Bacteria are deposited in a biofilm on the enamel surface and produce acids from carbohydrates which are in the food. The consequence of this is that the minerals in the enamel surface are decayed. The dental enamel is demineralized and thus bacteria and their metabolic products may infiltrate more strongly into deeper dental membranes.

Many biological, socio-economical and behavioral factors have an impact on the disease process. In 2004, four out of five individuals worldwide suffered from dental caries. This means that 60–90% of all pupils, as well as most of the adult population, are affected by dental caries. Normally, the saliva is a perfect preventive agent thanks to its natural physiological rinsing activities. Adequate and good oral hygiene, the application and use of fluoride agents, a healthy diet and regular visits to a dental surgery are further means of preventing dental caries.

Dental Diseases

► Oral Diseases

Dental Health

► Oral Health in Different Age Groups

Dental Health Behavior

► Oral Health Behavior

Dental Hygienist

Definition

Dental hygienists provide dental hygiene care for patients. Mostly, they work with dentists as part of the dental team. Education and training can be very different from country to country. The range of responsibilities varies considerably but focuses on teaching and counseling patients, plaque and calculus removal, and applying preventive materials such as fluorides and fissure sealants.

Dental Implants

Definition

A device made of alloplastic (foreign) material implanted into the jaw bone beneath the mucosal layer to support a fixed or removable dental prosthesis. Dental implants are often screw type or root-shaped and made from titanium.

Dental Plaque

Synonyms

Plaque; Bacterial plaque

Definition

Dental plaque is a biofilm, consisting of oral bacteria, extracellular polysaccharides, and proteins, that arises on the tooth surface. It is usually of a pale yellow to white color. If not removed regularly, dental plaque can lead to ► dental caries or ► periodontal inflammation, because those microorganisms nearest the tooth surface convert to anaerobic respiration and start producing acids. These acids lead to demineralization of the adjacent tooth surface, resulting in dental caries if the process persists and/or attack the gum and activate the body's immune response to infection. Plaque can become mineralized and form ► calculus.

Dental Public Health

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Introduction

Dental Public Health is a branch of Public Health that focuses on dental and oral health. In contrast to clinical practice which operates at an individual level, Dental Public Health is concerned with promoting the oral health of the population by focusing action at a community level. So the terms "Community oral health", "community dentistry" are essentially synonymous for Dental Public health (Pine, 1997). The *science* of Dental Public Health is concerned with making a diagnosis of a population's oral health problem, establishing the causes and effects of those problems, and planning effective interventions. The *practice* of Dental Public Health is to create and use opportunities to implement effective solutions to population oral health and health care problems (Chappel et al., 1996). The American Dental Association gives a definition, which was adopted 1976 and is still generally current:
"Dental Public Health can be defined as the science and art of preventing and controlling dental diseases and promoting dental health through organized community efforts. It is that form of dental practice which serves the community as a patient rather than the individual. It is concerned with the dental health education of the public, with applied dental research, and with the administration of group dental care programs as well as the prevention and control of dental diseases on a community basis" (American Dental Association, 1976).
Dental Public Health is a broad subject which seeks to expand the focus and understanding of dental profession on the range of factors that influence oral health and the most effective means of preventing and treat-

ing oral health problems. It can considerably contribute to a better and broader understanding of oral diseases (► Outline of Dental Public Health). Even though, many dental professionals have difficulties in understanding and implementing the public health paradigm. In the United Kingdom and North America, dental public health has a long history whereas in other countries this field is still evolving and its potential has not yet been fully utilized. Like Public Health in general, dental public health has shifted from "Old" to "New" Public Health. The working fields of "Old" Public Health encompass prevention, oral health in high risk groups (e. g. institutionalized elderly or migrants), sociology, psychology, environmental health, and epidemiology. "New" Public Health additionally focuses on gaining basic and practice-oriented knowledge about the system and the practice of health care comprising health policy, health system research, economics, political and management sciences. Public Health mainly focuses on the prevention of widespread and socially important illnesses, so that caries and periodontal diseases as the most common of the chronic diseases clearly belong in this context. However, not only high prevalence rates but also their significant psychological and social impact underlines their considerable high public health relevance and high treatment costs their health economic weight.

Oral Health Related Quality of Life

Because the majority of oral diseases do not cause life-threatening conditions, oral health is often a low priority for individuals, policy makers, and public health specialists. In fact, oral diseases have a considerable impact on society and individuals (e. g. pain, limited functioning and appearance, high treatment costs). It influences how people grow, enjoy life, look, speak, chew, taste food and socialize, as well as their feelings of social well-being (Locker, 1997). Oral health is integral to general health. This relation is proven by evidence. Severe periodontal disease, for instance, can be influenced by diabetes or increases the risk of a cardiovascular disease. So, oral health affects people's life physically *and* on a psychosocial level, ranging between initial dental caries and effects on general health and quality of life (► oral health related quality of life).

Oral health means more than just having healthy teeth and thus has been more broadly defined as "the ability to chew and eat the full range of foods native to the diet, to speak clearly, to have a socially acceptable smile and dentofacial profile, to be comfortable and free from pain, and to have fresh breath" (Sheiham, 1997). All things considered, oral health is an important public health concern.

Health, one domain of well-being, is closely related to Quality of Life (QoL). QoL is a concept that brings together the multidimensional and widespread character of health status. QoL and not just survival became a core issue for Public Health. Since oral health is a part of general health, Oral Health-related Quality of Life (OHRQoL) as a subset of Health-related Quality of Life (HRQoL) has been established. OHRQoL, based on *self-ratings*, comprises the patients' perceptions of their illnesses, the resulting limitations to their daily activities, and assesses the success of the therapy after treatment from the patients' point of view.

In the past, the patients' subjective awareness regarding their health status has been an integral part of medical care and was not regarded as something independent. Studies have, however, revealed that in dentistry, objective diagnostic findings often differ from the patients' subjective views (Heydecke et al., 2003). Within the frame of health needs assessment as one part of health services research, a high objective need for dental treatment is often contrasted by considerably lower subjective need. Whereas, for instance, restorations after tooth loss in the posterior region are required from most professionals' point of view, leaving untreated open spaces in the premolar and molar regions is often accepted by patients of different age groups even in countries with highly developed oral health care systems. Furthermore, discrepancies between diagnostic findings and patients' health status have been recognized. This emphasizes that assessments of Oral Health Status should cover more than merely clinical-somatic components. Growing life expectancy underlines and promotes this trend, because therapies have to be found out which preserve or even enhance the patient's quality of life effectively in order to keep the patients well and fit over a long period of their life (reduction of morbidity).

As a consequence, measuring OHRQoL as an indicator of patient's well-being and the quality of health care services has become accepted as an explicit criterion of evaluation. It is an essential component within the assessment of outcomes of oral health care,

capturing the outcomes of public health programs. As a consequence, a number of OHRQoL measures have been developed to assess the functional, psychological, social and economic implications, recording the patient's own assessment of his health by using questionnaires. The best documented and most popular instrument for measuring OHRQoL is the Oral Health Impact Profile (OHIP), a questionnaire including 49 issues/questions (Slade and Spencer, 1994). A major advantage of this measure is that the statements were derived from a representative patient group, and were not conceived by dental research workers.

Oral Diseases and Their Prevalence in Different Age Groups

Oral diseases have afflicted the human race since the dawn of recorded history (Weinberger, 1948). The impact of oral diseases on both society and the individual is significant. Common effects are pain, discomfort, sleepless nights, limitation in eating function leading to pour nutrition, and time of school or work as a result of dental problems.

Oral diseases can affect all dentofacial and oral structures: the hard tissues including bone and teeth as well as mucosal, pulpal, periodontal and glandular soft tissues (► oral diseases). Within the possible oral diseases *dental caries* is one of the most frequent diseases in the world. It is a multifactorial localized destruction of the hard tooth tissue, caused by microorganisms (infectious disease). The principal factors leading to destruction are (1) time, (2) microorganisms in dental plaque (predominantly Streptococcus mutans), (3) host and teeth, and (4) substrate (principally sucrose). Caries lesions themselves seldom cause pain not until inflammatory complications. Chiefly responsible for the development of modern patterns of caries seem to be dietary changes that began during the eighteenth century, when principally refinement of foods and greater availability of sugar increased. For example, import duties on sugar in Britain relaxed in 1845 and were completely removed by 1875, a period during which the severity of caries greatly increased (Corbett and Moore, 1976).

Dental caries is still a major oral health problem in most industrialized countries, affecting 60–90% of schoolchildren and the vast majority of adults (Petersen, 2003). Worldwide differences exist in the incidence of caries, e. g. Eskimos and blacks have less experience with caries than people from developed countries. Due to changing living conditions, however, it is expected that the incidence of dental caries will increase in many developing countries, particularly as a result of a growing consumption of sugars.

For monitoring disease trends and enabling international comparisons, in their manual for oral health surveys the World Health Organization (WHO) suggests five age-groups as representative index ages: the 5-, 12-, 15-, 35–44-, and 65–74-aged (WHO, 1997). In order to describe the caries experience of these age-groups, in representative samples the prevalence of the *d*ecayed, *m*issing and *f*illed *t*eeth per individual are counted by the *DMF(T)*-Index (Klein et al., 1938; ► oral health in different age groups).

Looking at the oral health of different age groups, within the 12-year-old children, for instance, a substantial decline of dental caries levels can be recognized worldwide. In 2001 the global weighted mean DMFT value for this age group was reported to be 1.74 continuing to increase until today (global weighted mean DMFT = 1.61 in 2004). Although efforts have been made, there are still countries which suffer from a high rate of caries, and only 74% of the nations reached the formulated goal in 2004, representing 86% of the world population. In several developing countries even a trend toward higher levels of dental caries has been reported. The decreasing prevalence of caries within children (5 years, 12 years) does not continue in adolescents. The wide majority of adults are suffering from dental caries, but the increase of caries-prevalence is lower than at younger ages. Severity depends on many life circumstances and environmental factors and can be very different among individuals of the same population. For example, there is a tendency among elderly people with lower income to miss regular dental examinations and treatments and neglect regular oral hygiene. In addition to this they frequently consume much sugar and smoke and therefore suffer more often from dental caries. Dental caries seems to be closely associated with social and behavioral factors (► risk factors and high risk groups).

Throughout the world, losing teeth is still seen by many people as a natural consequence of aging. In many industrial countries the prevalence of edentulism is over 20% in people over 65 years of age. Whereas at younger ages dental caries is the main reason for the loss of teeth, in adulthood *periodontal diseases* (gingivitis, periodontitis) are predominantly responsi-

ble for extractions. Both, gingivitis and periodontitis result from bacterial infection and have been prevalent throughout human history. For assessing and recording the periodontal status, the WHO recommends the *C*ommunity *P*eriodontal *I*ndex (*CPI*-Index) (Ainamo et al., 1982). He uses three indicators (gingival bleeding, calculus and periodontal pockets) and comprises five codes. Code 0 is related to healthy conditions, Code 1 and 2 are signs for gingivitis, and code 3 and 4 is given in case of periodontitis (► oral health in different age groups).

Gingivitis is an inflammatory process of the gingiva in which the junctional epithelium remains attached to the tooth at its original level. In the young population, the frequency of gingivitis is nearly up to 100%. The prevalence increases from the primary dentition on and reaches highest scores in puberty. Beside the high prevalence of gingival inflammation (CPI-code 1 and 2 within nearly 100%), first signs of elevated probing depths could already be recorded in younger people. Only with a perfect personal oral hygiene it may be possible to diagnose a patient with no forms of gingivitis.

Periodontitis is a multifactorial process that on the one hand is a reaction on an untreated gingivitis although not every gingivitis stringently leads to periodontitis. On the other hand, there are individual dispositions that even make patients with a perfect oral hygiene suffer from aggressive loss of periodontal attachment. The expression of clinical disease is therefore a function of both bacterial infection and the host response to that infection, mediated by environmental factors like for example smoking and oral hygiene, genetic dispositions, professional periodontal-treatment, and much more (Burt, 2005). Periodontitis is characterized by clinical attachment loss (CAL) of the periodontal ligament and loss of bony support of the tooth. The kinds of periodontitis are mainly divided into an aggressive and a chronic form. Whereas early-onset periodontitis is infrequent, adult periodontitis is rather prevalent all over the world as well as gingival bleeding and calculus. But advanced disease with deep periodontal pockets (≥ 6 mm; Code 4), leading to severe loss of supporting periodontal tissues and tooth loss, affects only 10–15% of adults worldwide (Petersen,2003). It is well known that the destruction of the attachment apparatus can be reduced by continuous plaque and calculus removal. Within the last few years, the influence of periodontitis on other medical subjects has become a point of research. It is certain that periodontitis is a risk for bacteraemia. This is especially important for patients suffering from certain cardiac diseases who are at high risk of endocarditis. Not only an influence of diabetes with its risk factors on periodontitis but also the influence of periodontal diseases on progression of diabetes is discussed at the moment. It has been also linked to preterm birth and low birth weight.

Of all conditions that dental professionals see and treat, oral cancer is the only one that has life and death implications. Worldwide, the combination of tobacco use, heavy alcohol consumption and poor diet is responsible for 90% of all oral cancers (Johnson, 2001). It is high among men and the eighth most common cancer worldwide (Petersen, 2003). Carcinomas of the oral mucosa, tongue, and lip comprise 80% of all oral cancers on a global basis. Other affections counted among oral diseases are craniofacial anomalies, especially cleft lip and/or cleft palate, dentofacial anomalies like temporomandibular disorders or malocclusion and dental trauma (► oral diseases).

Management and Prevention of Oral Diseases

The management of oral diseases includes all the steps from examination to the diagnosis and treatment of these illnesses (► management of oral diseases). Since oral disorders can affect all oral and dentofacial structures, several treatment disciplines (specialties) exist due to the different types of diseases:

- *oral (and maxillofacial) surgery* (infections, maxillofacial trauma, oral cancer etc.)
- *Operative (or conservative) dentistry* (dental caries, dental trauma etc.)
- *Prosthodontics* (partial edentulism, temporomandibular disorders etc.)
- *Periodontology or periodontics* (gingivitis, periodontitis etc.)
- *Orthodontics* (dental misalignment, skeletal dysgnathy etc.)

Additionally, disciplines evolved focussing on certain age-groups: *Pediatric dentistry* centering on the provision of dental services to children, and *geriatric dentistry* concentrating on elderly and infirm patients.

The ultimate goal of treating oral diseases is the "restitutio ad integrum". This aim can only be achieved in fewest cases. Dentists primarily try to get a disease free state of the hard and soft tissues and in case of

restoration they aim at the longest possible survival of the treated tooth or the restoration respectively. The available methods of treatment have changed within the years. Looking for example at the management of dental caries, until the nineteenth century extraction of the affected tooth was the only useful treatment. Since then there has been a transition to restorative care in which the infected parts of the tooth are removed and replaced with an inert obdurating filling. During the latter half of the twentieth century technology enhanced. Badly destroyed teeth can now be restored with a range of adhesive tooth colored materials. Larger portions of dental hard tissues can be rehabilitated with full crowns. If single or multiple teeth are missing, the gap can be closed not only with removable dentures as in former times but also with fixed dental prostheses. Moreover, the missing units can be replaced by using an artificial tooth root replacement called dental implant which bear restorations as crowns and fixed or removable prostheses.

All these treatments provided by the dentists in fact improve or maintain a person's functional status and might reduce the social impact of dental caries on affected people but they do not help to avoid recurrence and therefore play a minor role in preventing. Hence, in the last centuries in dentistry a paradigm shift away from restorative to preventive medicine took place. Several studies pointed out that caries and periodontitis are avoidable to a high extent by using simple measures (► prevention of oral diseases). Due to the burden of oral diseases for the individual patient and the society, prevention of oral diseases is a prime objective for dental public health administrators. As in any area of public health, prevention can be approached through health education and health promotion, and through early case-finding and treatment. In general, successful caries prevention is based on (1) regular oral hygiene, (2) healthy food choice, (3) periodical consultation to a dentist, and (4) the use of fluorides. There are a number of well-tested and powerful methods of prevention at individual, professional and community levels. Measures at the individual level are regular oral hygiene, fluoride applications, healthy food choices and smoking cessation. Services delivered by dentists or auxiliaries include professional oral hygiene procedures, topical fluoride applications and fissure sealing. Caries prevention for groups can be offered in schools or Kindergartens and encompasses healthy food choices, the use of fluoridated salt, and oral health education. Community level measures are water fluoridation, all actions suitable to reduce common risk factors and all campaigns for healthy food choices. Improvements can be achieved, for example, by reducing the sugar intake to a maximum of 6–10% of food energy or four times daily and by improving nutrition in young children with regard to breast and bottle feeding. Establishing a safer environment by using seatbelts, child restraints, mouth protectors and helmets also reduces dental injuries.

Risk Factors and High Risk Groups

In order to clear up the etiology of the main oral diseases, for a long time research in dentistry was aimed at specific biological risk factors (bacterial or micro-structural causes). It is well known nowadays, that the immediate causes of the major diseases, caries and periodontal diseases, are diet (frequent intake of simple sugar), and plaque.

Current research in dentistry is more directed towards a wider risk concept including biological and psychosocial determinants, following the common risk factor approach (► risk factors and high risk groups). The Common Risk/Health Factor Approach aims at reducing risk and promoting health factors, no longer focusing on single diseases but rather aiming at an improvement of health conditions for the whole population. Risk factors are not necessarily causal. They include aspects of a person's condition (genetics), lifestyle or environment. Various combinations of risk factors lead to the disease. The more risk factors are involved in the disease process the more complex is the etiology of the disease. Subjects of high risk groups show more often such patterns of risk factor combinations which lead to an earlier disease onset and – in consequence – to a higher disease prevalence. However it is difficult to predict the disease in an individual subject using an isolated risk factor. Only a certain probability for the onset of a disease can be given if a risk factor is present. Ultimately, the use of a dentist's clinical judgment to identify people at risk of oral diseases has been shown to be as good as other selected methods because it includes not only aspects of the oral situation, but also aspects of lifestyle and environment (Kay, 1999).

Studies in dentistry exhibited that oral health is not only determined by diet and hygiene, but also by smoking, alcohol use, stress and trauma (Sheiham, 2000). This

core group of risk factors is common to many chronic diseases and injuries. Dietary excess, for instance, leads on one hand to chronic diseases such as obesity, cancer, and diabetes and on the other hand causes dental caries and periodontal diseases. Tobacco use, also a risk factor for cardiovascular and pulmonary diseases, has been estimated to account for over 90% of cancers in the oral cavity, and is associated with aggravated periodontal breakdown, poorer standards of oral hygiene and thus premature tooth loss (Petersen, 2003). These risk factors are common risk factors also found within the four most prominent non-communicable chronic diseases (NCDs): cardiovascular diseases, diabetes, cancer and chronic obstructive pulmonary diseases. Risk factors, related to lifestyle, are preventable. Lifestyle behaviors themselves are again problems related to social and cultural milieu rather than problems of the individual. Hence, adopting a collaborative approach is more rational than one that is disease specific.

Available data from population based studies show, that lifestyle problems as well as chronic (oral) diseases are more prevalent in disadvantaged and socially marginalized populations. Members of these social strata are characterized for example by an unhealthy and risky lifestyle, inability to change unhealthy behavior, bad oral hygiene, bad self-assessment of health, non-participation in prevention programs even if they are free of charge, and low social support. Periodontal diseases occur more often in smokers and in subjects with poor general health. Other specific risk groups for oral diseases are physically disabled and mentally handicapped subjects as well as immobile subjects show a higher risk for oral diseases.

The care of risk groups in dentistry should be directed to the change of their unhealthy and risky behavior. Therefore, it seems more useful to influence common risk factors for oral diseases related to lifestyle and environment. A major benefit of the common risk factor approach is the focus on improving health conditions for the whole population as well as for high risk groups, thereby reducing inequalities.

Social Inequalities in Dentistry

For a long time, the (oral) health status of the population has been mainly defined by the delivery and financing of medical care. But within the last centuries scientific surveys show that also in highly developed countries extensive social inequalities exist due to the state of health (► social inequalities in dentistry). Those groups of the population have the highest risk to fall ill or to die at an early age which have the lowest income, the lowest education level, the least possibilities to structure their lives, the lowest social assistance by small social networks (social support) and the lowest political influence – as an individual and also as a group. In short: lower socio-economic groups have poorer general and dental health and a shorter life than higher socio-economic groups.

Due to this finding science and politics are more and more interested in the fact that (oral) health reacts very seriously to social environmental influences, the so-called social determinants of oral health (SDOH). An extensive and recommendable paper on SDOH has been submitted by Marmot and Wilkinson (Marmot and Wilkinson, 1999). The most important SDOH with a lifelong impact on health are education and care in early life, social exclusion/inclusion, job security and working conditions, income inequality, stress, social support, general access to medical care, housing and food security, and physical environment.

Thus, the socio-economical conditions influence quite more the health status of the individuals than personal health behaviors and medical care. However, not only the objective strains of an individual are in the focus but also the individual possibilities and capacities to accept these strains and to deal with them (Sense of Coherence). Thus, the health strain per se is not important but the relationship of health strain and the individual resources to cope with them. In this context, the personal health behavior of an individual is influenced by this interaction and also by the kind of health care.

Many surveys on the prevalence of oral diseases amongst the population have been made worldwide. Dental caries is thereby the most carefully examined dental disease, in particular in the group of children and young adults. Studies show that caries, periodontitis and tooth loss had a significant association with a person's social status. Looking at caries for example in children and adolescents many surveys and studies point out that there is in fact a continual decrease of caries frequency (caries decline) since the 1970th, but – on the contrary – also a considerable imbalance of the caries prevalence (caries polarization). A high portion of dental caries occurs in a relatively small group of socially deprived people. The proportion of naturally

healthy dentition of children and young adults of the upper class is quite beyond the one of the social underclass. Caries in deprived portions of a population in children and adolescents might be accompanied by high prevalence rates of early onset type II diabetes, obesity and malnutrition. Caries polarization cannot only be observed in the group of children and young adults. This socio-medical problem indeed exists in all age groups and in different severity. The second major oral disease (periodontitis), too, shows clear stratum-specific differences with regard to its frequency in the population (Micheelis 2001.

For Dental Public Health these findings are of great significance with regard to prevention and care politics. The wider social determinants of health have of course also an impact on oral health as they have it on general health. All fields of politics, the explicit health policy, the primary and secondary prevention as well as the health promotion and the curative and rehabilitation fields are influenced by the interaction and correlation of the social situation and the health status. Therefore, politics, public health research, health care research and authorities of prevention and health care must deal with the social determinants of oral health (SDOH) in order to analyze the causes of health deficits of the society and to develop strategies for a structure of the social determinants orientated per se towards a better general and oral health. This should of course also include the aspect of social equality as the problem of social inequality is of priority importance for the society as a whole.

Oral Health Promotion

Tackling such health inequalities by health promotion has become a key policy objective. Health promotion, a core competency of (dental) public health, goes beyond health care. It is defined by the WHO as the process of enabling individuals and communities to increase control over the determinants of their health and thereby improve their health. The Ottawa Charter for Health Promotion, formulated during the first international conference on health promotion in Ottawa in 1986, announced five key action areas in this field: *1. Building healthy public policy, 2. Creating supporting environments, 3. Strengthening community action, 4. Developing personal skills, 5. Reorienting health services* (► oral health promotion). Promoting health can be achieved by three basic health promotion strategies: by advocacy for health, by enabling people to achieve their full health potential, and by mediating between the different interests in society in pursuit of health (WHO, 1986). (Oral) health promotion strategies can be orientated either towards the population as a whole or towards groups or individuals at risk of disease.

Factors, that have a significant influence on health, are numerous, interactive, and shaped by culture, economy and politics, which means that the fundamental determinants of oral health are socio-economic. Individuals have only a limited control over these determinants, but oral health promotion is a way to deal effectively with them. Oral health promotion uses techniques for multi-sectoral working and develops partnerships across agencies. Potential partners are not only doctors, paediatric nurses, pharmacists and midwives, but also teachers, parents, social workers, food producers, the advertising industry and local, national and international government (Daly et al., 2002).

Some say that health inequalities can only be addressed through a significant redistribution of income, e. g. by tax and benefit reform. But programmes can also aim directly at oral health, promoting equity of oral health outcomes by oral health education. Health education is defined as any educational activity aimed at achieving a health-related goal (WHO, 1984). It generally gives knowledge, develops skills, ensures understanding of health issues and promotes self-esteem in order to improve an individual's ability to choose a healthier lifestyle. In dentistry, health education has been adopted as the central thrust of prevention. But it is important to stress, that knowledge does not necessarily lead to behavior change. People can only transform new knowledge into action, if they are enabled to. Hence, their environment has to be changed. Nancy Milio formulated the core concept of health promotion: *Make the healthy choices easy choices* (Milio, 1981). So oral health education as a part of oral health promotion can only develop its full potential if it is supported by structural measures (legal, environmental, regulatory etc.).

Assessing the extent to which health promotion actions achieve a valued outcome is called health promotion evaluation. It is important as a means of developing effective interventions, for sharing and disseminating examples of good practice and for providing feedback to funding agencies, staff and participants. It is divid-

ed into *outcome* and *process evaluation*. Outcome evaluation looks for *what* an activity has achieved. Process evaluation wants to explain *how* outcomes have been achieved. Both quantitative methods and qualitative methods should be used.

Delivery of Dental Care

Dental care delivery is the process of providing oral health care, classified into *primary, secondary* and *tertiary care*. The most common way of providing oral health care is face-to-face delivery between care provider and patient. Dental care providers are mostly dentists (dental practitioners, dental doctors) and dental auxiliaries (e.g. dental chairside assistants, dental nurses). Dentists are generally capable to give instructions on prevention measures, to diagnose and to treat anomalies and diseases affecting the teeth, mouth, jaws and adjoining tissue. Dental auxiliaries may assist with chairside activities and tasks, including advice and motivation of patients concerning prevention and therapeutic preventive measures (► delivery of dental care).
Oral health care is provided in dental practices, in universities, in hospitals, in multi-dentist centers or by public dental services. Its organization is influenced by political, economic, social and technological factors, e. g. the characteristics of a health care system have an important influence on the quality and structure of the delivery of dental care. Information's on practice conditions, treatment measures, quality standards, as well as on fees and tariffs have also a great impact on the choice of the patients and consequently on the motivation and therefore the incentives of the health professionals (transparency). Another important item of oral health care delivery is the dental remuneration system. Funding conditions have a great influence on health care delivery, as they define who pays the costs and how dentists are compensated. No matter whether paid ultimately by a government body, a sick fund or directly by the patient, fee-for-service (or fee-per-item) is the major form of payment for private dental practitioners all over Europe, varying considerably within the countries. The most significant differentiation in developed countries is the one between salaried public health care and market-based health care (as practiced in the U.S.). In the majority of the EU-countries dental care is mostly provided by non-salaried, independent practitioners established in their own dental surgery (private-, liberal- or general practitioners). Only in countries with a large, salaried public dental service the liberal general practitioners are of less importance and prevalence (e. g. in the Nordic countries). In addition to the general practitioners in most countries there exist dentists who are working in public dental services, in dental wards of the hospitals, in universities or in the Armed Forces.
The delivery of dental care is an important factor in dental public health research because most countries are confronted with increasing expenditures in the health-care systems due to the process of demographic aging of the population, to the increasing demands and to the medico-technical progress.

Health System in Dentistry

Dentistry is practiced within the oral health (care) system of a country. Health systems have existed ever since people first attempted to protect their health and to treat diseases (► health system in dentistry). Organized health systems in the modern sense, however, are an institution of the last hundred or so years and universal cover is predominantly confined to industrialized countries.
In general the concept of health system subsumes all institutions and activities directed towards the provision and funding of health benefits to the population. Therefore, the "oral health system" is a combination of "organizations, flows of finance, workforce training and structure, laws, regulations and accepted practice which are aimed at improving the oral health of individuals and communities" (Anderson et al., 1998). Analysis reveals that the oral health system can be broken down into three components: (1) the oral health care system proper (the medical system), (2) the social, political and economic background to the oral health care system (health policy) and (3) patients' individual capabilities and attitude patterns (influenced by the oral health care system and the socioeconomic background). The objectives of the system are enshrined, for example, in the German Dental Association's "Oral Health Goals", which are in turn based on the World Health Organization's "Global Goals for Oral Health 2020". Compared with the health system as a whole, the oral health system exhibits certain particularities as "most oral care is provided as an outpatient service, and hospital oral health care is very limited" (Holst et al., 2002). Both the structure and organization of the system of oral

health care and the level of benefits provided depend on a state's specific "sociopolitical culture". Hence, existing national differences in the design of oral health systems are largely attributable to the historical and cultural particularities of the countries.

As decision-makers in countries of all levels of development, struggling to make appropriate choices to improve the performance of their health system, are faced with common problems, the interest in *comparative (oral) health systems research* has grown rapidly during the last two decades. Its central topics include studies of national health systems and reforms, differences and similarities in the macro-level structures of the health services, and the way in which various systemic changes and reforms enhance the quality, accessibility and cost-effectiveness of these services. An important aspect of comparative health systems research is international comparison of the *performance* of health systems – that is, the extent to which health goals (including oral health goals) are achieved and the resources required for this purpose.

The oral health care systems of the EU-countries are based on three different models (also see ► delivery of dental care):

1. The *Bismarck Model*, a government-regulated social insurance system, where oral health care is mainly financed through compulsory social insurance, with the option of voluntary private insurance.

2. The *Beveridge Model*, a government-organized and tax-financed national health system, where financing of oral health care used to be predominantly provided out of general and/or specific taxation, collected by central or regional government.

3. The *Semashko Model*, a mixed system of Bismarck [financing] and Beveridge [provision], in which oral health care is mainly financed by compulsory social insurance.

As a rule, these models are not applied in pure form; that is to say, a given national health system may perfectly well include individual features of a different model and thereby assume a hybrid configuration. Since all national health systems are faced with similar economic and demographic challenges and a concerted European health policy is proposed for the medium term (under the "Open Method of Coordination"), it is generally assumed that there will be a "convergence of systems".

Health Economics in Dentistry

Health economics is an independent branch of economics that is concerned both empirically and theoretically with the economic aspects of healthcare and more particularly with the production and distribution of scarce health goods (► health economics in dentistry). Health economics, then, is fundamentally a science not of minimization but of optimization. In the particular field of dentistry, the subdiscipline of "dental health economics" has hesitantly come into being and is still relatively undeveloped in the German-speaking countries as compared with the United States, the United Kingdom, the Netherlands and Scandinavia. According to the World Health Organization's standard definition, the function of health economics is "inter alia to quantify over time the resources used in health service delivery, their organization and their financing; the efficiency with which resources are allocated and used for health purposes; and the effect of preventive, curative, and rehabilitative health services on individual and national productivity" (World Health Organization, 1975). Health economics in the sphere of dental care is concerned in particular with (1) the allocation of resources to dental treatment, (2) the efficiency of dental service, (3) the distribution of health goods and services, and (4) the creation of value. The specific methods used in health economics are characterized by systematic comparison of the costs and benefits of given actions and the balancing of alternatives against each other.

Health-economic analysis can be applied at different levels. On the *micro-level*, sometimes referred to as "health services management", it concerns the actions of individual actors. The *meso-level* examines the actions of the intermediate actors in the health system. Finally, the *macro-level* is that of analysis of the characteristics of the system as a whole. "Health system analysis" is conducted from the macroeconomic point of view, and examines such issues as dental overprovision, underprovision and malprovision.

For practical purposes, perhaps the most important aspect of health-economic evaluation in the dental field is assessment of the costs and effects of different therapies and/or preventive strategies. The outcome parameters used are epidemiological data, such as the DMFT value for caries or the Community Periodontal Index (CPI) for periodontal status. To ensure that the results

of health-economic evaluation studies can be validly interpreted, minimum requirements as to methodology and transparency must be observed (Drummond, 2005). Within the systematization of types of health-economic evaluation, studies are divided into non-comparative studies (e. g. Cost of illness study (CIS)) and comparative studies (e. g. Cost effectiveness analysis (CEA).

Economic evaluations facilitate the choice of alternatives in dental practice in a situation of scarce resources. A strikingly large number of evaluation studies in the dental field are devoted to comparison of the costs of preventive strategies with their effectiveness (CEA). Preventive measures have a relatively long tradition in dentistry. A comparison of the economics of various prophylactic measures shows that all current measures of prophylaxis and tooth conservation are cost-effective and hence to be recommended in terms of health economics. Apart from vaccination, no other field of healthcare has such high efficiency as dental prophylaxis, and in particular fluoridation for the prevention of caries. With regard to the development of cost utility analysis (CUA) and cost benefit analysis (CBA), health-economic research is still in its infancy, as investigation of the benefits of dental measures is enormously more complex in terms of methodology than determination of their costs. The significance of health economics as an instrument of rational policy-making is likely to increase further in the future, as (oral) health is in economic terms a superior good, which means that the demand for it increases disproportionately as incomes in society as a whole rise.

Oral Health Policies

The WHO has described that a basic policy value is *equity*, which means that everyone should have a fair opportunity to attain his or her full health potential. Disadvantaged people experience much higher levels of oral disease than well-off people. A number of specific innovative approaches to reduce health inequalities have been employed in various European countries. Closely linked is the value of *solidarity*, meaning that everyone contributes to the health system according to his or her ability. A health policy that promotes solidarity is better able to counterbalance social inequities. Health policies include actions of both public and private organizations inside and outside the health system. They refer to what health agencies actually do, although their decisions or actions may not be intended or even recognized as policy. Taking part in policy development is an important task for oral health facilitators (▶ oral health policies).

Oral health policies are oral health-related formal statements, which set overall guidelines and outline future directions, or courses of action that affect institutions, organizations, services, funding arrangements, groups and individuals. On the international level, global oral health objectives have been presented. With regard to the content of oral health policies, the WHO proposes to address priority action areas like, for instance, supporting the widespread allocation of fluorides (particularly important in the light of a changing diet), improving the health of important target groups like school children, youth and elderly people, avoiding and discontinuing the use of all forms of tobacco, stimulating oral health research, supporting the development of oral health services that matches the needs of the country and much more. The targets relate to disease and disability indicators and have to be adapted by local authorities. The strategy is built around the twin goals of *improving* population health and *reducing* health inequalities.

A health-making policy deals effectively with the environments and ways of living. The concept of "healthy public policy" has been described as follows (Milio, 1981): Personal behavior patterns are not simply "free" choices about "lifestyle", isolated from the social and economic context. Lifestyles are patterns of choices made from the alternatives that are available to people according to their socio-economic circumstances and to the ease with which they are able to choose certain ones over others.

Choice options available to the population and to social groups do not simply "happen". Rather they are themselves the result of policy choices: governmental and corporate decisions concerning technology, income maintenance, taxation, health care and other services. These policies represent the scope of health-making policy. Policy, from this perspective, is *option-setting*. A health-making strategy eliminates those options that result in health-damaging situations, or increases the cost of those options. It provides new, easier opportunities, or reduces the costs of these options. This approach emphasizes neither prohibition nor prescription, but rather new opportunities for choice-making. Individuals and organizations that want to continue to choose health-damaging options would be able to do

so. However, they would pay higher costs than if they made health-promoting choices.

The process of health policy making refers to the way in which policies are initiated, formulated, negotiated, communicated, implemented and evaluated. Trying to influence oral health policy requires maintaining a strong oral health unit within health agencies. Opportunities for funding may arise in conjunction with key policy developments currently taking place. Oral health policies should explicitly relate to policies in the health and social sectors. Partners have to be found among policy makers, professionals, organizations, groups and the public. Interest groups (e. g. companies and for-profit-organizations) try to influence public policy on particular issues at various stages of the policy process. But also organizations registered as not-for-profit may not be independent.

Summary

Caries and periodontitis are among the most common diseases. The burden of oral diseases for the individual patient and the society is substantial; their sequelae with tooth loss on top affect all health dimensions. Dental diseases can be successfully treated and for their prevention an array of measures is available. Being widespread, preventable and of high impact upon the society and the individual, oral diseases meet the criteria of a public health problem. Therefore, the interdisciplinary field of Dental public health has been established focusing on oral health and oral and dental diseases. As in any area of public health, prevention can be approached through health education and health promotion, and through early case-finding and treatment.

Cross-References

- ► Delivery of Dental Care
- ► Health Economics in Dentistry
- ► Health System in Dentistry
- ► Management of Oral Diseases
- ► Oral Diseases
- ► Oral Health in Different Age Groups
- ► Oral Health Policies
- ► Oral Health Promotion
- ► Oral Health Related Quality of Life
- ► Outline of Dental Public Health
- ► Prevention of Oral Diseases
- ► Risk Factors and High Risk Groups
- ► Social Inequalities in Dentistry

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Dental Restoration

Definition

In the narrow sense of the word, dental restorations comprise all means to restore single teeth or dental arches with fillings, crowns, bridges and implant-born crowns and bridges of any kind. Sometimes, also removable dentures are referred to as dental restorations.

Dental Sealant

Synonyms

Fissure sealing

Definition

A dental sealant is plastic material that is applied to the chewing surface (pits and fissures) of the ► molar teeth in order to prevent dental caries. The application of dental sealants is usually carried out in a dentist's office. The dentist or assistant first cleans and dries the tooth to be treated, then paints a thin layer of liquid plastic material on the pits and fissures of the tooth. After light curing, the plastic becomes a hard, thin layer covering the treated portions of the tooth. The approximal (sideward) tooth surfaces that are also very prone to caries are not accessible for sealants. When correctly applied, dental sealants are nearly 100% effective in preventing dental caries on treated tooth surfaces. Despite this, and the fact that dental sealants have been widely available since the early 1970s, it is estimated currently that fewer than 20% of the population have dental sealants.

Dental Treatment

► Management of Oral Diseases

Denture

► Complete Removable Dental Prosthesis

Denturist

Definition

A denturist is a non-dentist who provides treatment with removable dentures directly to patients. Many denturists have a dental technology background. Because intra-oral measures are conducted by non-medical professionals, denturists are only legally approved in some countries (e. g. some of the United States) whereas in others this approach is illegal.

2′-Deoxyribonucleic Acid

► Deoxyribonucleic Acid (DNA)

Deoxyribonucleic Acid (DNA)

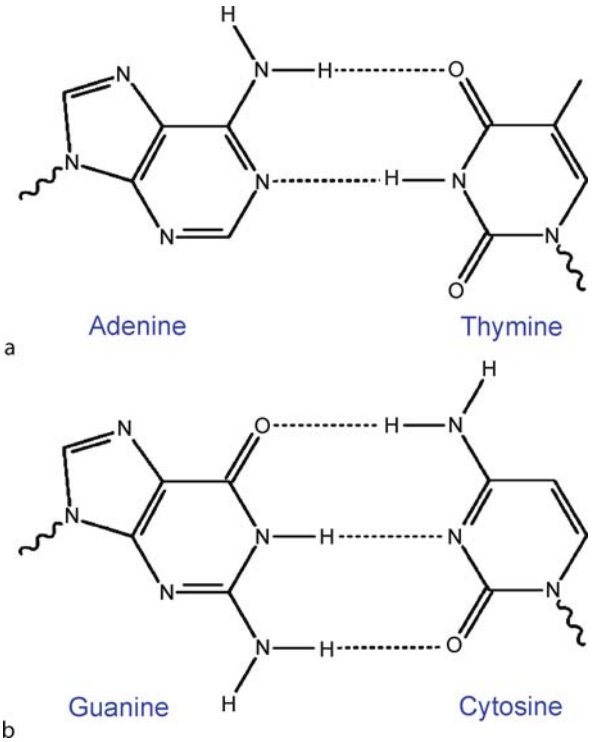
Synonyms

2′-Deoxyribonucleic acid

Definition

DNA is the molecule in which genetic information is primarily encoded in the genomes of most organ-

isms, including humans. It is a polymer which consists of subunits called 'deoxyribonucleotides' or just 'nucleotides,' and each subunit is made of a nitrogenous base (double-ringed purines Adenine (A) and Guanine (G), and single-ringed pyrimidines Thymine (T) and Cytosine (C)); a ringed five-carbon sugar, ribose, with a hydrogen (–H) instead of a hydroxyl group (–OH) bonded to the second carbon (2′ – hence, 2′-*deoxy*ribose), and a covalent bond between the first and fourth carbon; and phosphate groups ($-PO_4$) attached to the third (3′) and fifth (5′) carbon. In order to stabilize its structure, DNA aligns itself with a strand bearing a complementary sequence, as defined by the order of nucleotides on the strand; since A has an affinity for T, T for A, G for C, and C for G (Fig. 1), the sequence of the complementary strand always has the appropriate nucleic acid for weak bond formation. For proper orientation, the nucleotides of the complementary strand align with their 5′ and 3′ phosphate groups in the opposite direction of the 5′ and 3′ groups on the original strand, hence it is said that complementary DNA strands are 'anti-parallel'. For example, a section of sequence 5′-AGCTTA-3′ will align with a complementary sequence 5′-TAAGCT-3′. Two weakly-bonded nucleotides on complementary strands are often called a 'base pair', a term often used interchangeably with nucleotide. When DNA strands are copied in the process of ► replication, and when DNA is used as a template for the coding of an RNA transcript, both processes proceed by making base pairs with the template strand in the direction of the 3′ carbon; hence it is said that DNA is read 5′ to 3′. When complementary strands are first fully-bonded, the DNA relaxes into a coiled state as the most energetically ideal configuration; this right-handed coil of two strands is often called a double-helix and is the most common variant of DNA observed. Another important feature of the helical structure is that the distance between coil twists is asymmetrical- there is a major groove (18–19 angstroms between twists) and a minor groove (12–13 angstroms between twists), the existence of which is relevant to the binding of some proteins which interact with DNA. DNA is similar to ribonucleic acid (RNA), which is used for several functions in the cell. RNA differs from DNA in two ways: 1) there is no missing hydroxyl (–OH) group at the 2′ carbon – this allows degradative enzymes to recognize RNA so that transcripts are not overly abundant or repeatedly translated; and 2) instead of the nucleic acid Thymine (T), RNA incorporates Uracil (U), which differs in structure from Thymine by having one less methyl ($-CH_3$) group (Fig. 2).

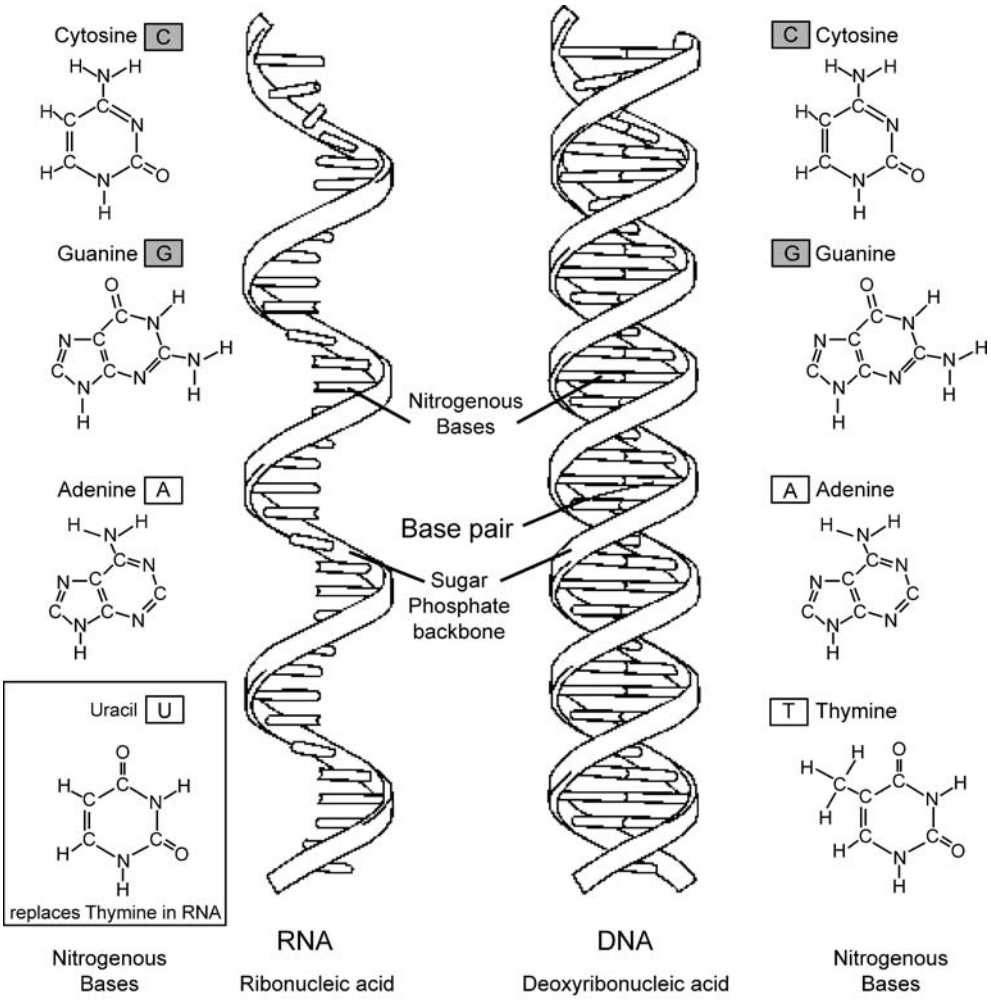


Deoxyribonucleic Acid (DNA), Figure 1 Illustration of bond formation between nucleotides in a base pair

Dependence Syndrome

Definition

A cluster of behavioral, cognitive, and physiological phenomena that develop after repeated substance use and that typically include a strong desire to take the drug, difficulties in controlling its use, persisting in its use despite evidence of harmful consequences, a higher priority given to drug use than to other activities and obligations, negligence of social responsibilities, increased tolerance, and sometimes a physical ► withdrawal state. The dependence syndrome may be present for a specific psychoactive substance (e. g. tobacco, alcohol, or diazepam), for a class of substances (e. g. opioid drugs), or for a wider range of pharmacologically different psychoactive substances.



Deoxyribonucleic Acid (DNA), Figure 2 Illustration of single-stranded RNA vs. double-stranded DNA

Cross-References

► Substance Dependence

Dependency Ratio

Definition

The dependency ratio is the ratio of the economically dependent portion of the population to the productive part of the population. Children under the age of 15 and adults ages 65 and older are assumed to be economically dependent, while individuals 15–64 are considered to be productive or capable of working. A higher dependency ratio (the number of children or elderly is larger relative to the number of working-age adults) indicates that the productive population must carry a larger burden in order to provide for dependent children and the elderly.

Dependent Groups Design

► Paired Groups Design

Dependent Samples Design

► Paired Groups Design

Dependent Variable

► Event
► Outcome Research Variable

Depressants

► Hypnotics and Sedatives

Depression

Synonyms

Depressive disorder

Definition

Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration. These problems can become chronic or recurrent and lead to substantial impairments in an individual's ability to take care of his or her everyday responsibilities. The term depression is often used to refer to any of several depressive disorders. Three are classified in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) by specific symptoms: major depressive disorder (major depression), dysthymia, and depressive disorder not otherwise specified. Two others are classified by etiology: depressive disorder due to a general physical condition and substance-induced depressive disorder.

Depressive Disorder

► Depression

Depressive Episode

Synonyms

Depressive reaction; Reactive depression; Psychogenic depression

Definition

Individuals suffering from depression show lowering of mood, reduction of energy, and decrease in activity. There are mild, moderate, or severe depressive episodes (with or without psychotic symptoms). Capacity for enjoyment, interest, and concentration is reduced in the depressed patient, and marked tiredness after even minimal effort is common. Sleep is usually disturbed and appetite diminished. Self-esteem and self-confidence are almost always reduced and, even in the mild form, some ideas of guilt or worthlessness are often present. The lowered mood varies little from day to day, is unresponsive to circumstances, and may be accompanied by so-called "somatic" symptoms, such as loss of interest and pleasurable feelings, waking in the morning several hours before the usual time, depression worst in the morning, marked psychomotor retardation, agitation, loss of appetite, weight loss, and loss of libido. According to ICD-10, depending upon the number and severity of the symptoms, a depressive episode may be specified as mild, moderate, or severe.

Depressive Neurosis

► Dysthymia

Depressive Personality Disorder

► Dysthymia

Depressive Reaction

► Depressive Episode

Dermatitis nodosa tropica

► Onchocerciasis

Dermatitis in Schistomoniasis

► Cercarial Dermatitis

Dermatology

Definition

Dermatology is the branch of medicine concerned with the diagnosis, treatment, and prevention of diseases of the skin, hair, nails, oral cavity, and genitals. It sometimes also includes cosmetic care and enhancement.

Descriptive Statistics

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Synonym

Exploratory data analysis

Definition

Descriptive statistics is a group of statistical procedures used for organizing, numerical description, and tabular and graphical representation of a data set.

Basic Characteristics

Frequency Distribution

Data analysis usually begins by organizing and counting the data and placing frequencies into tables. It is often important to know the ► ratio of absolute ► frequency (x) of a unit of observation that possesses a certain specific characteristic (belonging to a specific category or class interval) and the total number of units of observation (n). This relative frequency is called ► proportion: $p = x/n$. Proportion can be expressed as a percentage: $p(\%) = x/n \cdot 100$. Proportions can be interpreted as the equivalent of ► probability, because one of the definitions of probability (empirical probability) is based on relative frequencies (Bowers 2002).

For qualitative variables the organization of data is by categories (e. g. for vaccination status data can be organized into the categories "vaccinated" and "non-vaccinated"). Frequencies of categories are obtained by counting the units of observation in every category. An example of a ► graphical representation of category frequencies is a pie chart, where every segment is proportional to the frequency of the category which it represents. Another method of representation is a bar chart, where the height of the bars are proportional to the frequencies of the categories.

Discrete quantitative variables are given specific numerical values, and continuous quantitative variables are given class intervals. ► Frequency ► distribution is thus obtained by counting. Absolute frequency distributions are actual frequencies, and a relative frequency distribution is obtained by dividing them by the total number of data (Horwitz, Ferleger 1980). Cumulative frequency distribution is obtained by adding the frequencies of single groups or class intervals. Cumulative absolute frequency distributions are actual frequencies, and cumulative a relative frequency distribution is obtained by dividing them by the total number of data.

Distribution frequencies can be presented as a tabular display or a graphical display. A frequency table contains the values of the variables in the first column (names of the categories, discrete numerical values or class intervals), and the remaining columns contain the frequencies and relative frequencies.

An appropriate ► graphical representation of a frequency distribution of discrete quantitative data is a bar chart, and a frequency distribution of continuous quantitative data can be represented in a histogram, frequency polygon, or stem-and-leaf plot (Krishnamurty et al. 1995).

Frequencies in Epidemiological Measurement

Frequencies in epidemiological measurement are defined as: (a) incidence – frequency of a new event (disease, injury, death) in a population during a defined period of time, (b) point prevalence – frequency of events in a population at a certain point in time, and (c) period prevalence – frequency of people in the population who have been affected by the event at any time over a specified period.

► Rate is a ► ratio of the frequency of events (numerator) and the population at risk (denominator). It is multiplied by a constant (100, 1000, 10000 or 100000), in order to avoid the fractioning of events and enabling easier interpretation and understanding of the rates. When the numerator is incidence, the result is the incidence rate, and when the numerator is prevalence the result is the prevalence rate.

Risk is estimated as the proportion of people who may be affected by a risk event within the observed period (Katz 1997), i. e. measure of ▶ probability of occurrence of a risk event (Bowers 2002). Rates can be used for risk estimate (Katz 1997).

Theoretical Probability Distribution

Summary ▶ measures of central tendency and ▶ measures of dispersion are usually calculated after obtaining the empirical frequency distribution. Which of these measures will be applied depends on which model of theoretical probability distribution is closest to the actual empirical distribution. The theoretical model of ▶ normal distribution is the one that is most often suitable for the analysis of empirical distributions. Normal distribution is graphically displayed as a bell-shaped curve, when the value of the variable is on the x-axis and the probability density of occurrence of these values is on the y-axis. Deviation of the empirical distribution from the theoretical normal distribution can be estimated by applying the analysis of skewness and kurtosis, and by applying statistical tests for testing the null hypothesis that the sample data came from a normal population. When the empirical distribution is close to the theoretical normal distribution, then the data are best summarized by parametric summary measures such as mean, ▶ variance and ▶ standard deviation. If the data are drawn from a non-normal distribution, then the non-parametric statistics such as median, mode, percentiles and range may be more suitable.
Other important theoretical distributions are ▶ binomial distribution and ▶ Poisson distribution.

Measures of Central Tendency

▶ Measures of central tendency are values around which the data tends to group. The measures of central tendency that are most commonly used are ▶ mean, ▶ median, mode and geometric mean.
▶ Mean is computed by dividing the sum of all values by the number of values: $\bar{x} = (\sum x)/n$.
▶ Median is equal to the numerical value of the central data in the sequence of data ordered from the smallest to the largest. When the number of data is even, the median is equal to the average of the two central values. Mode is the value with the highest frequency of occurrence in a set of data.

Geometric mean is the n-root of the product of n observations: $G = \sqrt[n]{x_1 \cdot x_2 \cdot \cdots \cdot x_n}$. It can also be expressed as the antilogarithm of the mean of the logarithms of every value: $G = \text{antiln}(\sum \ln x)/n$.

Example 1

For the example data 1, 7, 1, 5, 1, 3, and 6, mean equals

$$\bar{x} = \frac{1+7+1+5+1+3+6}{7} = 3.43\,.$$

By rearranging the data from the smallest to the largest, the following sequence is obtained: 1, 1, 1, 3, 5, 6, 7. The central data in the sequence is the fourth data ((7+1)/2=4). The fourth data has a value 3, and this is, at the same time, the value of the median.
The mode value equals 1, because this is the value that has the highest frequency of occurrence (it occurs three times).
Geometric mean equals:

$$G = \text{antiln}\frac{\ln 1 + \ln 7 + \ln 1 + \ln 5 + \ln 1 + \ln 3 + \ln 6}{7} = \text{antiln}0.92 = 2.51$$

Measures of Dispersion

▶ Measures of dispersion show a degree of ▶ variability (variation or dispersion) of values of the observed variable around the measures of central tendency. The measures of dispersion can be divided into the measures based on quantiles and the measures based on deviation of observations from the mean.

Measures of Dispersion Based on Quantiles Quantiles are values of the observed variable which divide the frequency distribution into groups that consist of equal proportions of the number of observations. The most frequently used ones are quartiles, deciles and percentiles. Quartiles divide the sample of data into four groups, each containing 25% of the observations, deciles into ten groups, each containing 10%, and percentiles into 100 groups containing 1%. The median is equal to the second quartile, fifth decile and fiftieth percentile.

Range is the Difference Between the Largest and the Smallest Value Interquartile range is the difference between the first and the third quartile, i. e. 25. and 75.

percentile, and it contains 50% of the central observations. Minimal and maximal value, the first and third quartile and median (second quartile) are graphically presented by using the box-and-whisker plot.
Interdecile range is the difference between the first and the ninth decile, i. e. 10. and 90. percentile, and it contains 80% of the central observations. Reference range is frequently used and it contains 95% of the central observations, i. e. when 2.5% of observations are excluded on each side of the frequency distribution (Petrie, Sabin 2005).

Measures of Dispersion Based on the Deviation of Observations from the Mean ▶ Variance is a mean square deviation from the mean, and its estimate based on the sample data is obtained using the formula:

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = \frac{\sum x^2 - n\bar{x}^2}{n-1}$$

where x_i is an individual value, $\bar{x}$ is the mean, n is the sample size, and $n - 1$ is the number of the degrees of freedom.
▶ Standard deviation is the square root of the variance, and therefore it is expressed in the same units of measurement as the original observations. Standard deviation is a base for calculating the ▶ z-score (standard score), which gives the deviation of an individual value from the mean expressed in standard deviations (De Muth 2006):

$$z = \frac{x_i - \bar{x}}{s},$$

where x_i is an individual observation, $\bar{x}$ is the mean, and s is a standard deviation.
Coefficient of variation is a relative measure of variation obtained by dividing the standard deviation by the mean and expressing this ▶ ratio as a percentage: $CV = s/\bar{x} \cdot 100$.

Example 2

On the basis of the sample data from example 1 an estimate of the population variance equals:

$$s^2 = \frac{1^2 + 7^2 + 1^2 + 5^2 + 1^2 + 3^2 + 6^2 - 7 \cdot 3.43^2}{7-1} = \frac{122 - 69.21}{6} = 6.62,$$

and standard deviation $s = \sqrt{6.62} = 2.57$. *Coefficient of variation equals* $CV = 2.57/3.43 \cdot 100 = 75\%$.
Deviation of the second observation (value 7) from the mean, expressed by z-scores equals:

$$z = \frac{7 - 3.43}{2.57} = 1.39.$$

D

Effect Size

▶ Effect size is a measure of the strength of the ▶ relationship between two variables. Effect size estimates make comparison of results between different studies easier because they have characteristics of standardized indices and are independent from the sample size (Abelson 1995; Hojat, Xu 2004). Depending on the type of data and the design of the research, they are calculated in different ways. The estimates of the effect size are most frequently calculated based on (a) difference between the means, (b) difference and ratio of proportions, and (c) ▶ measures of association.

Effect Size Based on the Difference Between the Means Standardized mean difference is most frequently calculated in one of the following ways: Glass's Δ, Hedge's g and Cohen's d. Glass's Δ is calculated as $\Delta = (\bar{x}_E - \bar{x}_C)/s_C$, where $\bar{x}_E$ and $\bar{x}_C$ are means of the experimental and control groups, and s_C is a standard deviation of the control group. Modifications of this metric are Hedge's g calculated as $g = (\bar{x}_E - \bar{x}_C)s$, and Cohen's d calculated as $d = (\bar{x}_E - \bar{x}_C)\sigma$, where denominators are pooled standard deviations (standard deviation of all data from both groups). For dependent samples in repeated measurement (pre-test post-test design) pre-test standard deviation can be used as denominator.

Effect Size Based on the Difference and Ratio of Proportions Effect sizes that can be calculated based on the difference and ratio of proportions are risk difference and ▶ relative risk (formulas and examples for these measures are given in the essay "Analysis of frequencies").

Effect Size Based on the Measures of Association Estimates of effect size used as ▶ measures of association are ▶ Pearson's correlation coefficient, phi (ϕ) coefficient, contingency coefficient and ▶ odds-ratio.

► Pearson's correlation coefficient (r) is a measure of the linear association of two variables. In correlation analysis and calculation of correlation coefficient it is not necessary to assume a ► relationship between the variables, in terms of independent and dependent variables, like in ► regression analysis. ► Graphical representation of the relation of data pairs using the scatter diagram precedes the calculation of correlation coefficient. The values of correlation coefficient vary from −1 to +1. Positive values indicate positive correlation, i. e. tendency of values of both variables to increase or decrease together. Values from –1 to 0 indicate negative correlation, i. e. tendency that the increase of value of one variable is associated with the decrease of value of the other variable and vice versa. Values close to 0 indicate low correlation, and those close to –1 or +1 indicate strong linear correlation of two variables. The value of correlation coefficient can be estimated by the formula:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{n\sum x^2 - \left(\sum x\right)^2}\sqrt{n\sum y^2 - \left(\sum y\right)^2}}$$

where x and y are the values of the variables whose correlation we are examining, and n is the sample size.

When data are presented in rank order or the data are from the ordinal scale of measurement, instead of Pearson's correlation coefficient we use Spearman's rank correlation coefficient or Kendall's tau (Kirkwood et al. 2003).

Two special cases of Pearson's correlation coefficient are: (a) point-biserial correlation coefficient – correlation coefficient where one variable is continuous and the other is dichotomous, and (b) biserial correlation coefficient – correlation coefficient where both variables are continuous, but one of them is artificially converted into a dichotomous variable.

Phi (ϕ) coefficient, contingency coefficient and ► odds-ratio formulas and examples of calculation are presented in the essay "Analysis of frequencies."

Interpretation of the Effect Size For easier interpretation, effect sizes can be classified as small, medium and large. For the standardized mean difference the value of 0.20 can be considered as small, 0.50 as medium, and 0.80 as large. When the correlation coefficient, phi (ϕ) coefficient, or contingency coefficient are observed as the effect size, the value of 0.10 can be considered as small, 0.30 as medium, and 0.50 as large (Cohen 1998).

Cross–References

► Binomial Distribution
► Descriptive Statistics
► Frequency
► Frequency Distribution
► Graphical Representation
► Mean
► Measures of Association
► Measures of Central Tendency
► Measures of Dispersion
► Median
► Normal Distribution
► Pearson's Correlation Coefficient
► Poisson Distribution
► Probability
► Proportion
► Rate
► Ratio
► Regression Analysis
► Relationship
► Standard Deviation
► Variability
► Variance
► z-Score

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Descriptive Studies

Definition

A study that aims to reveal patterns associated with a specific disease without an emphasis on pre-specified hypotheses is called a descriptive study. Sometimes these types of studies are called hypothesis generating studies (to contrast them with hypothesis testing studies). There are three general reasons that may lead to conduction of a descriptive study: to help in planning resource allocation, to identify areas for further research, and to provide informal diagnostic information. Generally, in a descriptive study, the emphasis is on estimation rather than testing. Some of the quantities that are estimated within a descriptive study are the prevalence of a disease, the natural history of a disease, the resources required to treat the disease, and attitudes and perceptions about the disease.

Desired and Unwanted Fertility

Synonyms

Wanted and unwanted fertility

Definition

Desired fertility is the ideal number of children a woman, man, or couple would have regardless of the number he or she already has. Any births in excess of desired fertility are considered unwanted fertility. Alternatively, unwanted fertility can be measured as the proportion of births in the past year that were unwanted. Unwanted childbearing is an important indicator of the need for ► family planning services in a community, particular when women who desire no additional children are not using contraceptive methods (► contraception).

Determinant of Disease

► Risk Factor

Determinants of Health

Definition

Determinants of health are ► health indicators that represent factors which either directly cause illness and disease, or are risk factors that affect the health status of populations and individuals. Determinants of health roughly include the social environment (cultural, political, policy, socioeconomic factors, economic systems, social capital, and community capacity, etc.), the physical environment (living and working conditions), person-related dimensions (such as genetic endowment and health behaviors), and access to health services.

Development Cycle of Plasmodia

► Development of Plasmodia

Development of Plasmodia

Synonyms

Development cycle of plasmodia

Definition

For their cycle of development plasmodia need two different hosts. In humans, which are intermediate hosts, plasmodia reproduce asexually. In the *Anopheles* mosquito, which is the final or definite host, the germs reach a mature stage and reproduce sexually. From the mosquito's stomach wall the plasmodia get into the salivary glands. Then – with the next bite – they are transmitted into the human blood vessels. After an intermediate stop in the liver the parasites affect the red blood cells. When an infected person is bitten the plasmodia are taken up by the mosquito. Thus the cycle of development is repeated.

Devotion

► Religion

DG SANCO

Definition

DG SANCO is the French acronym for the "Directorate General Santé et protection des consommateurs" – Directorate General for Health and Consumer Affairs. It depicts an administrative unit of the European Commission and is divided in the following 3 sections:

- Public Health
- Food safety
- Consumer Affairs

Diabetes

Synonyms

Diabetes mellitus

Definition

The word "diabetes" is borrowed from the Greek word meaning "a siphon". The 2nd century AD Greek physician, Aretus the Cappadocian, named the condition "diabetes". He explained that patients with it had polyuria and "passed water like a siphon". Diabetes mellitus is a group of metabolic diseases characterized by high blood sugar glucose levels, which result from defects in insulin secretion, or action, or both.

Diabetes mellitus

Synonyms

Group of chronic diseases with hyperglycemia

Definition

Diabetes Mellitus is a group of metabolic disorders in man. It occurs as diabetes mellitus type 1 (Juvenile onset type) and diabetes mellitus type 2 (Adult onset type). These conditions are characterized by high blood sugar levels and loss of glucose in the urine resulting from defects in insulin secretion, or action, or both. Normally, when blood glucose level rises, insulin is released from the pancreas to normalize the level of blood glucose. Generally, in diabetic patients, the release of insulin is absent, insufficient or the body cells are unable to use insulin efficiently thus leading to a rise in blood glucose.

In type 1 diabetes (insulin dependent diabetes, IDDM), there is an absolute lack of insulin secondary to an autoimmune destructive process occurring in the beta cells of the pancreas due to abnormal antibodies. The tendency to develop these abnormal antibodies is understood to be, in part, genetically inherited. Some viral infections or environmental toxins may also trigger the development of such abnormal antibodies. Type 1 diabetes accounting for only 10% of diabetic cases, tends to occur mainly in young individuals under 30 years of age. Occasionally, it occurs in older persons and is referred to as latent autoimmune diabetes mellitus (LADA). In type 2 diabetes (non-insulin dependent diabetes, NIDDM), there is insulin resistance and a steady decline of pancreatic beta cells affecting mainly the metabolism of muscle and fat tissues. Patients with this condition are normally over 30 years of age and produce an amount of insulin which is inadequate to meet the needs of the body. In a condition with insulin resistance or insensitivity of body cells to insulin, the pancreas may produce insulin that is greater than the normal amount usually required by the body. Type 2 diabetes accounts for about 90% of diabetic cases, and is frequently associated with clinical obesity.

In both types of diabetes, acute complications may consist of: a) severely elevated blood sugar level due to lack or insufficiency of insulin, b) abnormally low blood sugar level due to high amount of insulin or other blood sugar-lowering medication.

Chronic complications of diabetes include microvascular diseases involving the eyes (retinopathy), kidneys (nephropathy), nerves (neuropathy), and macrovascular diseases involving the heart and large blood vessels.

According to the World Health Organization, there are more than 180 million people worldwide with diabetes and in 2005 there were 1.1 million people who died from diabetes whereof 80% lived in low and middle-income countries. Of the affected people worldwide, 90% suffer from type 2 diabetes which is largely driven by excess body weight and physical inactivity and can therefore influenced by appropriate behavior and prevention measures.

Cross-References

► Diabetes

Diabetes mellitus that Begins During Pregnancy

► Gestational Diabetes

Diagnosis Related Groups (DRGs)

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Definition

Diagnosis Related Groups (DRGs) are a classification system for inpatient hospital services. Patients are grouped together "according to principal diagnosis, presence of a surgical procedure, age, presence or absence of significant ► co-morbidities or complications, and other relevant criteria" (U.S. Congress 1983). As all patients within the same DRG are expected to have similar hospital resource use, this classification system is also used to reimburse the cost of inpatient hospital care.

Basic Characteristics

History

DRGs were originally developed by the scientific team around R. B. Fetter in the late sixties at Yale University in the United States. As an instrument to control the provision of ► inpatient health care, DRGs relate the type of patient to the specific costs of treatment incurred. In 1983, in response to the persisting increase in the cost of hospital care, the U.S. Congress legislated a prospective ► per-case payment system for all patients under the ► Medicare program (i. e. U.S. state insurance program for people over 65) based on DRGs. Hospitals were paid a specific predetermined amount for each patient treated according to its DRG regardless of the actual cost of care provided.

In 1987, the State of New York introduces DRG-based payments for all non-Medicare patients. A revision of the Medicare DRGs including more information on hospital case types for the younger population has become necessary. With further regional expansion of the DRG system, replacements and refinements of the original Medicare DRG system took place. Several different more sophisticated DRG systems have been developed in the U.S.:

- Refined DRGs (RDRG): including a revision of the use of complications and co-morbidities.
- All-Patient DRGs (APDRG): extension of DRGs from Medicare population to all patients.
- Severity DRGs (SDRG): re-evaluation of the use of complications and co-morbidities for Medicare DRGs.
- All-Patient Refined DRGs (APRDRG): further refinement of all-patient DRGs adding subgroups and re-evaluating the use of complications and co-morbidities.
- International Refined DRGs (IRDRG): new classification system allowing international comparisons regardless of the specific coding system of the country.

Today, there are around 500 DRGs defined in the US which are updated annually in the CMS DRG Definitions Manual (i. e. Manual published by the Centers for Medicare and ► Medicaid Services (CMS) explaining history, design, classifications rules, application and updating procedures of the DRG system). The implementation of a DRG system in a hospital necessitates DRG ► grouper software which is provided by several IT companies who constantly update their software according to the new standard applied.

Further Developments

The regional expansion of DRGs led to a broader use besides ► reimbursement. Two major functions can be distinguished:

1. Evaluation of the utilization of hospital services: As DRGs demonstrate similar use of hospital resources, hospitals can be compared with each other and a prognosis for future hospital payments can be made.
2. Evaluation of the quality of care: Since all cases in a DRG are clinically similar, treatment protocols and other factors such as related conditions or demographic distribution can be analyzed. In addition, quality reviews can be established, critical pathways

D

can be designed and benchmarking between hospitals can take place (► health care quality).

DRGs in the Context of Hospital Financing Methods

Throughout the industrialized world, methods of financing hospitals have changed significantly over the past 20 years. There is a shift from ► prospective budgets towards ► per-case payments based on DRGs. Prospective budgets were mainly based on historical spending or the specific function of hospitals. They did generally not incorporate incentives to spend less than the fixed budget. Therefore, under the persisting financial constraints in the hospital sector, in several countries, governments changed the financing method and adopted per-case payments based on DRGs (► hospitals).

International Applications

In 2003, The Organization for Economic Cooperation and Development (OECD) counted 19 of its members having introduced DRG-based payments to control hospital reimbursement (Forgione et al. 2004). Most of the countries have adapted the original U.S. model to fulfill country-specific needs. According to the specific health system in the country, DRG-based systems have also be designed for planning, budget allocation and management of the hospital care provided.

Some country-examples highlight the various use of DRG systems:

- As payment systems: Nordic countries (Finland Norway, Sweden, Denmark), Portugal, Spain, Italy, Australia, Germany, Switzerland
- As a mechanism for budget allocation: France
- As a means to reduce the length of stay: Belgium, Ireland
- As a management system of hospital provision: UK

Positive and Negative Effects of DRG-Based Reimbursement Systems

Advantages of a DRG-based system are:

- Transparency: Due to a fixed amount of payment per DRG-based admission, the transparency and control of hospital financing and resource use is high, prognosis of future payments is possible, administrators and doctors have a clear basis of discussion.
- ► cost-efficiency: Fixed payments encourage hospitals to eliminate unnecessary services, to reduce the lengths of stay and to develop a competitive advantage in areas in which they are high-performers, as well as to reduce complications.

Potential negative effects are:

- The number of admissions and the use of hospital resources per admission determine the efficiency of the hospital. The DRG system induces efficiency incentives by setting a fixed payment rate per DRG. A rather low payment rate may lead hospitals to increase their number of admissions and reduce the adoption of new technologies of care. Patients are then discharged too early which produces either more costs in other health care sectors (cost-shifting) or patients are quickly re-admitted and the hospital claims the same DRG related payment twice. The cost-shifting to other health care sectors as outpatient home care or long-term facilities is particularly undermining the intention of cost-efficiency, because these other sectors are often inadequately resourced and qualified.
- Issue of true classification of the patient where hospitals classify as many cases as possible as severe. This problem is the so-called DRG ► up-coding used by hospitals in order to receive a higher ► reimbursement especially in the context of budgetary restrictions. However, this practice abuses the financing of hospitals and distorts ► health statistics. Facing substantial error rates in DRG coding (for example 20.8% in ► Medicare DRG coding in 1988), measures are being developed to motivate clinically correct coding via new reward systems for doctors.
- DRG-based classification systems in hospitals are focused on illness patterns and reward the hospital for the accurate treatment of that illness. All issues of disease prevention and health promotion that would help to reduce future costs of health are often left out.

Conclusion

The 20-years experience with DRG-based reimbursements in the U.S. as well as more recent experiences in other countries demonstrate a trend towards cost containment and the reduction of the length of stay. Nevertheless, the precise and careful implementation of the DRG system is an important condition to prevent neg-

ative effects such as the increase of admissions and the cost-shifting towards other sectors of health. The success of DRG system induced cost-efficiency depends after all on the notion of quality of care applied in the hospital.

Cross-References

- ▶ Co-morbidity
- ▶ Cost-Efficiency
- ▶ Grouper Software
- ▶ Health Care Quality
- ▶ Health Statistics
- ▶ Hospitals
- ▶ Inpatient Health Care
- ▶ Medicaid
- ▶ Medicare
- ▶ Per-case Payment
- ▶ Prospective Budgets
- ▶ Reimbursement
- ▶ Up-coding

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Diagnostics of Malaria

- ▶ Thick Drop Method

Diet

Synonyms

Way of eating; Nutrition

Definition

Diet is defined as combination of food and drinks regularly consumed for nourishment. Usually "diet" implies restrictions in food or drink intake aimed at reducing body weight. Diet is influenced by climate, culture and tradition. Diets are rated in quality according to the balance of nutrients they provide and not solely on the type of food eaten or the amount of caloric intake. There are different types of diets such as low-calorie diet, low-fat diet, low-salt diet or hight-fibre diet.

Dietician

Synonyms

Nutritionist

Definition

A dietitian has expert knowledge in food and nutrition and helps to promote good health through proper diet. In medical care or rehabilitation, they often supervise the preparation and service of food, develop modified diets, and teach individuals and groups about good nutritional habits. Dieticians might also be involved in research where they examine, for example, the clinical aspect of nutrition for people with diseases or public aspects of nutrition on primary, secondary, and sometimes tertiary health prevention.

DIMDI

Definition

DIMDI, the German Institute for Medical Documentation and Information, is an institute of the Federal Ministry of Health (BMG). As a public institution, it aims to support all decision makers in health care from politics through hospitals, practitioners, and nursing, to the consumer. Therefore, open and freely acces-

sible modules are provided. Its scope ranges from an open process for identification and prioritization of topics for Health Technology Assessment (HTA) reports to a freely accessible information system covering HTA and related disciplines.

d Index

Definition

The *d* index measure of an ► effect size is appropriate when the means of two groups are being compared. The *d* index is typically used in association with the *t*-test. The formula for calculating the *d* index is:

$$d = \frac{X_1 - X_2}{(SD_1 + SD_2)/2}$$

X_1 and X_2 = the two group means
SD_1 and SD_2 = the average standard deviation of the two groups.
The *d* index expresses the distance between the two group means in terms of their common standard deviation. The *d* index is not only simple to compute but also scale-free.

Dioxins

Definition

Dioxins and PCBs are toxic long term chemical environmental polutants emerging from a number of industrial processes as well as from incineration of waste. They accumulate in milk and dairy products, meat, fish and moluscs. They cause chlor acne, toxic lesion on the liver, immunosupression. Long term exposure is manifested in endocrine and reproductive disorders. They can be found in human milk in people living in contaminated regions. Dioxins and PCBs are regulated in food and feed and traces of these compounds are found in many industrial products. PCBs are found in Baltic fish and threashold levels for herrings and salmon from the Baltic Sea are proposed for different age groups and pregnant women.

Diphtheria

Definition

Diphtheria is caused by the toxin producing *Corynebacterium diphteriae*. The infection, which is spread by saliva droplets, can take a life-threatening (lethal) course. Following an incubation period of 2–6 days, symptoms appear mainly in the nose-throat region. The most common localization of diphtheria is in the throat. The toxic effects lead to a robust inflammation with an intensive reddening and the development of a grey-white coating, afterwards the tissue becomes necrotic. The voice gets husky and difficulties in breathing can appear. Furthermore, there are general symptoms like fever, malaise, sore throat, headache, stomach ache and rheumatic pain. Dreaded complications are the generalized toxic effects, which cause myocarditis, paralyses and impaired functions of the liver and the kidneys. The effects of the toxin can be antagonized by an antitoxin, which should be used whenever somebody is suspected of having diphtheria. The bacterial production of toxins can be reduced by antibiotic therapy (penicillin, erythromycin). The most important preventative measure is active diphtheria-vaccination (► immunization, active).

Diphtheria Vaccination

Synonyms

Diphtheria immunization

Definition

Diphtheria toxoid has been available since 1925 and can be administered from the age of three months. ► Basic immunization is generally implemented three times as part of the 6-fold vaccination, or twice when no pertussis component is involved, at intervals of at least 4 weeks, followed by a further vaccination after 4–12 months. The first booster is given at 5–6 years of age. Further booster vaccinations should be given at intervals of 10 years, especially in the case of persons at risk, for example those employed in the health service or as public servants. For better tolerance, booster vaccinations for persons of 7 years of age or older are carried through with a reduced dose of diphtheria toxoid,

either alone (monovalent, "d") or in combination with the tetanus ► vaccine ("Td"). The clinical effectiveness of the diphtheria vaccine is more than 90%.

Direct Costs

Definition

In health economics, the term direct cost refers to all costs due to resource use that are completely attributable to the use of a health care intervention or illness. Direct costs can be split into direct medical costs and direct non-medical costs. Direct medical costs include the cost of a defined intervention and all follow-up costs for other medication and health care interventions in ambulatory, inpatient, and nursing care. All specialist and GP care, including emergency care, as well as rehabilitation and physiotherapy, is considered. Direct non-medical costs include e. g. transportation costs and additional paid caregiver time.

Directional Test

► One-Sided Test

Directly Observed Treatment

► DOTS

Direct Medical Costs

Definition

Cost for goods and services used in the prevention, diagnosis, treatment, and rehabilitation of the illness or disorder in question (e. g., cost for drugs, medical visits, hospitalization, diagnostic procedures).

Direct Non Medical Costs

Definition

Costs for all other resource use related to the disease of question (e. g., transportation costs, costs for social services but no medical cost).

Direct Payments

► Co-payments

Direct Standardization

Definition

Application of the stratum specific rates of each population to the number of individuals in the corresponding stratum in the standard population. This method yields an adjusted relative risk. The method is called "direct" because it uses the actual morbidity or mortality rates of the populations being compared.

Disability

Synonyms

Physical or mental impairment

Definition

Disability is an umbrella term for impairments, activity limitations or participation restrictions.

Disability is a physical or mental impairment that occurs at birth or later in life and is not curable. It substantially limits the condition or duration under which an average person in the population is able to perform a major life activity, such as walking, seeing, hearing, speaking, taking care of oneself, learning or working. The disability has not only a substantial but also a long term (at least 12 months) adverse effect on the person's ability to participate in the normal every-day life activities listed above.

According to the World Health Organization, disability is distinctive from functional impairment and handicap. While the term Impairment refers to any loss or abnormality of psychological, physiological, or anatomical structure or function, the term disability refers to any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being. This definition reflects the idea that to a large extent, disability is a social construct. (More information about the WHO's definition and classification of disability can be found at http://www3.who.int/icf/icftemplate.cfm)

Disability Adjusted Life Years (DALYs)

Synonyms

Estimate of a population related gender of disease

Definition

Disability adjusted life years (DALYs) for a disease are "the sum of the years of life lost due to premature mortality (YLL) in the population and the years lost due to disability (YLD) for incident cases of the health condition. The DALY is a health gap measure that extends the concept of potential years of life lost due to premature death (PYLL) to include equivalent years of 'healthy' life lost in states of less than full health, broadly termed disability". "The DALY combines in one measure the time lived with disability and the time lost due to premature mortality. One DALY can be thought of as one lost year of 'healthy' life and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability". (World Health Organization, 2007. http://www.who.int/healthinfo/boddaly/en/index.html)

Traditionally, health liabilities were expressed using one measure: expected or average number of Years of Life Lost (YLL). This measure does not take the impact of disability into account, which can be expressed by Years Lived with Disability (YLD). DALY can be calculated by taking the sum of these two components, in a formula: DALY = YLL + YLD. Originally developed by the World Health Organization, it is becoming increasingly common in the field of occupational health. DALY can reveal very important things about a working population's health.

Disability Compensation

Definition

Disability compensation is a monetary benefit paid to employees with work-related disability (► Work-Related Diseases). It means that the disability is the result of an illness, disease or injury incurred or aggravated while the worker performed his/her working activities. This benefit is to compensate for a reduction in quality of life due to work-related disability and to provide compensation for average impairment in earnings capacity. The term "disability compensation" in occupational health sometimes refers to the compensations and benefits (financial and care support, devices, and modifications that help overcome or remove a disability, "positive discrimination", etc.) for significantly restricted or absent ability caused by or related to occupational or work-related impairments or disorders.

The term disability in a medical sense is often used to refer to individual functioning, including physical or sensory impairment, cognitive impairment, and mental disorders. In social models, the term disability focuses on the ability of a person to interact with his/her social environment, as a matter of full integration of individuals into society.

The physician's role in the disability compensation process depends on whether they are situated inside or outside the worker's compensation organization. If the physician is outside the organization, they will be involved in the medical treatment and rehabilitation of the injured or disabled worker and will also fulfill some of the regulatory requirements of the compensation system, including the filling of required medical reports on the worker's condition. Physicians who are part of the worker's compensation organization are usually involved in some aspect of claimant referral for examination or treatment and medical adjudication of disability.

Disabled People's Organizations

Synonyms

DPOs; Organizations of persons with disabilities

Definition

DPOs are involved in the development, implementation and evaluation of ► community based rehabilitation programs. These organizations already exist in many countries and often they are formed by parents of children with disabilities. The goal of DPOs is to address more people with disabilities and to actively represent them. The key roles of DPOs include the education and training of people with disabilities. Thus, disabled people and their families should get a detailed understanding of their rights and the role of DPOs in acting

as advocates to ensure that these rights are enforced. As disabled people in rural areas and in poor urban areas are not well represented in DPOs, there is an increasing need to encourage people in all areas and all socio-economic groups to form DPOs. There are two types of DPOs: cross-disability organizations and single-disability organizations. Cross-disability organizations represent people with any kind of disability, single-disability organizations represent individuals with a disability related to a specific impairment, e. g. seeing or hearing.

Disaster

Definition

A disaster is a serious disruption of the function of society, causing widespread human, material or environmental losses that exceed the ability of the affected society to cope using only its own resources.

Disaster Aftermath

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Introduction

A disaster (catastrophe) can be interpreted as event that causes great destruction/damage and human suffering. The term literally means – ill-starred event, i. e. misfortune, bad luck. A disastrous event may hit anywhere at any time. It may build up over time or strike suddenly. A notion of risk embraces a possibility (chance or degree of probability) of such an adverse event.

We are living with hazards and risks of natural and man-made disasters which may cause severe human and material damage. They may seriously, and in an adverse way, affect life, livelihood, and property, possibly resulting in permanent changes to human societies and the environment. Disasters may exacerbate vulnerable conditions and exceed individuals' and communities' means to survive and thrive. Even if in the 20th century the health care has become effective and the average length of life and health status have dramatically improved, disasters continue to cause adverse, and severe, health-related effects and may challenge the existing public health and health care systems. Therefore, priorities of basic public health programs include maintaining the expertise and the infrastructure to address large disasters, to respond rapidly to urgent needs. Modern societies are not prepared for extreme disasters, which are far beyond our planning and design assumptions. Despite developments in technology and high expenditures on disaster mitigation works, the occurrence of disasters and the severity of their impact, with accompanying hardship and material damage, have not decreased in general.

Hazards, Natural

Natural disasters are determined by the presence of destructive elements (e. g. volcanic lava, earthquake force, fire, snow, mud, heat, cold, strong wind, abundant water, or lack of water) in vulnerable places with a high damage potential. Since the dawn of civilization, natural disasters have jeopardized people and their settlements (▶ hazards, natural).

There are several generating mechanisms of natural disasters, such as: earthquake, volcano eruption, tsunami, storm, flood, drought, wild fire, landslide, avalanche, extreme heat wave, cold winter weather, blizzard, meteorite fall. The probability of occurrence of a severe disaster in each of these categories depends on the geographical location.

Disasters are getting more frequent in the more overpopulated world, with busy traffic. In many areas of the globe, natural disasters have recently become more destructive, causing material damage costing tens of billions of dollars as well as human damage with tens of thousands of fatalities annually. In particular, catastrophic weather events have exhibited a rapid upward trend: average annual material damage, in inflation-adjusted monetary units, increased tenfold between the 1950s and the 1990s. Many people, a large proportion of the human population, experience a traumatic disaster.

Material damage, caused by natural disasters, has been increasing over time, for a number of reasons, but

mainly due to an increase in exposure. For instance, humans have massively encroached flood-endangered areas by developing floodplains and coasts, and increasing damage potential by the build-up of populations and wealth in flood-prone areas. Urban squatting accompanies high vulnerability to flooding. Also, urbanization of many watersheds has adversely influenced flood hazard. Increase in the portion of impervious area (roofs, yards, roads, pavements, parking lots, etc.), reduction of storage, e. g. by the loss of natural inundation areas (lakes, wetlands, flood plains), deforestation and regulation of watercourses result in faster and higher maximum river flow (water level) generated by intensive precipitation. Nowadays, less extreme rain (compared with the past) may lead to a serious flooding disaster. In mountainous areas, developments extending into hilly slopes, are endangered with landslides and debris flows, triggered by intense rains.

There have been many large natural disasters, which caused immense human and economic damage. Nearly every week, natural disasters, occurring somewhere in the "global village", are reported by the media.

Many people have died of hunger caused by drought- and flood-related famines. For example, during, and after, the 1931 floods in China, the death toll was up to 3.7 million, according to some sources (conflicting estimates). Hundreds of thousands of fatalities were caused by cyclones (e. g. in the Bay of Bengal), tsunamis, and earthquakes. About 500,000 people drowned (and 100,000 were missing) during a coastal storm surge caused by the Bhola cyclone in East Pakistan and Bangladesh in November 1970, while another cyclone killed nearly 140,000 in Bangladesh in April 1991.

The tsunami disaster in December 2004, triggered by an earthquake (Richter magnitude 9.0 to 9.3) in the seabed off the Indonesian island of Sumatra, was unique in encompassing a very large area from Indonesia to Africa, including numerous resorts packed with foreign Christmas holiday tourists. The number of dead and missing has been evaluated at about 230,000 and the number of displaced at nearly 1.7 million. The height of tsunami waves reached 30 meters. The furthest recorded tsunami-caused death occurred in Port Elisabeth (South Africa), i. e. 8000 km away from the epicenter.

The Great Kantō earthquake devastated Tokyo (Japan) in September 1923, killing 100,000–150,000 people. A more recent, Tangshan earthquake in China (July 1976) caused the death toll of over 240,000. On 1 November 1755, an earthquake *cum* resultant fires devastated Lisbon, causing 15,000–40,000 fatalities.

Heat wave events are associated with marked short-term increases in mortality. In August 2003, a heat wave in Western and Central Europe caused between 27,000 and 40,000 excess deaths, while the death toll of a heat wave in the summer of 1980 in the United States was between 1250 and 10,000.

Tens of thousands of people were killed by single volcanic eruptions, such as the Nevado del Ruiz volcano in Armero, Colombia (November, 1985), with the death toll of 23,000–25,000. A large number of fatalities have been caused by landslides (e. g. 20,000 were killed in Peru in 1970), avalanches (10,000 fatalities in Tirol, Austria, in 1916) and blizzards, killing over 300 people in one day in November 1950 in the Eastern United States.

Disaster events, which cause highest economic losses, are not necessarily the main killers. The costliest ever disaster was Hurricane Katrina in the United States (August 2005), with – according to some estimates – up to 300 billion US $ in direct damage and 1 trillion US $ in total (i. e. including indirect) damage. Estimates of the death toll vary between 1,600 and 5,000. The material damage of the Kobe earthquake (Japan) in January 1995 was about 100 billion US $ (with over 5000 lives lost), while the material damage tag of the 1998 floods in China exceeded 30 billion US $ (and over 3600 fatalities).

According to some definitions, epidemics also belong in the category of natural disasters. It is estimated that in the 14th century, pest and famine killed 75 million people in Europe. In 1918–1919, the (pandemic) epidemic of Spanish flu killed 25–30 million. More recently, the widely-spread infectious disease HIV/AIDS considerably challenged the public health care systems, worldwide. However, epidemics are not considered in the present field material.

Analysis of data for individual destructive flood events worldwide led to a finding that, in general, the ratio of material losses to number of fatalities grows with the wealth level measured by the GNP per capita of a country. That is, more wealthy countries are more successful in saving lives, while material damages cannot be avoided.

Hazards, Technological

The active presence of the fast growing population has added new hazard dimensions in the ever more crowded world. It is estimated that 7–8% of people who have ever lived on Earth are living right now. A category of man-made disasters has emerged. Also, in many areas, people have become more vulnerable to some natural disasters (► hazards, technological).

Man-made disasters can be caused by accidents – unfortunate, undesirable, unplanned and unforeseen events; which may, or may not, result from carelessness or ignorance. Accidents trigger loss, injury, or death which may not be due to any fault or misconduct on the part of adversely affected people.

Man-made disasters can be classified into a number of categories, e. g. disasters related to human production activities: mining disasters, industrial disasters, chemical accidents, nuclear accidents. Numerous man-made disasters are related to transport, dam breaks, oil spills, explosion or fire disasters, and terrorist attacks. One special category of man-made disasters are wars, including the two World Wars in the 20th century, with a legacy of hundreds of millions of victims – dead and wounded, and immense human suffering. Mismanagement-related disasters constitute a special category. The enforcement of the communist system (collectivization of agriculture) is to be blamed, at least partly, for large famines in the ex-USSR that killed millions of people.

Many catastrophes are related to transport: ship or ferry, rail, car or bus, and plane disasters. The sinking of the Titanic in April 1912 caused over 1500 fatalities. In Poland, road traffic accidents during a single weekend may kill more people than floods over decades.

The terrorist attacks on 11 September 2001 were an "innovative" intentional mass killing. Passenger jets with many people onboard, fully fueled, were taken over by terrorists who crashed them against most important buildings with very high damage potential. The death toll of the terrorist attack on 9/11 exceeded 3000.

Man-made disasters in the 20th century, with considerable human health consequences, included the Bhopal disaster in 1984 (7000 fatalities), the mercury poisoning in Minamata, Japan, and the Itaiitai disease, due to cadmium poisoning, in Japan. Disasters in nuclear power plants – the Three Mile Island and Chernobyl accidents – were another category. Among the disastrous oil spills in the last decades were the catastrophes of Amoco Cadiz and Exxon Valdez, and, above all, the oil spill and oil fires generated by Saddam Hussein in Kuwait. One of the widely known man-made environmental catastrophes, resulting from mismanagement of water resources, has been the shrinking of the area and volume of the Aral Sea.

In China, a dam on the River Huang He was blown up in order to halt the Japanese invasion. The dam break caused several hundred thousand fatalities. A large mining disaster in Honkeiko (China) in 1942 caused 1549 fatalities, while explosions in Greece in 1856 killed about 4000 people. A large fire in Sandoz works in 1986 caused inflow of 30 tons of mercury pesticides into the Rhine, which devastated life in the river. In 1989, in Asha, Ufa, Bashkiria, USSR, over 500 people were killed by explosion and fire caused by leakage in a long distance pipeline and sparks from passing trains.

Physical, Environmental and Social Aspects of Disasters

The socio-economic consequences of a disaster are represented, in an aggregate way, by number of fatalities and the aggregate economic damage. Disasters kill and wound people, ruin their livelihoods and prospects, and destroy property. There is a lot of disaster-related suffering (e. g. due to loss of dear ones, disaster-related starvation, being wounded), morbidity, hardship, stress, and feelings of helplessness and humiliation. The accustomed sense of security disappears.

In the disaster aftermath, a new image of the community emerges. Municipalities, which functioned very well in normal conditions, may fail completely when disaster strikes. Urban areas in the developed world temporarily lose their modern infrastructure and are downgraded below the level of rural Third World communities.

Towns destroyed by an earthquake may turn into a sea of rubble, large dumping sites with disordered remnants of human infrastructure and belongings, and human bodies (or parts thereof). The landscape can be contaminated by floating fuel oil, animal carcasses, and other toxic debris.

Consequences of disasters can be divided into direct ones (caused directly by disasters) and indirect ones, which may occur over a longer period of time (e. g. even years after a nuclear accident). Detection of changes in time series of health-related indices and attribu-

tion of the changes (e. g. to a disastrous event) are very difficult. Even identification of "disaster-related deaths" (additional or excess deaths) in a region devastated by a disaster causes considerable methodological problems.

As a rule, after a major disaster, buildings are damaged (in some areas, nearly every home is destroyed e. g. totally ruined, or deprived of windows, roofs and walls) or rendered unsafe. Utilities are discontinued. There is no electricity or safe water, food supplies are spoiled, cars are disabled or destroyed. There is significant damage to the infrastructure including roads, railways, and bridges, health clinics and hospitals, schools and public buildings, levees, industrial installations, irrigation channels, affecting large cropland. There is vast damage to personal property. Some people's only remaining possessions are the clothes on their backs. Survivors leave their communities for the relative safety of displacement camps.

Since disasters ruin the domiciles of many of those evacuated, homelessness becomes a problem. Disasters paralyze social systems. Many businesses are damaged, and all are closed in the immediate aftermath. There is a loss of many jobs, some of which may disappear permanently. Yet, reconstruction creates an emerging opportunity for employment, economic growth, and better disaster preparedness.

Typical conveniences such as immediate repair of a downed power line, mail delivery, or a functioning public phone cell or an automatic teller machine become difficult to access. Some residents may endure without a roof or a cooked meal for months.

In some cases disasters may lead to mobilization of dangerous chemicals from storage or remobilization of chemicals already present in the environment, e. g. pesticides. Hazards may be greater when industrial or agricultural land adjoining residential land is affected. Increases in population density and accelerating industrial development in areas subject to natural disasters increase the probability of future disasters and the potential for massive human exposure to hazardous materials released during disasters (► physical, environmental and social aspects of disasters).

Human Health Aspects of Disasters

Even if disasters are not commonly perceived as public health events, they do clearly lead to the deterioration of human health over vast disaster-affected areas (► human health aspects of disasters).

Direct health-related impacts of disasters are: deaths, injuries, communicable diseases and mental health problems. Health effects may result from unsafe or unhealthy conditions (lack of safe drinking water, spoiled food supplies) following the disastrous event. Indirect effects arise through economic disruption, infrastructure damage and population displacement.

There are short-term health effects (injuries, stress associated with disaster) and long-term health consequences – psychiatric disorders, depression, anxiety, substance abuse, functional disabilities, domestic violence.

Life-threatening situations may arise, e. g. in elderly and lonely people with severe health problems who are trapped and abandoned in their homes.

Population displacement following disasters leads to increases in communicable diseases resulting from over-crowding, lack of clean water and shelter and poor nutritional status. Due to the very large number of people that may be affected, malnutrition and famine triggered by disastrous events may be among the most important consequences of a natural disaster, and may outnumber the direct fatalities.

In areas hit by a disaster with no evacuation warning, the hardship can be even more intense. Families spend nights huddled together in places they believe to be relatively "safe".

Disasters test the integrity of water supply systems and increase the risk of outbreaks of water-borne diseases. The impacts of disasters are particularly severe in less developed areas, featuring environmental degradation, and in communities lacking basic public infrastructure. Populations with poor sanitation infrastructure and a high burden of infectious disease, often experience increased rates of diarrhoeal diseases after disaster events. Post-disaster increases in cholera and typhoid have been reported. After some disasters in less developed countries, such as the 2004 tsunami, there was a fair possibility of the outbreak of diseases caused by polluted drinking water and risk of communicable diseases.

There has been vast evidence of disaster impacts on mental health. The prolonged impairment from common mental disorders (anxiety and depression) may be considerable. Depending on how much destruction and death they witness during a catastrophe, some survivors

suffer from post-traumatic stress disorder (PTSD), the same disorder that afflicts combat veterans. It is a psychological damage that develops after a traumatic experience and is almost always a delayed reaction to the trauma. Symptoms might appear soon after the event, but they might not surface until several months or even years have passed.

Among the symptoms of PTSD are vanished sense of security, fear of another calamity, hyper vigilance, fatigue, poor concentration, feeling nervous or tense, depression, anxiety/stress, and somatic experiences (sleep disturbances, appetite difficulties, etc.). They are expected reactions because of PTSD and the changed life circumstances in which many individuals find themselves. Dealing with joblessness, loss of a home, the inconvenience of extensive repairs, or radically transformed neighborhoods, people get into a state of shock and their rational thinking processes fail to function normally.

Those, who experience disasters, are prone to severe stress. Children suffer ongoing nightmares. They often cling to their parents and refuse to go to school. And those who do attend school after a traumatic event – even those who typically are well-behaved – develop discipline problems.

Health impacts of disasters also fall under the categories of medically unexplained physical symptoms (MUPS) and functional somatic syndromes (FSS).

Many survivors of a disaster have two life-changing experiences. First, they endure the trauma itself (e. g. seeing floodwaters sweep away their homes or watching gale-force winds destroy their neighborhoods, or witnessing a sudden death of their dear ones), which might undermine (even irreparably) their sense of security and their ability to cope with life's problems. Then, they may face ongoing disorder in their day-to-day lives.

Vulnerability Concerns

Disasters often happen in environments where distress is already present. Certain populations can be identified as being particularly at risk during disasters. Those unprepared for change have no economic resiliency, and lack a secure support system. Hence they are predisposed to a complicated recovery. Vulnerable groups include the elderly, those of lower socio-economic status, transients, and the unemployed (► vulnerability concerns).

Impacts of natural disasters are not evenly distributed, either in relation to income status, age, or gender. Poorer communities are more likely to live in flood-prone areas. Low-income and high-density populations in low-lying coastal regions experience a high burden from weather disasters.

Also the benefits of rescue and recovery aid are not evenly distributed. After a disaster in the south of the USA, when trailers were provided to hurricane victims, one had to be a head of household and to have provided the correct documentation in order to benefit. In an area where many live in extended family and shared rent situations and some are illiterate or speak only Spanish, a number of people were unable to benefit from or negotiate the available aid system.

In many disaster areas in the south of the USA low-income individuals are numerous, including a migrant worker population consisting predominantly of recently arrived Central American and Mexican citizens. There is also a high unemployment rate. Transients are attracted by the warm weather, which is also a factor explaining the area's high proportion of retirees. Many residents came from somewhere else – illegal immigrants, unskilled laborers, and elderly widows and widowers. Some areas in the south of the USA (e. g. Florida) have a disproportionate number of individuals with little or no support systems.

Many families are reluctant to evacuate and leave the remains of their homes (some being afraid of looting). Many do not have the money to move from their damaged apartments.

Disasters affect women and men differently. As shown by the 2004 Asian tsunami, male survivors outnumber females. The differences apply to exposure to risk, risk perception; preparedness behavior, warning communication and response (e. g. Muslim women staying at home in the absence of their husbands may ignore warnings); and ultimately to recovery and reconstruction. Gender interacts with race, income level, social class, and access to resources in the experience of disaster. Women are the providers of child care, which may put them at greater risk during and following a disaster. They may have limited mobility, restricted access to resources, and may be subject to social isolation.

Mitigation Strategies

Disaster mitigation can be defined in several ways, for instance as taking measures in advance of a hazardous event (emergency or disaster) which are aimed at preventing disasters from occurring or (more commonly) reducing the adverse effects of disasters on society and environment. This can be achieved by reducing the vulnerability of communities to the hazard, or by changing the environment in which hazards and communities interact.

A rigorous and systematic risk management process helps communities to identify the most cost-effective disaster mitigation strategy – a combination of measures for the range of risks which they face. The plan of action for disaster mitigation reflects priorities determined by the community and stakeholders.

In some countries, a national framework for mitigation exists for the whole country, with the goal of improving the disaster mitigation system and reducing adverse personal, social, economic and environmental impacts of disaster. The process of building the disaster mitigation strategy may include establishing land-use planning (zoning), taking into account hazards in the building codes, developing emergency preparedness systems, preparing and disseminating guidelines for natural hazards, and raising awareness. Cost-effect considerations are important, i. e. examining the costs of natural disasters, and the benefits of disaster mitigation.

If the occurrence of natural disasters is spatially restricted (e. g. in flood-prone areas), three ► mitigation strategies come about: protect, accommodate, or retreat. One may try to protect as far as feasible in the cost-benefit sense – it may not be financially feasible to offer a very expensive protection to a small community with low damage potential. Accommodating disasters means living with disasters rather than hopelessly trying to avoid them at very high cost. Finally, retreat can be interpreted as a permanent relocation of inhabitants of unsafe areas.

Important discussion of flood protection strategy dates back to the mid-19th century USA, when the Congress decided to embank the Mississippi river in a single channel isolated from its floodplain. This decision has largely influenced flood protection policy in the USA and elsewhere, leading to transformation of rivers and reduction of wetlands. In 1936, the US federal government assumed primary responsibility for flood damage reduction across the nation and over the next decades embarked on a multi-billion program of structural defenses. Yet, despite the dedicated long-term effort and high investments, the flood risk has not been eradicated, and never will be.

The process of building the flood preparedness system may include some, or all, of the following components:

- Flood risk assessment and mapping, conveying valuable spatial message. (Yet, in a number of cases, such maps, commissioned by authorities, have not been disseminated – due to the likely consequences for the property market, being unbearable to the ruling powers.)
- Rigorous implementation of zoning – land use management to limit the use of floodplains for the site of vulnerable elements (including human settlements, industrial infrastructure, etc.).
- Relocation of riparian inhabitants and structures out of the floodplain.
- Raising awareness of the floodplain communities.
- Building an effective and reliable flood forecasting and warning system.
- Engineering of structures in the floodplain to withstand flood forces (dikes, flood walls with opening barriers, dams, storm water drainage systems).
- Adaptation of building codes, e. g. building design to elevate floor levels, use of flood-resistant building materials (water resistant materials, waterproof seals, strong foundations), placement of storage and sleeping areas high off the ground.
- Development of system of flood insurance.
- Development of preparedness system for the case when the existing structural defenses (e. g. dikes) will not be able to restrain the flood waters, flood evacuation preparedness including identifying shelters, preparing boats and rescue equipment; emergency plans with clear division of competencies and responsibilities of agencies.
- Awareness raising, creating a flood preparedness culture.
- Watershed management, storing as much water as possible (according to "catch water where it falls" principle).

Mitigation of (preparedness system to) other natural disasters include essentially similar types of components as in the flood preparedness example above,

aimed at weakening the load and strengthening the system resistance.

In an earthquake preparedness system, it is necessary to improve the resistance of the system by seismic zoning. Land-use management should reduce development in geological areas known to amplify ground vibrations, e. g. alluvial soils, reclaimed land. Upgrading structural design is needed, by engineering of structures to withstand vibration forces; compliance with seismic building codes, enforcement of generally higher standards of construction; and adequately high design standards for important buildings; and strengthening of existing buildings (retrofitting).

In the gale-wind preparedness system, land-use management can improve protection from wind, e. g. by planting of windbreaks. One can considerably improve the system resistance by engineering structures to withstand wind forces; siting of buildings on leeward side of hillsides; adapting wind-load parameter in building codes; good quality construction of wind-resistant buildings; adequate securing of elements which could be blown away or cause damage; trimming of tree branches and cleaning of gutters. It is necessary to develop severe-weather forecasting and warning systems, to raise community risk awareness, and to provide safety shelters and evacuation plans.

Also a system for wild fire mitigation includes measures to constrain the wild fire (planting of fire-resistant vegetation and wild fire breaks) and to improve the system resistance. The latter category includes zoning (land use management to limit development in high wild fire risk areas); appropriate siting of structures (away from the top of slopes/ridges); building codes for fire hazards; fire resistant building materials; removing wild fire 'fuel' (rubbish, branches, leaf litter) from around house and gutters; secure storage of flammable materials (fuel, wood, paint). Development of a fire weather warning systems and improvement of community awareness of wild-fire risk is necessary. A fire evacuation plan should be in place, and sufficient water supply, hoses and protective clothing should be available.

Natural and man-made disasters can be considered in the sustainability context. On the one hand, they destroy human heritage and jeopardize sustainable development (whose one definition refers to "non-decreasing quality of life"). On the other hand, following the most common interpretation of sustainable development, one should not choose such disaster protection policies that could be rated by future generations as inappropriate options of defense. This is how several large structural flood defenses are often looked upon.

Definitely, changes leading to aggravating flood risk are perceived as negative. In some locations, people regret that levees have been built and low-lying areas developed. Now, the issue of river renaturalization may come about. Some large reservoirs, whose construction required inundation of large areas and/or displacement of a high number of people, do not match the principles of sustainable development. Studies on decommissioning reservoirs are being made and in a few cases decommissioning has taken place. When looking back into past developments, one often finds one-sided arguments supporting a decision on flood protection strategy, with important aspects ignored. This was, on the one hand, due to lack of knowledge and understanding and, on the other hand, due to the fact that value judgments have changed with time.

Disaster Response

► Disaster response includes strengthening of the protection measures (e. g. strengthening and heightening of levees), as relevant and necessary, and undertaking actions to reduce human and material damage. This includes providing assistance to affected people (with evacuation or without evacuation). Disaster response deals with a situation of active crisis involving numerous people, who present multiple survival needs, therein basic needs (safe water, housing/shelter, hygiene), and health and medical needs (medical attention, care of special medical conditions – diabetes, epilepsy, temporary hospitals and pharmacies). Also mental health needs attention, in particular, post-traumatic stress disorder (PTSD) and child and spouse abuse. In the disaster-affected environment, many of the normal helping agencies are not able to deliver services to their clients. Emergency assistance includes providing safe water, food, shelter, medical supplies, blood and blood products, first aid, clothing, fixed/mobile feeding stations, cleaning supplies, emergency transportation, home repairs, household items, etc.

If a forecasting-warning-response system is in place, it may be possible to evacuate people from endangered areas and relocate them to temporary shelters (e. g. in school buildings), where they should be taken care of

by rescue workers, who provide them with safe water, warm food, blankets and clothing, and psychological support, which may be necessary over a longer time. In displaced families (temporarily or permanently), children suffer the stress of having lost a home, a neighborhood, friends, a pet, and a way of life, being in a strange environment (possibly moving in with family members into overcrowded living quarters) and a new school. Some adults, who keep their jobs, may experience longer commutes to work with increasing fuel costs, repairs, and stress.

Disaster response includes a system to share relevant and reliable information, to dispel hysteria and rumor, and to offer support, counseling, and referrals to those in need, to inform, assist, and calm the public. The disaster-affected community seeks disaster information, becoming almost addicted to TV coverage of the disaster and its management. Local television and radio stations provide useful information on how to obtain food and water, rebuilding material, and medical assistance, etc. The media become daily human resource guides.

Schools reopen with improvised schedules and scarce instructional materials. Though possibly damaged, schools are indeed islands in a sea of confusion and turmoil, and symbols of hope for the community. The ringing of the school bell becomes an early, and welcome, sign of getting back to normal.

Disaster heightens awareness of many chronic but ignored problems, such as poverty, unemployment and homelessness, which may have been politically unpalatable. However, since a disaster leaves many middle-class people homeless, the definition of homelessness changes in public perceptions. The sight of families with small children with no place to go convinces many of the need for an organized response.

Recovery Strategies

► Recovery strategies should make it possible to gradually re-establish order and continuity, build life support systems, and livelihoods. This means much more than just rebuilding houses.

In the disaster aftermath, a decision has to be made as to whether the strategy of retreat is feasible and advantageous. In some disaster sites, wrecked houses are not leveled to the ground. By staying there, the memory of the disaster is kept alive. If destruction is beyond repair, then evacuees have no place to come back to. They permanently move away from the area and the area is abandoned. Some former housing complexes consist of roofless, derelict buildings and piles of unidentifiable wreckage. History provides well known cases of disappearing settlements after a disaster, e. g. after the eruption of Vesuvius which destroyed Stabies, Herculanum, and Pompei on 23 August 79.

After the 1755 Lisbon disaster, Marquis de Pombal led the recovery action based on the three principal tasks, formulated as follows: to take care of survivors, to bury the dead and to rebuild the city. In general, none of these tasks is easy in a post-disaster landscape.

Early responses to traumatic disaster events are focused on providing concrete help, food and drinking water, warmth, shelter, and medical assistance (*cum* psychological help) to survivors. Normal health care systems are not functioning, yet the needs can be very serious. In the case of the 2004 tsunami, it was necessary to rescue survivors, trying to care for millions of homeless, increasingly threatened by disease amid the rotting corpses. It was necessary to treat specific syndromes such as acute stress disorder, depression, and other anxiety disorders.

After the 2004 tsunami it was not easy to bury the dead. There were not enough body bags and there were not enough coffins and those available were too small for the bloated bodies of foreigners.

When the decision to rebuild is made, masses of refuse, composed of remains of human property have to be removed to landfills. The homeless family problem has to be addressed, e. g. by establishing a tent city (climate permitting), including day care, job counseling, and mental health assistance. Services, such as water, sanitation, electricity, gas, telephone, transportation, postal service, legal services have to be re-established. It is necessary to help people recover their livelihoods, e. g. via temporary employment, to secure money flow and financial support.

A post-disaster recovery creates a unique opportunity to build better. After a disaster, the building codes are carefully examined and strengthened and new housing is monitored and inspected far more stringently, and developers are more accountable. This is unlike before the disaster, when many areas may have experienced rapid, unplanned growth. Disasters unveil many cases of poor workmanship, use of cheap materials, and temporary fixes. Structures may not have met build-

ing codes (e. g. use of plastic straps attaching roofs to walls).

In the disaster aftermath, when the shelters close, the tent cities fold, the media spotlights turn off, and high-rank decision makers leave and go back to their time-consuming routine duties, continuation of assistance to disaster survivors is less spectacular, but badly needed. There may be little available housing for the displaced. Rents skyrocket, with landlords taking advantage of a scarce market. For a long time, a large number of inhabitants may live in substandard or even unsafe housing. The economic recovery can be sluggish. With many jobs lost and many small businesses destroyed or relocated, unemployment remains a critical concern. There is a need for long-term medical assistance, including mental health, and health monitoring.

The solidarity and altruism of individuals and groups has been crucial for recovery efforts. For instance, ad-hoc aid organizations are formed that do home repair for the uninsured and provide legal or medical advice. Joint initiatives arise to deal with the overwhelming task of moving toward recovery and becoming better prepared for the next disaster.

Emergency Preparedness

In general, much of responses to extreme disasters used to be a result of trial and error, and adhockery. The imminent stress and disorganization in the early aftermath makes it clear that adequate preparation before the disaster is critical.

Since a disaster protection system guaranteeing absolute safety is an illusion, a change of paradigm is needed. It is necessary to live with the awareness of the possibility of disasters and to accommodate them, rather than to try, in vain, to eradicate them. Extreme hazards, which exceed the design values assumed for building the preparedness system, may happen. Disaster mitigation systems do not provide a complete, 100%, safety. Hence, there is a need for plans of ► emergency preparedness for rare, but not impossible, events exceeding the planning/design conditions. Extreme hazards, which the existing state of preparedness cannot meet, can be realistic. For instance, a levee may protect riparian populations from a 50-year flood, so that no damage is involved when such an event occurs, however, a plan should be in place which could be used if a 1000-year flood arrives and the levee breaks.

Creating a culture of preparedness is needed for the entire nation. It must build a sense of shared responsibility among individuals, communities, the private sector, NGOs, faith-based groups, and federal, state, and local governments. Initiative and innovation must be recognized and rewarded at all levels. Individuals must play a central role in preparing themselves and their families for emergencies.

In France, emergency preparedness includes preparation of maps of the hazards, from which land-use regulations are issued; and plans for emergency and rescue.

Hurricane Katrina and the subsequent sustained flooding of New Orleans was a deadly reminder that the USA can and must do better in responding to emergencies. The disaster exposed significant flaws in the national preparedness for catastrophic events and the capacity to respond to them. The USA proved not to be as prepared as it should be at all levels: federal, state, local, community, and individual. The government felt obliged to re-examine how to address the full range of potential catastrophic events – both natural and man-made.

President Bush made clear that the federal US government would learn the lessons of Hurricane Katrina so that the nation can make the necessary changes to be "better prepared for any challenge of nature, or act of evil men, that could threaten people."

The emergency system preparedness should be in place prior to a disaster strike. Among the actions needed are such as the following ones, foreseen in the US as a part of lessons learnt from Katrina:

- ensuring that relevant federal, state, and local decision-makers are working together and in close proximity to one another in the event of a disaster;
- ensuring situational awareness by establishing rapid deployable communications;
- clear and non-ambiguous distribution of tasks and responsibilities; embedding a single point of contact to enhance coordination of military resources supporting the response;
- identifying and developing rosters of federal, state, and local government personnel who are prepared to assist in disaster relief;
- employing adequate technology to update and utilize the national emergency alert system in order to provide the public with advanced notification of and instruction for disasters and emergencies;

- enhancing the mechanism for providing federal funds to states for preparations upon warning of an imminent emergency;
- improving the delivery of assistance to disaster victims by streamlining registration, expediting eligibility decisions, tracking movements of displaced victims, and incorporating safeguards against fraud; and
- reviewing state evacuation plans and essential emergency services;
- checking if there are adequate help lines, offering information and advice in case of a disaster.

Advanced technologies must be leveraged to win the war on natural disasters. Advanced systems like infrared sensors, scanners can be mounted on helicopters and unmanned aerial vehicles and can help find trapped people. New radarscopes and sensors can be used on robots, which can sense a human being inside a building through 30 cm of concrete and 15 m beyond and can even sense breathing; after someone is discovered in the initial cleanup, the rescue teams can be called to the specific location.

Resiliency and backup services form a key part of disaster recovery. Network resiliency makes it possible to recover from a network failure or issue related to a disaster. A high availability network design is often the foundation for disaster recovery. Handling a crisis effectively could save lives and much money just as dealing with it ineffectively could do the opposite. And while a well managed crisis often enhances the organization's reputation, a poorly managed one can not only damage the reputation but also open the organization up to costly litigation.

Health Warning Systems

► Health warning systems, based on forecasting extreme weather and floods, help to protect life and health, and property and enhance the national economies. Some such systems have been in place, and others are being envisaged.

In the United States, excessive heat is the main weather-related killer, causing more fatalities in an average year than floods, strong winds (tornadoes and hurricanes), lightning, and winter events (storms and extreme cold spells). During an average summer, there are over a thousand excess deaths in the USA, which could be attributed to heat. If deaths by heart attacks, strokes or respiratory illness are above normal during a heat wave, they could be considered heat-related deaths, even if they may not be treated as such by a medical examiner. People living in cities with strong summer weather variability have the strongest weather-mortality relationship. They are not adapted to extremely hot weather, which is infrequent and occurs irregularly. The number of deaths reported during an intense hot spell is higher in such cities than in many tropical (hence always hot) cities. Early season heat waves can cause higher mortality, because people better acclimatize to the heat as the hot season continues.

There has been a considerable progress in the design and implementation of health warning systems in the USA, established to reduce effects of weather extremes as well as for the seasonal predictions of infectious diseases. Warning systems are being developed to permit urban health agencies and local meteorological offices to issue advice to the public if a dangerous heat wave is imminent. The National Weather Service (NWS) of the National Oceanic and Atmospheric Administration (NOAA) in the United States provides advance notice (with forecast capability of five days) of extreme heat events for the protection of life and health, based on a single heat index value derived from temperature and humidity. The excessive heat warning program started in Philadelphia and is currently functioning in 14 cities. A custom-made system is developed for each city, based on specific conditions of meteorology of each urban area, as well as urban structure and demography. The NWS is developing a plan to expand a heat/health warning system to each of over 70 large US municipalities, with population exceeding 500,000. The system initiated in Philadelphia is now becoming a worldwide model for heat forecasting and collaborative attempts to construct heat/health warning systems for vulnerable large cities around the world have been undertaken in three continents: North America, Europe, and Asia.

The situation which arose in France in August 2003 showed that the death toll of the heat wave was not foreseen and detected only belatedly; health authorities were overwhelmed by the influx of patients, retirees' houses had no space-cooling environment, and the number of deaths exceeded the working capacity of undertakers and crematoria. This lesson demonstrates the need for establishing health and environment surveillance, and heat wave forecasting and warning. Air conditioning in retirees' homes proved efficient (yet

very energy-consuming, hence contributing to enhancement of the greenhouse effect and global warming).

The World Meteorological Organization (WMO) develops a number of global products and services relevant to natural disaster management. For example, the WMO Tropical Cyclone Programme monitors all tropical cyclones around the globe from their early stages of formation, throughout their life time, providing information on their behavior, movement and changes in intensity, and on associated storm surges and floods. The WMO's Severe Weather Information Center project, carried out in collaboration with the Hong Kong Observatory, has the goal to develop a centralized source of official tropical cyclone warnings and information around the world.

Since deadly extreme heat events occur in many regions of the world, the World Meteorological Organization (WMO) is working with the World Health Organization (WHO) to develop guidelines that any country can use to set up and run heat/health warning systems. These systems will include monitoring and prediction of conditions leading to intense heat waves to be carried out by the national meteorological and hydrological services, communication between the meteorological and health sectors, and increasingly will include special measures for intervention (by the health and social service sectors), to inform and better protect the most vulnerable members of society.

Long-term forecasts, seasonal forecasts, e. g. based on El Niño-Southern Oscillations (ENSO), are being used in many regions, e. g. in drought warning, to improve preparedness and reduce disaster-caused human and material losses.

Aftermath Risk Awareness, Perception, Assessment and Communication

Improving information about hazards is badly needed for awareness raising and enhancing the consultative process, which leads to a hazard mitigation strategy. Only informed stakeholders can make rational decisions about the choice of strategy, in a cost-benefit framework. Aware citizens are likely to behave in a way that is compatible with disaster management activities.

Experience demonstrated that repeated occurrence of a disaster in the same place within a relatively short time may enhance the learning effect. For example, there were two large floods on the Rhine, in December 1993 and January 1995. The maximum water levels in Cologne were of comparable magnitude (the second being actually a little higher), but the values of the damage caused by each of the two floods largely differed; the damage in the second (higher) flood was considerably lower. Occurrence of the first flood raised awareness and triggered actions towards improvement of the flood preparedness system, based on the lessons learned.

Misconceptions and myths about natural disasters and flood protection are deeply rooted in society – the general public, politicians and decision-makers alike. It is of utmost importance to dispel and to rectify misconceptions and counter-productive "principles", valid throughout political and social systems, such as the rule of hydro-illogical cycle, holding for floods and droughts. Flood (drought) occurrence triggers high expenditures on flood (drought) protection. Yet, memory fades and, after some time without flood (drought), the willingness to pay for costly preparedness systems drastically decreases. It is not easy to effectively communicate this truth to the electorate and decision-makers whose term of office is short. A major disaster may not occur during their terms of office.

Efficient actions aimed at awareness raising are of vast importance for a disaster preparedness system. There is a systemic lack of experience with a catastrophic flood of extreme dimension. Over 50 fatalities occurred in the 1997 flood in Poland and many could have been avoided had there been better awareness. Most flood fatalities in the US are related to vehicles whose drivers underestimate the danger and get trapped in their cars. Obeying simple driving rules alone could help reduce the number of fatalities in many flood events.

Media may play an essential role in awareness raising and information. The risk perception is to a large extent framed by the media coverage. In some cases, risk atmosphere is created by the media (cf the Three Miles Island impacts, where the actual damage was low).

Risk perception involves one's beliefs, attitudes, judgments and feelings, as well as the wider social and cultural values and disposition towards hazards (being risk-prone, risk-neutral, or risk-averse). It depends on age, gender, education, and traumatic experience.

In many areas, river levees (dikes) are the principal flood defenses. Existence of properly dimensioned and maintained levees, which adequately protect adjacent

areas for small and medium floods, creates a misconception – an unjustified feeling of complete safety among the riparian population. When a dike breaks during an extreme flood, the damage may be higher than it would have been without a dike. The Netherlands, a large part of which is located below the mean sea level and remembers the tragedy of the coastal flooding of 1953, has higher safety standards (design flood) than any other country in the world. Yet, even in the Netherlands, safety levels have been re-examined to take into account the effects of global change. Building flood risk consciousness among the public and rectification of misconceptions, such as false feeling of absolute safety, is of paramount importance. No matter how high a design flood is, there is always a possibility that a greater flood could occur, inducing losses. Should dikes be designed to withstand a 100-year flood or a 500-year flood? The latter solution would give a better (but still incomplete) protection, being far more costly (prohibitively costly in most places, with the Netherlands being a notable exception, embarking on the high safety standards with design values of 1250-, 4000- and 10,000-year event for river, large river, and coastal protection).

Disaster risk communication is a difficult issue, especially communication of uncertainties, which requires assistance in understanding. When issuing warnings – communicated messages that a hazard is producing specific risks for a particular segment of population – the response depends on the source, channel credibility, and past experience (relevance and accuracy of earlier warnings). People are likely to heed warnings if past warnings did not "cry wolf" (aftermath risk awareness, perception, assessment and communication).

Disaster Management, International

Disaster management, especially in less developed countries, requires massive international assistance and the issue of disaster reduction has been one of articulated major human needs. The UN Millennium Summit, which adopted *UN Millennium Declaration* resolved "… to intensify cooperation to reduce the number and effects of natural and man-made disasters." The UN International Decade for Natural Disaster Reduction (IDNDR) was launched by the United Nations to enhance disaster preparedness. It provides a framework for international collaboration for strengthening preparedness skills and an institutional base. By the end of the decade, the UN International Strategy for Disaster Reduction (ISDR) aims at building disaster-resilient communities by promoting an increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters.

While effective emergency management plays a vital role in avoiding loss of life and suffering, it generally fails to make the connection between the disaster risk and sustainable development. In recognition of this, the United Nations Development Programme (UNDP) has adopted a view that disasters are unresolved development problems that occur when risks go unmanaged. The mainstreaming of disaster reduction into development and post-disaster recovery has become an essential component of building a capacity for sustainable development. Ideally, disaster risk planning and preparation considerations should be factored into national and regional development programs and countries should take advantage of post-disaster recovery as unique opportunities to mitigate future risks and vulnerabilities in their countries. Mainstreaming disaster reduction in UNDP practice takes place in such areas as: poverty eradication and sustainable livelihoods; gender equality and the advancement of women; environmental and natural resources sustainability, and sound governance.

There are a number of agencies dealing with disaster management on the international scale, both IGOs (intergovernmental organizations, within the UN system) and NGOs (non-governmental organizations). Among the former are: UN Department of Humanitarian Affairs (DHA), UN Office for the Coordination of Humanitarian Affairs, United Nations Development Programme (UNDP), Food and Agriculture Organization (FAO), World Food Programme (WFP), World Health Organization (WHO), United Nations Children's Fund (UNICEF), and World Meteorological Organization (WMO). The UN High Commissioner for the Refugees (UNHCR) provides massive airlifts from UNHCR's global and regional stockpiles of life-saving supplies and operational capacity. There are several regional agencies, such as the Humanitarian Aid Office (ECHO – European Community Humanitarian Office) created to improve efficiency and give human-

itarian aid a higher profile. The Caribbean Disaster Emergency Response Agency is a regional inter-governmental agency responsible for disaster management in the region. It makes an immediate and coordinated response to any disastrous event, once a state requests such assistance. It secures, collates and channels comprehensive and reliable information on disasters affecting the region. It contributes to mitigating or eliminating as far as possible, the consequences of disasters, establishing and maintaining on a sustainable basis, adequate disaster response capabilities; and mobilizing and coordinating disaster relief.

Among the NGOs involved in disaster management, there are many organizations. Some are dedicated to the purpose of providing emergency medical and humanitarian aid, e. g. the International Federation of Red Cross and Red Crescent Societies (IFRC) or *Médicins sans frontiers*. Others act within a more general remit of assistance (e. g. ActionAid International). Also multiple national institutions, both governmental (e. g. development assistance agencies) and private contribute to disaster response, worldwide. Contributions of many agencies in raising disaster awareness and developing disaster preparedness material are numerous and very valuable.

After a disaster, agencies initiate fund raising and undertake immediate assistance efforts. An example of an ad-hoc coordinated activity is the United Nations' Inter-agency Earthquake Response Plan after the earthquake in Indonesia (27 May 2006). The UN Food and Agriculture Organization (FAO) mobilized resources to help farmers affected by a disaster in Indonesia, who had lost their productive assets and source of income, to quickly resume farming and livestock production activities. Early recovery of the agriculture sector is essential for quick and sustainable improvement of rural people's livelihoods.

The occurrence of a large disaster triggers international solidarity. After a large disaster, many international organizations and national organizations in many countries pledge emergency aid and send supplies, doctors and experts to devastated areas (► disaster management, international).

Disaster Management, National

On the national level, there is typically a central government department whose mandate is to lead the effort to prepare the nation for all hazards and effectively manage response and recovery efforts following any disaster. In some countries, a disaster management agency exists at the ministerial level (e. g. Ministry of Disaster Management in Sri Lanka, or Ministry of Emergency Situations in some independent countries born after the fall of the former Soviet Union). Often, such a government agency works in partnership with other organizations that are part of the nation's emergency management system (e. g. include state, regional, and local emergency management agencies). Among them are – civil defense units, army, police, and fire brigades. In some countries, problems exist of co-ordination of efforts, due to the existence of several agencies, whose responsibilities are not clearly straight cut; hence occasional problems in co-operation may occur. There are also many private disaster relief institutions (NGOs, charities related to churches).

In some countries and regions, active agencies play extremely valuable roles in disaster awareness raising and in contributing to the relief and recovery work. In a few countries, disaster risk assessment has become public and one can see an on-line hazard map for one's location.

The response to Hurricane Katrina, the most destructive (in terms of material damage) disaster on record worldwide, revealed several weaknesses in incident management, planning discipline, and field-level crisis leadership, in the most powerful country on the globe. Implementation of corrective actions was found necessary in many organizations (including the Federal Emergency Management Agency – FEMA), in order to ensure that the problems encountered during Hurricane Katrina will not occur again. The federal US government decided that the existing national preparedness system must be improved to minimize the impact of disasters on lives, health, property, and the economy.

Hurricane Katrina and its aftermath have provided the USA with the imperative to create a culture of preparedness, to design and build a unified and comprehensive, national preparedness system; preparing for and responding to natural and man-made disasters. Starting with a national, domestic, all-hazards preparedness goal, a robust preparedness system is being built that includes integrated plans, procedures, training, and capabilities at all levels of government. The system should integrate and synchronize the nation's policies, strategies, and plans across federal, state, and local gov-

ernments, as well as the private sector, non-governmental organizations (NGOs), faith-based groups, communities, and individual citizens, who share common goals and responsibilities. The objective of the system is to achieve and sustain risk-based target levels of capability to prevent, protect against, respond to, and recover from major natural disasters, terrorist incidents, and other emergencies.

The federal government has clearly articulated national preparedness goals and objectives and created the infrastructure for ensuring unity of effort. Among the elements of critical importance for a national preparedness systems are:

- building and integrating the federal government's operational capability for emergency preparedness and response;
- strengthening capacity to direct the national response effort while providing resources to responders in the field;
- ensuring unity of effort and eliminating delays in providing national assistance to disaster areas;
- strengthening disaster awareness, by education, exercises, and training programs; and
- ensuring that risk assessments, lessons learnt, and corrective action programs are institutionalized throughout the national government (► disaster management, national).

Prospects for the Future

The human and material damage caused by many disasters can be reduced if adequate measures are taken. Alone extension of the temporal horizon of forecasts, its penetration, and improvements in their accuracy and reliability, could save many lives and considerably reduce human suffering. Changes in the risk of natural disasters depend on the population and economic growth and the quality of the preparedness system.

However, human kind will never be free of natural disasters, generated by extreme geophysical (climatic, hydrological, seismological, volcanological) events and disasters caused by man. Potentially, the most disastrous event could be a collapse of a large man-made infrastructure object – a large dam break, jeopardizing people living downstream. In many areas, population density below large dams is high.

The September 11 tragedy unveiled the possibility of emergence of new man-made disasters – "innovative" and inhuman acts of violence, aimed at massive killing, where maximizing the number of anonymous fatalities is the terrorists' target. This was also the terrorists' objective behind the use of Sarin gas in the Tokyo subway, and the bombs in Madrid and London transportation systems.

Possible causes of hypothetical futural disasters are: a gigantic asteroid colliding with the planet Earth, megatsunami, and global climate change, which – in the long term – may severely, and adversely, affect life support systems in many areas. Climate change itself can indeed generate a disaster. Ultimate changes due to the finite Sun's lifetime are expected in the time scale of billions of years. Changes in solar activity and in parameters of the trajectory of Earth's movement around the Sun generate climate changes at a large time scale (e. g. many millennia – cf. glaciation periods). In the past, sudden climate change, e. g. induced by a fall of a large meteorite or strong volcanic eruption, caused severe effects, such as, possibly, the extinction of the dinosaurs, or "a year without summer" (1816), respectively.

There has been increasing evidence of the ongoing climate change, which is attributable to human activities, such as the rising emission of greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.) leading to buildup of greenhouse gases in the atmosphere and enhancement of the greenhouse effect, and land-use changes (e. g. deforestation in tropical areas). The global climate system has been driven out of the stable natural variability mode. Global warming already has been observed and further, stronger, warming (by 1.1 to 6.4 °C by year 2100) is projected. All of the seven globally warmest years on record (since the beginning of global instrumental temperature observations, in 1860) have occurred since 1998. There have been ongoing changes in such variables as precipitation (growth in some areas, decrease in other areas of the globe), river flow, glacier extent, sea level. The area of the globe in very wet or very dry states has been increasing and the water cycle has accelerated, with extreme consequences. In many areas, increases in intense precipitation has been observed, which can be translated into increases in flood hazard. Even stronger changes are projected for the future.

Any regional increases in climate extremes (storms, floods, cyclones, droughts, etc.) associated with climate change would cause physical damage, popula-

tion displacement, and adverse effects on food production, freshwater availability and quality. Adverse health effects would increase, and in particular the risks of infectious disease epidemics in developing countries. Already at present, diarrhoeal diseases attributable to unsafe water and lack of basic sanitation cause almost 2 million deaths a year worldwide. Malnutrition affects every third human, dwarfing most other diseases. Increased risk of extreme events caused by climate change is likely to jeopardize the situation and exert adverse human health impact.

The 2003 European heat wave killed many thousands of people, showing that even developed countries may not be adequately prepared to cope with extreme heat. There were 10 days with temperatures over 35 °C in Paris and mortality in the time period from 1 to 20 August increased by 55%, as compared to earlier years. Occurrence of a heat wave as extreme as that in Europe in August 2003 would be unlikely in the absence of anthropogenic climate change. Hence, these excess deaths can be attributed directly to climate change. An increase in the frequency or intensity of heat waves in the future will increase the heat-caused risk of mortality and morbidity, particularly in the older age groups (sick people, isolated people), and among the urban poor (► prospects for the future).

Summary

Mankind is not free of natural and man-made disasters that have caused severe human and material damage, adversely affecting life, livelihood, and property. Despite developments in technology and high expenditures on disaster mitigation works, disasters do occur and the severity of their impacts and accompanying hardship and material damages is very high. Even if the health care has become effective and the average length of life and health status has dramatically improved, disasters continue to cause adverse, and severe, health-related effects, challenging the existing public health and health care systems. In brief, modern societies are not prepared for extreme disasters, which are far beyond planning and design assumptions. The present synopsis reviews components related to disaster aftermath.

Cross-References

► Aftermath Risk Awareness, Perception, Assessment, and Communication
► Disaster Management, International
► Disaster Management, National
► Disaster Response
► Emergency Preparedness
► Hazards, Natural
► Hazards, Technological
► Health Warning Systems
► Human Health Aspects of Disasters
► Mitigation Strategies
► Physical, Environmental,and Social Aspects of Disasters
► Prospects for the Future
► Recovery Strategies
► Vulnerability Concerns

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Disaster Impacts On Human Health

► Human Health Aspects of Disasters

Disaster Management, International

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Synonyms

Emergency management

Definition

Disaster management is a systematic process of using the body of policy, administrative decisions, organization, and operational skills and capacities to reduce the risk of natural or man-made disasters and their adverse effects. Disaster management can be realized at various levels – sub-national (local, regional), national, and international, and at various times – before, during, and after a disaster.

Basic Characteristics

International disaster management can be understood in two ways. On the one hand, it is management of international disasters affecting a number of countries, such as a tsunami, flood, drought, hurricane, epidemic, or war. On the other hand, the term describes international assistance to national (regional or local) disaster management (► disaster management, national).

Disasters devastate the lives, health, and livelihoods of millions of people every year. The vast majority of disaster-related deaths and adverse health effects occur in developing countries, where already fragile public services are further weakened. Disaster management, especially in less developed countries, requires massive international assistance. The United Nations (UN) Millennium Summit, during which the ► UN Millennium Declaration was adopted, resolved "... to intensify cooperation to reduce the number and effects of natural and man-made disasters" (United Nations 2000).

The 1990s were proclaimed the UN International Decade for Natural Disaster Reduction (IDNDR) by the UN. During the 1990s, the framework for international collaboration for strengthening preparedness skills and institutional bases was provided. The UN International Strategy for Disaster Reduction (ISDR) now promotes the building of disaster-resilient communities by increasing awareness of the importance of disaster reduction (► mitigation strategies) as an integral component of ► sustainable development, with the goal of reducing human, social, economic, and environmental losses (► physical, environmental and social aspects of disasters) due to natural hazards (► hazards, natural) and technological (► hazards, technological) and environmental disasters.

There are a number of agencies dealing with disaster management at the international scale, both intergovernmental organizations (IGOs; within the UN system) and non-governmental organizations (NGOs). Among the former are: UN Department of Humanitarian Affairs (DHA), UN Office for the Coordination of Humanitarian Affairs, United Nations Development Programme (UNDP), Food and Agriculture Organization (FAO), World Food Programme (WFP), World Health Organization (WHO), United Nations Children's Fund (UNICEF), and World Meteorological Organization (WMO). The UN High Commissioner for the Refugees (UNHCR) provides massive airlifts from UNHCR's global and regional stockpiles of life-saving supplies and operational capacity.

There are several regional agencies, such as the European Community Humanitarian Office (ECHO), cre-

ated to improve efficiency and give humanitarian aid a higher profile. The Caribbean Disaster Emergency Response Agency is a regional intergovernmental agency responsible for disaster management in the region. It makes an immediate and coordinated response to any disastrous event, once a state requests such assistance. It secures, collates, and channels comprehensive and reliable information on disasters affecting the region. It contributes to mitigating or eliminating the consequences of disasters as far as possible; establishing and maintaining adequate disaster response capabilities on a sustainable basis; and mobilizing and coordinating disaster relief.

Within the UN system, responsibility for disaster response rests with the Resident Coordinator within the affected country. However, in practice, an international response can be coordinated if requested by the affected country's government, by deploying a UN Disaster Assessment and Coordination (UNDAC) team from the UN Office for the Coordination of Humanitarian Affairs (UN-OCHA).

There are many NGOs involved in disaster management. Some are dedicated to the purpose of providing emergency medical and humanitarian aid, e. g. the International Federation of Red Cross and Red Crescent Societies (IFRC) or *Médicins sans frontiers*. Others act within the more general remit of assistance (e. g. ActionAid International). There are also multiple national institutions, both governmental (e. g. development assistance agencies) and private, that contribute to disaster response worldwide. The contributions of many agencies to raising disaster awareness and developing disaster preparedness material are numerous and very valuable.

The IFRC has played a pivotal role in responding to emergencies and reducing the impact of disasters around the world. The IFRC offers coordinated and focused responses to disasters by deploying emergency response units (ERUs), pre-trained teams of specialist volunteers (who already knew each other) and prepacked sets of standardized equipment ready for immediate use. Teams of experienced IFRC disaster managers (field assessment and coordination teams) are on standby to provide support after sudden major disasters. The deployment of ERUs speeds up the disaster response. ERUs are now a crucial part of the IFRC's disaster response and are part of the IFRC's integrated disaster management programming, which deals with emergency response, preparedness, and rehabilitation.

While effective disaster management plays a vital role in avoiding loss of life and suffering, it generally fails to make the connection between the disaster risk and sustainable development. In recognition of this, the UN Development Programme (UNDP) has adopted a view that disasters are unresolved development problems that occur when risks go unmanaged. The mainstreaming of disaster reduction into development and post-disaster recovery has become an essential component of building a capacity for sustainable development. Ideally, disaster risk planning and preparation considerations should be factored into national and regional development programs and countries should take advantage of post-disaster recovery as unique opportunities to mitigate future risks and vulnerabilities in their countries. Mainstreaming disaster reduction in UNDP practice takes place in such areas as poverty eradication and sustainable livelihoods; gender equality and the advancement of women; environmental and natural resources sustainability; and sound governance.

After a disaster, agencies initiate fundraising and undertake immediate assistance efforts. An example of an ad-hoc coordinated activity is the UN Inter-agency Earthquake Response Plan after the earthquake in Indonesia (27 May 2006). The UN Food and Agriculture Organization (FAO) mobilized resources to help farmers who had lost their productive assets and source of income due to the disaster in Indonesia, allowing them to resume farming and livestock production activities quickly. Early recovery of the agriculture sector is essential for quick and sustainable improvement of rural people's livelihoods.

Occurrence of a large disaster triggers international solidarity. After a large disaster, many international organizations and national organizations in many countries help affected societies to attain recovery.

Cross-References

- ▶ Disaster Management, National
- ▶ Hazards, Natural
- ▶ Hazards, Technological
- ▶ Mitigation Strategies
- ▶ Physical, Environmental,and Social Aspects of Disasters

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Disaster Management, National

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Synonyms

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Definition

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Basic Characteristics

The responsibility for disaster (► hazards, natural; ► hazards, technological) management typically reflects the ► subsidiarity principle. It is attempted, as far as possible, to solve problems related to emergency at the lowest possible administration level of the place where the emergency occurs. The resources of the local authority (local government) are used first to manage a disaster occurring in a community. The response of local police, fire, and emergency medical services can be sufficient in the case of a smaller-scale emergency. Once it becomes clear that the resources of the local government are overwhelmed, the resources of the province are called upon (by the head of the local government, e. g. mayor) for additional help. When the resources of local and province governments are overwhelmed, the central government is called upon to help. Governors of the affected provinces may request a disaster declaration from a head of the central government (or a president) to ease the disaster management. In the case of a large disaster, foreign aid may be sought (► disaster management, international).

Disaster management is often considered a fundamental function of government at the national, provincial, regional, and local levels, and dedicated government agencies are established in many countries, reflecting the structure and functions of disaster management. On the national level, there is typically a central statutory authority for controlling any state of emergency declared by the central government. It is often a central government department whose mandate also involves leading efforts to prepare the nation for all hazards and effectively managing response and recovery efforts following any disaster that may occur. In some countries, a disaster management agency exists at the ministerial level (e. g. Ministry of Civil Defence and Emergency Management in New Zealand, Ministry of Disaster Management and Human Rights in Sri Lanka, and Ministry of Emergency Situations in some former Soviet republics). In the USA, the Federal Emergency Management Agency (FEMA) is the central, lead agency for disaster management. In some countries, the responsibility for governmental disaster management is placed with the institutions for civil defense.

Typically, provinces and local government bodies such as regional and city councils also have disaster management agencies to control local states of emergen-

cy. All these agencies defer to the central agency if a national state of disaster is declared. The central government agency works in partnership with these lower-level agencies and with other organizations that are part of the nation's disaster management system. Among them are civil defense units, the army, police, and fire brigades.

Disaster management deals with such issues as risk management, health planning and policies, management of health facilities, control of communicable disease, disaster medical services, psychological preparedness and response, and health information systems (including early warning, surveillance, and communication systems), among others.

In some countries and regions, active disaster management agencies play an extremely valuable role in raising disaster awareness in the society. In a few countries, disaster risk assessment has become public and individuals can see an on-line hazard map for their location.

The primary means of addressing disaster management is accomplished through relevant legislation. In some countries, such as the USA, there has been a long tradition of developing disaster management legislation. An early case of assisting people affected by a natural disaster through legislation was in response to the fire destroying New Hampshire (USA) over 200 years ago. In 1803, a Congressional Act was passed to provide financial assistance to the town. The Flood Control Act of 1934, which bestowed the responsibility for flood control upon the U.S. Army Corps of Engineers, the National Flood Insurance Act of 1968, and the Disaster Relief Act of 1974 were passed in the USA to address natural disasters. The current focus on terrorism was triggered by the attack on 11 September 2001. It is important that policies and legislation define the powers, duties, and functions of agencies involved in disaster management in an unambiguous way. There have been many examples when co-ordination of efforts led to problems due to existence of several agencies whose responsibilities were not clearly defined. Effective disaster management relies on the integration of emergency plans at all levels of government and active involvement of non-government bodies. Activities at each level affect the other levels of disaster management.

Chances of reduction of human losses and material damage and prospects of recovery (► recovery strategies) are greatly improved when survival plans are prepared beforehand (by local, provincial, and national governments, emergency services, and businesses), and geared to disasters (► hazards, natural; ► hazards, technological) that may occur in the area.

The response to Hurricane Katrina, the most destructive (in terms of material damage) disaster ever recorded worldwide, revealed several weaknesses in disaster management, planning discipline, and field-level crisis leadership in the most powerful country on the Globe. Thereafter, implementation of corrective actions was found necessary in many organizations (including FEMA), in order to ensure that the problems encountered during Hurricane Katrina are not likely to occur again. The federal US government decided that the existing national preparedness system must be improved to minimize the impact of disasters on lives, health, property, and the economy.

Hurricane Katrina and its aftermath have provided the USA with the imperative to create a culture of preparedness; to design and build a unified and comprehensive national preparedness system, preparing for and responding to natural and man-made disasters. Starting with a national, domestic, all-hazards preparedness goal, a robust preparedness system is being built that includes integrated plans, procedures, training, and capabilities at all levels of government. The system should integrate and synchronize the nation's policies, strategies, and plans across federal, state, and local governments, as well as the private sector, non-governmental organizations, faith-based groups, communities, and individual citizens, who share common goals and responsibilities. The objective of the system is to achieve and sustain risk-based target levels of capability to prevent, protect against, respond to, and recover from major emergencies.

Cross-References

► Disaster Management, International
► Hazards, Natural
► Hazards, Technological
► Recovery Strategies

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Disaster Response

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Synonyms

Management damage reduction

Definition

Undertaking actions to reduce human and material damage caused by a disaster.

Basic Characteristics

The disaster response phase embraces the entirety of actions following the occurrence of the disaster, and is aimed at reduction of human and economic damage. Disaster response deals with a situation of active crisis, possibly involving numerous affected people in urgent need of assistance (► disaster management, national; ► disaster management, international). Search and rescue efforts after sudden disasters (such as earthquakes) start at an early stage in order to save lives. Depending on injuries, the ambient temperature, and victim's access to air and water, it is possible to survive for minutes, hours, or days. The chance of finding survivors decreases dramatically with time, particularly in the case of wounded people and cold weather.

People affected by a disaster present multiple survival needs, including basic needs (safe water, housing/shelter, hygiene), and health and medical needs (first aid, medical attention, care of special medical conditions such as diabetes and epilepsy, and temporary hospitals and pharmacies). Mental health also needs attention, particularly with regards to ► post-traumatic stress disorder (PTSD) and child and spouse abuse. Emergency assistance includes providing clothing, cleaning supplies, emergency transportation, home repairs, household items, etc. In the disaster-affected environment, the capacity of disaster management agencies is over-stretched and diminished by the disaster so that they are not able to deliver their usual services.

Some natural disasters can be forecast. If a forecasting-warning-response system is in place, it may be possible to evacuate people from endangered areas (at times, the number of evacuees can be very high). Families follow instructions and evacuate to friends, relatives, or to specially designated temporary evacuation shelters (e. g. school buildings, municipal arenas) on foot, by their own cars, or by means of transport delivered by rescue workers. They take an adequate amount of supplies, if possible. At evacuation shelters, they should be taken care of by rescue workers and provided with their basic requirements: safe water, warm food, blankets and clothing, and psychological support, which may be required over a longer time. In displaced families (temporarily or permanently), children suffer particularly from the stress of having lost a home, a neighborhood, friends, a pet, and a normal way of life, and being in a new, and unknown, environment (possibly moving in with family members into overcrowded temporary housing). The response can also take the shape of home confinement, i. e. a family may stay in their home for a long time (days) without outside support.

The disaster response plan should be well prepared and rehearsed in a disaster-free time. It should be developed as a part of the disaster preparedness plan. Improvisation in the time of emergency does not pay off and disables efficient coordination of rescue efforts.

Disaster response includes a system to share relevant and reliable information for several purposes: to dispel hysteria and rumor; to offer support, counseling, and referrals to those in need; and to inform, assist, and calm the interested public. Disaster-affected communities seek disaster information, becoming almost addict-

ed to media coverage of the disaster and its management. Local media (TV and radio stations and newspapers) provide a wealth of useful practical information on how to solve crucial everyday problems, such as obtaining medical assistance, food and water, rebuilding material, etc.

Schools may reopen with improvised schedules and without proper instructional materials. Though possibly damaged, schools buildings may play the role of save havens, islands in a sea of confusion and turmoil, and symbols of good hope for the community.

Disaster heightens awareness of many chronic but ignored problems, such as poverty, unemployment, and homelessness, which may have been politically unpalatable. However, since a disaster leaves many middle-class people homeless, the public perception of homelessness is likely to change positively. The sight of families with small children and no place to go convinces many of the need for an organized response.

The disaster response can be provided by national (► disaster management, national) and/or international agencies and organizations (► disaster management, international). If many organizations respond, effective coordination of disaster assistance is crucial. The disaster response includes the mobilization of the necessary emergency services and first responders in the area stricken by disaster, such as civil defense, fire brigades, police (if necessary and feasible – military units), dedicated Non-governmental organisations (NGO), and volunteers, driven by noble motives, who can help in the disaster response. However, non-coordinated actions of spontaneous and unaffiliated volunteers may be a hindrance to the disaster response and harm recovery efforts.

Cross-References

► Disaster Management, International
► Disaster Management, National
► Human Health Aspects of Disasters
► Post-traumatic Stress Disorder (PTSD)

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Discarding

► Disposing

Discounting

Definition

Discounting is defined as the adjustment of future values – whether costs or outcomes – to better reflect their present day value. The discount rate is the rate at which future values are adjusted. The rationale behind discounting is the observation that it is preferred to receive and consume something of value today rather than in the future. As there is no common standard discount rate, a rate of 3% or 5% is recommended for the base case analysis and a further sensitivity analysis with a rate between 0% and 10% should be conducted.

Discrete Event Simulation (DES)

Definition

In general, discrete event simulation describes the chronological sequence of events representing the operation steps of a system. In health economic ► modeling, discrete event simulation techniques are seen to be more flexible and, due to the consideration of individual patient experiences, more naturalistic than Markov models and decision tree analysis.

Discriminant Analysis

Synonyms

Discriminant function analysis; Linear discriminant function analysis

Definition

Discriminant analysis (DA) is one of a large class of methods for performing supervised classification. It uses a set of measured characteristics or attributes of subjects or objects to (a) put the observed units into one of two (or more) alternative groups *a priori* defined or (b) formulate differing classes or groups. Thus, the method can be used with two rather distinct objectives. The first is as a predictive tool with the aim of formulating a rule that will permit objects to be classified into one of several predefined classes. The second is to help understanding (i. e., explanation or description) with the aim of building a model that helps us understand the structure in data. For example, is it possible to predict which patient's breast cancer will have spread to the surrounding lymph nodes? In what way do those infants at high risk of dying from Respiratory Distress Syndrome differ from those at low risk when a set of variables that include sex, gestational age, birthweight, etc. are available? DA considers the classification procedure using the assumptions that a nominal outcome has two (or more) values, that independent variables are normally distributed and linearly related, and by applying Bayes' Theorem.

Discriminant Function Analysis

► Discriminant Analysis

Discrimination

Definition

Discrimination of mentally ill individuals is the treatment of a mentally ill person in a less favorable way compared with a person without mental illness but in the same circumstances.

Disdain

Synonyms

Scorn; Dislike; Aversion

Definition

Lack of respect accompanied by a feeling of intense dislike.

Disease

Definition

Disease refers to abnormalities in the structure and function of body organs and systems.

Disease Frequency

Synonyms

Morbidity

Definition

The term disease frequency usually refers to the rate of ► incidence of a disease. It reflects the rate of sickness as in specified community or group. It also may denote ► prevalence (the total number of cases in a particular population at a particular point in time) and incidence (the number of new cases in a particular population during a particular time interval) of a disease.

Cross-References

► Incidence
► Morbidity

Disease Frequency, Measures

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Synonyms

Incidence rate in occupational medicine

Definition

In epidemiology (► epidemiology, aims and scopes), measures can be defined as a variety of parameters used to quantify the occurrence of health events in a population.

Basic Characteristics

To investigate distributions and determinants of health events, besides the number of ► cases, it is necessary to know the size of the ► population at risk and the time period during which the data were collected. There are three general tools used to relate the number of cases of disease or the outcome to the size of the population in which they occurred: ratio, proportion, and rate (Hennekens et al. 1987).

Ratio is any number divided by another without any specific relationship between the numerator and the denominator. The ratio may be expressed in the form *x*/*y* and is dimensionless. An example of a ratio is the ratio of male to female births.

Proportion is a type of ratio where the numerator is a part of the denominator. Proportions may be expressed as fractions, decimal numbers, or percentages. An example is the proportion of male deaths out of the total number of deaths (male deaths plus female deaths).

Rate is a special form of proportion because the denominator includes a measure of time. The rate expresses the probability or risk of a disease or outcome in a defined population over a specified period of time (Mausner, Kramer 1985; Bhopal 2002). Rates can range from zero to infinity. They can be crude (► crude rate), specific (► specific rate), or standardized (► standardized rate).

All measures refer to morbidity (illness) or mortality (death).

Measures of Morbidity

Presence of disease in a population or the probability (risk) of its occurrence can be measured using prevalence or incidence.

Prevalence indicates the number of existing cases of disease in the population at a specified point in time or over a specified period of time. Prevalence is measured as a proportion, so it must lie between zero and one. It provides an estimate of the probability that an individual will be ill at a particular point in time.

There are three types of prevalence, but when used without qualification it generally refers to point prevalence (Bhopal 2002).

Point prevalence comprises all affected persons that exist in the population at risk at a point in time. The numerator includes all new and pre-existing cases on a certain date. The denominator is the total population on that date.

Period prevalence combines the concept of incidence and point prevalence. It denotes the total number of cases that exist during a specified period of time, for instance a week, month, or longer time interval (a year or two). The numerator in the *period prevalence* is the number of cases at the beginning of a defined period (the point prevalence) and new or recurrent cases that occur during the period of interest. The denominator is the average population. Period prevalence is useful for studying episodic, recurrent diseases such as mental illness, migraine, low back pain, etc.

Lifetime prevalence is an extension of the idea of period prevalence, and includes all those who have had the disease at any time in their life. Lifetime prevalence is useful for investigating how common some diseases are.

Prevalence is based on both incidence and duration of disease.

Prevalence data are useful in describing the burden of a disease in a community (especially for long lasting infections, such as HIV), and in planning health resources such as facilities and personnel. Prevalence data are not helpful for studies of etiology of diseases.

Incidence is the number of new cases of disease or health conditions that develop in a population at risk within a specified period of time. Incidence expresses the probability or risk of illness in a population over a period of time. Incidence data can help in research on the etiology of disease. There are two specific types of incidence measure defined by the type of denominator: cumulative incidence and incidence rate or incidence density.

Cumulative incidence is the proportion of new cases of a disease during a specified period of time in the population at risk. The denominator is the size of the population at the start of the time period. The distinction between cumulative incidence and lifetime prevalence is that cumulative incidence permits the inclusion of any person who has developed the disease whereas lifetime prevalence tends to imply retrospective examination of individuals who are currently at a certain age.

Incidence rate expresses the probability or risk of illness in a population over a period of time, counting, as with the cumulative incidence, the number of new cases of a disease in that population. However, the denominator (called person-time of observation) consists of the sum of the different times that each individual was at risk of developing the disease. For example, a person at risk of disease followed for one year contributes one person-year of observation.

Attack rate is an alternative form of incidence, which is applied to a narrowly defined population observed for a limited time, such as during an ► epidemic (► outbreak).

Measures of Mortality

Measures of mortality are mortality rate and case-fatality rate.

Mortality (death) rate is a measure of the frequency of occurrence of death in a defined population during a specified period of time (for example, one year). It is calculated by dividing the number of deaths in the population during that period by the person-time of observation or by the average population (or the population at midyear). The number of persons in the population at midyear is used as an approximation because the population usually changes during the time period (Gordis 2004). The ► fetal mortality rate, the ► maternal mortality rate, and the ► infant mortality rate are commonly used as the indicators of the level of health in a community.

Case-fatality rate refers to the number of deaths from a particular disease, divided by all cases of that illness (Hennekens et al. 1987). Contrary to the mortality rate, where the denominator is the entire population at risk of dying, the denominator in the case-fatality rate represents only the individuals who already have the disease. This measure is usually expressed as a percentage or as a decimal. The case-fatality rate is a measure of the severity of a disease. In other words, what percentage of people diagnosed as having a certain disease die within a certain time after diagnosis (Gordis 2004).

Summary Measures of Population Health

Summary measures of population health are statistical measures relating to the burden of disease that combine information on mortality and morbidity (Murray, Lopez 1996).

Disability Adjusted Life Year (DALY) combines in one measure the time lost due to premature mortality and the time lived with disability. DALYs measure the gap between a population's actual health and some defined goal. They are calculated by taking the sum of the ► years of life lost due to premature mortality (YLL) in the population and the ► years lived with disability (YLD) for incident cases of the health condition. One DALY, for example, represents the loss of one year of equivalent full health (Murray et al. 2001).

Cross-References

► Case
► Crude Rate
► Epidemic
► Epidemiology, Aims and Scope
► Fetal Mortality Rate
► Infant Mortality Rate
► Maternal Mortality Rate
► Outbreak Investigation
► Population at Risk
► Prevalence
► Specific Categories
► Standardized Rate
► Years of Life Lost (YLL)
► Years Lived with Disability (YLD)

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Disease Incidence and Prevalence

► Morbidity

Disease Management

Definition

A system of coordinated health care interventions and communications.

Disease Management Organizations (DMOs) (U.S.)

Definition

DMOs are providers of health care services for people suffering from typically chronic, high-cost and high-volume diseases covered by a disease management program. DMOs typically receive a prospective payment of care based on fixed prices combined with a performance bonus. They are generally required to report health outcomes of the patients as one of their primary goals is to improve the ► health status of the patients. The US Agency for Health Care Administration contracts for example with DMOs to provide health care services for ► medicaid patients enrolled in a ► primary care case management Program for ► chronic diseases such as AIDS, asthma or diabetes.

Disease Management Programs

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Definition

Disease management programs (DM programs) are coordinated health care intervention programs using interdisciplinary clinical teams, continuous analysis of relevant data, and cost-effective technology to improve the health status of patients with treatable chronic diseases (e. g. asthma, diabetes, etc.).
The design of a DM program involves typically a certain number of disease management activities. According to the Disease Management Association of America (DMAA), these activities comprise "population identification processes, evidence-based practice guidelines (also ► evidence based medicine, in HTA, ► evidence based medicine in Epidemiology); collaborative practice models, patient self-care management education as well as process and outcomes measurement".
In practice, the application and the design of DM programs varies from comprehensive patient care management programs including full medical service to limited medical assistance programs focusing on pharmaceutical services and administrative functions.

Basic Characteristics

History

► Chronic diseases necessitate generally a higher use of health care services, i. e. hospital care, doctor's visits and prescription of drugs. The increase in the number of people with chronic diseases and the rise in overall health care spending have led payers of health care (government, employers, insurances) to seek for measures to reduce their health care costs. Since 1990, disease management of chronic diseases has become increasingly popular in the United States because DM programs aim to enhance health conditions of chronically ill people while reducing the costs of health care by avoiding complications and unnecessary use of health care services. Traditionally it has been part of the comprehensive care that has been furnished by so called ► disease management organizations (DMOs). Today, there are many approaches of disease management used among the ► fee-for-service population and the approach is expanding worldwide.

Design Components of a DM Program

To design a successful DM program in terms of program implementation as well as cost and quality improvements, according to the DMMA six major activities have to be fulfilled:

1. Population identification processes:
   DM programs target costly chronic diseases or combination of diseases such as asthma, diabetes, congestive heart failure, coronary heart disease, etc. DM programs use demographic characteristics, utilization trends and medical cost components to identify individuals among the population who may enrol as

patients for a specific DM program. Once patients are identified by the most severe disease, ► co–morbidities need to be analyzed before enrolling in a specific DM program.

2. Evidence-based practice guidelines:
   Many DM programs develop practice guidelines for doctors based on clinical evidence to ensure that all patients receive the same medical treatment and lifestyle counseling about how to better live with their chronic conditions.
3. Collaborative practice models:
   To provide a comprehensive care management for the patients, DM programs use direct patient-physician contact with interdisciplinary teams including physicians, nurses, pharmacists, dieticians, respiratory therapists, and psychologists. The education of the individual to better manage its disease may lead health care providers to also work with support-service providers to fill in any gaps in the care team, such as the need for nutrition screening or patient monitoring at distance.
4. Patient self-management education:
   The patient's self-management education or treatment compliance education is an important factor in DM programs. It allows patients to receive better health care and ultimately leads to cost-savings. DM program enrollees may need additional support to stick to their medical regiment such as home visits, counseling, 24-hour call centers, etc.
5. Process and Outcomes measurement:
   DM programs need a system of quality measurement defining measurable goals for the process and the outcome of the program. Typically, DM programs measure the costs and use of all care components, the quality of care, the patient's and physician's satisfaction and changes in health status and well-being of the patient. These measures are defined prior to the beginning of the program and compared to a baseline or a control group at regular interval.
6. Routine reporting and feedback between patients, providers and health plans:
   Routine reporting and feedback between patients and members of the care team assure that patients are receiving the care they need and that they progress in managing their chronic disease. Reporting and feedback towards health plans helps to evaluate the overall impact and effectiveness of DM programs.

The components of effective disease management can take many forms in terms of the tools used, the techniques, and the latest advances.

Application of Disease Management Programs in the USA

DM programs are either applied by ► managed health care plans or by the government.

Managed health care plans have developed and implemented at least one or more DM programs. The most common programs concern the ► chronic diseases of diabetes, asthma and congestive heart failure. To provide services, managed health care plans typically contract with ► vendors or so called ► disease management organizations (DMOs). Some health care plans provide the necessary services on their own.

On the government level, since 1990 more than 20 states are engaged in developing and implementing ► medicaid DM programs for their primary case management and their ► fee-for-service population. Although DM programs have become increasingly popular, several differences between the state programs occur. Some states administer the DM programs on their own, others work with DMOs. Some states offer DM programs including the whole spectrum of necessary medical services and patient counseling, others focus on managing pharmaceutical services only. Some states build a medical care team around their DM programs, others contract with various professionals to fulfill the care management function in the DM programs. The use of performance indicators as for example cost savings, return on investment, secondary prevention activities, adherence to ► clinical guidelines or education of professionals and patients also varies from state to state.

International Applications

With the increasing need for cost containment in the health care systems of industrialized countries, the US approach of DM programs for chronic diseases has recently become popular in many other countries.

In Germany for example, the first initiatives of regional DM programs for breast cancer and diabetes became operational within the statutory health insurance funds in early 2003.

In the UK, the government introduced in January 2005 a model designed to help improve the care of people

with long term conditions. This model offers a personalized care plan for vulnerable people most at risk through improved care in primary and community settings.

Positive Effects and Potential Drawbacks of DM Programs in the USA

Positive effects of DM programs:

- Improves health outcomes: DM programs are based on a patient-centered approach which provides care by addressing psychological aspects, caregiver issues, and treatment of multiple diseases using evidence-based practice guidelines and evaluation of health outcomes.
- Patient satisfaction is generally high because DM programs support the physician-patient relationship by enhancing communication and facilitating feedback.
- Reduction of health care costs: The success of disease management programs in improving self-care practices can lead to the reduction of various health care services, including hospital admissions and emergency room visits. The ► medicare diabetes management program demonstrates among other examples that health care expenditures for certain populations with chronic conditions have decreased.

Potential drawbacks:

- As DM programs are still relatively new and cost-saving studies concentrate generally on a short period of time, the reduction of health care costs in the long run cannot yet be determined.
- The compliance of patients is a central element to assure success of a DM program. Patients are required to spend time and effort in order to improve their health care practices, but sometimes they feel oppressed by the health plans and lack motivation.
- Communication barriers between patients and providers pose challenges. Cultural differences, as well as language barriers, but also the lack of easy access to the provider can inhibit program outcomes.
- Patients may suffer from one or more chronic disease, making coordination of services or different DM programs necessary.
- As standards of care develop with innovation and technological progress over time, DM programs should be reviewed annually and revised as necessary based upon new treatments.
- There is a lack of common standards for measuring costs and clinical outcomes in order to evaluate nationwide the true impact of DM programs.

Conclusion

Although research on the impact of US disease management programs is somewhat limited, there has been some evidence that DM programs have improved the quality of care with limited cost savings. As people with chronic diseases tend to increase in number and to live longer, disease management efforts will certainly continue improving the effectiveness as well as the economic efficiency of DM programs. If the performance of DM programs increases, they may find a permanent home in the infrastructure of health care delivery not only in the USA but in all other well developed health care systems around the world.

Cross-References

► Chronic Diseases
► Clinical Guideline
► Co-morbidity
► Disease Management Organizations (DMOs) (U.S.)
► Evidence Based Medicine
► Fee-for-Service Population
► Health Care Quality
► Health Maintenance Organizations (HMOs) (U.S.)
► Managed Health Care Plans (U.S.)
► Medicaid
► Medicare
► Primary Care Case Management (PCCM) (U.S.)

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Disease with Multiple Etiology

► Multifactorial Disease

Disease Outcome

Synonyms

Disease result

Definition

The outcome is the possible result that may stem from exposure to a causal factor, or from some intervention. To assess the results, investigators compare rates of disease, death, recovery, or another appropriate outcome. The outcome of interest is measured in the experimental and control group to evaluate efficacy.

Cross-References

► Outcome (Health Economics)

Disease Prevention

Synonyms

Health control; Health promotion; Healthy public policy

Definition

Health promotion comprises all activities to improve people's health and ultimately prevent diseases. These activities are a combination of educational and environmental support actions. They include the provision of information on health and well-being enabling individuals to increase control over their health situation. Health promotion moves beyond the traditional treatment of diseases and ► prevention by vaccination by concentrating its efforts on social, physical and economic factors that influence health including the promotion of physical fitness, healthy eating and living habits as well as early detection of health risks. Actions promoting health are taken at different levels in society: health and social policy at government level, school and community care centers at community level, and family and self at the individual level.

Cross-References

► Health Control
► Health Promotion
► Healthy Public Policy

Disease Registry

Definition

A disease registry aims to collect information on every individual with a particular condition (for example a cancer registry would include information on the primary site and morphology of the cancer) within a given geographical area. Diagnosing physicians are not required by law to report diagnoses to registries; instead, registry personnel identify cases through hospital records reviews. The purpose of a registry is to gather information that may advance the scientific understanding of a disease and to have incidence and prevalence data.

Disease Screening Practices

Synonyms

Preventive screening

Definition

Screening asymptomatic persons to detect preclinical disease has become an important part of public health. However, preclinical screening makes sense only if treatment initiated earlier in the disease process will reduce morbidity and mortality from the disease: there is no benefit in living with a diagnosis if a person's life or quality of life is not extended. The selection of appropriate tests for a given individual depends primarily on that person's age and sex. In addition, consideration of individual risk factors, such as lifestyle or family history, often is used to determine which tests are appropriate tests and how often testing should be performed. Screening for ► sexually transmitted diseases, hypertension, cervical cancer, colorectal cancer, breast cancer and prostate cancer are common examples.

Diseases with Multiple Etiology

Synonyms

Multifactorial disease

Definition

The term "disease with multiple etiology" is usually interchangeable with the term "multifactorial disease". Although, in some opinions, the terms are similar, they are not synonyms because a risk factor for disease development does not necessary mean it is the direct cause of a disease as determined by medical diagnosis or research.

Disinfectant

► Antiseptic

Disinfection

Definition

Disinfection is a process that eliminates many or all pathogenic microorganisms on inanimate objects or skin, but not necessarily bacterial spores. Bacteria grow attached to surfaces because of their insolubility in water. Disinfection reduces the number of bacteria to a level that is not harmful to health. In healthcare settings, disinfection is usually accomplished by the use of a liquid chemical or wet pasteurization. Antimicrobial agents that are applied during disinfection are called disinfectants.

Disinfection of Surfaces

► Antiseptic

Dislike

► Disdain

Disparity

► Health Disparities

Dispensaries

Definition

Dispensaries refer to a charitable or public facility where medicines are furnished and free or inexpensive medical advice is available.

Displaced Person

► Refugee

Displacement of Populations

Definition

Displacement of populations occurs when groups of people are forced to leave their homes or home regions. This phenomenon, known as forced migration, can be due to political or religious reasons, war, ► environmental degradation, or be development-induced. The latter is associated with the forcing of populations to leave their homelands, e. g. to make way for the construction of dams for hydro-electric power and irrigation purposes.

Disposal in Landfills

► Communal and Industrial Waste

Disposing

Synonyms

Throwing away; Dumping; Removal; Discarding

Definition

Help to keep your environment clean. Disposing is getting rid of potentially dangerous waste such as asbestos, pesticides, old electrical equipment, etc. Garbage should be placed in covered metallic containers that render the contents inaccessible to dogs and other animals and do not permit the breeding of flies. There are two general methods of refuse collection: the mixed system and the separate system. A garbage disposal or garburator is an electrically-powered device

installed under a kitchen sink. It shreds food waste into very small pieces so that they can be passed through the plumbing without clogging. Also called a food waste disposal.

Dissociation

Definition

Dissociation reflects a perceived detachment of the mind from the emotional state or even the body and it is a critical feature. Dissociation also is characterized by a sense of the world as a dreamlike or unreal place and may be accompanied by poor memory of the specific events, which, in severe form, is known as dissociative amnesia.

Distorted Thinking

► Psychotic Disorders

Distress

Definition

Distress is a negative form of ► stress with negative consequences. The resources of a distressed person are not adequate to cope with the challenges.

Distribution

Definition

Distribution is the dispersion or dissemination of (pharmacological) substances throughout the fluids and tissues of the body.

Diver's Disease

► Caisson Disease

Diviners

► Indigenous Health Care Services

DMF-Rate

► DMFT-Index

DMFT-Index

Synonyms

Caries index; DMF-rate

Definition

The DMFT-index describes the amount – the prevalence – of ► dental caries in an individual (so-called "caries load"). This index is used worldwide in epidemiological surveys to indicate the prevalence of dental caries in an individual. Thus, all **T**eeth or **S**urfaces respectively which are **D**ecayed, **M**issing and **F**illed due to dental caries are given a number. The sum of the three figures is the DMFT-value. It is used to get an estimate and idea of how much of the dentition has been affected by dental caries before the individual came for dental examination. For the primary dentition all indices are written with small initial letters (dmf-index). The caries prevalence increases during the lifetime of an individual. The DMFT-average of the 12-years-old children is 0.7 in Germany, making this German age group the top group worldwide (situation as per 2005).

DNA Chip

► DNA Microarray

DNA Microarray

Synonyms

Gene chip; Gene arrays; DNA chip

Definition

A DNA microarray is a solid surface onto which DNA (► deoxyribonucleic acid) molecules are arrayed at high density. DNA microarrays can be fabricated with short segments of DNA (oligos) or full length gene fragments (cDNA). DNA microarrays can be spotted mechanically onto a glass slide or may be synthesized *in situ.* DNA

microarrays provide a key tool to quantify transcript levels ► genome-wide.

DNA Transcription

► Transcription

DNA Variants

► Polymorphisms

Doctrine

► Ethical Principles

Domestic Mites

► House Dust Mites

Domestic Violence

► Intimate Partner Violence

Domiciliary Care Facility

► Assisted Living Facilities

Dominant Strategy

Definition

In ► health economic evaluation dominace describes a distinct situation. The strategy that is less costly and more effective is the dominant strategy and should be preferred. In extension to this situation of simple dominance, in a situation where two new alternatives are compared with the standard and both new alternatives show higher costs but also higher outcomes gained, the alternative with the better cost-outcome ratio is dominating. This situation is described as extended dominance.

Dose-Response Assessment

Definition

Dose-response (toxicity) assessment estimates how much of a substance does what kind of harm to humans. Dose-response assessment is the process of characterizing the relation between the dose of a ► hazard received, and the incidence of an adverse health effect in exposed populations. It determines whether the adverse effect increases with increasing exposure to the hazard. 'Dose' is commonly used to indicate the amount of a hazard while 'response' refers to the effect. The dose-response assessment is a second step in the ► risk assessment procedure. In this context, the dose-response assessment identifies the relationship between the exposure level and the magnitude of risk. In the toxicity assessment, uncertainties arise when the findings are extrapolated from animals to humans.

DOTS

Synonyms

Directly observed treatment; Short-course

Cross-References

► Tuberculosis and Other Mycobacterioses

DPOs

► Disabled People's Organizations

Dracunculiasis

Synonyms

Guinea worm infection; Medina worm infection; Serpent worm infection; Dragon worm infection

Cross-References

► Guinea Worm Infection
► Water Quality and Waterborne Infectious Diseases

Dragon Worm Infection

► Dracunculiasis
► Guinea Worm Infection

Drinking Water

Synonyms

Potable water; Clean water; Safe water; Water free off germs; Non-contaminated water

Definition

Drinking water is freshwater. Its quality has to fulfill certain standards to be suitable for human consumption. Between industrial nations and developing countries there is a considerable difference in quality. In industrial nations the composition of drinking water is subject to particular regulations which set constituent standards. Drinking water should be odorless and colorless, the taste should be tempting and it should contain at least a minimum of minerals. Most frequently, drinking water stems from groundwater, which is supplied from springs or wells. Surface water from lakes or dams as well as water from rivers can be recycled as drinking water. Near coasts, water can be obtained from desalinized seawater.

Droplet

Definition

Droplets are generated from the source person during coughing, sneezing, or talking, and during the performance of certain procedures in hospitals, such as bronchoscopy. The transmission of infectious agents occurs when droplets containing microorganisms generated from the infected person are propelled through the air and deposited on the host's conjunctivae, nasal mucosa, or mouth. Droplets are large particles that cannot be transmitted beyond a radius of about 1 meter or less.

Drug

► Drug Law

Drug Abuse

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Synonyms

Medication abuse; Harmful use (of drugs); Hazardous use (of drugs)

Definition

Medication drug abuse can be defined as 'the consumption of a drug apart from medical needs', often 'apart from the licensed indication claim or in unnecessary quantities and duration'. However, the term is wide and used in varying meanings. Drug abuse is often referred to as the period before ► drug dependence. Drug dependence can be described as an ► adverse drug reaction, which has to be considered like other ► side effects. Drug dependence is a state of psychological or sometimes physical symptoms resulting from the interaction between a living organism and the chemicals of a drug. Drug dependence is characterized by behavioral and other responses that always include a compulsion to take the drug on a continuous or periodic basis in order to experience its psychological effects or sometimes to avoid the discomfort of its absence. The World Health Organization (WHO) is now using the term 'drug dependence' instead of 'drug addiction' or 'drug habituation' (WHO 1994).

Basic Characteristics

Substances Which May Lead to Abuse

The WHO has classified different groups of drugs that are prone to be abused and can be summarized as (for details see Poser and Poser 1996):

- Alcohol containing medications (e. g. cold or herbal remedies sometimes include up to 79 vol. %).
- ► Analgesics or antitussives (containing ► opioids (e. g. morphine, codeine) or over-the-counter analgesics with or without caffeine).
- ► Hypnotics and sedatives (containing barbiturates,

benzodiazepines, diphenhydramine and newer hypnotics such as zolpidem and zopiclone).
- ► Psychostimulants (containing amphetamines, anorectics, drugs containing ephedrine such as cold remedies).
- Other drug groups (containing laxatives, steroids, erythropoietin, antihistamines, anticholinergics (e. g. biperiden, atropine), beta-blockers, diuretics).

Therefore, abuse can occur with respect to psychotropic and non-psychotropic drugs (non-dependence-producing substances in terms of the WHO). The latter ones have no effects on the central nervous system (CNS). Because psychotropics are mentioned in several textbooks, we briefly discuss abuse of some non-psychotropic medications here. The chronic use of laxatives (e. g. bisacodyl, also strong herbal laxatives) leads to bowel habituation. Because of constipation due to liquid and electrolyte loss (especially potassium) more laxatives have to be taken and a vicious circle is started. The loss of electrolytes can also induce cardiac arrhythmia. The same holds for the abuse of diuretics (agents that promote the excretion of urine), e. g. by athletes, models, and people addicted to slimming who abuse dehydrating drugs for weight control and weight reduction. Steroids or erythropoietin may also be consumed by bodybuilders and sportsmen for doping purposes. Nose drops containing adrenergic alpha-agonists should only be taken for short-term. After 5–7 days of using such drugs they may dehydrate the nasal mucosa and, in the last stage, cause an atrophy of the nasal mucosa and a chronic rhinitis (drug induced cold) leading often to a continuing use (Rogers et al. 1984). Beta-blockers are reported to be abused as anxiolytic drugs by sportsmen and examination candidates. The misuse of over-the-counter analgesics, which were originally taken for headache, may result in drug-induced headache.

Epidemiology

As stated above, one has to distinguish between drug use, abuse, and dependence. Especially in the studies of medications such a distinction can be difficult. Although healthcare utilization data sets are increasingly available, their use for studying drug abuse is limited. To get information about the prevalence of such disorders, surveys should be carried out. However, due to different methodologies, drugs and classifications, estimated prevalences can vary in different countries or surveys. In the United States the National Survey on Drug Use and Health (NSDUH) has been conducted annually since 1971. Monitoring the Future (MTF), which started in 1975, is another annual study on adolescent drug use in America. Therefore, trends can be estimated from both surveys. Recent data of the NSDUH show that in 2004 an estimated 14.6 million Americans aged 12 years or older (6.1 percent of the population) used psychotherapeutics (defined as prescription-type analgesics, stimulants, hypnotics and sedatives but excluding ► over-the-counter drugs) non-medically during the past year. Analgesics (4.7 percent of the population), hypnotics and sedatives (2.4%), and stimulants (1.2%) were reported most frequently and some persons abused more than one of these drugs simultaneously. Respectively, an estimated 48 million persons aged 12 or older (20 percent of the population) had at least one non-medical use of psychotherapeutics in their lifetimes (Substance Abuse and Mental Health Services Administration 2005). Data of the Monitoring the Future survey suggest that the proportion of teenagers who used illicit drugs during the past year has dropped over the previous 15 years. But during the same period, the proportion of young people, using psychotherapeutics without medical supervision increased often because of the perception that these drugs were safe (Johnston et al., 2006). For Germany, however, repeated and representative survey data are rare. Only the German Epidemiological Survey on Substance Abuse (Epidemiologischer Suchtsurvey) fulfills these criteria. In 2003, the prevalence of problematic use of prescription drugs was 4.3% (Kraus and Augustin 2005).

Overall, data suggest that women are more likely to abuse drugs than men (especially analgesics, hypnotics and sedatives). With increasing age the prevalence of such disorders is on the rise (Kraus and Augustin 2005; Poser and Poser 1996). It is also suggested that health care professionals (e. g. doctors, nurses, pharmacists) may be at an increased risk of medication abuse. But the most important risk factor for drug abuse and dependence is a previously known dependency (e. g. alcoholism).

Consequences

The harmful consequences of drug abuse include not only dependence but traffic accidents, poor health and

disturbed patterns of behavior. But one should not forget that non-illicit drugs such as alcohol and tobacco may pose an even greater problem. The continuous abuse of psychotropic drugs may lead to drug dependence. Although initially a drug is often taken for medical purposes (e. g. headache, insomnia, common cold) several pathways can lead to abusive consumption. Dependence on psychotropis often occurs slowly and insidiously from drug abuse. Especially in benzodiazepines long-term use frequently does not result in dose increase. But psychological dependence, which is the craving for the drug in order to get the feeling of satisfaction, may occur in the long run. ► Withdrawal may result in physical disturbances, these symptoms are also seen in non-psychotropic drugs (e. g. laxatives, nose drops) (Poser and Poser 1996).

Because of their high rates of comorbidities, ► polypharmacy and changes in physiological functions and drug metabolism, older adults are at an increased risk for side effects of drugs and can have more adverse health consequences than younger persons. Furthermore, some drugs which may be abused (e. g. long-acting benzodiazepines, barbiturates) are considered to be inappropriate in the elderly because the risks outweigh the benefits.

Conclusion

A great number of medications are prone to be abused, not only prescription drugs but also those that can be obtained over the counter (see above). Pharmacies should, therefore, most carefully inform about drugs that can potentially be abused while doctors should, since many people visit different doctors to get more than one prescription (so called 'doctor hopping'), especially watch out for patients asking for these drugs. People who have had drug problems before should not be given drugs that may cause abuse or dependence. Health care professionals should continuously update information on drug abuse and potentially dangerous drugs. Drug abuse may lead to a vicious circle of needing more of a drug the more often it is taken. Drug abuse may, therefore, lead to drug dependence. But if not used for medical purposes, taking drugs may in this respect be compared to doping in sports. Drugs are, however, not for doping in everyday life. But they are sometimes used with wrong expectations, for example laxatives or diuretics have no lasting effects on body weight.

Generally, taking medications is socially more accepted than the use of alcohol or illicit drugs. Furthermore, subjects abusing drugs manage their everyday life without being conspicuous. But drug abuse and its general effects on public health should, therefore, not be underestimated. Especially the problem of abuse of non-psychotropics is frequently ignored in studies and in the public opinion. Even young people take analgesics and laxatives for the purpose of coping with apparently difficult situations (stress at school or at work, weight problems). Advertising also promotes the false conclusion that a pill exists for every indisposition ('a pill for every ill'). And even children are socialized with this behavior. It is, therefore, most important that schools should also provide the very young ones with information on the dangerous and destructive effects of drug abuse.

Cross-References

► Adverse Drug Reaction
► Analgesics
► Drug Addiction
► Drug Dependence
► Hypnotics and Sedatives
► Opioids
► Over-the-Counter Drugs
► Polypharmacy
► Psychostimulants
► Substance Use Disorders
► Withdrawal

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Drug Addiction

Synonyms

Drug dependence; Drug abuse; Substance abuse

Definition

Drug addiction represents habitual or chronic use of any chemical substance aimed at altering the state of the mind and body or at avoiding the pain and discomfort in its absence. Drug usage is compulsive despite the physical and/or psychological harm to the user and society. With the course of time, addicts need to increase the dose of the drug they are taking in order to feel the same effect. Addictive drugs include narcotics (e. g. heroin, cocaine), many types of sedative and tranquillizer, and nicotine. Psychological dependence is the subjective feeling that the user needs the drug to maintain a feeling of well being; physical dependence is characterized by tolerance (the need for increasingly larger doses in order to achieve the initial effect) and withdrawal symptoms when the user is abstinent. Nowadays, the term "substance abuse" is more often used than "drug addiction" because of the broad range of substances (including alcohol and inhalants) that can fit the addictive description.

Cross-References

► Drug Dependence
► Substance Dependence

Drug Dependence

Synonyms

Drug addiction; Drug habituation

Definition

Dependence as a general term can be defined as the state of needing or depending on something or someone for support or to function or to survive. Drug dependence is a state of psychological or physical symptoms resulting from the interaction between a living organism and the chemicals of a drug. It can be seen as an ► adverse drug reaction. Symptoms of drug dependence can be, for instance, continuous use despite adverse consequences, very strong desire for a drug (craving), decrease in response to a drug dose (tolerance), impaired control or ► withdrawal after cessation or dose reduction.

Cross-References

► Drug Addiction
► Substance Dependence
► Substance Related Disorders

Drug Habituation

► Drug Dependence

Drug Law

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Synonyms

Drug; Medication; Medicament; Medicine; Remedy

Definition

Many sensitive ethical, financial and medical aspects are involved in the use of medicines; as a result, the law, based on consumer protection principles and on criteria relating to quality, safety and efficacy, has provided specific rules and regulations.

Basic Characteristics

From the beginnings of civilization people have been concerned about the quality and safety of foods and medicines. In 1202, King John of England proclaimed the first English food law, the Assize of Bread, which prohibited adulteration of bread with such ingredients as ground peas or beans. Regulation of food in the

United States dates from early colonial times. Federal controls over drug supply began with the inspection of imported drugs in 1848. The Food and Drug Administration (FDA) has been in place in the USA since 1930, though it was only with the "Food and Drug Administration Act" of 1988 that FDA was officially established as an agency of the Department of Health and Human Services with a Commissioner of Food and Drugs appointed by the President, with the advice and consent of the Senate; the Act broadly spelled out the responsibilities of the Secretary and the Commissioner for research, enforcement, education, and information.

One of the main factors which has influenced the new biomedical approach to diseases is the discovery of an incredible number of drugs, both, derived from nature and produced in laboratories. Most of the pharmaceutical industries are private, therefore, when dealing with drug issues a very important factor to be considered is the financial one; yes, there are obvious medical needs for new and better pharmaceutical products, yet the development of these products can take, and make, substantial amounts of money. As a consequence, ethical, medical, financial and social concerns are involved in all phases of drug use: from drug development, to pricing, to availability, to prescribing, to advertising. It is thus understandable why drugs are, of all consumer products, the most extensively regulated by law.

Developing a new drug involves investments of hundreds of millions of dollars, of which around 60 per cent is spent in ► clinical trials; the full development process takes 10–12 years. New medicines are selected from a range of many thousands of substances with the potential to treat the targeted condition. Fewer than one or two compounds in 10,000 tested actually make it through the process and are eventually authorized for use in patients. A potential new medicine may be rejected at various stages in the development process on safety, efficacy or quality grounds.

A new medicine arises from a series of pre-clinical tests, using techniques which identify potentially beneficial new compounds, like computer modeling, high-speed computer technology and tissue culture studies; it is then tested in a series of scientific studies using animals before any trials involving humans. In the search to understand, prevent and treat disease, clinical trials involving healthy volunteers and patients play an essential role. Their aim is to evaluate new medicines or a combination of medicines, as well as other types of therapies, to determine their potential benefits and safety.

Having decided clinical development is justified, clinical researchers will need to develop protocols for the necessary trials. A protocol is a study plan which is not only designed to answer specific research questions but also has the safety of participants in mind. Used as the basis for all clinical trials, protocols also determine:

- Who can participate.
- The schedule for tests, dosages and other details of the study.
- The trial duration.

Once the protocol has been established, a trial then needs physicians to carry out the study, always monitoring and caring for the patients involved.

A new medicine has to demonstrate its safety, quality and efficacy through a series of rigorous clinical trials in order to obtain a license (called a marketing authorization) and be available to the general public. Clinical trials consist of four phases: the first three occur before a license is granted and the last is conducted as a post-licensing phase. Each phase varies in size, character and focus:

1 *Phase 1* primarily determines how a medicine works in humans and helps to predict the dosage range for the medicine, and involves healthy volunteers.
2 *Phase 2* tests efficacy as well as safety among a small group of patients (100–300) with the condition for which the medicine has been developed.
3 *Phase 3* involves a much larger group (1000–5000) of patients which will help determine if the medicine can be considered both safe and effective.
4 *Phase 4* trials are conducted after a medicine has been granted a license. In these studies a medicine is prescribed in everyday health care environments which allows results to be gathered from a much larger group of participants. Safety is a major part of Phase 4 trials, which often involve several thousand patients so that more rare side effects, if any, may be detected.

Participants can only take part in a clinical trial on a voluntary basis. Additionally, these volunteers – whether they are healthy participants or patients – can only participate in clinical trials if they have given their ► informed consent and have confirmed that they have received and fully understood information about the trial. They are also free to withdraw from a trial at any time without prejudice to their continuing care.

Throughout the process, data is collected and recorded for analysis to evaluate patients' responses; however, only the investigators and their teams know the identities of the patients; the sponsoring company will only have patient code numbers to bring all the individual patient data together (► coded data). To make sure that data acquisition (► data acquisition and protection) will not contravene ► privacy and ► confidentiality, data protection (► data acquisition and protection) laws are applied.

Pharmaceutical physicians are essential members of the team working throughout the timespan of a therapeutic intervention, from the discovery research phase, through preclinical and clinical testing, licensing, launching, post-marketing studies and ► surveillance, any new formulation and new indications work, or through to its eventual demise on the grounds of lake of relative safety and ► efficacy or commercial non-viability. They should recognize their ethical responsibility to stand aside from product loyalty when assessing factors affecting the product itself. ► Ethical principles regulating physicians' activities are well outlined in various guidelines at national and international levels (► ethics, aspects of public health research), based on ► professional ethics, ► bioethics, etc.

► Ethical committees review and advise on whether proposals for research studies meet required ethical and scientific standards. These reviews are designed to protect people participating in studies. Many ethical and legal issues can be involved. A few examples are:

- the recruitment of subjects should be exempt from coercion, that is, subjects should not feel as though they cannot refuse to participate;
- involvement of ► vulnerable groups or individuals requires extra precautions;
- trials are increasingly conducted around the world, in order that greater numbers of patients and different ethnic groups can be included in a study; however, some more ethical considerations get added in ► international research, whereby we also have to deal with problems raised by the local culture (► ethics and culture) (language, beliefs, social values, relationship between individuals and communities) and by religious aspects, all components which may affect the meaning and the role of informed consent and autonomy, ► beneficence and ► non-maleficence, and of ► justice;
- most trials will make some sort of comparison between medicines or treatments; this means that in many clinical trials, while one group of patients will be given an experimental medicine or treatment, a control group is given either an existing standard treatment (comparator) for the illness or a ► placebo (a dose that looks like the medicine being tested but, in fact, contains no medical ingredients); placebos may be ethically justified when no adequate, proven prophylactic, diagnostic or therapeutic method exists, and the temporary withholding of an effective treatment would not expose the subjects to serious risk and there is no added risk of long-term harm.

Ethics committees are completely independent of industry and are at liberty to reject a clinical trial.

A great deal of detailed legislation now covers all industrially produced medicines, (including vaccines, toxins or serums and allergens, blood products, radiopharmaceuticals and medical devices) and some specific issues, such as animal and human research, self-medication, controlled substances, alternative medicines, orphan drugs, veterinary drugs, the manufacture of generic drugs, the use of contraceptives and abortive drugs, and the patenting of biologic materials.

Based on consumer protection principles, in addition to criteria relating to quality, safety and efficacy, legislation has also provided rules relating to:

- procedures for marketing authorization (time limits, giving of reasons, publication);
- manufacture (quality control and inspections concerning also the application of principles of good laboratory practice);
- labeling (packaging to include information relating to dose, ingredients, side effects);
- advertising of medicinal products.

Specifically on the last point, a very debated issue concerns laws on "Direct to consumer ► advertising" (DTCA). In general, the unnecessary use of drugs is one of the main problems in the field of health. Using unnecessary pharmaceuticals, not using necessary pharmaceuticals and using the necessary medication over the wrong period of time are examples of the inappropriate use of pharmaceuticals. It is stated that more than 50% of drugs are inappropriately prescribed, distributed or sold throughout the world, and that nearly half of this medication is then incorrectly used. In various countries, the ethical criteria suggested by the World

Health Organization in 1988, which emphasizes that prescribed drugs are not to be advertised to the public, still remains in effect. However, as the share of drug expenses have increased within the total health expenses of most countries, the institutions, employers and insurers who reimburse drug purchases have recently started to set limits on these expenses; restrictions on the prescriptions of physicians have been the easiest and the most frequently used method of imposing such limits. This situation is one of the important reasons which led drug companies to implement new advertisement strategies in terms of DTCA.

The Internet is an important factor in spreading knowledge about health issues to the public. For instance, 25% of information on the Internet in the USA is associated with health, and more than half of adults using the Internet make use of it to acquire information concerning health issues. Some of these Internet users, on the basis of gained knowledge, have later obtained certain drugs from their physicians. However, it is estimated that there are more than 300,000 Internet sites related to the sale of all kinds of pharmaceuticals. And, although drug companies would like to demonstrate responsible DTCA by claiming these sites are a form of educational activity, often they are actually more of a commercially, sale-based activity. In such cases, public-oriented drug advertisements play on the general public's poor knowledge and education in health; and these advertisements can have a significant effect on increasing unnecessary drug consumption, with consequent increasing drug expenditures and risk of adverse drug effects. Although these aspects are of importance in the developed countries, it is in the developing countries that their negative consequences have a major impact; not only do rising pharmaceutical costs drain health services in particular and the economy in general, but also records of side effects are often inadequate and insufficient.

It is the duty of public health institutions to counteract DTCA by providing adequate health education for the rational use of drugs.

For some decades, the wide range of the above-mentioned policies and laws have been felt mostly at nationwide levels, since drug approval policies are strictly linked to national health policies and the related budgets. Recently, more and more efforts have been made to standardize the most important drug laws worldwide. For example, The Food and Drug Administration (FDA) has been doing so in the USA, while as from 1994 the European Commission has established the European Medicines Evaluation Agency (EMEA) in an endeavor to harmonize member states' national drug policies.

At an international level, ► globalization has also influenced the drug market, calling for efforts to promote the standardization of drug approval policies and procedures. A very important step in this direction has been the work of the International Conference on Harmonization of Technical Requirements for the Registration of Pharmaceuticals for Human Use (ICH). The ICH, constituted by regulatory authorities and the representative pharmaceutical industry groups from Japan, Europe and the US, has set guidelines on the processes involved in clinical trials on medicines, based on the principles of good clinical practice (GCP). One of the aims of the Conference is to facilitate the mutual acceptance of data on clinical trials, thus reducing significantly the costs of drug development.

As a consequence, at this stage, all clinical trials must be performed in line with ICH GCP principles or they will be rejected by the regulators.

Cross-References

► Advertising
► Beneficence
► Bioethics
► Clinical Trials
► Coded Data
► Confidentiality
► Data Acquisition and Protection
► Efficacy
► Ethical Principles
► Ethics, Aspects of Public Health Research
► Ethics Committee, EC
► Ethics and Culture
► Globalization
► Informed Consent
► International Research
► Justice
► Non-Maleficience
► Placebo
► Privacy
► Professional Ethics
► Public Health Surveillance
► Vulnerable Groups

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Drugs

Synonyms

Pharmaceutical products

Definition

Drugs are substances and mixes of substances that are developed to cure and improve the health status of ill people. Drugs are developed by researchers within the pharmaceutical industry and distributed through pharmacists and hospitals. According to their active ingredients drugs are classified into 'RX drugs' which are available only upon prescription and 'over the counter drugs' which can be purchased in pharmacies without any prescription. Over the counter drugs may in some countries also be purchased in supermarkets and drugstores. Each country regulates the dispensation of drugs, i. e. which drugs are available only with prescriptions and which ones are available over the counter. 'RX drugs' are in general reimbursed through health insurance but over the counter drugs have to be paid for by the patients. The reimbursement of drugs often includes a prescription charge which is a small part of ► co-payment by the patient depending on the specific contract of the health insurance.

Drug Safety Studies

Definition

Drug safety studies are designed to investigate the safety and efficiency of drugs. ► Observational studies, frequently used for this purpose, evaluate drug safety in a large number of patients in a real-world setting, where practice patterns, including off-label use, can be assessed. Such studies have a limited ability to determine causation, but they can detect signs that may suggest a safety concern. On the other hand, randomized controlled trials provide robust data on drug safety but may be subject to multiple sources of bias.

Drugs against Fever

► Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Drugs against Fungal Infections

► Antimycotics

Drugs against Mycoses

► Antimycotics

Drugs against Pain

► Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Drugs to Treat AIDS

► Fusion Inhibitors
► Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)
► Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)
► Protease-Inhibitors (PI)

Drug Therapy in Multiresistant Tuberculosis

► Medicinal Treatment of Multiresistant Tuberculosis

Drug Utilization Studies

Definition

Drug utilization studies are designed to improve rational drug use in populations and provide data for cost-benefit analysis. Various methodologies can be employed in drug utilization studies and numerous drug databases are available for drug utilization research. WHO defines drug utilization studies as involving marketing, distribution, prescription and use of drugs in a community, where special attention has been paid to medical, social and economic implications.

Duala Peoples (Western Africa, Cameroon)

► Indigenous Health – Africa

Ducrey's Disease

► Ulcus Molle

Duengero

► Dengue Fever

Dum-Dum Fever

► Leishmaniasis, Visceral

Dump

► Landfill

Dumping

Definition

Dumping is the refusal of health care professionals to treat patients whose costs are expected to exceed the compensation payment of ► third-party payers to health care professionals.

Cross-References

► Disposing

Duran-Nicolas-Favre Disease

► Lymphogranuloma Venereum (LGV)

Durex

► Condom

Durex; French Letter

► Condom

Dust Mites

► House Dust Mites

Dysentery by Giardia lamblia

► Lambliasis

Dysfunctional Family

Definition

A family in which the relationships and/or communication is impaired such that the family cannot provide closeness and/or autonomy for its members. Often results in symptomatic behavior by one or more family members.

Dysfunction, Craniomandivular

Synonyms

Craniomandibular disorder

Definition

Dysfunction means deviations from normal function. In dentistry, common dysfunctions are related to the temporomandibular joint and the jaw muscles. Signs and symptoms for dysfunctions comprise, for instance, abnormalities during mouth opening, certain joint noises, tenderness of the temporomandibular joint or muscles on palpation, and parafunctional activities such as clenching or grinding.

Dysthymia

Synonyms

Depressive neurosis; Persistent anxiety depression; Depressive personality disorder; Neurotic depression

Definition

Dysthymia is a chronic depression of mood, lasting at least several years. However, this chronic depressive mood is not sufficiently severe, or individual ► depressive episodes are not sufficiently prolonged, to justify a diagnosis of severe, moderate, or mild ► recurrent depressive disorder.

Early Detection and Treatment of Diseases

► Prevention, Secondary

Early Neonatal Mortality

Definition

Early neonatal mortality is defined as the death of an infant within 7 days of life.

Eating

► Nutrition

Eating Disorders

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Synonyms

Anorexia; Anorexia nervosa; Atypical anorexia nervosa; Bulimia; Bulimia nervosa; Atypical bulimia nervosa; Binge-eating disorder; Vomiting associated with other psychological disturbances; Psychogenic vomiting; Overeating associated with other psychological disturbances; Psychogenic overeating; Psychogenic loss of appetite; Pica in adults

Definition

We talk about an eating disorder if an abnormal eating behavior represents the main symptom of a psychological disorder. It is not just a "bad habit", but a disorder that is associated with severe psychosocial limitations (e. g. thoughts, feelings and activity focusing on food-related issues), increased mortality, physical complications (e. g. cardiovascular problems and renal insufficiency) and psychiatric symptoms like episodes of depression. An eating disorder is a complex compulsion to eat in a way that disturbs mental and physical health as well. The eating may be too limited (i. e. restricting) or excessive (i. e.compulsive, over-eating); it may include normal eating punctuated with episodes of purging or cycles of binging and purging. The three most common eating disorders are ► anorexia nervosa, ► bulimia nervosa, and binge eating disorder.

Basic Characteristics

History

Anorexia nervosa has been described in detail as early as in the 19th century and bulimia nervosa in 1978. The concept of binge eating disorders is relatively new, introduced to the classification systems only in 1990.

Anorexia Nervosa

According to the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, published by the American Psychiatric Association), the leading symptom of anorexia nervosa is a body weight of 85% of that expected or, according to ICD-10 (International Statistical Classification of Diseases and Related Health Problems) a ► body-mass-index (BMI = weight [kg]/height^2 [m^2]) at or below 17.5. Further characteristics are a distinct fear of weight gain despite being under-

weight, a distorted body image with regard to shape and weight or their disproportionate importance for the self-evaluation, as well as an amenorrhea. The disorder of the body scheme manifests itself in a distorted body perception in which one's own body is perceived as being not thin or even as too fat despite being underweight. This perception is accompanied by a disorder of visceral processes, so that hunger, satiety and the emotions associated with them can no longer be correctly identified. The aspired weight loss is mainly achieved by avoiding high-caloric food, self-induced vomiting, laxative and diuretics abuse and excessive exercise. The above-mentioned amenorrhea is mostly a consequence of weight loss or the ensuing reduced production of the hormone estrogen. Furthermore, the classification systems specify two types of anorexia nervosa, the restrictive type without active measures to reduce weight and the "purging" type which uses active methods to reduce weight.

Even though individual symptoms of an abnormal eating behavior, like restricted eating or bouts of binge eating, are frequent phenomena with women in adolescence or young adult women, the complete clinical picture of an anorexia nervosa is far more uncommon. The prevalence of anorexia nervosa for young women between 14 and 20 years of age range is, depending on the study, between 0.2 and 0.8%. The majority of these disorders is diagnosed before the age of 25. The ratio of women to men is 10 : 1. Though individual studies suggest an increase of eating disorders, there is also evidence to the contrary. Recent studies, however, accept an overall increase (Pawluck and Gorey 1998).

As with the majority of psychological disorders, eating disorders are assumed to have multiple causes. These could be complications during pregnancy and birth (e. g. genetic factors, gender, premature birth) as well as risk factors during childhood (e. g. early health problems, conflicts around eating and meals) or youth (e. g. early onset of puberty, diet behavior). The individual cause can usually be found within this framework, but not all of these factors have to play a role in an individual case. Apart from the predispositions and risk factors mentioned above, a comprehensive model will also have to consider familial, socio-cultural and biological factors.

In clinical practice, different elements of therapy are combined to treat anorexia nervosa. Even though nowadays there are a number of successful therapeutic approaches available, the prognosis for anorexia is still rather unfavorable. For mainly short-term results, behavior-therapy intervention to increase body weight and alter the distorted body perception has proved effective. For adolescence, a therapeutic method involving the family seems to be the method of choice. Medications can at best be used to stabilize a previously accomplished change and should be limited mainly to female patients with distinct symptoms of comorbidity.

Bulimia Nervosa and Binge Eating Disorder

► Bulimia nervosa is characterized by bouts of binge eating and counteracting behavior like vomiting or use of laxatives. During binge eating attacks, excessive quantities of food are consumed over a very short time. These binge eating episodes are accompanied by a feeling of lack of control, often preceded by feelings of tension, fear, boredom or loneliness. The bouts of binge eating can relieve these negative emotions short-term, but often generate feelings of shame, guilt and self-hatred. Self-induced vomiting is frequently used as a means of compensation. The use of laxatives is less frequent. As with anorexia nervosa, patients are preoccupied with weight, shape and food. The majority of patients with bulimia nervosa have a normal body weight; overall, the diagnoses describes a group of patients with normal weight or overweight with a high intensity of episodes of binge eating and compensating behavior.

Patients with binge eating disorders show bouts of binge eating, but lack a consistent compensating behavior. Most people with binge eating disorders are overweight and show a considerable amount of stress and psycho-social impairment. The patients suffer from their eating behavior, their weight and the failure of their purely dietetic approaches.

The prevalence of bulimia nervosa in western countries is estimated to be 1–2% for young women and 0.2% for young men. Studies regarding lifetime prevalence resulted in 1.1% for women and 0.1% for men. Even though some studies report a drastic increase also for bulimia nervosa, there is not sufficient evidence to indicate an increase in the number of cases (Fairburn and Beglin 1990; Garfinkel et al. 1995; Sullivan et al. 1998). The prevalence for binge eating disorders among adult women is 3% and 1% among men. Though eat-

ing disorders can be found in all cultures researched so far, bulimia nervosa is mainly found in western industrialized countries, and here mainly among competitive athletes, ballet dancers and people in the fashion business. Patients with bulimia nervosa and binge eating disorders often show a number of other disorders like depression, obsessive-compulsive disorders, anxiety disorders, substance abuse and personality disorders.

Models for the etiology of bulimia nervosa and binge eating disorders have to take into consideration similar elements as the models for the causes of anorexia nervosa; there is, however, the problem that the exact etiology factors for these eating disorders are unknown. The main risk factors seem to be an interaction between biological adjustment processes which are intensified by diets, cultural pressure on women to be thin, and a dysfunctional evaluation process regarding shape, body weight and nutrition, often in combination with a restrictive eating behavior and lack of physical activity.

The prognosis for the therapy of bulimia nervosa and binge eating disorders is more favorable than the one for anorexia nervosa. Psychological intervention is usually in line with cognitive behavioral therapy. Information about the disorder and its therapy, control of food-related behavior and behavior related to physical activity, identification and change of dysfunctional assumptions and evaluations of shape, body weight and nutrition are important elements. Drug treatment mainly involves selective serotonin re-uptake inhibitors (SSRIs) and tricyclic antidepressants. The use of SSRIs requires a higher dosage than for the treatment of depression, though, and the effect of a combined treatment with psychotherapy and medication is not superior to a solely cognitive-behavioral therapy.

Cross-References

- ► Anorexia Nervosa
- ► Atypical Anorexia Nervosa
- ► Atypical Bulimia Nervosa
- ► Binge-Eating Disorder
- ► Body Mass Index (BMI)
- ► Bulimia Nervosa
- ► Overeating Associated with Other Psychological Disturbances
- ► Psychogenic Loss of Appetite
- ► Vomiting Associated with Psychological Disturbances

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Eating Habits

- ► Behavior of Nutrition

EBM Literature Guides

Definition

The guideline-based approach to healthcare is a relatively recent one and originated in the United States in the 1990s. Guidelines are usually produced at national or international levels by medical associations or governmental bodies. A medical guideline (also called a clinical guideline, clinical practice guideline, or clinical protocol) is a document that has the aim of guiding decisions and criteria in specific areas of healthcare, as defined by an authoritative examination of current evidence. Clinical guidelines briefly identify, summarize,

and evaluate the best evidence and most current data about prevention, diagnosis, prognosis, therapy, etc.

Ebola Disease

► Ebola Hemorrhagic Fever
► Infection with Ebolavirus

Ebola Fever

► Ebola Hemorrhagic Fever
► Infection with Ebolavirus

Ebola Hemorrhagic Fever

Synonyms

Ebola disease; Ebola Fever; Infection with Ebolavirus

Definition

Ebola hemorrhagic fever is an acute viral illness caused by the Ebola virus which belongs to the Filovirus group. It is transmitted from person to person by direct contact or by drops through mucous membranes or indirectly by infected blood, secretions, semen and vomit. The reservoir of the infection is unknown and therefore it is difficult to evaluate the risk of transmission. Fatality rate is 50–80%. Symptoms are acute fever, diarrhea (often bloody), nausea, vomitting, headache, and, at a later stage, nosebleeds, conjuctival infection, dysphagia, and affection of central nervous system. The implementation of control measures may be difficult due to cultural reasons such as the custom of eating primate meat.

Echinococcosis

Synonyms

Hydatid disease; Infection with fox tapeworm; Infection with fox tenia; Infection with dog tapeworm; Infection with dog tenia; Infection with Echinococcus granulosus; Infection with Echinococcus alveolaris; Infection with Echinococcus multilocularis

Definition

Echinococcosis is caused by the ingestion of larvae of the dog tapeworm or the fox tapeworm. While the dog tapeworm (*Echinococcus granulosus*) is found worldwide, the fox tapeworm (*Echinococcus alveolaris* or *Echinococcus multilocularis*) is only present in the northern hemisphere. As humans are intermediate hosts, the larvae do not develop into adult worms, but stay at the larval stage. These larvae can settle in different organs. In infection with the dog tapeworm, the liver is concerned in 60–75%, settlement in the lungs, the brain, the kidneys and the spleen are possible. Due to the formation of fluid filled cavities (cysts), a feeling of pressure and pain is caused, in an infection of the lungs difficulties in breathing and cough occur. The fox tapeworm is predominantly found in the liver and the lung; the brain is seldom involved. Dense, knotty parasitic tumors develop, which cause pain and icterus in advanced stages of the infection. Without treatment, infection with the fox tapeworm often takes a lethal course. Treatment of echinococcosis is surgical intervention; in fox tapeworm infection an additional perioperative medicinal treatment is recommended. If an operation is not possible, long-term therapy with mebendazole is necessary. Prophylactic measures involve regular worming treatments of domestic animals. Moreover, contact with foxes and other wild animals should be avoided. Prior to the ingestion, wild berries and other free growing foodstuff should be washed thoroughly.

ECHTA

Definition

The ECHTA project (European Collaboration for Assessment of Health Interventions) – funded by DG V (Directorate General of the European Commission) – is coordinated by a research team at the SBU in Stockholm; all European HTA agencies participate in one of the working groups of the ECHTA project. It is the general aim of the ECHTA to strengthen coordination and cooperation of all kinds of HTA activities on the evaluation of health interventions. The main focus of ECHTA is to strengthen the structures of exchange of HTA knowledge.

Ecological Association

Definition

An association between a risk factor and a health outcome not at the level of individuals but of populations is called 'ecological'. For example, researchers in an ecological study may estimate the average salt consumption in a country and also obtain the average blood pressure of the population. If both are high, they have demonstrated an ecological association (i. e., one at population level) that may or may not hold at individual level – it could be that those individuals who consume the highest amount of salt also have the highest blood pressure, but the opposite could be the case as well. Only a study obtaining data for salt consumption and blood pressure at individual level could answer this question.

Ecological Health Promotion

Definition

The term 'ecological health promotion' refers to the close ties between human health and the environment as interdependent and mutually interacting systems. In contrast to 'ecological disease prevention', which aims at reducing and eliminating hazardous substances and pathogens from the environment, ecological health promotion tends to take a more positive stance by tapping into maintaining, restoring and strengthening the health-promoting resources in the environment. Accordingly, ecological health promotion comprises strategies and disciplines which contribute to promote and shape environmental and living conditions (e. g., in the context of ► environment-related health protection).

Ecological Study

Synonyms

Correlation study

Definition

An ecological study is a study in which data of average exposure and outcome for a population are compared with similar data for other populations in order to look for associations between the exposure and the outcome. Group-level study may also be the only way to study the effects of group-level constructs, such as laws (e. g., the impact of a seatbelt law) or services (availability of a suicide prevention hotline).

Ecological studies are fairly quick and easy to perform and they are useful for hypothesis generation. However, they do not allow causal conclusions to be drawn since the data are not associated with individual persons and are not good for hypothesis testing.

e-Commerce

Definition

e-Commerce describes the process of business transactions in health care. The goods that are sold this way refer to information, pharmaceuticals, and health services.

Economic Analysis in Toxic Substances Control

Synonyms

Economic benefits

Definition

In toxic substances control, an economic analysis of cost-benefit is required. In response to the escalating costs of hazardous waste cleanup and other consequences of pollution, the pollution prevention hierarchy was set out. As a rule, it is cheaper and smarter to reduce pollution at the source.

Prevention activities of pollution control save resources and contribute to the rationalization of medical care in the public health system. Benefits include:

- reduced incidence of unintentional, intentional, and occupational poisoning at the workplace, in the home, and in the outdoor and indoor environment
- early detection and elimination of unusually hazardous commercial products through regulatory measures, repackaging, or reformulation.

Economic Evaluation

► Health Determinants, Economic
► Health Economics in Dentistry

Economic Evaluation of Health

Definition

Economic evaluation of health is a "comparative analysis of alternative courses of action in terms of both their costs and consequences" (Drummond 2005). Such analyses can be set within the context of a randomized control trial or other health research study design, or can be undertaken through decision analysis modeling approaches.

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Economic Evaluation of Health Care Technologies

► Health Economic Evaluation

Economic Growth

Definition

Economic growth is the increase in value of the goods and services produced by an economy. It is conventionally measured as the percent rate of increase in real gross domestic product (GDP). Growth is usually calculated in real terms, i. e. inflation-adjusted terms, in order to net out the effect of inflation on the price of the goods and services produced.

Economic Measures

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Definition

Economic measures are the means by which health care costs and benefits are quantified and valued for use in economic evaluations. For the scientific analysis of economic aspects of health care programs, a number of specific measures are used. For economic evaluation studies, the cost and the outcome are measured. This essay gives a brief overview of the means by which costs and outcomes can be quantified.

Basic Characteristics

The purpose of economic evaluation of health care programs by programmatic decision-makers is to provide estimates of the relative merit or value of alternative measures in order to aid decision-makers in the distribution of assets to achieve objectives.
In conducting a health economic evaluation, the four main steps involve:

1. Quantifying the total costs of care incurred by the therapy, which provides the numerator in the cost/outcomes ratio
2. Quantifying outcomes of the therapy, which provides the denominator in the ratio
3. Assessing whether and by how much costs and outcomes differ
4. Comparing the magnitude of differences and outcomes in a ratio.

In this essay, the first two steps will be addressed by describing the means by which costs and outcomes can be quantified.

Quantifying Total Costs Incurred by the Therapy

There are three parts in quantifying the cost of care (► costing process). First, the costs to be included in the analysis must be identified through a probability tree of the therapeutic pathway that describes all relevant downstream events (CCOHTA 1996) (► costing process: identification of relevant resource use). Secondly, the resources used should be measured and quantified (► costing process: measurement of resource use). The

third aspect of quantifying the cost of care is establishing the unit costs of these resources (► costing process: valuing). These should be reported separately from the quantity of resource utilization, in order to establish the relevance of these factors to the setting.

Evaluating costs from a societal viewpoint, the main direct cost categories are those arising from the health care sector, resource use by the patient and family, social services costs, and spill-over costs on other sectors such as education. These are in addition to the indirect costs of lost time and productivity. Estimates of resource quantities should be based on data from real patients, collected either prospectively or retrospectively from medical records. Such sources provide accurate data on resource utilization with minimal burden to patients but require patient consent and/or patient questionnaires, which provide the highest level of detail possible, but are costly and subject to recall bias.

Quantification of Direct Costs

Direct health care costs (► direct cost) fall into three main domains: inpatient, outpatient, and other disease-related costs (Mittendorf 2003). Care must be taken to avoid overlapping and double-counting services such as diagnostic tests conducted during physician visits that are aggregated in the cost of the visit. Additionally, the cost of capital equipment purchased or used for the program or intervention should be discounted for depreciation.

To evaluate inpatient costs, the following utilization of resources should be documented: hospital facility costs, including surgery, physicians, nursing, and radiology, as well as overhead costs of the hospital; diagnostic measures; drugs; and rehabilitation and nursing home costs, as well as overhead costs of the hospital.

For the documentation of outpatient costs, the quantity of the following services can be included: physician visits (general practitioner and specialists), outpatient surgery, physiotherapy, occupational therapy, psychological counseling, drug expenses, diagnostic tests and therapeutic procedures, emergency room visits, and aids and devices.

Other disease-related costs can include transportation, such as ambulance services, taxi, and vehicle costs; home health care services, such as district nurse visits and community services; home remodeling; alternative medicine costs and out-of-pocket payments, including co-payments, and over-the-counter drugs; additional public transportation; disease-related payments not covered by insurance; and expenses incurred by relatives involved in caring for the patient.

Valuation of Direct Costs

Direct costs can be valued by three alternative costing methods, depending on how accurate or precise the cost estimates need to be within a given study: micro-costing, unit costing, and Gross costing. A major factor is the quantitative importance of each cost category in the evaluation, where a more detailed costing of the items which have the greatest impact on the study results is usually required.

Micro-costing (i. e. time and motion) provides very precise estimates and enables the detection of differences between various severity levels, but is costly. Unit costing also provides a precise estimate and enables the detection of small cost differences between groups but can be impractical if the individual cost data are overly burdensome to collect. Gross costing can be used when large differences in costs are expected. In this approach, cost estimates are more readily available and easier to apply than cost estimates of individual elements but subtle cost differences may not be detected.

The valuation of resource items is very dependent on the availability of local financial data. Nevertheless, general data sources for valuation are available, including patient bills, which render an accurate account of the patient's encounter with the health care system, and data from administrative databases, which provide real-world data for patients in clinical practice. These eliminate the need to collect resource utilization and cost data separately, but also contain charges that do not reflect the actual cost of the service given or are subject to various biases associated with who is treated.

Quantification and Valuation of Indirect Costs

The inclusion of ► indirect costs that are due to productivity loss is an essential part of costing in an economic evaluation from a societal perspective. Nevertheless, some methodological aspects remain controversial. For further details, refer to the essay about ► cost of illness and the costing process, where the different approaches for quantification of indirect costs are described (► human capital approach, ► friction cost method).

Discounting

Future costs are discounted to reflect the fact that individuals and society in general have a positive view of ► time preference. People prefer desirable consequences (such as benefits or delayed expenditures) to occur earlier and undesirable consequences (like costs) to occur later. Therefore, future costs are discounted to reflect the preference of having them occur in the future. The discounting of benefits remains controversial. On one hand, to maintain consistency in the evaluation, future benefits can be discounted to reflect the fact that they are worth less, simply because they occur in the future rather than the present. This also allows for consistency in the comparison of health care projects in the overall allocation of resources. On the other hand, discounting life-years in the future give less weight to future generations in favor of the present one. However, the argument for discounting has become increasingly strong and it is important that all studies use a common discount rate for comparability across studies, no matter how controversial the actual rate may be. Currently, a 3–3.5% discount rate for both costs and benefits is recommended (including an allowance for inflation) but variations of this rate (e. g. 0% to 5%) should be undertaken in sensitivity analyses, varying the rate for both costs and consequences.

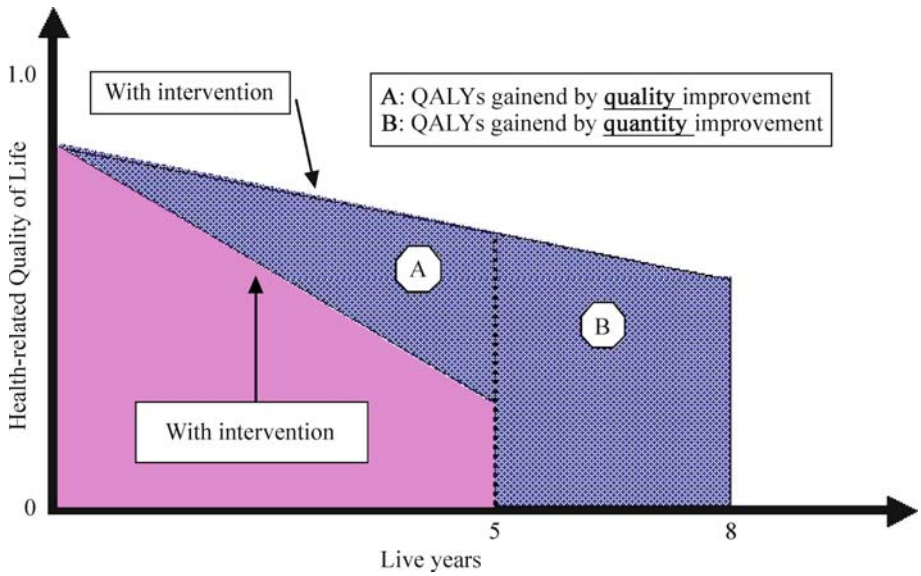
Quantifying Outcomes of the Therapy

Benefits can be defined in monetary terms or as clinical outcomes in natural units. Monetary outcomes, used in a cost-benefit analysis, include concepts such as resources saved by the intervention, the individual's ► willingness-to-pay (WTP) additional amounts for the program, or their willingness-to-accept (WTA) compensation for the removal of a program. Examples of clinical outcomes for use in cost-effectiveness analyzes include number of lives saved or adverse events avoided, or can be preference-based, with utility measurements of health-related quality of life (in a cost-utility analysis).

Quality-Adjusted Life Year

Cost-effectiveness analyzes require the selection of relative clinical outcomes. There is a wide variation in what can be selected, from events or cases averted, to changes in quality of life, to years of life gained. Examining only the years of life gained overlooks the effect that treatments may have on a person's quality of life. To overcome this deficiency, and in order to compare program across populations, diseases, and interventions, combining the duration of life with health-related quality of life into the single summary utility measure known as ► quality-adjusted life year (QALY) has become the method of choice in recent years.

Health state utilities, measured between 0 (death) and 1 (perfect health), are generated over the evaluation period either by specified generic questionnaires, such as the EQ5D, visual analogue scales, or the processes



Economic Measures, Figure 1
Quality-adjusted life years gained from an intervention (adapted from Drummond)

of ► time trade-off or ► standard gamble. Multiplied by the time in that health state, they are then summed to calculate the number of quality-adjusted life years. The difference between the QALY of one intervention and the QALY of another is the incremental benefit received by the intervention (Fig. 1). The number of QALYs gained can also be discounted to adjust for ► time preference.

Accurate quantification and valuation of economic indicators used in the economic evaluation of health care initiatives provide the basis for achieving an accurate appraisal of the value of such programs. Care should be taken to establish the appropriate perspective for the evaluation and to ensure that all costs and outcomes have been identified in the evaluation.

Cross-References

► Cost of Illness – Costing
► Costing Process
► Costing Process: Identification of Relevant Costs
► Costing Process: Measurement of Resources Use
► Costing Process: Valuation
► Direct Costs
► Friction Cost Method
► Human Capital Approach
► Indirect Costs
► Quality-Adjusted Life Years (QALY)
► Standard Gamble
► Time Preference
► Time Trade-Off
► Willingness to Pay

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Economic Modeling

► Modeling

Economic Principle

► Minimum Principle

Economies of Scale

Synonyms

Increasing returns to scale

Definition

Economies of scale is a term often used by economists to describe the situation where the cost of producing a good or service decreases when the volume of goods or services produced increases. In other words, an equal percentage increase in all inputs results in a greater percentage increase in output. Economies of scale are especially relevant for industries with a high share of fixed costs. In service industries like the health care industry, fixed costs include costs for medical technology, core administrative functions, and expensive computer systems. Additional size advantages can result from volume discounting with suppliers.

Economies of Scope

Definition

Economies of scope are the benefits that arise from collectively producing multiple, often similar goods or services, instead of doing this separately. The tendency towards joint practices offering different medical specializations in many countries is driven by economies of scope. In the ► hospital sector, it often costs less to provide a range of services in one single hospital instead of having several hospitals offering a smaller range of services; for example, the emergency surgery unit and

treatment of heart attacks should be provided by one single institution instead of being offered separately.

Ecosystem Acidification

► Acid Rain

Ectopic Pregnancy

Synonyms

Heterotopic pregnancy

Definition

An ectopic pregnancy occurs if a fertilized egg implants and develops outside of the Corpus uteri. The most common site is within the Fallopian tube (95%), but implantation may also happen in the peritoneal cavity, the ovary, and the Cervix uteri. A ruptured ectopic pregnancy is a major cause of death in the first trimester of pregnancy. Symptoms of ectopic pregnancy are missed menses or an abnormal episode of bleeding and abdominal / pelvic pain. Early detection of ectopic pregnancy through recognition of symptoms, biochemical markers, and ultrasound technology prevent rupture and complications. Risk factors for the development of ectopic pregnancies are pelvic inflammatory disease and previous interventions in the genital tract: tubal surgery, reproductive techniques, intrauterine device. The recurrence rate is up to 50%.

Effect of an Intervention

► Effectiveness

Effectiveness

Synonyms

Effect of an intervention; Effect measured by impact and output

Definition

Effectiveness is a measure of the extent to which a specific intervention, procedure, regimen, or service, when deployed in the field in routine circumstances, does what it is intended to do for a specified population. It refers to the performance of an intervention in practice. Only a small number of clinical trials set out to answer questions of effectiveness. Assessment of community effectiveness of clinical interventions involves assessment of five components: ► efficacy, diagnostic accuracy, provider compliance, patient compliance, and coverage. Effectiveness is the performance of an intervention under conditions of routine service delivery within the target population. These conditions are frequently less ideal than the study of previous ► efficacy research conditions. The effectiveness may suffer e. g. from low acceptance in the target population, unspecific indications for its application or interference with the physical or social environment. Effectiveness relates to the question whether a health procedure, service or programme *does* work and to the actual usefulness to whom it is offered.

Effectiveness deals with the question "does offering a treatment or an intervention help under ordinary circumstances?", whereas efficacy asks the question "does receiving a treatment work under ideal conditions?". In other words, effectiveness is the capability of a medical intervention to produce an effect. However, it does not inform whether the effect is positive or negative, or compare the given effect to a standard. Contrary to efficiency, the focus of efficacy is the achievement as such, not the resources spent in achieving the desired effect. Therefore, what is effective is not necessarily efficacious, and what is efficacious is not necessarily efficient.

Effect Measured by Impact and Output

► Effectiveness

Effect Modifiers

Synonyms

Moderators of effect size

Definition

An effect modifier is a factor, such as age or disease severity, which alters the effectiveness of an interven-

tion. It is important that these effect modifiers be identified as they may explain apparent differences in the findings of the primary studies included in the meta-analysis. *Effect modification* means that the relation of the exposure and outcome is different depending on which stratum of the effect modifier we are in. Another series of possible "effect modifiers" in meta-analysis relate to study design. If the moderator proves to be significant, the meta-analyst should present an average effect size and confidence interval for each grouping of studies.

Effect Size

Synonyms

Treatment effect

Definition

The effect size is some specific non-zero value in the population. The larger this value, the greater the degree to which the phenomenon under study is manifested. It is convenient to use the phrase "effect size" to mean the degree to which the phenomen present in the population or degree to which the null hypothesis is false. Each effect size index is associated with a particular research design.

Efficacy

Definition

Efficacy is the net health benefits achievable under ideal conditions for carefully selected patients. It is a prerequisite for ► effectiveness and must be evaluated first. An efficacious treatment is one that does more good than harm to those who receive it. Efficacy of treatment can be estimated in randomized control trials.
The performance of an intervention under near ideal, e. g. study conditions. These positive conditions include a high compliance of study participants, a high adherence to the intervention, a standardized indication to begin with the intervention and the control of interferences with the environment. Efficacy relates to the question whether a health procedure, service or programme *can* work.

Efficacy is the ability to produce a desired amount of a desired effect. In a medical context it indicates that the therapeutic effect of a given intervention (e. g. intake of a medicine, an operation or a public health measure) is acceptable; for example, an efficacious vaccine has the ability to prevent a specific illness. In medicine, a distinction is often drawn between 'efficacy' and 'effectiveness'. Whereas efficacy may be shown in clinical trials, effectiveness is demonstrated in practice. The concept of 'self-efficacy' is an important one in the self-management of chronic diseases.

Efficiency

Synonyms

Most economical way of achieving a task

Definition

Efficiency is the capacity of intervention to produce maximum output for a given input. It measures the best possible result of a specific program against utilized resources. In other words, the most economical way of achieving a task.The approach is directed toward policy makers rather than clinicians and reflects several methodological developments. Efficiency is usually used to control increases in cost. This requires an understanding of patterns of treatment, volumes of services, and costs.

Efficiency, Dynamic

Definition

Allocative and technical efficiency refer to a static situation – i. e. efficiency at a given point in time. Dynamic efficiency refers to the development of innovations – increased efficiency of products and processes – over time.

Efficiency Postulate

► Minimum Principle

Efficiency, Technical

Definition

Technical efficiency describes a situation where producers use only those inputs that are technically necessary to attain a given output.

Egalitarianism

Definition

The underlying assumption of egalitarianism is that all persons are of equal moral worth and thus have basic political and civil rights. Egalitarians see equality as a basic value and associate justice necessarily with equality. In their conceptions of justice, some egalitarians favor equality of resources, some equality of opportunity and others equality of capabilities. As opposed to libertarians (► Liberalism and Libertarianism), egalitarians in general tend to strive for equal distribution of wealth within societies.

e-Government

Definition

E-Government refers to the implementation of communication and information technologies in the management of a community, region or state. The similarity with ► e-health is that e-government has the same aim – to provide all users with valuable information, at the right time, in the right place, and in an understandable and applicable form. In addition, one of the main aims of e-government is the improvement of e-Health in a community or state.

e-Health

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Definition

E-Health is the use of the Internet or other electronic media by patients, health workers, and the public, to disseminate or provide access to health and lifestyle information or services. The implementation of e-Health should facilitate communication between population members, health professionals, health insurers and financers, policy providers, and other stakeholders. The primary aim of e-Health is to increase the quality of health services. e-Health encompasses telemedicine, telehealth, and teleconsultation, etc. (Wyatt 2005).

Basic Characteristics

The term e-Health is not easy to define. Revision of 51 definitions revealed a wide range of themes, including health, technology, and commerce, but no clear consensus about the meaning of the term could be identified (Oh et al. 2005). One of the widest definitions describes e-Health as the application of information and communication technologies across the whole range of functions that affect the health sector. e-Health tools do not refer only to Internet-based applications; they include health information networks, electronic health records, telemedicine services, personal wearable and portable communication systems, health portals, and many other information and communication technology-based tools assisting prevention, diagnosis, treatment, health monitoring, and lifestyle management (COM 2004).
The first incorporation of telecommunication systems into curative medicine was ► telemedicine, which is considered the origin of e-Health (Wootton 1996). Later, the concept of telemedicine expanded from the exclusively curative nature of medicine to the preventive fields of medicine, leading to the creation of the concept of ► telehealth (WHO 1997). Another term used synonymously to describe the application of communication technologies for all health-related services is ► health telematics (WHO 1998).

Benefits of e-Health

The implementation of e-Health offers advantages for the health system (► health systems) in several domains (Eysenbach 2001; COM 2004):

1. Benefits for the health sector: e-Health is expected to deliver significant improvements in access to

care, quality of care, and the efficiency and productivity of the health sector (► teleservices, ► telecare). e-Health tools support the aggregation, analysis, and storage of clinical data in all forms; information tools provide access to the latest findings; while communication tools enable collaboration between many different organizations and health professionals. Further progress in medical research, better management and diffusion of medical knowledge, and a shift towards evidence-based medicine are all supported by e-Health.

2. Benefits for health consumers: Both as patients and as healthy citizens, people can benefit from better personal health education and disease prevention. Health consumers today are actively involved in decisions related to their own health, rather than simply accepting knowledge that health professionals present to them, and are therefore proactively looking for information on their medical conditions. Teleconsulting (► teleconsultation) is another example of a method of seeking health information, second opinions, or advice from specialists using telecommunication systems. By making the knowledge base of medicine and personal electronic records accessible to consumers over the Internet, e-Health supports the development of therapy at a distance, i. e. ► teletherapy. All of these disciplines shift the midpoint of medicine from the health services toward the patient, which is known as patient-centered medicine.
3. Benefits for health professionals: e-Health tools and applications can provide fast and easy access to electronic health records at the point of need. They can support diagnosis by non-invasive imaging-based systems, and provide access to specialized resources for education and training. Examples include teleradiology, teledermatology and telepathology; all of which enable health professionals to transfer and access images anywhere.
4. Benefits for health authorities and health managers: Increasing efficiency in health care should lead to a decrease in health costs, by avoiding duplicative or unnecessary diagnostic or therapeutic interventions, through enhanced communication possibilities between health care establishments, and through patient involvement. e-Health systems can empower managers by spreading best practices, and helping to limit inefficient and inappropriate treatment.

Major Challenges for the Implementation of e-Health

The use of the ► Internet and other ► telecommunication strategies for the dissemination of health care and patient-related information is, however, facing some major challenges (Iakovidis 1998; Eng 2001; Podichetty 2003; COM 2004; Wyatt 2005). The proposed problems that need to be overcome in the future are:

- **Organizational issues** – common understanding, concerted efforts and long-term commitment of state authorities, health professionals, consumers, managers, and the community is needed. Only through concerted efforts by all can successful implementation be ensured, with benefits for all expected.
- **Financial issues** – the costs of implementation of a system are divided into investments and ongoing costs. To address this, a study on sustainability of the system must be performed at an early phase. Another question is the payment of health services provided by the system – whether by reimbursement, out of pocket, or insurance; together with the issue of paying health professionals for their services.
- **Technical issues** – in order to assure interoperability of e-Health systems, a thorough standardization of system components and services such as health information systems, health messages, electronic health record architecture, and patient identifying services is of prime importance. Furthermore, e-Health systems and services must be user-friendly, a quality highly dependent on the characteristics of the Internet connection. Practically, it will be difficult to provide similar standards in medical technology and equipment, especially in rural or low-income areas, and to enable interoperability of technology with future developments.
- **Education of professionals and patients** – the educative process should increase knowledge on the applications of the system, and enable judgment of the quality of the health information released on the Internet. This depends on the personal characteristics of the users (comfort using new technology, fears or doubts about technology effectiveness, and acceptance of the e-Health system, etc.) (► health education).
- **Ethical issues** – Security and confidentiality problems usually occur while transmitting information through the system. Sensitive topics include con-

fidentiality and protection of patient data, authentication and authorization of system users, secure transfer and storage of health data, and standards of data quality, etc. The ► e-Health Code of Ethics was developed by the Internet Healthcare Coalition in 2003 to ensure high quality of information on the Internet, protect users' privacy, and respect patients' rights to be informed and to decide if their personal data can be collected, used, or transferred (IHC 2003). The Health Insurance Portability and Accountability Act (HIPAA) has obliged health care providers who conduct financial and administrative transactions electronically to disclose how they use, store, and share health information; ensure patients have access to their medical records; and obtain patient consent before releasing patient information (► ethics, ► consumer protection).

- **Quality assurance** – one of the most important challenges for the e-Health system is quality assurance. Good quality e-Health services reduce delays in seeking appropriate health care, increase knowledge, reduce confusion on health-related issues among users, and promote improvements in consumers' health-related behavior. Criteria applied for quality assurance on the Internet are similar to general quality criteria, including accuracy, completeness, relevance, adequate presentation, usefulness, and privacy and confidentiality (► data quality). In addition to these, technical quality must be provided, referring to speed, browser compatibility, presence of search engines, design of the site, and disclosure of authorship and sponsorship, etc. (► data dissemination and utilization) (Eysenbach et al. 2002).
- **Access for all to e-Health** – the equal access of all groups of society to health services is an important goal in the public health policy field. e-Health can not reach some groups of society, such as isolated ethnic communities, immigrants, the homeless, the elderly, disabled persons, illiterates, the poor, and others who do not have access to computer technology. This phenomenon is referred to as the "digital divide" and is expected to persist even when new technologies become available.

Public e-Health

In the era of prevention, health promotion and evidence-based medicine, the Internet offers many possibilities for multidimensional communication. The Internet is not only a tool for the exchange of scientific information, but also a communication medium. In the field of public health, the Internet offers a chance to put health promotion and prevention onto a higher level, including allowing public access. Public health services can play an important role in providing the population with high quality, relevant and scientifically-based information on issues such as risk factors for non-communicable diseases, healthy life styles, and environmental issues, etc. (► public e-health).

The future applications of e-Health are not easily predictable. There are some indications that e-Health could be implemented in commercial services (► e-commerce), management in health care (► e-government), and the distribution of health receipts (► e-receipts) (Jähn 2004).

Conclusion

The benefits of e-Health for health professionals, health systems, and individual patients will come to light in the future since e-Health offers many opportunities for prevention, promotion, decision making, health care, disease management, and policy making. The issues of quantity, quality, access, equity, and security of information need to be clearly addressed in the future.

Cross-References

► Consumer Protection
► Data Dissemination and Utilization
► Data Quality
► e-Commerce
► e-Government
► e-Health Code of Ethics
► e-Receipt
► Ethics
► Health Education
► Health Systems
► Health Telematics
► Internet
► Public e-Health
► Telecare
► Telecommunication
► Teleconsultation
► Telehealth
► Telematics Platform
► Telemedicine

► Teleservices
► Teletherapy

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e-Health Code of Ethics

Definition

A group of about 100 international experts included in the Internet Healthcare Coalition developed the e-Health Code of Ethics in 2003. The Code obliges organizations and individuals who provide ► health information, health products, or ► health services on the ► Internet to uphold the following eight guiding principles: candor, honesty, quality, informed consent, privacy, professionalism in online health care, responsible partnering, and accountability.

Elderly

► Mental Health in Older Adults

Elderly and Health

► Aging and Health

Elderly Persons

Definition

In medical terminology, elderly persons are those over 50 years of age. With reference to social legislation, elderly and old people are defined by their entry into retirement. Further categories have been developed in accordance with the growing life expectancy. Such categories differentiate, for instance, between the very old (persons over 80 years of age) and the "young" old. This leads to a more accurate identification of the differing needs and demands manifested in elderly or old people and is therefore important for social and health care planning.

Elective Mutism

Definition

Elective mutism is characterized by a marked, emotionally determined selectivity in speaking, such that the child demonstrates a language competence in some situations but fails to speak in other (definable) situations. The disorder is usually associated with marked personality features involving ► social anxiety, withdrawal, sensitivity, or resistance.

Electroencephalogram

Definition

An electroencephalogram (EEG) is a test that measures and records the electrical activity of the brain. Electrodes attached to the head are connected by wires to a machine that amplifies and records the electrical activity inside the brain as a series of wavy lines drawn by a row of pens on a moving piece of paper, or as an image on the computer screen. There are several types of brain waves. Alpha waves have a frequency of 8 to 12 cycles per second and are present only in the waking state when the eyes are closed. Beta waves (13 to 30 cycles per second) are normally found when a person is alert or has taken high doses of certain medications. Delta waves (less than 3 cycles per second) and theta waves (4 to 7 cycles per second) are present only in children or during sleep. An EEG may be done to diagnose epilepsy, brain tumor, Parkinson's disease, inflammation, infection, bleeding, head injury, or sleep disorders, and to confirm or rule out brain death in a person who is in a coma.

Electronic Data Interchange

Definition

Electronic data interchange is the mutual exchange of routine information between businesses using standardized, machine-readable formats.

Electronic Health Record (EHR)

Synonyms

Electronic medical record (EMR)

Definition

In contrast to the traditional paper record, an electronic health record stores electronically all medical information of a patient's past and present ► health status and health care. It can serve the different users in the health care system to obtain quickly up-to-date information about an individual's health and to manage the whole history of a patient's health information. The use of EHR throughout the health care system implies that all providers of health care are equipped with computers and the software necessary to receive, transmit and store the relevant data on the electronic health record.
An electronic health record is a computer-based record system that includes the lifelong summary of a person's health episodes, assembled from summaries of individual electronic patient records and other relevant data. The electronic health record includes something that the ► electronic patient record neglected – the so called "wellness information" – innformation on the patient's state of health throughout their life. This system is accessible online from many separate, interoperable automated systems within an electronic network. Furthermore, the patient can also access and input some information into the system. The advantages of the electronic health record are availability, easy retrieval, access, and transfer of information for different specialists (physicians, nurses, pharmacists, and administrative staff). Electronic records offer many types of organization and presentation of data. The disadvantages of electronic health records are considerable start-up costs (hardware, software, and their upgrade), provision of adequate training for health professionals who use them, and employment of information technology staff for system maintenance.

Electronic Medical Record (EMR)

Definition

These two terms are sometimes used as synonyms. The electronic medical record is considered to be the ancestor of both the ► electronic health record and the ► electronic patient record. An electronic medical record is the digital documentation of each use of the health service by a single person. Therefore, one patient can have as many electronic medical records as the number of times different health services have been used (visits to general practitioner, dentist, and specialist, etc.).

Cross-References

► Electronic Health Record (EHR)

Electronic Patient Record (EPR)

Synonyms

Computer-based patient record

Definition

The electronic patient record (EPR) is a computer-based clinical data system designed to replace ► paper-based patient records. It includes a complete record of all the health-related information of a person, including data on dental and psychiatric visits. This means that the electronic patient record combines all of the existing electronic medical records of one patient. On the other hand, unlike electronic health records, the EPR is accessible from a single, automated provider-based system (e. g. a physician's or hospital's system), but data confidentiality and security must be provided.

Elimination

Definition

Elimination is the excretion of (pharmacological) substances from the body.

Embargo

Definition

Embargo is a legal term depicting an instrument attributed to the realm of trade law. Embargo describes import and export restrictions for products and goods from and to defined countries. An embargo may be limited to a defined group or category of products or limited to a specific country or area. Embargos are often used as a means of political sanctioning of certain countries. They can also be released based on health and safety reasons.

Embodied, Embodiment

Synonyms

Incarnate

Definition

Discussions about people can become quite abstract. People can be thought of as sharing universal characteristics without distinction or regard for the particulars of their lives and the histories of the other people with whom they share their living. The concept of embodiment seeks to redress this imbalance. It reminds us that there are environmentally conditioned physiological limitations that shape how people perceive and relate to their environments and others; they even shape our consciousness of ourselves. The term can help us avoid the other extreme of thinking that consciousness is *merely* the epiphenomenon of material processes. We might say that humans are embodied psychosocial beings who are more or less embedded in social structures that afford or deny a means of making a way through life and cultural systems that engender or destroy shared ways of making life meaningful in our particular environments. Others would extend embodiment to include a spiritual dimension as well.

Emergency Care

Definition

Emergency care is a medical service for the treatment of acute symptoms of illness or injury that are life threatening. Medical conditions requiring emergency care are generally sickness or injury of an advanced degree of severity in which urgent medical care is necessary to preserve the person's life or bodily functions. Emergency care is generally delivered in hospitals or specialized emergency ambulances.

Emergency Contraception

Synonyms

Post-coital contraception; Morning-after-pill" (colloquial)

Definition

By definition, emergency contraception (EC) does not constitute a termination of pregnancy (abortion). According to the moment in time within the menstrual cycle when the drug is taken, EC inhibits or delays

ovulation or tubal transportation of the sperm. The most common method is the intake of hormones within a few hours or up to 5 days after unprotected intercourse. Mechanical post-coital contraception comprises the insertion of an intrauterine device after unprotected intercourse. Availability of EC has the potential of preventing unwanted pregnancies. Making EC available is of particular importance in situations where sexual coercion and violence against women and girls, and as a result unwanted pregnancies, are common.

Emergency Management

► Disaster Management, International
► Disaster Management, National

Emergency Preparedness

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Synonyms

Hazard preparedness

Definition

Developing plans of action for the situation when the disaster strikes.

Basic Characteristics

In general, many of the responses to extreme disasters (► hazards, natural; ► hazards, technological) used to be based on trial and error, and adhockery. The imminent stress, disorganization, and chaotic developments in the early aftermath make it clear that adequate preparation before the disaster (i. e. anticipative, rather than reactive adaptation) is crucial.

Since a disaster protection system guaranteeing absolute safety is an illusion, a change of paradigm is needed. It is necessary to live with the awareness of the possibility of disasters and to accommodate them, rather than to try, in vain, to eradicate them. While trying to protect from floods up to some design magnitude, it should be borne in mind that extreme hazards may happen, which exceed the design values assumed for building the preparedness system. Disaster mitigation systems do not provide a complete, 100%, safety. Hence, there is a need for plans of emergency preparedness for rare, but not impossible, events exceeding the planning/design conditions. Extreme hazards, which the existing preparedness system cannot bear, are realistic. For instance, a levee system may protect a riparian population from a 50-year flood (► N-year event) in such a way that a flood of design magnitude is contained between levees, so that no damage is involved. However, a plan should be in place, which could be used if a 1000-year flood (► N-year event) arrives and the levee breaks, causing massive inundations of settlements.

Creating a culture of preparedness in the entire nation is needed. There must be a sense of shared responsibility among individuals, communities, the private sector, NGOs, faith-based groups, and authorities at all administrative levels. Individuals must play a central role in preparing themselves and their families for emergencies.

In contrast to disaster mitigation ► mitigation strategies which are aimed at preventing disasters from occurring, emergency preparedness results in developing detailed and robust plans of action for the situation when the disaster strikes. Common measures of preparedness include the proper maintenance and training of the emergency services, the development and testing of the system of the emergency warning and its dissemination, rehearsing an evacuation plan. The planning should include emergency shelters and detailed evacuation plans, equipment and supplies (a stockpile of supplies for sheltering purposes), warning devices, back-up life-line services (e. g. power, water, sewage). It is important to plan for the coordination of the agencies involved in emergency management, possibly in the form of an emergency operations center (EOC), with reliable external communications (including access to radio networks), to coordinate the activities in the response phase of the emergency.

Also members of the general public should be aware of the risk of disasters, and be prepared for them, so that they know what to do when disasters strike. In the USA, for the specific hazard of hurricanes and the likelihood of evacuation, the federal agency (Nation-

al Oceanic and Atmospheric Administration, NOAA) recommends preparation of a 'disaster bag' including, among other things, a flashlight with spare batteries; a battery-operated portable radio; a battery-operated NOAA weather radio; first aid kit; prescription medicines; cash and credit card(s); a cell phone with a fully charged spare battery; spare keys; a three-day supply of water; high energy non-perishable food; blankets or sleeping bags. Also special items for infants, the elderly or disabled family members; and a change of clothing should be included.

In France, emergency preparedness includes preparation of maps of the hazard areas, from which land-use regulations are issued; and plans for emergency and rescue. Preparation of flood risk maps and flood risk management plans are compulsory activities requested by the Floods Directive, being prepared by the European Union.

Hurricane Katrina and the subsequent sustained flooding of New Orleans was a deadly reminder that the USA can and must do better in responding to emergencies. The disaster exposed significant flaws in national preparedness for catastrophic events and the capacity to respond to them. The most powerful country in the world proved not to be as prepared as it should have been, at all levels: federal, state, local, community, and individual. The US government felt obliged to re-examine how to address the full range of potential catastrophic events – both natural and man-made.

President Bush made clear that the federal US government would learn the lessons of Hurricane Katrina so that the nation can make the necessary changes to be "better prepared for any challenge of nature, or act of evil men, that could threaten people."

The emergency system preparedness should be in place prior to disaster strikes. Among the actions needed are, for example, the following (foreseen in the US as a part of lessons learned from Katrina):

- ensuring that relevant federal, state, and local decision-makers are working together and in close proximity to one another in the event of a disaster;
- ensuring situational awareness by establishing rapid deployable communications;
- clear and non-ambiguous distribution of tasks and responsibilities; embedding a single point of contact to enhance coordination of military resources supporting the response;
- identifying and developing rosters of federal, state, and local government personnel who are prepared to assist in disaster relief;
- employing adequate technology to update and utilize the national emergency alert system in order to provide the public with advanced notification of and instruction for disasters and emergencies;
- enhancing the mechanism for providing federal funds to states for preparations upon warning of an imminent emergency;
- improving the delivery of assistance to disaster victims by streamlining registration, expediting eligibility decisions, tracking movements of displaced victims, and incorporating safeguards against fraud;
- reviewing state evacuation plans and essential emergency services; and
- checking if there are adequate helplines, offering information and advice in case of a disaster.

Initiative and innovation (therein advanced technologies) must be recognized and rewarded in emergency preparedness. Advanced systems like infrared sensors and scanners (e. g. mounted on helicopters) can help find trapped people. New technology developments, such as radarscopes and sensors can be used on robots, which could sense a living human inside a building (through 30cm of concrete and 15m beyond). After a living person is discovered and precisely located in the initial cleanup, a rescue team could be called to that specific location.

► Resiliency forms a key part of disaster recovery ► recovery strategies. Resiliency makes it possible to smoothly recover from a failure related to a disaster. A high availability network design is often the foundation for disaster recovery. Handling a crisis effectively could save lives and much money just as dealing with one ineffectively could do the opposite. And while a well managed crisis often enhances an institution's reputation of authority and leadership, a poorly managed one can damage both and open up costly litigation.

Cross-References

► Hazards, Natural
► Hazards, Technological
► Mitigation Strategies
► Recovery Strategies

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Employee

Synonyms

Worker; Agent

Definition

The employee is a person who works for an employer pursuant to the instructions and organizational control of the employer. The employee is legally dependent on the employer. He is entitled to claim wages as agreed in the underlying employment contract.

Employees Health

► Workplace Health

Employer

Synonyms

Principal

Definition

The employer is a person, company or any other legal entity that provides individuals (employees) with employment. The employer has the right to give instructions to his employees. On the other hand, he is obliged to pay their wages as agreed in the underlying employment contract.

Employment and Workers Safety Law

► Labor and Occupational Safety Law

Empowerment

Definition

In ► health promotion, empowerment is a process through which individuals and groups gain greater control over decisions and actions affecting their health. It may be a social, cultural, psychological or political process through which individuals and social groups are able to express their needs, present their concerns, devise strategies for involvement in decision-making, and achieve political, social and cultural action to meet those needs.

A distinction is made between individual and community empowerment. Individual empowerment refers primarily to the individual's ability to make decisions and have control over their personal life. Community empowerment involves individuals acting collectively to gain greater influence and control over the determinants of health and the quality of life in their community.

Enable

Synonyms

Enabling

Definition

Health promotion focuses on achieving ► equity in health. ► Health promotion action aims at reducing differences in current health status and ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. This includes a secure foundation in a supportive environment, access to information, ► life skills and opportunities for making healthy choices. People cannot achieve their fullest health potential unless they are able to take control of those things which determine their health. This must apply equally to women and men.

Enablement/Enabling

Definition

Enabling is one of the three major ► health promotion action strategies laid down in the ► Ottawa charter (WHO 1986). In health promotion, enabling means taking action in partnership with individuals or groups to empower them, through the mobilization of human and material resources, to promote and protect their health. The emphasis in this definition on ► empowerment through partnership, and on the mobilization of resources draws attention to the important role of health workers and other health activists acting as a catalyst for health promotion action, for example by providing access to information on health, by facilitating the development of skills, and supporting access to the political processes which shape public policies affecting health.

References

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Enabling

► Enable

Encephalitis

Synonyms

Infection of brain tissue; Inflammation of brain tissue

Cross-References

► Acute Life-Threatening Infections

Endemic

Synonyms

Autochthonous; Indigenous

Definition

Endemic disease is defined as disease that is constantly present to a greater or lesser degree in people of a certain class or in people living in a particular location. It also refers to presence of an organism, plant, species, etc., "belonging","native to", or "prevalent in" a particular field, area, region, or environment.
In contrast to ► epidemics, endemic problems are distinguished by their consistently high levels over a long period of time.

Endemic Infectious Diseases

Synonyms

Endemics

Definition

The term "endemic" stems from the Greek and means "in people." Endemic diseases occur regularly in contained regions or populations and do not spread further. The cause of the disease, the pathogen, is permanently present in an endemic region. Endemics can appear wherever pathogens or their hosts depend on specific atmospheric conditions. Knowledge about where and how pathogens occur plays an important role in travel medicine. Examples of countries and their endemic diseases are: Japan encephalitis (see acute life-threatening infectious diseases), Tsutsugamushi fever (see tropical diseases/travelers diseases), West Nile fever (see tropical diseases/travelers diseases) and TBE (see tropical diseases/travelers diseases).

Endemics

► Endemic Infectious Diseases

Endocrine Disturbances

Synonyms

Endocrine system disease; Endocrinological dysbalance

Definition

Endocrine disturbances are about the glands and hormones of the body and their related disorders. In particular, it comprises pathological processes of the endocrine and diseases resulting from abnormal level of available hormones.

Endocrine System Disease

► Endocrine Disturbances

Endocrinological Dysbalance

► Endocrine Disturbances

Endpoints

► Outcome (Health Economics)

End Stage Disease

Synonyms

Terminal disease stadium; Life threatening illness; Incurable disease

Definition

Patients with end stage disease suffer from metastatic, relapsed cancer and chronic diseases in their terminal stage – like heart failure, terminal renal insufficiency (uremia), hepatic failure, diabetes mellitus with its complications, AIDS, and chronic progressive neurological disorders, including Alzheimer's disease. These patients are given palliative care at this incurable end stage, when alleviation of their symptoms, including of unwanted drug effects, is required.

Engagement

► Participation

Engagement in Health Promotion

► Health Promotion Engagement

Enjoyment of Food

► Pleasant Taste

Enterobiasis

Synonyms

Infection with Enterobius vermicularis; Pinworm infection

Definition

Enterobiasis is the most common worm infection in moderate zones; in tropical regions it is rare. The eggs are ingested and in the intestines the larvae are set free and develop to adult worms. The female parasites are 8–13mm long, the male up to 5mm. At night the female worms move to the anal region to release their eggs causing severe itching. Due to scratching and afterwards touching the mouth, renewed self-infection can occur. Transmission can also occur from contact with contaminated dust or bed linen. Eggs can be detected using a sticky tape around the anus. Enterobiasis can be cured by pyrantel or pyrvinium. As the therapeutics only kill the adult worms but not the larvae, a second treatment is necessary after an interval of 2–3 weeks. Successful treatment depends on compliance with hygienic rules and simultaneous treatment of other family members may be necessary.

Environment

Synonyms

Milieu; Surroundings; Setting; Background; Scope

Definition

Environment may be defined as conditions and influences of the place of living. There are many different types of environment (for example, urban, rural, etc.). Also environment refers to the social and cultural forces

that shape the life of a person or a population. Physical environment describes the characteristics of a landscape (e. g. climate, geology) which have not been changed markedly by human impact, whereas the geographical environment includes the physical environment together with any human modifications (e. g. agricultural systems, industrialization, urbanization).

Environmental Contaminants

► Environmental Pollutants

Environmental Degradation

Definition

Environmental degradation relates to the deterioration of the environment, both in terms of quantity and quality. Quantity refers e. g. to the extinction of wildlife species and quality to air, water or land pollution. Environmental degradation has many forms and can occur naturally or through human processes. The loss of rain forests, air pollution and smog, ► ozone depletion, and the destruction of the marine environment are some of the main areas of concern at present. Pollution is occurring all over the world and the planet's oceans. Even in remote areas, the effects of marine degradation are obvious.

Environmental Engineering

Definition

Environmental engineering is the application of science and engineering principles to improve the environment (air, water, and/or land resources); to provide healthful water, air, and land for human habitation and for other organisms; and to remediate polluted sites. Negative environmental effects can be decreased and controlled through public education, conservation, regulations, and the application of good engineering practices. Many environmental standards are based in whole or in part on the best available technology.

Environmental Factors

Definition

The complete background of an individual's life.

Environmental Hazards

Definition

Environmental hazards are all kinds of environmental factors that adversely affect health or the ecological balance necessary to human health, safety and well-being. Environmental factors involve characteristics of the occupational or personal environment such as work safety and housing conditions, but also the global environment such as water, air and food. Environmental hazards are for example water contaminants, toxic chemicals, wastes, air pollution (► air quality and pollution), disease transmitters and ► radiation.

Cross-References

► Workplace Hazards

Environmental Health

Synonyms

Environmental hygiene

Definition

Environmental health is a medical discipline dealing with those aspects of human health and disease that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health. It strives to promote health and quality of life by preventing or controlling those diseases or deaths that result from interactions between people and their environment. Environmental health includes identification, evaluation, control, and prevention through education of all those factors in the total environment that exercise a detrimental effect on individual physical, mental, and social well being and development. It also implies continuous efforts to educate and prevent individuals from effecting the environment in such

a way that it becomes detrimental to their well being and development.

Cross-References

► Urban Environments

Environmental Health Determinants

► Health Determinants, Environmental

Environmental Health Indicators

Definition

Environmental health indicators are a set of parameters that directly influence health and quality of life. This category of indicators includes air and water quality, food safety, and exposure to environmental substances. In addition, home, workplace, or recreational conditions can also affect health and may result in premature disability or mortality.

Environmental Hygiene

► Environmental Health
► Urban Environments

Environmental Justice

Synonyms

Equity in the distribution of environmental hazards and resources

Definition

The environmental justice movement started in the USA during the 1980s as an initiative of African-American civil rights groups who protested against a disproportional clustering of hazardous waste dumps and industrial plants in the immediate vicinity of residential areas inhabited mainly by ethnic minorities and socio-economically weak groups. It therefore differs markedly from traditional supraregional environmental movements which seek to protect nature and the environment and whose members are mainly middle class. With its central mission – calling attention to the ethnic and social inequality and environmental justice in the immediate living space and eradicating this form of discrimination – the mainly locally oriented environmental justice movement has contributed significantly to politicizing environmental justice in the USA. The environmental justice movement has since spread across the world and, being particularly significant in the Third World, has now become an environmentalism of the poor.

Environmental Law and Public Health

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Synonyms

Environment law

Definition

Environmental law stands for all legal rules that are aimed at the protection and development of the environment and its compartments as well as the protection of public health from harm, risks, and nuisances arising from the environment and the human-made interaction with the environment.

Basic Characteristics

The importance and perception of environmental law significantly increased in the final quarter of the 20th century. This is particularly the case for the laws that are designed to protect the environment. However, in the realm of public health, it was already understood that "disease and a poor environment went hand in hand" (Reynolds 1995). Indeed, public health laws traditionally and at an early point in time intended to improve the conditions the population lived in. Therefore, the reduction of health risks and nuisances arising from the environment were also the focus of early public health laws in the 14th and 15th century (Reynolds 1995; Coker and Martin 2006). For example, the importance of clean drinking water and sanitary conditions have long been recognized as important factors for healthy populations. The interrelation of public health and the envi-

ronment is much better understood today and a large number of laws govern specific aspects of this interrelation.

Environmental laws can be differentiated into two branches:

1. Environmental laws include "*environmental protection laws*" which consist of those legal rules that are aimed at the protection of the environment and its compartments as natural habitats. Their goals are the protection of the natural biological diversity and the protection of species (including herbal protection of species and animal protection);
2. Environmental laws also include "*environmental health laws*". Environmental health laws are legal rules that are aimed at the protection of human health from risks arising from the environment. This includes those "human-made" risks resulting from interactions between human beings and the environment (e. g., air and water pollution). Environmental health laws should be regarded as a distinct part of public health law. (Locke et al. 2007, with additional remarks).

In practice, these two distinct branches of environmental law have built their own infrastructure. There are regularly different agency units, some covering environment protection aspects and others covering environmental health aspects. Nevertheless, a relevant area of overlap exists so that to a certain extent both areas remain interwoven.

General Legal Remarks

Environmental health aspects have become one of the main pillars of contemporary public health practice. As the health risks resulting from the environment receive more and more policy attention, this correspondingly increases the awareness of the necessary and underlying environmental health laws. As there is a multitude of environmental health risks, public health actions to cope with them have a corresponding multitude of starting points. The safeguarding of public health from environmental health risks must combat, among others, health risks arising from air and water pollution and from the built environment as well as animal-caused health risks. Environmental health law has a broad scope. As the number of its practice areas will demonstrate below, the range of legal topics and issues is so multifaceted and complex that environmental law is indeed a "complex legal landscape" (Locke et al. 2007). In the following, a number of specific legal concerns related to the practice of environmental health are highlighted briefly.

Environmental health law is a cross-sectional subject that embraces legal provisions located in different areas. As such, environmental health law includes legal rules located in occupational safety laws as well as criminal law provisions that prohibit and sanction environmental crimes. Therefore, in the practice of environmental health, the competent authority for a particular issue may not be that easy to identify. This is particularly true as environmental law may be subject to federal legislation as well as state legislation so that federal and state authorities may be in conflict. The laws governing this field must set forth clear regulatory competencies and responsibilities. They also have to regulate interagency cooperation.

Because of the diversity of environmental health risks, the corresponding laws must provide the administration with sufficient authority and a broad range of legal means to combat the variety of risks. The agencies in charge of environmental health protection need powerful legal means, particularly as these agencies have to mitigate health risks that can affect large parts of the population. Therefore, the legal responsibility of the public health practitioner is enormous. On the other hand, his actions may affect the addressees (e. g., companies, individuals) severely, especially as some risk mitigation decisions are based only on preliminary assessments that can turn out to be incorrect in retrospect. In light of the personal and property rights affected by such public health actions, lawsuits and legal actions are not uncommon in the practice of environmental health law.

Structure and Practice Areas

Among the environmental laws, there is differentiation between rules for "general environmental law" and legal rules for "special environmental laws", which encompass the specialized legal fields of environmental law (Sparwasser et al. 2003):

- *General environmental laws* comprise the legal provisions, means, methods, and competencies that are relevant to all specialized environmental law practice areas. They may be regarded as umbrella provisions that apply to all fields of environmental law.

- *Special environmental laws* govern the legal means and practice of the different specialized practice areas of environmental law.

The specialized fields of environmental law cover a broad range of practice areas. They relate:

- To the protection of environmental compartments. As such, these provisions include air protection, land protection, water protection, and nature protection laws;
- To the sources of environmental and public health threats. These sources include hazardous activities, substances, or products. These legal provisions are not strictly linked with a particular environmental compartment. They include intromission protection laws, nuisance abatement laws, chemical laws, hazardous substances laws, nuclear energy laws, electronic equipment laws, construction materials laws, and waste and recycling laws (Sparwasser et al. 2003);
- To potential sanctions and recovery after the detection of environmental offenses. These provisions particularly form the body of environmental criminal law and environmental liability law.

The boundaries of these legal fields are not always clear-cut from other areas of public health law. Environmental law fields overlap and have numerous intersections with several other public health law fields (e. g., occupational safety laws, infectious diseases control laws, legal regulation of products and businesses). The instruments of environmental law are as diverse as the scope of this legal field.

General Legal Means

Environmental law has several legal avenues. In general terms, this field of law makes use of traditional tools of administrative law (e. g., administrative orders, injunctions). It also effectuates tools based on cooperative approaches. Therefore, the legal means and their mechanisms could be summarized as follows (Kloepfer 2004):

- Direct behavior influencing (e. g., by regulatory supervision, administrative orders);
- Indirect behavior influencing (e. g., by means of tax law, commerce law);
- Planning and zoning activities to create a healthy environment, including a healthy built environment (Perdue et al. 2003);
- Sovereign environmental protection activities conducted autonomously by the state and its administration;
- Information and education activities and state funded research;
- Legal means for promoting and funding cooperation between state and private institutions.

Besides these general techniques, the legal means of environmental law may be differentiated depending on the differing objectives of the field. Fundamentally, environmental law needs an administrative agency infrastructure. These agencies are created and funded by virtue of legal authorization. They must be granted with sufficient powers to be effective. Environmental law is an intensively regulated field. It contains numerous statutes, regulations, and ordinances, which govern various fields of this practice area (e. g., laws regulating industries or professions and laws governing water, chemicals, construction materials, food, drugs, cleaning and washing products, or waste). Administrative agencies play important roles in environmental law even though the legal means available to individuals and private organizations also contribute to the mitigation of environmental health risks.

Long-Term Legal Means

Environmental law must create a basis for a sustainable and healthy interaction between humans and the environment. This is a long-term objective. As environmental law particularly protects environmental compartments from harmful alterations, its tools must have a broader scope. Therefore, environmental law applies legal means vis-à-vis the general public like standards, technical rules, or thresholds for nuisances. This is accompanied by regulatory supervision, which includes surveillance, inspections, and reporting and notification obligations. Thus, environmental law imposes obligations on individuals and companies in the interest of the community's welfare. These are particularly directed towards companies operating potentially harmful plants or conducting risky activities.

For prevention purposes, environmental agencies are entitled to conduct their own research, e. g., with respect to environmental health risks or new technologies. The research results are used in advising the agency's addressees (e. g. industries, companies, individuals) so that they act with the best knowledge available. Agen-

cies also cooperate with their addressees to safeguard the public's health. In addition, they inform the public in order to influence behavior towards voluntary healthy behavior (health promotion). Through interplay with other legal fields, particularly tax and commerce law, environmental law may additionally provide incentives for healthier behavior.

Near-Term Legal Means

Environmental law also has to avert acute risks. Therefore, environmental agencies not only provide the industry with standards and thresholds but if they become aware of an acute risk (e. g., because of elevated levels of hazardous substances), they must react immediately and abate the risks. They may also inform and warn the public. Law must provide them with sufficient near-term means and corresponding legal authority to enforce their orders as such means may intrude personal and property rights (e. g., if an agency orders the closure of a business). If agencies detect violations, environmental law provides for immediate abatement and sanctions as well as remedies and penalties. Agencies may impose administrative fines or notify the prosecutor for criminal punishment if criminal offences are unearthed. These are all tools of indirect behavior influencing. Similarly, specific environmental crimes and liability rules are laid down in many jurisdictions.

Legal Means of Non-Governmental Actors

Apart from administrative agencies, individuals may also enforce a healthy environment and make use of a set of legal means, particularly if the agencies fail to react to mitigate risks in a timely manner. Here, individuals can have significant effects by means of private litigation (Locke et al. 2007). Individuals may litigate against the sources of the nuisances or pollution. They may also file lawsuits against the agencies in order to force them to take measures against a particular public health threat. Such individuals or non-governmental organizations may indeed be regarded as "private attorney generals" (Locke et al. 2007). In Germany, a city government was convicted by the Federal Administrative Court and forced to take appropriate public health measures to reduce air pollution caused by dangerous micro dust particles. This type of lawsuit, filed by private persons or public health advocacy organizations, is primarily intended to ensure and promote the public's health by urging the administration to take safeguarding action.

Overall, environmental law has a broad scope and encompasses a variety of legal means. Here, regulatory agencies play crucial roles. Individuals and private organizations are also relevant actors for the protection of the public's health from environmental risks.

E

Perspectives

Environmental health law faces new challenges and new threats. Particularly, climate change and its impact on the global environment is gaining importance. Therefore, the need for global legal initiatives and actions continuously emerge. The process of globalization and internationalization of environmental law is one of the major developments in recent years. Some of the contemporary environmental health risks can only be mitigated by a concerted international approach. Here, international laws will have to play their role.

In the future, environmental health laws will also have to handle new risk-profiles and new technologies with yet unknown risks. The administration will have to accompany these developments, conduct their own research, and inform the public accordingly. In addition, environmental health law will strengthen information, education, and health promotion activities. Such health promotion campaigns are already successfully used in other areas of public health (e. g., infectious diseases control, food safety). Environmental health law will continue to be a necessary but also highly complex branch of public health law.

Cross-References

- ▶ Administrative Law and Public Health
- ▶ Disaster Aftermath
- ▶ Epidemiology
- ▶ Health Campaigns
- ▶ Health Information
- ▶ Infectious Diseases Control Law
- ▶ Occupational and Environmental Health
- ▶ Public Health Law, Information and Communication
- ▶ Public Health Law, Legal Means

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Environmental Medicine

Definition

Environmental medicine as a part of modern medical research evolved from a variety of fields in medicine, above all toxicology, occupational medicine, environmental hygiene and the sub-disciplines water, soil, air and food hygiene as well as environmental ► epidemiology. Being interdisciplinary, environmental medicine draws on the know-how of a number of fields and occupations within medicine (e. g., the public health service, non- and paramedical professions) in dealing with the influence and effects of environmental factors on human health and well-being. Having developed along these lines, environmental medicine now runs on two tracks: the population-oriented preventive approach and the clinical, individual-oriented medical approach.

Responding to the increase in environment-related disorders, universities, public health services and state offices in Germany started opening environmental medicine clinics and counseling centers as early as the 1980s.

Environmental Pollutants

Synonyms

Environmental contaminants

Definition

Environmental pollutants are substances coming from mineral and fossil sources or are produced by humans. Pollutants can harm ecosystems, plants and animals and cause health problems in humans. Major air pollutants are carbon monoxide (CO), carbon dioxide(CO_2), chlorofluorocarbons (CFCs), lead, ozone (O_3), nitrogen oxide (NO_x), sulfur dioxide (SO_2), and volatile organic compounds (VOCs). Environmental pollutants are also found indoors. Other forms of pollution are water, soil and radioactive contamination.

Environmental Substainability

► Sustainable Development

Environmental Tobacco Smoke

► Passive Smoking

Environmental Tolerance

Synonyms

Adaptation

Definition

Adjustment in human systems in response to actual or expected stimuli/changes, in order to moderate potential damages, benefit from opportunities, or cope with consequences.

Environmental Toxins

Definition

Environmental toxins are any chemical in the environment that is poisonous to humans. While naturally occurring substances like aflatoxin can be toxic, the majority of the environmental toxins are man-made substances such as CFCs (chlorofluorocarbones), asbestos, carbon dioxides and nitrates. These and many other chemicals are or were once used in consumer products, manufacturing or other industrial uses, but escaped into the air, water or soil, where they can endanger entire communities. Exposure to environmental toxins can cause transient or irreversible damages, including cancer, birth defects, organ damage and blood disorders.

Environment Law

► Environmental Law and Public Health

Environment-Related Determinants of Health

► Health Determinants, Environmental

Environment-Related Health Protection

Definition

As a task which falls to states, cities and communes, environment-related health protection (ERHP) straddles health protection and environmental protection. Its focus is protecting human health from hazardous environmental factors. Formerly mostly reactive in nature, seeking to detect and eliminate existing health hazards (i. e., damage containment); ERHP has become increasingly proactive and prevention-oriented. Its main thrust now is educating the public through the media, assessing the effects of environmental factors from a public health perspective as well as encouraging and implementing measures for preventing health hazards and long-term effects (as by decreasing traffic immissions and ► noise pollution). Amongst others, the information and data required are provided by ► environment-related public health reporting services.

Preventive identification and analysis of potential health hazards through preventive measures (e. g., conducting health tolerance tests and taking ► health impact assessment surveys, public education campaigns in city districts) and using the environment as a health resource (e. g., green areas as health-promoting rest and recreation (R&R) areas) will play an increasingly greater part in ERHP. Likewise, ERHP will no longer be restricted to the environment and human health, and thus to the realm of public health, but henceforth requires interdisciplinary cooperation straddling different fields of research and activity.

Environment at Work

► Working Environment

Epidemic

Synonyms

Widespread Illness

Definition

The term "epidemic" stems from the Greek and means "upon people." An epidemic infectious disease is an outbreak of the disease in a given region or community in which masses of people are infected. Epidemics are restricted to a particular region and a certain period of time. Infections can appear simultaneously or subsequently.

Cross-References

► Widespread Illness

Epidemic Diseases

Definition

Epidemic diseases are diseases that spread rapidly and excessively among the population in one specific area due to easy transmission and insufficient protection. When the incidence of an epidemic disease extends beyond a country or continent, the disease is called pandemic. The contrary of epidemic or pandemic diseases are sporadic diseases occurring only as individual cases in separated geographic areas.

Epidemic Investigation

► Outbreak Investigation

Epidemiological Genetics

► Genetic Epidemiology

Epidemiologic Surveillance

► Public Health Surveillance

Epidemiologic Transition

Definition

The term epidemiologic transition describes the trajectory of changes in the pattern of disease and causes of death in a given country. In its original formulation by Omran, the epidemiologic transition referred to the process whereby the impact of natural disasters and the prevalence of infectious diseases declined and the prevalence of chronic and degenerative diseases increased in populations experiencing economic development. While initially thought to be a uniform and progressive process, the transition is now understood as a more complex and continuous transformation process with some diseases disappearing and others re-emerging across time and geographical settings.

Epidemiology

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Introduction

Definition

Defining epidemiology is difficult, primarily because it does not represent a body of knowledge, like some other disciplines (e. g. anatomy or pathology), nor does it target a specific organ system, like cardiology or nephrology. Epidemiology is a philosophical method of studying a very broad range of health problems within populations, and the basic science of public health. The term *epidemiology* originates from the Greek words *epi* (upon), *demos* (people), and *logos* (study of) (Friis and Sellers 1999).

There have been many definitions of epidemiology. In the past 60 years, the definition has broadened from concern with communicable disease epidemics to take in all phenomena related to health in populations.

Last's *Dictionary of Epidemiology* gives the definition that has been widely accepted. It defines epidemiology as "the study of the distribution and determinants of health related states or events in specified populations, and application of this study to control of health problems" (Last 2001).

Based on what has been done in the past, especially in the last century, epidemiology is the science and practice that describes and explains disease patterns in populations, and puts this knowledge to use to prevent and control disease and improve health. "The concept of populations is therefore fundamental to epidemiology. This embraces all aspects of epidemiology, including studies in general population, occupational populations, and the clinical populations. These populations experience exposures and health outcomes and to understand their etiologic relationships it is not sufficient to simply describe the occurrence (the distribution) of disease; epidemiologists also need to develop and test etiologic theories (which may involve population-level, individual-level or micro-level exposures) about the causes (the determinants) of these population patterns. Bearing all of these considerations in mind, the most appropriate definition of epidemiology is that it is the study of the distribution and determinants of disease in human populations" (Pearce 2004).

Historical Background

The historical antecedents of epidemiology began with Hippocrates, who implicated the environment as a factor in disease causation almost 2,400 years ago. He described the distribution of diseases by season, climate, age, and personal behavior – which is much the same perspective as modern epidemiologists have. John Graunt, a London businessman and one of the first "counters" of health events, compiled vital statistics in the mid-1660s. He provided statistical evidence for many theories on diseases, and also refuted many widespread ideas.

Well-known early epidemiologic experiments include Lind's trial of fresh fruit (oranges and lemons) against scurvy in 1747, and Jenner's experiments with cowpox vaccination in 1796. Lind found, almost 200 years before a cause of the disease was established, that ill sailors receiving oranges and lemons improved rapidly. Jenner showed that smallpox could be prevented by vaccinating with serum from the lesions of cowpox, taking the first steps that led to worldwide eradication of this disease by the late 1970s (Last 1998).

The birth of modern epidemiology occurred during the 19th century. Epidemic investigations prior to the mid-

dle of that century were mostly descriptive. The classic investigations on the transmission of cholera (John Snow), typhoid fever (William Budd), and puerperal fever (Ignaz Semmelweiss) led to understanding and the ability to reduce the spread of major infections. Pierre Charles Alexandre Louis (1787–1872) systematized the application of numerical thinking and championed its cause. His influence was widespread, primarily through his students. One of them, William Farr, pioneered the use of statistics in epidemiology. He set up a system for the routine collection of data on the number and causes of deaths and other vital statistics, and introduced the concepts of death rate, dose-response, herd immunity, and cohort effect. Together with William Guy and William Budd, he founded the Statistical Society in London in 1834 (Schoenbach 2003).

The relationship of epidemiology with war has been a reciprocal one. The U.S. Centers for Disease Control and Prevention (CDC) was born as the World War II Office of Malaria Control in War Areas, becoming the Communicable Disease Center in 1946, the Center for Disease Control in 1970, the Centers for Disease Control in 1980, and receiving its present name in 1992. The CDC's Epidemic Intelligence Service was established during the Korean War, in response to concern about importation of exotic diseases from Asia (Schoenbach 2003).

For more than half a century, since World War II to the present, epidemiology has expanded in a multiplicity of directions, penetrating the whole field of medicine and public health in a capillary manner. Many new departments have been created since the start of 1970s, when there were only a dozen schools of public health and few medical schools had epidemiologists among their faculties. The first textbook, of an introductory nature, appeared in 1960 (MacMahon et al. 1960), while we have several dozens today, for epidemiology generally and within specific subdomains.

The Aims and Scope of Epidemiology

As the basic science of public health, epidemiology has several aims (Gordis 2004):

- To identify the etiology or the causes and risk factors of a disease, and to improve public health by reducing or eliminating exposure to these factors.
- To determine the extent of disease found in the community.
- To study the natural history and prognosis of disease.
- To evaluate both existing and new preventive and therapeutic measures and modes of health care delivery.
- To provide the foundation for developing public policy and making regulatory decisions relating to environmental problems.

A prime purpose of epidemiology is the application of its findings in health promotion, health care, and health policy to improve the health of populations. Epidemiology is a population science. The focus on population distinguishes it from clinical research and the other medical sciences, which primarily study the individual (Bhopal 2002). However, epidemiology also has a big role in clinical medicine.

Epidemiologists have several roles in the process of policy making, including generating and interpreting data, presenting specific policy options and projecting the impact of each option, developing specific policy proposals, and evaluating the effects of policies after they have been implemented.

The scope of epidemiology has broadened with the discovery or invention of new applications and methods. This, and the changing pattern of diseases, has encouraged subdivisions of epidemiology. Nowadays there are many branches of epidemiology, like infectious disease epidemiology, cancer epidemiology, psychiatric epidemiology, cardiovascular disease epidemiology, public health epidemiology, spatial epidemiology, social epidemiology, clinical epidemiology, hospital epidemiology, nutritional epidemiology, pharmacoepidemiology, genetic epidemiology, behavioral epidemiology, molecular epidemiology, etc. ► epidemiology, aims and scopes.

Causation and Causal Inference

Epidemiology is the science that describes the relationship between the agent, the environment, and the host. Several *epidemiological – ecological models* have been developed in order to depict the ways in which these interactions influence the occurrence of disease: the triangle, the wheel, and the web of ► causation.

Establishing a cause and effect relationship between agent/exposure and disease is very important for public health, even though it is often difficult to do. If it

is determined that an exposure is associated with a disease, the next question is whether the observed association reflects a causal relationship. In 1840, Henle proposed postulates for causation that were expanded by Koch in the 1880s (Gordis 2004):

1. The organism is always found with the disease.
2. The organism is not found with any other disease, and
3. The organism, isolated from one who has the disease, and cultured through several generations, produces the disease in experimental animals.

These postulates were very useful for infectious diseases. However, they are not applicable for diseases that are not generally of infectious origin.

Although epidemiologic evidence by itself is insufficient to establish causality, Hill suggested that the following aspects of an association be considered in attempting to distinguish causal from non-causal associations (Hill 1965):

1. Strength of the association
2. Dose-response relationship
3. Consistency of the association
4. Temporal relationship
5. Biologic plausibility
6. Experimental evidence
7. Coherence
8. Specificity of the association

"Despite the popular view that these criteria should be used for causal inference, there is no necessary or sufficient criterion for determining whether an observed association is causal" (Rothman and Greenland 2005). The decision about causation must always remain a matter of judgments based on all available evidence.

Epidemiologic Measurement – Measures of Disease Frequency

Population health status has many dimensions, classifications, and measurements, as well as interactions between these, that pattern and trends often cannot be identified easily. Thus, the need for comprehensive population health measures and standardization of data collection is obvious and longstanding (Van der Maas 2002).

The prerequisite for any epidemiologic investigation is the ability to measure the occurrence of morbidity and mortality carefully and accurately, i. e. to quantify the occurrence of disease. Rates tell us how fast the disease is occurring in a population, and proportions tell us what fraction of the population is affected.

Measures of morbidity are incidence rate and prevalence, while measures of mortality are mortality rate and case fatality rate.

There are three general categories of rates: crude rates, specific rates, and adjusted rates. Although the crude rates are important and useful summary measures of the occurrence of disease, specific rates are more precise indicators of risk, especially if it is possible to construct rates specific to subsets of the population (e. g. age, sex, or race). To make comparisons across populations, adjusted rates may also be used.

In the last decade of the 20th century, a considerable effort has been put into the development of summary measures of population health (SMPH) that combine information on mortality and non-fatal health outcomes. In 1993, the Harvard School of Public Health in collaboration with The World Bank and the World Health Organization (WHO) assessed the global burden of disease (GBD). Aside from generating the most comprehensive and consistent set of estimates of mortality and morbidity by age, sex, and region ever produced, the GBD study also introduced a new metric – disability adjusted life year (DALY) – to quantify the burden of disease and to compare disease burden across a range of diseases, injuries, and risk factors. The use of DALY allows researchers to combine years of life lost from premature death (years of life lost – YLL) and years of "healthy" life lost because of illness and disabilities (years lived with disability – YLD) in a single indicator (Murray and Lopez 2002).

SMPH are a generalization of the concept of disease burden measurement. They include measures of the health gap (e. g. DALY) and measures of the health expectancy, for example, disability adjusted life expectancy (DALE).

SMPH have been proposed and developed as useful analytical tools for health policy-makers and analysts. The value of summary measures of population health as a tool for health policy and planning purposes has been increasingly recognized. ► disease frequency, measures.

Design Strategies in Epidemiologic Research

To determine whether an association exists between an exposure and a disease, different epidemiologic studies can be used. They can be divided into two broad groups – observational and experimental studies.

Observational Studies

In ► observational studies, the distribution of an exposure and/or an outcome is examined without any attempt by the investigator to influence them. The investigator only observes the natural course of events, with changes or differences in one characteristic being studied in relation to changes or differences in other characteristics, without intervention other than to record, classify, count, and statistically analyze results (Last 2001). Observational investigations include descriptive and analytic studies.

Descriptive studies are concerned with describing the distribution of disease, particularly in relation to person, place, and time. They can be used to determine the health status of the people in the community, to measure risks, generate hypotheses, etc. Descriptive data are primarily useful for the formulation of hypotheses about factors related to disease.

The first approach in determining whether an association exists might be to conduct a study of group characteristics, called an ecological study.

An ecological or ► correlation study is a study in which data of average exposure and outcome for a population are used to compare with similar data for other populations in order to look for associations between the exposure and the outcome.

The ► case report is the most basic type of descriptive study of individuals, consisting of a careful, detailed report of the profile of a single patient by one or more clinicians.

A ► case series describes characteristics of a number of patients with a given disease.

Postulated hypotheses can subsequently be tested using an analytic design. The common types of ► analytical studies are cohort, case-control, and cross-sectional.

In a ► cohort study, the investigator selects a group of exposed individuals and a group of nonexposed individuals and follows up both groups to compare the incidence of disease (or other outcome) in the two groups. The design may include more than two groups. There are two main types of cohort studies – prospective cohort study and retrospective or historical cohort study. The only difference between them is calendar time. In a prospective cohort design, exposure and nonexposure are ascertained as they occur during the study, the groups are then followed up for several years into the future, and outcome is measured. In a retrospective cohort design, exposure is determined from past records and outcome is ascertained at the time the study is begun (Gordis 2004).

In a ► case-control study, the investigator selects two groups – a group of individuals with a disease of interest (or other outcome variable), called cases, and, for purposes of comparison, a suitable group of people without that disease, called controls. The history of exposure to suspected risk factors is compared between "cases" and "controls" (Gordis 2004).

Nested case-control design combines elements of both cohort and case-control studies and offers a number of advantages.

A cross-sectional study is a study in which the prevalence of an exposure and/or an outcome is measured in a given population at a specific point in time. The data may be analyzed to look for an association between the exposure and the outcome (Gordis 2004).

Experimental Studies

In experimental (interventional) studies, conditions are under the direct control of the investigator (Last 2001). These studies are designed to test hypotheses by modifying an exposure within the study population.

► Experimental studies maintain the greatest control over the research setting. They ideally take the form of randomized controlled trials.

A ► randomized controlled trial (RTC) is an epidemiologic experiment in which subjects in a population are randomly allocated into groups, usually called *study* and *control* groups, to receive or not receive an experimental preventive or therapeutic procedure, maneuver, or intervention (Last 2001). The RTC is generally considered the "gold standard" of study designs. When hierarchies of study design are created to assess the strength of the available evidence supporting clinical and public health policy, RTC are always at the top of the list.

Studies in which the investigator does not have full control over the allocation of the exposure are called *quasi-experimental studies*.

An important consideration in any trial is the possible introduction of bias in the assessment of outcomes from the expectations of either the investigator or the participant. The best protection against this source of bias is a *double blind study* – neither the patient nor the physician knows whether the patient is receiving the treatment of interest or the control treatment.
Because of ethical reasons, allocation of exposures that are known to be hazardous is not possible. Such exposures can be assessed in experimental studies only indirectly, by attempts to eliminate them (Hennekens, Buring 1987; Gordis 2004).

Bias, Confounding and Interaction

Epidemiological studies are prone to error, because they usually study human populations in natural settings. Three important issues in deriving causal inferences are ► bias, confounding, and interaction.
Bias has been defined as any systematic error in the design, conduct, or analysis of an epidemiological study that results in a mistaken estimate of the association between exposure and risk of disease. There are a number of ways of categorizing the different types of bias. Biases reflect inadequacies in the design or conduct of the study and affect the validity of the findings. They need to be assessed and, if possible, eliminated. The types of bias encountered in epidemiologic studies are *selection bias* and *information bias*. While selection bias refers to any error that arises in the process of identifying the study populations, information bias includes any systematic error in the measurement of information on exposure or outcome (Hennekens, Buring 1987).
On the other hand, confounding and interaction describe the reality of the interrelationships between certain factors and a certain outcome.
Confounding is a major cause of bias in epidemiology, and one of the most important problems in observational studies. Confounding causes an error in the assessment of the association between a disease and a postulated causal factor.
Several methods are available to control confounding, either through study design or during analysis of the results. The control of confounding in study design includes randomization, restriction, and matching. Control of confounding in the analysis of results includes stratification and mathematical modeling (Gordis 2004).
Interaction (effect modification) is defined as the interdependent operation of two or more causes to produce or prevent an effect (Last 2001).The effect can be greater than expected (positive interaction, synergism) or less than expected (negative interaction, antagonism).

Prevention

A major goal of epidemiology is to assist in the prevention and control of disease and in promotion of health by identifying risk factors or etiologic factors for disease and the ways in which they can be modified (Beaglehole et al. 1997).
Prevention means actions aimed at eradicating, eliminating, or minimizing the impact of disease and disability, or if none of these is feasible, retarding the progress of disease and disability. The concept of prevention is best defined in the context of levels, traditionally called primary, secondary, and tertiary, and latterly including primordial prevention (Last 2001).
Primordial prevention aspires to establish and maintain conditions that minimize hazards to health, while primary prevention (► prevention, primary) aims to reduce the incidence of disease by controlling causes and risk factors. Primary prevention involves two strategies: population strategy (focuses on the whole population with the aim of reducing average risk), and individual strategy (focuses on people at high risk as a result of particular exposures).
Secondary prevention (► prevention, secondary) aims to reduce the prevalence of disease by shortening its duration through early diagnosis and treatment.
Tertiary prevention (► prevention, tertiary) aims to reduce the number and/or impact of complications.
Primary prevention denotes an action taken to prevent the development of a disease in a person who does not have the disease in question (e. g. immunization against certain diseases). Secondary prevention is the identification of people who have already developed a disease at an early stage of the disease's natural history (e. g. early detection of disease through screening and subsequent early treatment). The term early detection of disease means detecting a disease at an earlier stage than would usually occur in standard clinical practice. This denotes detecting disease at a presymptomatic stage, at which point the patient has no symptoms or signs of disease ► epidemiology, prevention.

Screening

According to the *US Commission on Chronic Illness*, ► screening is defined as "the presumptive identification of unrecognized disease or defect by the applications of tests, examinations or other procedures which can be applied rapidly". Screening tests sort out apparently well persons who probably have a disease from those who probably do not have a disease (Last 2001). The main aim of screening is to reverse, halt, or slow the progression of disease more effectively than would normally happen. Persons with positive findings must therefore be referred to their physicians for diagnosis and necessary treatment.

However, some purposes of screening are more controversial than trying to achieve a better outcome for individuals. It is also done to protect society, even though the individual may not benefit or might be harmed (e. g. screening potential immigrants for contagious disease at the port of entry; screening potential employees in the police, armed forces and airlines to select out unhealthy people) (Bhopal 2002).

A successful screening program will focus on a serious disease for which early diagnosis and effective treatment can reduce the risk of significant morbidity and mortality. A high-risk population for whom the test is acceptable must exist. The general principles that govern the introduction of screening programs include:

- the disease should be an important health problem;
- the disease should have a detectable preclinical phase;
- the natural history of the lesions identified by screening should be known;
- there should be an effective treatment for such lesions;
- the applied screening test should be acceptable for the target population and safe (Miller 2005).

In addition, a good screening test should be simple, rapid, and inexpensive (Friis, Sellers 1999).

Every screening program must to be evaluated, which involves consideration of two issues: feasibility and effectiveness of the proposed program (Hennekens, Buring 1987).

Investigation of Disease Outbreak

One of the most important roles of epidemiology is the investigation of disease outbreaks – epidemics – that occur suddenly and in a relatively limited geographic area. The emergence of a disease outbreak requires immediate action to determine the origin of the problem and to prevent further spread of the disease. ► Outbreak investigations also provide the opportunity to discover new etiological agents, to understand factors that promote the spread of the diseases, and at the same time to identify the weaknesses of existing prevention and health programs. Although there is no simple way to teach how to investigate a disease outbreak, there is an organized way of approaching and interpreting the data that assists in the solution of problems. According to Gregg, ten basic steps that are commonly used are the following (Gregg 2002):

1. Determine the existence of the epidemic
2. Confirm the diagnosis
3. Define a case and count cases
4. Orient the data in terms of time, place, and person
5. Determine who is at risk of becoming ill
6. Develop an hypothesis that explains the specific exposure that caused disease and test this hypothesis by appropriate statistical methods
7. Compare the hypothesis with the established facts
8. Plan a more systematic study
9. Prepare a written report
10. Execute control and prevention measures

Not all disease outbreaks warrant investigation. The decision to investigate an outbreak is typically based on the severity of illness, the number of affected persons, uncertainty about the pathogen, and the perceived need to control further spread of the disease.

Public Health Surveillance

► Public health surveillance (*epidemiologic surveillance* or *surveillance)* is a fundamental role of public health. It has been defined by the CDC as "the ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice" closely integrated with the timely dissemination of these data to those who need to know. The term public health surveillance describes the scope (surveillance) and indicates the context in which it occurs (public health) (Thacker 2000).

Surveillance is distinguished from ► monitoring by the fact that it is continuous and ongoing, whereas monitoring is intermittent or episodic (Last 2001).

Surveillance is most frequently conducted for communicable diseases, but in recent years, it is increasingly being applied to other fields, such as primary care, noncommunicable diseases (e. g. cancer registers), environmental and occupational health, injuries, poisonings, and exposures or behaviors that predispose to disease.

Public health surveillance information is used to assess public health status, define public health priorities, detect epidemics, test hypotheses, evaluate programs, conduct research, etc.

Surveillance can be active, passive, or combined active/passive.

At the beginning of the 21st century, several activities have contributed to the evolution of public health surveillance. First, use of the computer has revolutionized the practice of public health surveillance. In developed countries, surveillance systems link all state health departments by computer for the routine collection, analysis, and dissemination of information on many conditions. The second field of renewed activity associated with surveillance, as a by-product of the use of computers, is the ability to make more effective use of sophisticated tools in order to detect changes in patterns of occurrence of health problems. In addition, more effective use of electronic media and all the other communication tools should facilitate the use of surveillance information for public health practice. Finally, surveillance needs to be used more consistently and thoughtfully by policymakers. Epidemiologists not only need to improve the quality of their analysis and interpretation, they also need to present surveillance information in its most useful form to the appropriate audience and in the necessary time frame (Teutsch, Churchill 2000).

Clinical Epidemiology

In the second half of the 20th century, accelerated development of ► clinical epidemiology followed by pharmacoepidemiology took place.

The term clinical epidemiology is derived from clinical medicine and epidemiology. It seeks to answer clinical questions and to guide clinical decision making with the best available evidence. Many of the methods used to answer these questions are epidemiologic methods.

There have been many definitions of clinical epidemiology. Fletcher and colleagues defined it as "the application of epidemiologic principles and methods to problems encountered in clinical medicine" (Fletcher et al. 1996). Clinical epidemiology had its origins in clinical practice and according to Sackett and colleagues, it is "a basic science for clinical medicine" and "science of the art of medicine" (Sackett et al. 1991).

Clinical epidemiology comprises many issues: abnormality versus normality (Is the patient sick or well?); diagnosis (How accurate are tests used to diagnose disease?); frequency (How often does a disease occur?); risk (What factors are associated with an increased risk of disease?); prognosis (What are the consequences of having a disease?); treatment (How does treatment change the course of disease?); prevention (Does an intervention, e. g. immunization, keep disease from arising? Does early detection and treatment improve the course of disease?); cause (What conditions lead to disease?); and cost (How much will care for an illness cost?) (Fletcher et al. 1996).

The clinical events of primary interest in clinical epidemiology that doctors try to understand, predict, interpret, and change when caring for patients, are the health outcomes known as the five Ds: death, disease, discomfort, disability, and dissatisfaction (Fletcher et al. 1996).

The purpose of clinical epidemiology is to ensure that clinicians' practice and decision-making is evidence-based. Clinical decision-making requires answering questions about diagnosis, therapy, prevention, and harm; providing estimates of prognosis; and obtaining unbiased and precise estimates of intervention effects. Clinicians should use the best evidence for clinical decision-making. Thus, clinical epidemiology and evidence-based medicine are closely linked: while clinical epidemiology grounds the clinical investigators' viewpoint, evidence-based medicine provides the framework for application of research findings in clinical practice (Schunemann, Guyatt 2005).

Evidence Based Medicine

► Evidence-Based Medicine (EBM) is a great beneficiary of epidemiology, and it is an important and relevant contribution to modern medicine. EBM is defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients". The practice of EBM means integrating individual clinical expertise (the proficiency and judgment that individual clinicians acquire through clinical experience and clinical practice) with the best

available external clinical evidence (clinically relevant research on causation, prognosis, diagnostic tests, and treatment strategies) (Sackett et al. 1996).

The goal of EBM is to increase the likelihood of a better clinical outcome for an individual patient due to making better clinical decisions and doing so in a more efficient, cost-effective manner.

In order to apply EBM to the clinical problem of interest, the first step is to classify the problem as one of diagnosis, prognosis, therapy, harm, or another clinical and health care issue. The practice of EBM can then be divided into the following components: identifying a problem or area of uncertainty; converting information needs into answerable questions; selecting the most likely resources to search; searching and appraising the evidence found for its validity (closeness to truth) and usefulness (clinical applicability); acting on and appropriately applying the evidence; and evaluating the outcomes of the actions (Sackett, Rosenberg 1995).

Not all evidence is judged to be of equal value, that is, there are hierarchies of research design that are evaluated to have different strengths and different levels of value in the decision making process – the evidence pyramid.

Most clinicians do not have the time to read the literature in their own areas, to be up-to-date on new information, and to be able to critically appraise the literature and its validity and usefulness. Fortunately, there are readily available sources, like the *Cochrane Collaboration*, an international non-profit and independent organization that aims to help people make well-informed decisions about healthcare by preparing, maintaining, and promoting the accessibility of systematic reviews of the effects of healthcare interventions (The Cochrane Collaboration 2006).

Pharmacoepidemiology

One of the youngest scientific disciplines, ► pharmacoepidemiology, or drug epidemiology, has developed at the interface between clinical pharmacology and clinical epidemiology. It can be defined as the application of epidemiologic knowledge, methods, and reasoning to the study of the effects and uses of drugs in human populations (Porta-Sera, Hartzema 1997).

The main purpose of pharmacoepidemiology is to determine the impact of drugs upon the health of the population. It may be drug-oriented, emphasizing the safety and effectiveness of individual drugs or groups of drugs; or utilization-oriented, aiming to improve the quality of drug therapy. In the second instance, pharmacoepidemiology may focus on the drug (e. g., dose-effect), the prescriber (e. g., quality indices of the prescription), or the patient (e. g., selection of drug and dose vs. kidney function, drug metabolic phenotype/genotype, age, etc). Drug utilization research is thus an essential part of pharmacoepidemiology as it describes the extent, nature, and determinants of drug exposure. In common use, these two terms are sometimes used interchangeably. Since pharmacoepidemiological studies need to be large to study effectiveness and rare adverse effects, they are often conducted on existing databases that cover many exposed individuals. Among the examples of adverse and possible beneficial effects of drugs that have been revealed by systematic collection of data are the positive association between oral contraceptives and venous thrombotic episodes, and the negative associations between statins and dementia, and antibiotics and acute myocardial infarction. Pharmacoepidemiological studies may also provide useful information on patterns of drug utilization and pharmacoeconomic issues. Technology development has led to a considerable increase in the number of individual-based registers and databases, which may be of value in pharmacoepidemiological research, and the number of studies that are based on these data may be expected to increase.

A great challenge ahead is linkage of pharmacoepidemiological studies with the latest techniques of genetics, biochemistry, immunology, and molecular biology (Garbe, Suissa 2005).

Hospital Epidemiology

The disciplines of ► hospital epidemiology and infection control were born at the Vienna hospital, where, in 1847, Ignaz Semmelweiss decreased mortality from puerperal sepsis by instituting a disinfection procedure. Other luminaries followed and left their marks: Joseph Lister with his promotion of surgical antisepsis and asepsis, Florence Nightingale with observations on the deplorable conditions in hospitals that promoted the spread of infection, William Halsted with the introduction of rubber gloves during surgery, and Robert Koch who placed the germ theory on firm scientific ground (Mayhall 2004).

The field of hospital epidemiology is young and still growing. The challenges faced are getting more complex and multifaceted. The character of hospitals has changed. Patients are older and sicker, underlying diseases are more compromising, invasive diagnostic and therapeutic procedures are more common, and resources fail to keep up with demand for services. Antimicrobial resistance, often multiple, is increasing inexorably. Today, even more issues challenge and stimulate the hospital epidemiologists. As a consequence of the growing AIDS epidemic, employee safety from bloodborne pathogens and diseases has emerged as a major infection control issue.

The basic concepts of hospital epidemiology and infection control may not have changed radically from the time of Semmelweiss, yet the application of science and implementation of effective programs require knowledge in several disciplines including microbiology, infectious diseases, epidemiology, biostatistics, and the social sciences (Mayhall 2004).

Because of the illnesses, deaths, and added costs related to nosocomial infections, the field of infection control has grown in importance over the last 40 years.

Molecular Epidemiology

In recent years, developments in molecular biology were taken over by epidemiologists, and the use of biomarkers of exposure and effect has led to a boom of so-called molecular epidemiology (Ahrens et al. 2005). The basic premise of molecular epidemiology is that greater precision in estimation of exposure-disease associations can be made by using molecular biology in epidemiologic studies. This "discipline" (a method of measurement rather than a discipline) has already made many valuable contributions to biomedical and clinical science and has great promise for the future.

Genetic Epidemiology

A great improvement in understanding of the human genome led to the rapid progress of genetic epidemiology. Last's dictionary defines genetic epidemiology as a "science that deals with the etiology, distribution, and control of disease in groups of relatives, and with inherited causes of disease in populations. The study of the role of genetic factors and their interaction with environmental factors in the occurrence of disease in human populations" (Last 2001).

A popular textbook on genetic epidemiology defines it as a "discipline that seeks to unravel the role of genetic factors and their interactions with environmental factors in the etiology of diseases, using family and population study approaches" (Friis, Sellers 1999).

The terms *molecular* and *genetic* epidemiology are sometimes used interchangeably. These two fields overlap in some respects, but they differ in others. Genetic epidemiology is concerned with inherited factors that influence the risk of disease (it includes the identification of unknown genes); whereas molecular epidemiology uses molecular markers to establish exposure-disease associations (it evaluates the association of variation in a known gene with risk of disease).

Genetic epidemiology can be considered as a science designed to answer the following four questions:

- Does the disease cluster in families?
- Is the clustering a result of common environment and lifestyle, or similar risk factors?
- Are the risk factors for a disease within families consistent with Mendelian transmission of a major gene?
- Where is the chromosomal location of the putative gene?

The expected future scientific discoveries in the field of molecular and genetic epidemiology will not only improve our understanding of disease etiology, but may lead to better and more tailored approaches to primary and secondary prevention (e. g. screening for some diseases) (Friis, Sellers 1999). ► epidemiology, genetics.

Psychological, Behavioral, and Social Epidemiology

The field of social epidemiology is concerned with the influence of a person's position in the social structure on the development of disease. Behavioral epidemiology studies the role of behavioral factors in health. The term psychosocial epidemiology has been more broadly conceptualized as social, behavioral, and psychological factors (Friis, Sellers 1999).

Disaster Epidemiology

Epidemiologic methods can be used to measure and describe the adverse health effects of natural and human-caused disasters, and the factors that contribute to those effects. By identifying risk factors for specific outcomes such as death and injury, epidemiologists can help develop effective strategies to prevent future

disaster-related morbidity and mortality. In addition, they play an important role in establishing priorities for action by public health authorities, and in emphasizing the need for valid and timely data collection and analysis as the basis of immediate decision-making (Noji 1997).

The Feature of Epidemiology

In his essay "Epidemiology: Quo vadis?", Professor Olli S. Miettinen, one of the most influential epidemiologists of the 20th century, argues strongly that epidemiology has a 'central role in the production of the knowledge base for scientific medicine' and that epidemiologists have a crucial mission in this regard, proposing a 'larger and higher mission'. This 'meta-epidemiologic' mission places epidemiology centrally within medicine, and broadens its purpose into a number of clinical domains. He calls for a new activism on the part of epidemiologists, suggesting that they become 'agents of change' in challenging epidemiologists to face the future in non-epidemiologic environments (Miettinen 2004).

Where is epidemiology heading? In recent years, it has become an increasingly important approach in both public health and clinical practice. There are new challenges ahead for epidemiology and epidemiologists, some reflective of Miettinen's 'higher mission'. New technologies are 'pushing' biomedical research and medical practice, bringing the possibility of testing hypotheses at deeper biological levels in the population context. Research models and approaches are changing and becoming increasingly multidisciplinary. Public and funder expectations are high. If the past is a good predictor of the future, then epidemiology is well on track. The future is both challenging and promising (Samet 2004).

Summary

Epidemiology is the study of the distribution and determinants of health-related states in populations, and the application of this study to control of health problems. The concept of populations is fundamental to epidemiology. This embraces all aspects of epidemiology, including studies in the general population, occupational populations, and clinical populations. Epidemiology can identify the cause of a disease and the risk factors, determine the burden of disease in the community, describe the natural history of disease, predict disease trends, identify the health needs of a community, test the efficacy of intervention strategies, and evaluate intervention and public health programs.

Epidemiology has both the theoretical, and now increasingly, practical methodological tools to make it possible to examine the big questions of individual and population health. Epidemiological practice, uniquely in medicine, embodies the big-picture outlook of both community medicine and modern public health.

Epidemiologic methods are often the first scientific methods applied to a new health problem in order to define its pattern in the population and to develop hypotheses about its causes and methods of transmission. Epidemiological studies have apparently distinct designs but are unified by their common goal to understand the frequency and causes of disease, by their strategy of seeking associations between exposure to potential causes and diseases, by their utilization of the survey method, and by their basis in defined populations.

The scope of epidemiology has broadened with the discovery or invention of new applications and methods. This and the changing pattern of diseases have encouraged subdivisions of epidemiology. Nowadays there are many branches of epidemiology, like infectious disease epidemiology, cancer epidemiology, cardiovascular disease epidemiology, general epidemiology, epidemiology of aging, clinical epidemiology, hospital epidemiology, injury epidemiology, behavioral epidemiology, pharmacoepidemiology, genetic epidemiology, disaster epidemiology, etc.

In recent years, epidemiology has become an increasingly important approach in both public health and clinical practice. If the past is a good predictor of the future, then epidemiology is well on track. The future is both challenging and promising.

Cross-References

- ▶ Bias
- ▶ Case Control Studies
- ▶ Case Series
- ▶ Causation
- ▶ Clinical Epidemiology
- ▶ Cohort Studies
- ▶ Disease Frequency, Measures
- ▶ Ecological Study
- ▶ Epidemiology, Aims and Scope

- ▶ Epidemiology, Genetics
- ▶ Epidemiology, Prevention
- ▶ Evidence Based Medicine
- ▶ Experimental Studies
- ▶ Hospital Epidemiology
- ▶ Individual Case Description
- ▶ Monitoring
- ▶ Observational Studies
- ▶ Outbreak Investigation
- ▶ Pharmacoepidemiology
- ▶ Prevention, Primary
- ▶ Prevention, Secondary
- ▶ Prevention, Tertiary
- ▶ Public Health Surveillance
- ▶ Randomized Controlled Trials
- ▶ Screening

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Epidemiology, Aims and Scope

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Definition

Epidemiology is defined as "the study of the distribution and determinants of health related states or events in specified populations, and application of this study to control of health problems. *Study* includes observation, surveillance, hypothesis-testing analytic research methods, and experiments. *Distribution* refers to analysis according to time, place, and classes of persons affected. *Determinants* are the physical, biologic, social, cultural, and behavioral factors influencing health. *Health-related states or events* include diseases and injuries, causes of death, behavior such as use of tobacco, reactions to preventive or therapeutic regiments, and provision and use of health services. *Specified populations* are those with identifiable characteristics, such as precisely known numbers. *Application to control* makes explicit the purpose of epidemiology – to promote, protect, and preserve good health" (Last 2001).

Basic Characteristics

Introduction

"Based on what it has done in the last 150 years, epidemiology is the science and practice which describes and explains disease patterns in populations, and puts this knowledge to use to prevent and control disease and improve health" (Bhopal 2002).

Epidemiology is primarily concerned with disease and health hazards in populations, not individuals. Patterns of disease in populations are results of multiplicative interactions between individuals, societies and environment. The science of epidemiology combines elements of biology, social science and ecology (Bhopal 2002). It is complemented by statistics, ► demography and philosophical theories. However, "epidemiology can not be reduced to a sub-division of one of the contributing sciences but it should be considered as a multidisciplinary science giving input to the applied field of public health" (Ahrens et al. 2005).

Aims of Epidemiology

The principal aim of epidemiology is to identify factors related to the ► occurrence of disease. Identification of these factors both causal (► causation) and ► risk factors, enable developing a rational basis for prevention (► epidemiology, prevention). This can be illustrated by investigation of an outbreak (► outbreak investigation) of food poisoning in order to determine which food was contaminated with the microorganisms or chemicals that caused the epidemic (► outbreak investigation), as well as by investigation of the relationship between various environmental factors and/or genetic factors with the occurrence of breast cancer.

Epidemiological investigations provide evidence which underline the critical processes of clinical practice, including diagnosis, prognostication, and selection of therapy. The practice of medicine depends on population data. "The physician applies a population-based probability model to the patient who is lying on the examining table" (Gordis 2004).

The epidemiology is a basic science of ► public health. Studying frequency and distribution of disease in a population, and the natural history of disease, as well as evaluating existing and new preventive and therapeutic measures and modes of healthcare delivery, epidemiology provides the foundation for developing healthcare policy and planning (Gordis 2004). For example; the Salk vaccine field trial (1954), which comprised nearly one million children, gave the basis for worldwide implementation of poliomyelitis vaccination programs for disease prevention; the community-intervention trials of fluoride supplementation in water (beginning during 1940s) have led to widespread primary prevention of dental caries; knowledge from Framingham Heart Study, initiated in 1949, and other similar epidemiological studies, has helped to stem the epidemic of cardiovascular mortality in majority of developed countries (Rothman, Greenland 1998).

Scope of Epidemiology

For many years epidemiology was considered to be restricted to the infectious diseases, which were the major health problem in the past. With changing pattern of population morbidity and mortality, the scope of epidemiology has been enlarging. "It is generally accepted that epidemiological studies can appropriately be applied to all diseases, conditions, and health related events, and it is concerned not only with epidemics, but also with interepidemic periods and with ► sporadic and ► endemic occurrence of disease" (Mausner 1985). "For more than half a century epidemiology, as an aggregate of knowledge with a methodological core, has expanded in a multiplicity of directions, penetrat-

ing in a capillary way the whole field of medicine and public health" (Saracci 2004).

The growing implementation of epidemiological methods in investigating health problems resulted in formulating of separate areas of epidemiology, defined according to disease groups (infection disease epidemiology, cardiovascular epidemiology, cancer epidemiology, neuroepidemiology and other) or according to group of factors, which relationship with diseases is investigated (social epidemiology, environmental epidemiology, nutritive epidemiology, reproductive epidemiology and other).

In the second half of the 20th century accelerated development of clinical epidemiology followed by pharmacoepidemiology, took place.

In recent years, developments in molecular biology were taken over by epidemiologists, and the use of biomarkers of exposure and effect has led to a boom of so-called molecular epidemiology. A great improvement in understanding of the human genome, led to the rapid progress of genetic epidemiology (Ahrens et al. 2005).

Most definitions are taken from the last edition of Last's Dictionary of Epidemiology (Last 2001). We are much obliged to Professor Last for his kind consent.

Cross-References

- ► Causation
- ► Demography
- ► Endemic
- ► Epidemiology, Prevention
- ► Occurrence
- ► Outbreak Investigation
- ► Public Health
- ► Risk Factor
- ► Sporadic

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Epidemiology, Genetics

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Definition

Classic epidemiology is the study of the frequency and distribution of diseases in populations and the factors associated with their causation; the ultimate aim of such study is the prevention of disease. On the other hand, the techniques of molecular biology, e. g. DNA typing, are utilized in molecular epidemiological studies. Genetic epidemiology is an extension of molecular epidemiology, which evaluates the role of inherited factors in the cause of disease in families and in populations (Khoury et al. 1993). Thus, genetic epidemiology involves principles and methods from epidemiology, molecular biology and genetics.

Basic Characteristics

Genetic epidemiology was developed in the 1960s, as a "mixture" of population/statistical/mathematical genetics and classic/molecular epidemiology (Khoury et al. 1993). Gene–gene and, especially, gene–environment interactions are important in such epidemiological studies as genetic epidemiology aims to detect the pattern of inheritance of a particular disease by the localization of genes and the finding of markers associated with disease susceptibility.

Types of Genetic Epidemiological Studies

At any given point in time, the distribution of genetic traits in a population is a function of the combination of occurrence of mutation, forces that can alter allelic and genotypic frequencies, such as migration, selection, and drift due to population size. Thus, the measures of disease frequency can also be applied to

genetic traits using descriptive epidemiological studies. Study designs for examining associations include cohort, cross-sectional and case-control studies. The basic goal for all these studies is to examine the relationship between disease occurrence and the gene(s) of interest. Sometimes both cross-sectional and longitudinal components can be used in the same study (Bickeboller 2005).

The steps included in genetic epidemiological investigation of a disease are as follows: a) establishing that there is a genetic component to a disorder; b) establishing the relative size of that genetic effect in relation to other sources of variation in disease risk (environmental risk factors), and c) identifying the gene(s) responsible for genetic susceptibility. There are two essential types of genetic epidemiological studies in accordance with these steps,: family studies (segregation, linkage, association) and population studies (association). Additionally, genetic risk studies include family-based and twin/adoption studies (Khoury et al. 1993; Greenberg et al. 2004).

Clustering or familial aggregation of a disease is suggested when the ► recurrence risk among relatives of affected persons exceeds that among relatives of unaffected persons. Cohort and case-control studies are used most frequently to study and quantify a familial aggregation of disease (Neale and Cardon 1992).

► Twin studies provide a simple way to separate genetic from environmental factors, i. e. assess the relative importance of genetic and environmental factors by comparing monozygotic and dizygotic twins for concordance of disease. Greater concordance for disease among monozygotic twins as compared with dizygotic twins suggests genetically determined susceptibility (Neale and Cardon 1992). Similarly, ► adoption studies provide opportunities for separating genetic from environmental factors in a familial aggregation of disease; affected parents who have given up children for adoption and control parents who have given up children for adoption are identified and the frequency of disease in their children compared (Khoury et al. 1993).

► Segregation analysis is a complex statistical technique used to study the pattern of occurrence of disease within pedigrees and requires multigenerational family trees, preferably with more than one affected member. This type of genetic epidemiological study can suggest the likely mode of inheritance (autosomal dominant, autosomal recessive, or multifactorial), i. e. which mode of inheritance is most consistent with the pattern of disease occurrence seen within families (Bickeboller 2005).

Linkage studies (► linkage analysis) use parametric or nonparametric methods such as allele sharing methods (affected sibling-pairs method) with no assumptions about the mode of inheritance, penetrance or disease allele frequency. It is an indirect approach, that depends on a genetic linkage between the genetic marker and the disease susceptibility gene. Linkage studies provide information on crude chromosomal location (candidate regions) of the gene or genes associated with the phenotype of interest (Khoury 1998).

► Association studies may be family-based (transmission/disequilibrium test–TDT) or population-based. Alleles, haplotypes or evolutionary-based haplotype groups may be used in association studies. The studies can include nuclear families (index case and parents), affected relative pairs (sibs, cousins, and any two members of the family), extended pedigrees, twins (monozygotic and dizygotic) or unrelated population samples. "The aim of association studies is to show evidence for association and ► linkage disequilibrium in a population" (Bickeboller 2005).

Gene–Environment Interactions

The concept of genetic–environmental interaction is crucial in understanding the dynamics of health and disease (Ottman 2001). Five biologically plausible models account for the relationship between genotypes and environmental exposures, in term of their effects on disease risk. Under the model A, the genetic factor is the primary determinant of the disease, while the environmental factor has no effect by itself, but can modify the risk associated with the genetic factor. Model B specifies that the environmental factor is the primary determinant of the disease, while the genetic factor has no effect by itself, but can modify the risk associated with the environmental factor. In model C, the environmental factor exacerbates the effect of the genetic factor, but there is no effect of exposure in the low-risk genotype. In model D, both environmental and genetic factors are required to increase the risk of disease. Finally, in model E, both the genetic and environmental factors may increase or decrease the risk of disease by themselves, but the effect of each of these factors depends on the presence or absence of the other factor (Ottman 1990).

Genetic Epidemiology and Prevention

"Genetic epidemiology addresses the fundamental goals of preventive medicine and public health at the various levels of disease prevention" (Khoury et al. 1993). There are numerous methods for the prevention of genetic disorders, such as genetic counseling (primary prevention), genetic screening (secondary prevention), or for minimizing the effects of genetic diseases by preventing complications and deterioration (tertiary prevention). In line with these, the availability of genetic centers providing genetic counseling and prenatal diagnosis are essential for the prevention and management of many genetically determined diseases. Recently, special attention has been paid to family-centered prevention with the aim of predicting the risk of disease in relatives of individuals affected with inherited disorders.

Genetic epidemiology might be of great importance in ► public health surveillance, especially in fields of surveillance on teratogens, mutagens and carcinogens. In many developed countries, population-based surveillance systems for birth defects, including structural defects and chromosomal abnormalities, have been established with the aim of providing baseline information for prevention and research.

Cross-References

► Adoption Studies
► Association Studies
► Linkage Analysis
► Linkage Disequilibrium
► Public Health Surveillance
► Recurrence Risk
► Segregation Analysis
► Twin Studies

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Epidemiology, Prevention

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Definition

Prevention is defined as "actions aimed at eradicating, eliminating or minimizing the impact of disease and disability. The concept of prevention is best defined in the context of levels, traditionally called primary, secondary and tertiary prevention" (Last 2001).

Basic Characteristics

The goals of medicine are to promote health (► health promotion), to preserve health, to restore health when it is impaired and to minimize suffering and distress. The primary role of clinical medicine is to treat people who are sick. In population health we would prefer that people did not become ill. Epidemiology can play a central role in prevention by identifying ► causes of disease. In particular it provides quantitative measures of ► relative risk and ► absolute risk that help directly preventive action, and it plays a major role in evaluating whether preventive programs actually work in practice (Webb 2005).

Levels of Prevention

In discussing prevention it is helpful to distinguish levels of prevention customarily called *primary*, *secondary* and *tertiary* and later added *primordial* prevention. Between these levels there are no precise boundaries (Last 2001). All levels of prevention are important and complementary, although primordial and primary prevention most contribute to the health of the whole population.

Primordial Prevention

The aim of *primordial prevention* is to avoid the emergence and establishment of the social, economic and cultural patterns of living that are known to contribute to an elevated risk of disease. The target for primordial prevention is whole population (► target population) or selected groups. This level of prevention have been recognized the most recent as a result of increasing knowledge about the epidemiology of cardiovascular diseases. It is also needed in respect of the global effects of air pollution (the greenhouse effect, ozone-layer depletion) and health effects of urban smog (lung diseases). Effective primordial prevention often requires strong government regulatory action. The countries need to avoid the spread of unhealthy lifestyles before they become ingrained in society. The importance of primordial prevention, regrettably, has often been realized too late (Beaglehole and Bonita 1997).

Primary Prevention

The aim of *primary prevention* is to limit the incidence of disease by controlling causes and risk factors. Target for primary prevention may be the whole population, selected groups or healthy individuals. Primary prevention involves two strategies that are often complementary. It can focus on the whole population with the aim of reducing average risk (the population strategy), or on people at high risk as a result of particular exposures (individual strategy).

Population based approaches can be considered public health approaches, whereas high-risk approaches often require clinical action. In most situations, a combination of both approaches is needed (Gordis 2004).

The major advantage of the population strategy is that does not require identification of the high-risk groups, and main disadvantage is that it offers little benefit to individuals because their absolute risks of disease are quite low. For example, most people wear a car seatbelt while driving without being involved in a crash, while the widespread wearing of seat-belts has produced benefits to many societies. This phenomenon has been called the ► prevention paradox (Rose 1985).

Good examples of primary prevention are ► vaccination against infectious disease in children, use of condoms in the prevention of HIV infection, needle exchange system for intravenous drug users to prevent hepatitis B and HIV infection, and so on.

Secondary Prevention

Secondary prevention aims to cure patients and reduce the more serious consequences of disease through early diagnosis and treatment. It is directed at the period between onset of disease and the time of diagnosis, and aims to decrease the prevalence of disease. The two main requirements for a useful secondary prevention are a safe and accurate method of detection of the disease, preferably at a preclinical stage (► screening), and effective methods (► effectiveness) of intervention. Cervical cancer provides an example of the importance of secondary prevention and also illustrates the difficulties of assessing the value of prevention programs, because the mortality rates for cervical cancer were already decreasing before organized screening programs started. Many studies supported the values of such screening programs, and they are now widely applied in many countries. The example of secondary prevention that is widely used is blood pressure measurements and treatment of hypertension in middle-aged and elderly people (Beglehole and Bonita 1997).

Tertiary Prevention

Tertiary prevention is aimed at reducing the progress or complications of established disease and is an important aspect of therapeutic and rehabilitation medicine. It consists of measures intended to reduce impairments and disabilities. The rehabilitation of patients with strokes, injuries, blindness and so on is of great importance in enabling them to take part in daily social life (Beaglehole and Bonita 1997).

The importance of each level of prevention is inversely related to their range. From the public health point of view the greatest importance has been given to population approaches in primordial and primary prevention.

Choosing the Prevention Strategy

While the principle goal of ► public health should be primary prevention, for many diseases we do not have enough information to perform such program effectively. Even when we do have enough information, the barriers to implementation may be substantial (e. g. financial, cultural, ethical). For example, we know that ensuring everyone has access to clean water would prevent a large proportion of infectious diseases, but the practical and financial implications are enormous. Sim-

ilarly, by persuading people to stop smoking, stay out of the sun, exercise more and eat better we could prevent much chronic diseases, but changing behavior remains a major challenge.

The continuously changing patterns of mortality and morbidity over time indicate that great number of diseases are preventable. Epidemiology, by identifying causes of diseases, play central role in prevention. In addition to epidemiologists, in prevention are involved other medical doctors as well as sanitary engineers, chemists, sociologists, psychologists, economists and others.

The need for prevention is gaining acceptance in all countries as the limitations of modern medicine in curing disease become apparent and the costs of medical care escalate.

Cross-References

- ► Absolute Risk
- ► Causation
- ► Effectiveness
- ► Health Promotion
- ► Prevention Paradox
- ► Public Health
- ► Relative Risk
- ► Screening
- ► Target Population
- ► Vaccination

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Epiglottitis

Synonyms

Supraglottitis; Inflammation of the epiglottis

Definition

Epiglottitis, which is caused by the bacterium *Haemophilus influenzae* type B (Hib), usually occurs in children at the age of 2–6 years. It is a disease with a dramatic course and a potentially lethal outcome. There is severe swelling of the epiglottis and the entrance of the larnyx; typical symptoms are: extreme deterioration, fever, sore throat, signs of respiratory distress, muffling or changes in the voice, difficulties in speaking and swallowing and salivation. An airway occlusion can lead to suffocation. The quick administration of antibiotic therapy (cephalosporines) is essential. Intensive care measures, like intubation or even an incision in the windpipe (tracheotomy) with subsequent mechanical ventilation, may be necessary. Luckily, since the introduction of the active Hib-vaccination (► immunization, active), the incidence of epiglottitis has declined rapidly.

Episodic Paroxysmal Anxiety

► Panic Disorder

Equality

Synonyms

Principle of equal treatment

Definition

Equality implies that all persons are equal to one another; they have the same rights and should have the same opportunities. It is the principle by which all persons or things under consideration are treated in the same way.

Equilibrium of Body Fluids and Electrolytes

► Body Fluid and Electrolyte Balance

Equity

Synonyms

Principle of fair treatment

Definition

Equity is defined as follows:

Equity means fairness. Equity in health means that people's needs guide the distribution of opportunities for well-being. The WHO global strategy of achieving "Health for All" is fundamentally directed towards achieving greater equity in health between and within populations, and between countries. This implies that all people have an equal opportunity to develop and maintain their health, through fair and just access to resources for health. Equity in health is not the same as equality in health status. Inequalities in health status between individuals and populations are inevitable consequences of genetic differences, of different social and economic conditions, or a result of personal lifestyle choices. Inequities occur as a consequence of differences in opportunity which result, for example in unequal access to health services, to nutritious food, adequate housing and so on. In such cases, inequalities in health status arise as a consequence of inequities in opportunities in life.

Equity in the Distribution of Environmental Hazards and Resources

► Environmental Justice

Equivalent Continuous Noise Level

Synonyms

Equivalent sound level; Equivalent sound pressure level

Definition

Equivalent continuous noise level (L_{eq}) is the continuous steady ► noise level that would have the same total acoustic energy as real fluctuating noise over the same interval of time. The mathematical definition of L_{eq} for an interval defined as occupying the period between two points in time, t_1 and t_2, is:

$$L_{eq} = 10 \log \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p^2(t)}{p_0^2} \, dt \right]$$

In this definition, $p(t)$ is the time-varying sound pressure, and p_o is a reference pressure, taken as 20 μPa. L_{eq} has been adopted by the International Standard Organization for the measurement of community noise and assessment of hearing damage risk.

Equivalent Sound Level

► Equivalent Continuous Noise Level

Equivalent Sound Pressure Level

► Equivalent Continuous Noise Level

e-Receipt

Definition

A great change occurred with the emergence of paperless receipts when the Electronic Communications Act was published in Great Britain in 2000. Many European countries have since developed and locally tested electronic receipts or e-receipts. The proposed model of implementation is as follows: the physician should order a drug by entering specific data into the patient's record on the server, and the patient provides the pharmacist with a specific code that grants authorized access to the receipt on the server.

Ergonomics

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Synonyms

Human factors; Human factors engineering; Human engineering

Definition

Ergonomics or "human factors" is a multidisciplinary, applied science that relates to the interaction, physical and behavioral, between the people and their work system, tool, task and environment. "Human factors" is a term used mainly in the United States. Variants include "human factors engineering", an extension of

an earlier phrase, and "human engineering". In Europe, Japan and the rest of the world, the term "ergonomics" is more prevalent. "► Human factors" is an umbrella term for several areas of research that include human performance, technology, design, and human-computer interaction. It is a field that deals with human abilities and characteristics which affect the design of equipment, systems, and jobs. Whereas ergonomics tends to focus on the anthropometrics and biomechanics for optimal human-machine interaction, human factors is more focused on the cognitive and perceptual factors.

Basic Characteristics

Overview

The limits of ergonomics itself are not entirely agreed. It crosses the boundaries of several scientific and professional disciplines and utilizes data, findings, and principles from all of them. Ergonomics draws on many disciplines in its study of humans and their environment, including anthropometry, biomechanics, kinesiology, work physiology, environmental medicine and psychology, as well as parts of engineering, industrial design, and operations research.

The terms ergonomics and human factors engineering are often used interchangeably. Initially ergonomics was more physiology and health and comfort oriented, while human factors engineering was more oriented to physical sciences. The focus of the study is the human interacting with the engineered environment. Human-factors engineers regard humans as an element in systems. A "► man-machine system" is the usual way of representing that relationship. A "man-machine system" means that the man and his machine have a reciprocal relationship with each other. A man is effectively a single channel device, although one that time shares. No matter how important it may be to match an individual ► operator to a machine, some of the most challenging and complex human problems arise in the design of large man-machine systems and in the integration of human operators into these systems. Examples of such large systems are modern airplanes, control rooms in industrial plants, air-traffic control rooms and artificial life support systems in space or in a nuclear submarine. With the adoption of a systems point of view, the scope of ergonomics has passed beyond the concern of individual worker and his machine or workplace to include consideration of the total work environment.

Ergonomists adapt the design of products and workplaces to human's sizes and shapes and their physical strengths and limitations. Ergonomists also consider the speed with which humans react and how they process information, and their capacities for dealing with psycho-physiological factors, such as stress and mental load. Knowing the complete picture of how humans interact with their environment, ergonomists develop the best possible design for products and systems. Ergonomists view human operators and the objects they use as one unit, and ergonomic design blends the best abilities of people and machines. An ergonomically sound system provides optimum performance because it takes advantage of the strengths and weaknesses of both its human and machine components. This has always been done intuitively by good designers, but systems ergonomics aims to ensure that this is done systematically. This involves a body of knowledge and techniques that are new and are not derived from the other sciences. The ergonomists work in teams which may involve a variety of other professions: design engineers, computer specialists, occupational health physicians, psychologists, health and safety practitioners, and specialists in human resources.

In the US human factors engineering was emphasized by the US military with concentration on human engineering and engineering psychology. The focus was on enhancing performance and reducing errors. Areas of interest for human factors specialists may include the following: workload, fatigue, situational awareness, user interface, learning and skill ability, training, vigilance, memory, human performance, information processing capacity, human reliability and errors, human-computer interaction, control and display design, stress, visualization of data, individual differences, aging, accessibility, safety, shift work, organization and work design, work in extreme environments including virtual environments, and decision making.

The term human factors engineering is used to designate equally a science, a technology, and a profession. As an intermediate science, among engineering, medicine and psychology, human-factors engineering is a collection of data and principles about human characteristics, capabilities, and limitations in relation to machines, jobs, and environments. As a technology, it refers to the design of machines, machine systems, work methods, and environments to take into account the safety, comfort, and productiveness of human users

and operators. As a profession, human-factors engineering includes a range of scientists and engineers from several disciplines that are concerned with individuals and small groups at work. In practice, human factors engineering is a problem solving process.

Domains

The International Ergonomic s Association (IEA) divides ergonomics broadly into three domains:
Physical ergonomics deals with the human body's responses to physical and physiological loads. Relevant topics include manual materials handling, workstation layout, job demands, and risk factors such as repetitive motions, force and awkward/static postures related with musculoskeletal disorders.
Cognitive ergonomics, also known as engineering psychology, concerns mental processes such as perception, attention, cognition, and memory storage and retrieval as they affect interactions among humans and other elements of a system. Relevant topics include mental workload, vigilance, decision making, skilled performance, human error, human-computer interaction, and training.
Organizational ergonomics is concerned with the optimization of socio-technical systems, including their organizational structures, policies, and processes. Relevant topics include shift work, scheduling, job design and restructuring, job satisfaction, motivational theory, supervision, and teamwork.

History

Although the terms "human factors" and "ergonomics" have only been widely known in recent times, the field's origin is in the design and use of aircrafts during World War II to improve aviation safety. World War II marked the advent of highly sophisticated machines and weapons, creating previously unseen cognitive demands on operators in terms of decision-making, attention, situational awareness and hand-eye coordination. The modern discipline of ergonomics was born in the United Kingdom on July 12, 1949, at an interdisciplinary meeting of the British Admiralty where the term ergonomics was officially proposed by Prof. Hugh Murrell. The term ergonomics came into use about 1950 when priorities of developing industry were taking over from the priorities of military. In United Kingdom, Ergonomics Society was formed in 1952, while in United States the Human Factors Society was founded in 1957, and renamed in 1992 as Human Factors and Ergonomics Society (HFES). Today, the ▶ International Ergonomics Association (IEA) is a federation of forty-two individual ergonomics organizations from around the world.

Application Examples

Ergonomists work to eliminate repetitive strain injuries, carpal tunnel syndrome and low back pain by designing workplaces without continuous repetitions of the same motions, like screwing or twisting items on an assembly line and without awkward postures, like banding or reaching. They design adjustable workbenches, desks, and chairs to comfortably accommodate workers of many different sizes. Ergonomically designed chairs distribute a person's body weight evenly to avoid back and neck strain. In recent years ergonomics have been associated more and more with computer products, such as ergonomic mice and keyboards. Specially curved computer keyboards enable typists to hold their wrists in a position that is less likely to cause a carpal tunnel syndrome. Human factors issues are also considered in a design of consumer products. Examples include cellular phones and other handheld devices. Some ergonomists practice in the area of job design, while cognitive ergonomists specialize in information design – the best way to present complex information. Ergonomists also design training simulations. Training for pilots and astronauts may include simulations developed by ergonomists. Quality of life for older and disabled people may also be enhanced by the ergonomic improvements in the built environment. Many ergonomists investigate the way control panel operators interpret information, their reaction speed, and how both of these factors are influenced by the stress of an emergency. Warning signals must be easy to interpret and control devices must be easy to use particularly in aircrafts, air traffic control rooms, and nuclear power plants, where quick accurate reactions are imperative to public safety. Number of accidents occurred due to disregarding of ergonomic design principles. A poorly designed control panel and human errors made during the night shift were factors during the near meltdown of the nuclear generating station at Three Mile Island, Pennsylvania, in 1979. Poorly designed aircraft cockpit was a factor in a crash of a China Airlines Air-

bus A300–600R during landing at Nagoya airport in 1994. The Presidential Commission on the space shuttle Challenger disaster determined that human error and poor judgment related to sleep loss and fatigue during early morning shift contributed to that incident (Scott 1994). The nuclear disaster in Chernobyl is attributable to plant designers not paying enough attention to human factors (Munipov 1998). The complexity of the reactor and the control panel outstripped the operator's ability to understand what is going on.

Cross-References

- ► Biotechnology
- ► Human Factors
- ► International Ergonomics Association
- ► Man-Machine System
- ► Operator

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Error

Definition

Error could be considered as a false or mistaken result obtained in a study. Error can be either random or systematic. Random error is a part of variation in a measurement that has no apparent connection to any other measurement or variable, generally regarded as due to chance. Random error is often leading to lack of precision in the measurement of an association. Systematic error, often has a recognizable source, e. g., a faulty measuring instrument. It leads to results consistently wrong in a particular direction, and differ from the truth in a systematic way.

Error in Measurement

Synonyms

Measurement error

Definition

In all measurements some degree of uncertainty is present, and it can be expressed as error in measurement. Error is the difference between the measured value and the true value. The errors that occur in the measurement process are inherent, and can be reduced only by more adequate measuring. The errors can be classified into two categories: systematic and random errors (see essay Measurement). The measurement can be more adequate by identifying and minimizing error. Measurement adequacy subsumes various concepts such as ► accuracy, ► agreement, ► precision, ► reliability, validity.

Erythema infectiosum

Synonyms

Parvovirus B 19 infection; Fifth disease; Slapped cheek syndrome

Definition

Erythema infectiosum is caused by parvovirus B19, which was detected in 1974. The name "fifth deasease" stems from the 17th century practice of listing the rash-illnesses of childhood; erythema infectiosum was the fifth disease listed. Often the infection is either asymptomatic or presents with flu-like symptoms. The incubation period lasts 4–14 days. Contagion is highest between the first 4–10 days, that means even before symptoms develope. The typical rash is only seen in 15–20%; it starts in the face with bright red cheeks and then spreads over the upper arms, shoulders, thighs and buttocks. With the spots confluating and becoming pale in the center they look like a garland. Possible complications are joint pain and arthritis. As the viruses affect the red blood cells and their precursors in the bone marrow, anemia can result. A primary infection in pregnancy might be transmitted to the unborn child leading to an intrauterine infection of the baby (► congenital erythema infectiosum).

Erythema subitum

Synonyms

Exanthem subitum (ES); Roseola infantum; Infection with human herpesvirus 6; Pseudorubella

Definition

Exanthem subitum, which is spread by droplets, is caused by human herpesvirus 6 (HHV 6). It is most common in children between six months and three years of age. In most cases the disease takes a harmless course. It is followed by a lifelong immunity. After an incubation period of 5–15 days roseola infantum starts with high fever. The fever lasts for three days and then suddenly decreases. When body temperature returns to normal, a macular exanthem appears on the trunk, which spreads to the arms and legs. Usually, there is no rash on the face. In general, no therapy is necessary except for antipyretic measures.

Eskimo (United States)

► Indigenous Health, North America

Espundia

► Leishmaniasis, Mucocutaneous

Essential Public Health Services

Definition

Essential public health services are health services identified in "Public Health in America" that define the practice of public health. Ten services are listed: monitoring health status; diagnosing and investigating health problems; informing, educating, and empowering people; mobilizing community partnerships; developing policies and plans; enforcing laws and regulations; linking people to needed services; assuring a competent workforce; conducting evaluations; and conducting research.

Establishment of the Menses

► Menarche

Estimate of a Population Related Gender of Disease

► Disability Adjusted Life Years (DALYs)

Estimation

Definition

Estimation is concerned with inference about the numerical value of unknown population values from incomplete data such as a sample. If a single figure is calculated for each unknown parameter, the process is called point estimation. If an interval is calculated within which the parameter is likely, in some sense, to lie, the process is called interval estimation.

Cross-References

► Evaluation, Models

Ethical Absolutists

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Ethical absolutists are those who do not see the point of an ethics discussion because they already know the right answer and do not wish to defend their values by giving reasons or to make themselves open to other views; usually their values are strongly based in a religious perspective.

Ethical Framework for Public Health Genetics

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Definition

Public health genetics involves the application of genetics, genomics, and biotechnology to improve public health and to prevent disease. Genetics involves the analysis of DNA (► deoxyribonucleic acid), RNA, ► chromosomes, proteins and certain metabolites in order to understand heritable disease related ► genotypes, ► mutations, ► phenotypes, or karyotypes. Genomics studies the relationship between genetic factors and the environment, broadly defined to include all exogenous factors – chemical, physical, or social. Ethics involves the systematic analysis of moral principles, ideals, values, and standards of right and wrong, benefit and harm in human conduct and social policy.

Basic Characteristics

Until recently, medical genetics involved the study and treatment of rare disorders and the public health component of genetics was limited to newborn screening programs for the early detection and treatment of a small number of conditions such as phenylketonuria (PKU), Tay-Sachs, sickle cell anemia, and the thalassemias. Public health practice also extended into the area of health service delivery involving individual ► genetic testing and ► genetic counseling, although those areas have tended to be seen more as clinical practices rather than public health services. Both public health practice and the contemporary field of medical genetics inherently involve ethical questions, controversies, and issues. The intersection of public health and genetics is a domain that is particularly complex from an ethical perspective because potential conflicts between the rights and interests of individuals and the health and interests of society frequently arise.

A New Era of Public Health Genetics

In the 1990s The Human Genome Project and related genetic research moved the relevance of genetics for both clinical medicine and public health to a new level. It is now possible to identify genes (specific sequences of base pairs comprising the huge DNA molecule found curled in the nucleus of each cell of the body) associated with biochemical abnormalities that are in turn linked to symptomatic disease, dysfunction, and perhaps tendencies toward certain forms of behavior (Kitcher 1996).

The mapping and sequencing of the human genome (completed in 1994) has already begun to transform medical practice, and it promises both a better understanding of human biology and greatly increased insight into the causes and potential prevention and treatment of many very prevalent types of human disease. Effective ► gene therapy still lies years in the future. But the development of a vast array of new genetic tests, and less expensive testing methods, appears to offer a precise, objective approach to identifying who has or is at risk for certain diseases, thereby permitting earlier and better-targeted interventions, and hence may greatly enhance the knowledge base of public health beyond the level of epidemiological studies based on phenotype and the presence of symptomatic disease alone (Beskow et al. 2003). Genetic information may make it possible to develop more effective therapies or pharmaceuticals (► pharmacogenomics) for individuals or groups, including those socially defined as distinct racial groups. Data bases historically maintained by public health agencies may be important tools in new and advancing research in this field, and policies concerning the degree of public health involvement and cooperation in such research will have to be developed.

Unfortunately, this new knowledge and technology also threaten to create new forms of discrimination and domination (Duster 1990; Nelkin and Tancredi 1994). There are three principal reasons why the field of public health must exercise ethical caution as it adapts to and embraces the new knowledge base and technologies of genetics and genomics. First, the field of public health has been traditionally more oriented toward the values of population benefit and societal interests than it has to the rights and interests of individuals. Second, the history of public health involvement with matters of genetic and hereditary disease (► eugenics) is not a proud or ethically exemplary one (Kevles 1995). Third, the current state of public understanding of the significance of genetics is poor and due to misunderstanding about purported genetic determinism the danger exists of serious social stigma and discrimination against particular individuals or groups. On the other side of this coin is the potential for suspicion and loss of trust in public health authorities by such groups if public health is perceived as an instrument of such discrimination.

Individual Rights and the Public Interest

Public health and public health genetics are primarily concerned with population level knowledge and health. However, genetic information is inherently particular, unique and individuating. It is a mark of individual risk, potential, and even identity. It implicates the most intimate kinds of family and reproductive relationships and decisions. It has an impact not only on social stigma, but also personal self-esteem. In the areas of both surveillance and intervention, public health measures that are important on a population level may adversely affect the ► privacy and ► autonomy of individuals. And, in the case of the relationship between race and genetics, it may also adversely affect the self-perception and definition of communities.

For these reasons, public health genetics must resist the tendency to resort to legal "police powers" and coercive compliance measures in the areas of genetic screening, testing, and in the use of collected information. Public health should rely instead whenever possible on voluntary programs incorporating the requirement of individual ► informed consent and assuring the provision of adequate genetic counseling services. In the collection of genetic information personal identifiers should be carefully protected and confidentially (► confidentiality) maintained. Public health genetics poses very difficult balancing between the health of the society as a whole and the rights and protections of individuals and sub-groups within society.

The Ethical Legacy of Eugenics

Social science research has demonstrated that scientific knowledge is shaped by the worldviews and ethical values of the group(s) claiming that knowledge. Thus one can expect that the information that genetics appears to bring to medicine will reflect the cultural, religious, and historical perspectives and assumptions of those who apply this information in medical research, prevention, and treatment of disease. Because both health care practitioners and the lay public will view the findings of genetics through their pre-existing intellectual and experiential frameworks of health and illness, it is important to understand the prevailing views of medicine and disease in our society and the ethical tensions that they already embody.

Public health is not immune to social or racial prejudice (Paul 1995). It may mistake the individual who suffers from disease for a vector responsible for the spread of a disease. Its mission to rid society of disease, disability and other health burdens can be misconstrued as a mission of eliminating the genetic factors contributing to disease from the population (negative ► eugenics). It may also mistake its mission of promoting human health and welfare for the task of enhancing the traits and biological properties of individuals and populations (positive eugenics). Many of the methods and so-called public health programs of the past, such as forced sterilization and euthanasia, were crude and monstrous, almost unthinkable in today's climate. But this should not blind public health practitioners to the dangers of much more subtle methods and inducements (financial, social, and cultural) that might be associated with the goals of public health genetics in the future (Parens and Asch 2000). Here the safeguards of autonomy, freedom of choice, informed consent, and nondirective genetic counseling are important hallmarks of ethical public health programs. In addition, it is a public health responsibility to contribute to increasing the genetic literacy of the population and to increase the social acceptance and equal rights of those with various impairments and disabilities so that dangerous norms of "perfect functioning" or "perfect health" are offset by toleration and solidarity.

Partnership with Communities and Genetic Citizenship

The last consideration mentioned above underscores the importance of the role of public health agencies in working with local communities on educational and program efforts to incorporate the tools of genetics into accessible health programs without reproducing the prejudice and discrimination to which genetics is socially and culturally prone. Individuals confront public health genetics at two levels, as private consumers of genetic technologies and services and as public citizens concerned with just public health policy.

At the first level, the ethical practice of public health is concerned with providing equitable access to genetic services so that the new scientific and technological advances do not produce a multi-tiered system of genetic benefit for some and genetic disenfranchisement for others (Buchanan et al. 2000). Given the current distribution and internal incentives in the American system

of health insurance, this prospect of genetic inequality is very real.

Individuals are more than health care *consumers*; they are (and should be) health *citizens*. Public health should facilitate the involvement of community representatives and grassroots participants in the discussion, design, implementation, and evaluation of public health programs across the board, including those involving genetics.

Conclusion:
Guidelines for Public Health Genetics

Due to its particular ethical sensitivity and potential for injustice and the violation of individual rights, policies and programs in the area of public health genetics must be especially careful to adhere to ethical guidelines and benchmarks such as those developed by Childress, Faden, Garre, et al. (Childress 2002). Public health genetics programs must be:

- Effective (They must be reasonably likely to achieve appropriate goals.)
- Proportionate (The probable benefits of the program should outweigh it harms and risks.)
- Necessary (There must be no way to realize the goal without the program.)
- Flexible (The program should be the least restrictive option in terms of individuals rights, liberty and privacy.)
- Transparent (The program must be given a public, open justification.)

Cross-References

► Autonomy
► Chromosome
► Confidentiality
► Deoxyribonucleic Acid (DNA)
► Eugenics
► Gene Therapy
► Genetic Counseling
► Genetic Testing
► Genotype
► Informed Consent
► Mutation
► Pharmacogenomics
► Phenotype
► Privacy

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Ethical Imperialism

Definition

Ethical imperialism has been used to refer to the application of Western ethical standards, particularly in developing nations with different cultural norms.

Ethical Principles

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Synonyms

Ethical rules; Canons; Standards; Doctrine

Definition

Ethical principles are part of a normative theory that justifies or defends moral rules and/or moral judgments; they are not dependent on one's subjective viewpoints. Ethical principles in public health practice refer to those general judgments that serve as a basic justification for the many particular ethical prescriptions and evaluations of public health activities.

Basic Characteristics

Definitions of public health vary widely. However, the field of public health is concerned with health promotion (► health promotion, ethical aspects) and disease prevention (► prevention and health promotion) throughout society, with a broad interest in a more equitable distribution of social and economic resources because social status, race, and wealth are important influences on the health of populations. Public health ethical issues were minimal when an attitude of ► paternalism ruled public health measures and was widely accepted by society. From the second half of the 20th century the authority of medicine and the paternalistic approach of physicians and public health officials has been questioned due to certain factors:

- the discovery of new treatments and new technologies enormously increasing the chances of cure along with the risk of causing harm;
- patients' knowledge in general and on medical issues in particular growing out of proportion;
- the place of the individual gaining more ground in society, and government policies and laws evolving to protecting the individual, on the bases of ► autonomy and ► human rights issues.

Consequently, codes of conduct for studies and research in medicine have been updated to meet this new reality and have been given the more inclusive term of "► bioethics". Bioethics' strong point of reference is the patient-centered approach, giving clinicians clear guidelines for their interaction with patients, based on four fundamental principles: ► beneficence (doing good), ► non-maleficence (not doing harm), autonomy (respect for the person and its rights), and ► justice (distributing benefits, risks and costs fairly).

Those four principles have also strongly influenced public health decisions in recent decades, based on the argument that, while directed to the whole population, public health activities affect individuals. Though public health practice should not overlook the rights, interests, and freedom of the individual, can the ethical principles and values (► ethical values) applied in bioethics (which follow the individualistic orientation) be used as a point of reference for public health interventions which look at the well being of the entire population?

Let us take the principle of non-maleficence. If the point of reference is a single person, it is (somehow) easy to understand what harm might be done to that individual and, as a consequence, measures taken to avoid it. But, in the case of a policy which targets the whole population, it becomes much more difficult (if not impossible) to identify all the factors which might cause harm to all the individuals within that population; even if some factors can objectively be identified, it may not be feasible to take precautions at an individual level when an intervention has to be carried out at the population level. As a conclusion, in public health the principle of non-maleficence can be understood as doing the least harm possible to the least possible number of people.

If we take the principle of justice things get very complicated. Different approaches define in different ways the concept of justice, which goes from the equal distribution of resources to the equal distribution of benefits.

Let us consider the principle of autonomy. The essay "On Liberty", by the 19th century philosopher John Stuart Mill clearly describes the ► autonomy principle. He states: "The only purpose for which power can be rightfully exercised over any member of the civilized Community, against his will, is to prevent harm to others. His own good, either physical or moral, is not sufficient warrant ... In the part which merely concerns himself, his independence is, of right, absolute."

This approach has deeply influenced bioethics and it is one of the roots of conflict in public health ethics between the concepts of common good and individual freedom and liberty. An example of this conflict is the issue of ► informed consent, which is an absolute requirement in clinical practice.

It is clear then that the ethical principles postulated in bioethics cannot be applied in public health practice just as they are.

There are other principles recognized as important in public health practice:

- the principle of ► equality: all people are equal;
- the principle of ► utility: actions and the use of resources should do the greatest good for the greatest number, but no one should be left out;

- the principle of ► stewardship: stakeholders should exercise social responsibility and good use of common resources.

It is not always easy and straightforward to get all the stakeholders involved in public health to agree on solutions to ethical dilemmas associated with some interventions. However, there are some tools which can help find a way forward and protect against some abuses.

A very good tool in the hands of public health workers and stakeholders involved in public health is the "► *Code of ethics for public health*", formally adopted by the American Public Health Association in 2002. It is the first broadly accepted document of its kind. It lists 12 principles for the ethical practice of public health, 11 values and beliefs which inspire the principles, and some notes to better understand them. Codes of ethics are not designed to provide clear solutions to convoluted ethical issues; that process requires deliberation and debate over the many factors relevant to a particular issue. It does, however, provide a list of values and principles that should be considered in any dispute.

The 12 principles for public health listed in the code are the following:

1. *Public health should address principally the fundamental causes of disease and requirements for health, aiming to prevent adverse health outcomes.* This principle gives priority not only to prevention of disease or promotion of health, but also to identifying the fundamental causes of disease. It acknowledges that public health is concerned with immediate causes and curative activities. For example, the treatment of curable infections is important to the prevention of transmission of infection to others.
2. *Public health should achieve community health in a way that respects the rights of individuals in the community*. This principle identifies the common need in public health practice to weigh the concerns of both the individual and the community. There is no ethical principle that can provide a solution to this perennial tension in public health practice. We can highlight, however, that the interest of the community is the primary interest in public health practice. Still, there remains the need to pay attention to the rights of individuals when exercising the police powers of public health.
3. *Public health policies, programs, and priorities should be developed and evaluated through processes that ensure an opportunity for input from community members*. The input process can be direct or representative. In either case, it involves processes that work to establish a consensus. Input from the community should not end once a policy or program is implemented. There remains a need for the community to evaluate whether the institution is implementing the program as planned and whether it is having the intended effect. The ability of the public to provide this input is critical in the development and maintenance of public trust in the institution.
4. *Public health should advocate and work for the empowerment of disenfranchised community members, aiming to ensure that the basic resources and conditions necessary for health are accessible to all*. While a society cannot provide resources for health at a level enjoyed by the wealthy, it can ensure a decent minimum standard of resources. The code cannot prescribe action when it comes to ensuring the health of those who are marginalized because of illegal behavior. It can only underscore the principle of ensuring the resources necessary for health to all. Each institution must decide for itself what risks it will take to achieve that.
5. *Public health should seek the information needed to implement effective policies and programs that protect and promote health.*
6. *Public health institutions should provide communities with the information needed for decisions on policies or programs and should obtain the community's consent for their implementation.* This statement is also the community-level corollary of the individual-level ethical principle of informed consent. Particularly when a program has not been duly developed and evaluated, the community should be informed of the potential risks and benefits, and implementation of the program should be premised on the consent of the community (though this principle does not specify how that consent should be obtained).
7. *Public health institutions should act in a timely manner on the information they have within the resources and the mandate given to them by the public.* Ability of public health institutions to act is conditional on available resources and opportunities, and by competing needs. Moreover, the ability to respond to urgent situations depends on having

established a mandate to do so through the democratic processes of Ethical Principle number three.

8. *Public health programs and policies should incorporate a variety of approaches that anticipate and respect diverse values, beliefs, and cultures in the community*. Public health programs should have built into them a flexibility that anticipates diversity in those needs and perspectives that might have a significant impact on the effectiveness of the program. Types of diversity, such as culture (► ethics and culture) and gender, were intentionally not mentioned. Any list would be arbitrary and inadequate.
9. *Public health programs and policies should be implemented in a manner that most enhances the physical and social environment.* This principle stems from the assumption that there is an interdependence among people, and between people and their physical environment. It is similar to the ethical principle from medicine, "do no harm," but it is worded in a positive way.
10. *Public health institutions should protect the confidentiality of information that can bring harm to an individual or community if made public. Exceptions must be justified on the basis of the high likelihood of significant harm to the individual or others.* This statement begs the question of which information needs to be protected and what the criteria are for making the information public. The aim of this statement is modest: to state explicitly the responsibility inherent to the "possession" of information. It is the complement of Ethical Principles 6 and 7, about acting on and sharing information.
11. *Public health institutions should ensure the professional competence of their employees.* The criteria for professional competence would have to be specified by individual professions, such as epidemiology and health education.
12. *Public health institutions and their employees should engage in collaborations and affiliations in ways that build the public's trust and the institution's effectiveness.* This statement underscores the collaborative nature of public health practice while also stating in a positive way the need to avoid any conflicts of interest that would undermine the trust of the public or the effectiveness of a program.

The "Code of Ethics for Public Health" is a very good tool; however, it is just a starting point, since it will need to be updated as society and medicine evolve; moreover, the process of globalization implies that many cultures come together in the same community, making it difficult to have one code of ethics which can be applied to all.

Cross-References

- ► Autonomy
- ► Beneficence
- ► Bioethics
- ► Code of Ethics
- ► Equality
- ► Ethical Values
- ► Ethics and Culture
- ► Health Promotion, Ethical Aspects
- ► Human Rights
- ► Informed Consent
- ► Justice
- ► Non-Maleficience
- ► Paternalism
- ► Prevention and Health Promotion
- ► Stewardship
- ► Utility

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Ethical Relativists

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Ethical relativists think that there are no universal standards of right and wrong; what is right for one person, or society, is not necessarily right for another person or society. For them having a reasoned discussion about ethics is questionable, since dialogue, persuasion, and agreement about ethics and values are impossible.

Ethical Rules

► Ethical Principles

Ethical Standards

► Ethical Values

Ethical Subjectivists

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Ethical subjectivists believe that ethical values have no rational nor interpersonal basis; they are subjective and, therefore, will differ from one person to the next.

Ethical Values

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Synonyms

Ethical standards

Definition

Value is given to what we choose as worthwhile or believe to have merit, in a general or broad sense, and that conforms to what is ethically right. Values should be freely and thoughtfully chosen; people should prize and promote them in order to further the human good (or the good of all beings). In this present context we refer to those values that assist decision-making in public health activities.

Basic Characteristics

Ethical values, to some extent, apply in virtually any decision-making situation: in families no less than in bureaucratic or legal settings. Ethical values influencing personal choices and actions can find their justification in religious faith, in the individual's consciousness or rationality and, more generally speaking, in the individual's culture (► ethics and culture). It is apparent that some values (like tolerance, veracity, ► respect for persons, human well being, freedom, empathy, altruism, partnership, citizenship, community) are taken to be good or desirable in themselves and transcend culture. On the other hand, the cultural context of a specific value may create very different meanings and result in different practices.

Public health ethics may be defined as the principles (► ethical principles) and values that help guide actions designed to promote health and prevent injury and disease in the population. It may be difficult to find a single set of values that relates to all public health professionals, because in public health many issues merge and many stakeholders get involved.

Public health ethics embraces issues of ► autonomy and coercion, of common good and individual freedom, of ► human rights and ► social justice, of research norms (► ethics, aspects of public health research), of cultural and behavioral changes and of multi-cultural values and environmental issues on a global scale.

Stakeholders involved in public health can be politicians, lawyers, different government departments, public representatives, social groups, each of them having their own values, which may be even supported by different types of political and moral theory.

Those who believe in ► liberalism, for example, would stress human rights and individual opportunities and would protect the individual from some abuses which have taken place in the past in the name of the common

good; they would justify opposing drug law restrictions, limits on abortion, motorcyclist's helmet requirements, and so on.

Those who follow a utilitarian approach would look at the consequences of a decision, specifically at their effect on the sum total of individual well being, or at the greatest happiness of the greatest number of people. ► Utilitarianism, however, by looking at the well being of the greatest number can lead to unfairness and to approaches which can conflict with society's views on moral conduct or even justify, in the name of the future benefits to the population, immoral actions as in the case of the Nazi experiments on humans and of the ► Willowbrook State School scandal.

► Communitarians would stress social order and social connectedness where individuals are parts of a community. A basic question for communitarians is who decides what is good for that community. One view is that every community defines its own norms which should, then, be respected. Things become complex when we try to define "community", since at times the term refers to the majority within the group, leaving behind the interests of the minority. ► Universalist communitarians, by contrast, believe in a single true form of good society and its associated virtues. They believe that certain behaviors and cultural patterns, can be justified by their health consequences (e. g. not smoking in public) or be regarded as rights (e. g. female literacy), and should be promoted in all societies, regardless of local cultural norms, as good in themselves, as part of a superior form of social organization. ► Globalization is bringing about new challenges to universal communitarians since other countries may have ideas which conflict with theirs (coexistence, tolerance, mutual learning, openness, dialogue and respect for differences which should exist among individuals and societies, being sources of mutual enrichment).

► Ethical subjectivists believe that ethical values have no rational nor interpersonal basis; they are subjective and, therefore, will differ from one person to the next; ► ethical relativists, closely related to the subjectivists, think that there are no universal standards of right and wrong; what is right for one person, or society, is not necessarily right for another person or society. For both, subjectivists and relativists, having a reasoned discussion about ethics is questionable, since dialogue, persuasion, and agreement about ethics and values are impossible.

At the other extreme are the ► ethical absolutists, who also do not see the point of an ethics discussion because they already know the right answer and do not wish to defend their values by giving reasons or to make themselves open to other views; usually their values are strongly based in a religious perspective. Even here globalization is bringing new challenges.

Each of these approaches, as we have seen, has some positive aspects. Though none of them can be used as an absolute point of departure for public health ethics, nonetheless, all of them influence in different ways, the many people involved in decision-making in public health practice. It is, therefore, not always easy and straightforward to get all stakeholders involved in public health practice to agree on solutions for the ethical dilemmas associated with some interventions. However, there are some tools which can help in finding a way forward and in protecting against some abuses.

A very good tool in the hands of workers and stakeholders involved in public health is the "► *Code of Ethics* for Public Health" formally adopted by the American Public Health Association in 2002. It is the first broadly accepted document of its kind. It lists 12 principles for the ethical practice of public health, 11 values which inspire the principles, and some notes to better understand them. Codes of ethics are not designed to provide clear solutions to convoluted ethical issues; that process requires deliberation and debate about the many factors relevant to a particular issue. A code does, however, provide a list of values and principles that should be considered in the discussion.

A code of ethics for public health clarifies the distinctive elements of public health and the ethical principles that follow from or respond to those distinct aspects. It makes clear to populations and communities the ideals of the public health institutions that serve them. A code of ethics thus serves as a guide for public health institutions and practitioners and as a standard to which they can be held accountable.

The values and beliefs listed in the code are the following:

Health

1. *Humans have a right to the resources necessary for health*. The Public Health Code of Ethics affirms Article 25 of the Universal Declaration of Human Rights, which states in part "Everyone has the right to a standard of living adequate for the health and well-being of himself and his family . . . "

Community

2. *Humans are inherently social and interdependent*. Humans look to each other for companionship in friendships, families, and communities; and rely upon one another for safety and survival.
   Positive relationships among individuals and positive collaborations among institutions are signs of a healthy community. The rightful concern for the physical individuality of humans and one's right to make decisions for oneself must be balanced against the fact that each person's actions affect other people.
3. *The effectiveness of institutions depends heavily on the public's trust*. Factors that contribute to trust in an institution include the following actions on the part of the institution: communication; truth telling; transparency (i. e. not concealing information); accountability; reliability; and reciprocity. One critical form of reciprocity and communication is listening to as well as speaking with the community.
4. *Collaboration is a key element to public health*. The public health infrastructure of a society is composed of a wide variety of agencies and professional disciplines. To be effective, they must work together well. Moreover, new collaborations will be needed to rise to new public health challenges.
5. *People and their physical environment are interdependent*. People depend upon the resources of their natural and constructed environments for life itself. A damaged or unbalanced natural environment, and a constructed environment of poor design or in poor condition, will have an adverse effect on the health of people. Conversely, people can have a profound effect on their natural environment through consumption of resources and generation of waste.
6. *Each person in a community should have an opportunity to contribute to public discourse*. Contributions to discourse may occur through a direct or a representative system of government. In the process of developing and evaluating policy, it is important to discern whether all who would like to contribute to the discussion have an opportunity to do so, even though expressing a concern does not mean that it will necessarily be addressed in the final policy.
7. *Identifying and promoting the fundamental requirements for health in a community are of primary concern to public health*. The way in which a society is structured is reflected in the health of a community. The primary concern of public health is with these underlying structural aspects. While some important public health programs are curative in nature, the field as a whole must never lose sight of underlying causes and prevention. Because fundamental social structures affect many aspects of health, addressing the fundamental causes rather than more proximal causes is more truly preventive.

Bases for Action

8. *Knowledge is important and powerful.* We are to seek to improve our understanding of health and the means of protecting it through research and the accumulation of knowledge. Once obtained, there is a moral obligation in some instances to share what is known. For example, active and informed participation in policy-making processes requires access to relevant information. In other instances, such as information provided in confidence, there is an obligation to protect information.
9. *Science is the basis for much of our public health knowledge*. The scientific method provides a relatively objective means of identifying the factors necessary for health in a population, and for evaluating policies and programs to protect and promote health. The full range of scientific tools, including both quantitative and qualitative methods, and collaboration among the sciences is needed.
10. *People are responsible to act on the basis of what they know*. Knowledge is not morally neutral and often demands action. Moreover, information is not to be gathered for idle interest. Public health should seek to translate available information into timely action. Often, the action required is research to fill in the gaps of what we do not know.
11. *Action is not based on information alone*. In many instances, action is required in the absence of all the information one would like. In other instances, policies are demanded by the fundamental value and dignity of each human being, even if implementing them is not calculated to be optimally efficient or cost-beneficial. In both of these situations, values inform the application of information or the action in the absence of information.

The code of ethics for public health practice is a very good tool; however, it is just a starting point, since it will need to be updated as society and medicine evolve; moreover, the process of globalization implies that many cultures come together in the same community, making it difficult to have one code of ethics to be applied to all.

Cross-References

- ▶ Autonomy
- ▶ Code of Ethics
- ▶ Communitarians
- ▶ Ethical Absolutists
- ▶ Ethical Principles
- ▶ Ethical Relativists
- ▶ Ethical Subjectivists
- ▶ Ethics, Aspects of Public Health Research
- ▶ Ethics and Culture
- ▶ Globalization
- ▶ Human Rights
- ▶ Liberalism
- ▶ Respect for Persons
- ▶ Social Justice
- ▶ Universalist Communitarians
- ▶ Utilitarianism
- ▶ Willowbrook State School

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Ethics

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E

Introduction

The modern approach to public health practice in the Western world, having as a goal the health of populations through health promotion and disease prevention, is only a few centuries old; however, its roots go much further back into the history of mankind:

- in very olden days, religions set rules to regulate behavior that specifically related to health, from types of food eaten, or alcohol drunk to the conduct of sexual relationships;
- in China around 1000 BC immunity from smallpox could be gained by inhaling the dried crusts that formed around lesions of infected individuals; also children were protected by inoculating a scratch on their forearms with the pus from a lesion;
- the Romans installed water supply and waste disposal systems;
- in the medieval period the practice of quarantine helped mitigate the effects of some infectious diseases;
- during the 14th century Black Death in Europe, dead bodies were removed and some areas of cities burned in an attempt to prevent the spread of disease.

The nineteenth century saw a very important stage in the foundation of modern public health:

- in England, between 1849 and 1854, before *Vibrio cholerae* was identified as the causative agent of cholera, John Snow observed an association between the distribution of cholera cases and house water supply systems, thus initiating the science of epidemiology;
- the discoveries of Koch and Pasteur completely changed the approach to infectious diseases, posing new challenges and putting new tools into the hands of public health officers.

From there on, because of the socio-economic and technological changes which have occurred in the Western world, the whole concept of public health practice has rapidly evolved, provoking even more challenges and ethical dilemmas.

Public Health

The 20th century saw very fast changes taking place; socio-economic, political, technological, medical and ethical transformations influenced both mankind and the environment. Public health practice was impacted by this general innovation and has since become more and more comprehensive. The processes of industrialization and urbanization brought new threats to health from food adulteration and contamination, pollution, occupational hazards, and pharmaceuticals. In the constant endeavor of preventing diseases and promoting health, after contributing to the great achievements in fighting infectious diseases through immunization and drugs (at least in the Western world), public health practice began to pay more attention to conditions such as cancer, heart disease, disability, aging, obesity, and diabetes.

Nowadays, thanks also to the development of epidemiology and biostatistics, public health practice deals with patterns of disease, and aims at identifying their causes; it establishes collective and institutional interventions to alleviate the risk or burden of diseases within the population (establishment of environmental regulations, immunization programs, regulations on use of tobacco, occupational health and safety standards, etc.); it embraces various programs for primary prevention (preventing a healthy person acquiring a certain disease), for secondary prevention (screening for a disease before it becomes clinically evident) and for tertiary prevention (preventing complications and providing rehabilitation).

The idea of health promotion continues to evolve, broadening its scope from influencing individual behaviors and risk factors to consideration of population-level issues such as inequality among population groups, levels of poverty, living environment and education standards (known as "social determinants of health"), in an endeavor to fairly distribute health benefits and disease burdens throughout society. Looking at the concept of social justice has been a major step forward in the recent evolution of public health practice: social status, race and wealth have been proven to have important influences on the health of individuals; at the same time, the increased costs of health care have brought along disparities in its distribution and accessibility within a specific population. Moreover, looked at globally, it cannot be ignored that the developing world is still devastated by preventable infectious diseases, malnutrition and poverty.

The "new public health" takes into consideration these health inequalities calling for population-based policies that improve the health of the whole population in an equitable way.

The evolution is still ongoing, as shown by the diversity of "public health" definitions:

- The Institute of Medicine in 1988, in its report on "The Future of Public Health", proposed one of the most influential contemporary definitions: "Public health is what we, as a society, do collectively to assure the conditions for people to be healthy." This definition emphasized the mutually shared obligation we all, as society, have, and reinforced the responsibility that governments and communities should take for health.
- The Associations of Schools of Public Health (ASPH) states that public health is: "The science and art of protecting and improving the health of communities through education, promotion of healthy lifestyles, and research for disease and injury prevention. Public health helps improve the health and well being of people in local communities and across our nation. Public health helps people who are less fortunate to achieve a healthier lifestyle."
- From a population health perspective, health has been defined as "the capacity of people to adapt to, respond to, or control life's challenges and changes" (Frankish et al, 1996).
- The European Public Health Association (EUPHA) in its "10 Statements on the Future of Public Health in Europe" states: "The term new public health is coming up. New public health defines health as an investment factor for a good Community life. It focuses on the behaviour of individuals in their present environment and the conditions of life that influence behaviour. Apart from the classic preventing disease, public health work is about promoting physical and mental health of individuals. This includes influencing living habits and living conditions, but also promoting self-esteem, human dignity and respect."

Public Health Ethics

Ethics, in general, is derived from philosophy. Some authors make no distinction between ethics and morals,

they are seen as the beliefs and standards which define the concepts of good and bad, right and wrong in a society; others distinguish the two concepts, and refer morality to individual behavior and ethics to social rules; others define ethics as the systematic study of morality: ethics, in other words, is the theory and morality is the practice.

More specifically, public health ethics may be defined as the principles and values that help guide actions designed to promote health and prevent injury and disease in the population. As a subject, it can be subdivided into a field of study (also called metaethics) and a field of practice (also called normative ethics).

Public health ethics, as a field of study, seeks to understand and clarify principles and values which influence decision making in public health practice. Whereas, public health ethics, as a field of practice, applies principles and values to public health activities; it helps to deal with ethical dilemmas, in order to come up with the best possible solution for a specific case. Public health ethics is also concerned with the ethical dimensions of public health as a specific profession (professional ethics).

Public health ethical issues were minimal when the paternalistic approach to public health measures was accepted (paternalism is the attempt to impose limitations upon someone or to require actions by someone for his or her own good; such impositions usually are justified with children because it is assumed that they are incapable of deciding on their own behalf, and with those who, because of cognitive limitations, cannot choose on their own behalf). As from the second half of the 20th century the authority of medicine and the paternalistic approach of physicians and public health officials started to be questioned due to certain factors:

- the discovery of new treatments and new technologies has enormously increased the chances of cure along with the risk of causing harm;
- patients' knowledge in general and on medical issues in particular has grown out of all proportion;
- the place of the individual has gained more ground in society, as have government policies and laws which have developed towards protecting the individual, being informed by autonomy and human rights issues.

Medical ethics has proportionally increased its body of study and research, in an effort to update its code to the new reality, which now includes problems like medicine and palliative medicine (► palliative care and hospice). As a result, the more inclusive term for ► ethics in clinical medicine is "bioethics". Bioethics has found a strong point of reference in the patient-centered approach. As a result, clinicians have clear guidelines for their interaction with patients, based on four principles: beneficence (doing good), non-maleficence (not doing harm), autonomy (respect for personal rights and the individual), and justice (distributing benefits, risks and costs fairly).

Those four principles have also strongly influenced public health decisions in the last few decades, based on the argument that, while directed to the whole population, public health activities interact with individuals. Although public health practice should not overlook the rights, interests, and freedom of the individual, it has to look at the well being of the entire population; therefore the ► ethical principles and values (► ethical values) applied in bioethics, which follow the individualistic orientation, cannot be used as a point of reference when dealing with and entire population.

Let us take the principle of non-maleficence (not doing harm). If the point of reference is an individual, it can be (somehow) easy to identify a possible harm and, as a consequence, be easy to avoid that harm. However, if the case is of a necessary intervention targeted at a whole population, there may well be individuals likely to be harmed by the intervention who are difficult (if not impossible) to identify and the harm, therefore, cannot be avoided. As a conclusion, in public health practice the principle of non-maleficence can be understood as doing the least harm possible to the least possible number of people.

If we take the principle of justice (distributing benefits, risks and costs fairly) things are very complicated. Different approaches define in different ways the concept of justice, which goes from equal distribution of resources to equal distribution of benefits.

The essay "On Liberty", by the 19th century philosopher John Stuart Mill clearly describes the autonomy principle. He states: "The only purpose for which power can be rightfully exercised over any member of the civilized Community, against his will, is to prevent harm to others. His own good, either physical or moral, is not sufficient warrant. He cannot rightfully be compelled to do or forbear because it will be better for him to do so, because it will make him happier, because in the opin-

ion of others to do so would be wise or even right. These are good reasons for remonstrating with him or reasoning with him or persuading him or entreating him but not for compelling or visiting him with any evil in case he does otherwise ... In the part which merely concerns himself, his independence is, of right, absolute."

This approach has deeply influenced bioethics and is one of the roots of the conflict in public health ethics between common good and individual freedom and liberty.

It is clear that public health ethics should find its own answers to dilemmas linked to the population-based perspective.

Public Health Ethical Dilemmas

Ethical issues in public health often pose genuine ethical "dilemmas" and, because there are many stakeholders involved, many different approaches may be required.

Everybody agrees that public health interventions have as a goal the well being of the whole population. Some of those interventions have to be compulsory and universal in order to be effective; for example, standards for public amenities (such as air and water quality, food safety and waste disposal, road and building safety) and regulations to safeguard the environment and individuals from damage caused by hundreds of chemicals, have to be imposed. Nevertheless, they are easily accepted by the people and their imposition is not seen as violating demands for individual consent and autonomy, partly because they are supported by officially proclaimed rights (e. g. the United Nations Commission on Human Rights made in 2001 proclaimed that everyone has the right to live in a world free from toxic pollution and environmental degradation), partly because they do not act directly on the individual's freedom and lifestyle, and partly because individuals cannot judge those standards by themselves.

Things change when public health interventions act directly on the individual's freedom. In those cases there would always be someone who disagrees with a certain policy and therefore will feel coerced. In public health ethics, one core question is whether the individual should be subordinated to the common good or whether the autonomy-focused and antipaternalistic approach in bioethics should also serve as a point of reference for public health activities. This dilemma involves most of the programs in the main fields of public health: from prevention (► ethics, aspects for prevention) of diseases to infectious disease control (► ethics, aspects of infectious disease control), from health promotion (► health promotion, ethical aspects) to research (► ethics, aspects of public health research).

In the past, infectious disease control programs included screening for the disease, surveillance and name-based reporting, contact tracing, treatment monitoring, isolation (the separation of individuals known to be infectious) and quarantine (the restriction of the activities of healthy individuals who have been exposed to a communicable disease). During the 20th-century, screening for the presence of disease, and at times occult infection, was a central feature of public health practice. Often such screening was imposed, as in the case of screening couples for venereal disease prior to marriage, screening children for entry into public schools, screening newborns for specific genetic conditions, and screening for tuberculosis in schools and workplaces.

A very typical example of coercion in infectious disease control programs is the isolation and quarantine applied in the name of the common good. In those cases, though the rights of the individual are overruled, the intervention is accepted because the course of the disease and the timeframe of the treatment are known. Things become more complex when isolation and quarantine are applied as interventions in cases where knowledge about the evolution and treatment of an infectious disease is lacking. A case which posed very dramatic dilemmas from many points of view, including an ethical one, was the worldwide threat of severe acute respiratory syndrome (SARS); because of the "unknown", governments took steps towards protecting public health which did not consider individual freedom, by using isolation and quarantine as a tool for controlling the spread of the disease. Dealing with infected cases was mostly accepted, but many queries were raised when dealing with only suspected cases or suspected exposure: the number of people put into isolation escalated very rapidly. A balance was reached once there was more knowledge about the course of the disease.

A supportive element for coercion in the SARS kind of intervention is that although individuals had no direct responsibility in contracting the disease, they presented a public health danger. Moreover, the "harm princi-

ple", which states that one person's freedom should not result in another person's harm (see the already mentioned "On Liberty" by John Stuart Mill), was supporting those interventions from the ethical point of view.

Things were different, from the very beginning, in the case of HIV/AIDS epidemics because of two of its main characteristics:

1. it presented as a lethal disease, with a latent period of incubation, during which the partner, the community in general, and even the individual infected, are not aware of the risk;
2. from the start HIV/AIDS was related to individual behaviors linked to a very strong social stigma.

Very soon a very dramatic ethical dilemma exploded: following the traditional name-based case reporting would have allowed public health officials to single out infected individuals and to counsel them in order to prevent further transmission, and would have permitted the monitoring of the incidence and prevalence of the infection; however, the antagonists of name-based reporting argued that social hostility and HIV-related hysteria could lead to changes in policy that would permit breaches in confidentiality with serious consequences for those appearing in the reports, in terms of losing their jobs, their housing and perhaps their liberty. How, then, to protect the individual freedom and privacy, and at the same time the partner or other community members from getting infected?

The already strong gay men organizations influenced the decision of public health policy makers on management of HIV/AIDS epidemics by framing the whole issue into the human rights perspective. From a public health perspective, then, the HIV/AIDS concern became a socio-political-moral-health issue. For the first time a new "exceptionalist" approach to an infectious disease epidemic was promoted, which rejected coercive measures that might "drive the epidemic underground" and focused on mass health education for behavioral changes, voluntary testing and counseling, following the principle that no public health policy which violated the rights of individuals could be effective in controlling the spread of HIV.

To this point we have focused on public health interventions designed to discover or monitor infectious diseases and prevent the spread of such conditions.

The "harm principle" has been the ethical point of reference also for other programs aiming at preventing some contagious diseases, as in the cases of compulsory vaccination. A child is vaccinated in order to avoid becoming infected and therefore infecting others not yet immunized. Vaccination for children for some infectious diseases is compulsory in many countries, bringing about a significant reduction in their incidence. In some states, however, exceptions are accepted for religious or philosophical reasons, which, true, involves a very small number of children, but, they pose the ethical question of whether parents have a right to place at risk, because of their beliefs, their children by failing to immunize them and therefore, place at risk those others who could be infected by them. With the falling-off of some of these infectious diseases, the problem of vaccine side effects comes to the fore: when many children are dying from a given disease a few cases of side effects is easy to accept but once there are few cases of the disease, side effects become more striking; as a result, parents are encouraged to refuse their children's immunization because of fear of harming their children. The ethical dilemma in these cases is sharpened by what is called "herd immunity": immunization involves both a direct benefit to the individual child as well as to those in the community who remain unimmunized and benefit from the immunization of the vast majority. An ethical principle which can help here is the one of justice, as fair distribution of risks and benefits.

Some countries are trying to replace compulsory vaccination for some diseases, which are now very rare, with an effective health education of parents; the conviction is that by showing them all risks (which are anyhow less and less) and all benefits of vaccination, the number of parents vaccinating their children would not drop.

Traditionally, the "harm principle" mentioned before, has been also used by governments in the field of health promotion to impose restrictions on individual autonomy and freedom; the paternalistic approach, which often inspired those activities, was considered universally accepted when the harm was obvious. Divergences arise when the harm to others which is to be prevented is not clear, or when health promotion activities interfere with individual privacy and freedom in the name of the common good. Some examples are taxes on cigarettes and alcohol, laws on motorcyclists' helmets, or even campaigns on lifestyle changes. After evidence of the health hazard of cigarette smoking was given, government interventions, like high taxes on cigarettes, were more accepted, both on the lines of protecting the

non smokers and discouraging adolescents from starting smoking; restrictions on smoking in public places was also accepted, knowing that harm occurs to passive smokers. Concerning regulations on motorcyclists' helmets one could say, quoting Mr Mills, that "over himself, over its own body and mind, the individual is sovereign"; however, "harm" can also be defined as the financial burden on society due to accidents and diseases which could have been avoided, and this justifies the application of the "harm principle" even in this case. After all, in a highly integrated society what action does anyone take that does not ultimately have an impact on society?

The issue of lifestyle changes takes us a step further. To what extent can the state regulate, restrict or prohibit behaviors that lead to premature morbidity and mortality? According to Mr Mills, "He cannot rightfully be compelled to do or forbear because it will be better for him to do so, because it will make him happier, because in the opinion of others to do so would be wise or even right." What role, if any, should government then play in urging citizens to give up their pleasurable butdamaging habits? Many people believe that a government should rarely exercise coercive powers either because they are ineffective or because they overrule the individual's autonomy, privacy, or liberty. In past decades, individual responsibility over health has often been subsumed under individual rights or demands to be guaranteed by government and delivered by public and private institutions. The evidence of the negative consequences of some private habits and lifestyles, both on the public and on the individual's health, has added to the idea that there is an obligation to preserve one's health for the common good. How should society determine whether to intervene to protect the public's health and safety when doing so will diminish a personal or economic interest and will undermine individual freedom and personal responsibility? And how can the state be prevented from taking power to remove more and more choice in the name of better population health?

A very important role in this dilemma is played by health education. The debate, in these cases, is whether health education, which preserves individual autonomy and avoids coercion, is enough, and whether health promotion campaigns and advertising are appropriate. Anyway, from the public health official's point of view, there could be justification for some paternalistic health promotion interventions: we are morally bound to prevent avoidable suffering and death regardless of its social costs.

The whole concept of health promotion was broadened by the World Health Organization (the ► United Nations specialized agency for health) at its first international conference on health promotion held in Ottawa in 1986. The Ottawa charter states that "Health promotion is the process of enabling people to increase control over, and to improve, their health. Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy life-styles to well-being. The fundamental conditions and resources for health are peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice, and equity. Improvement in health requires a secure foundation in these basic prerequisites."

This new perspective has opened an on-going, challenging debate over its political and ethical implications.

An area of common interest for clinical medicine and public health is research: when research deals with humans it faces ethical concerns at the level of the personal behavior of the research team, and in the development, implementation, analysis, and dissemination of the study results. It is imperative, then, that researchers have to address issues like ► informed consent, individual right to privacy, to confidentiality, and to autonomy. The danger of breaching confidentiality increases in longitudinal studies, when data collection happens at different points in the life of the individual who, therefore, needs to be identified by the researcher. When identification is not essential for the research, then anonymous data are provided by changing the personal details of the participant with unidentified codes.

A much debated aspect of research, which requires extra precautions, is the involvement of vulnerable groups or individuals. By "vulnerable" we mean that they may be more than usually susceptible to exploitation in the process of research, either because they may be more likely to be pressured to participate, or to fail to understand the full implications of participation and may therefore be misled into participation. Types of vulnerability include: cognitive or communicative (e. g. mentally disabled persons, young children), institutional (e. g. imprisonment), deferential (i. e. cognitively able to consent but subject to the authority of someone else), medical (e. g. having a serious condition for which there is no satisfactory treatment), economic and social (e. g. members of undervalued social

groups). In these cases even the signed informed consent may not be meaningful. Some people believe that signing a consent form means that they are waiving their rights, including those to sue if something goes wrong, and that the primary purpose of a consent form is to protect doctors and hospitals from legal liability; in addition, the forms may be incomprehensible to them, it is therefore impossible to fully understand what they agree to. At times, to avoid these kinds of problems, vulnerable groups have been excluded from research, which protected them from the research-associated risks, but also meant that they were less likely to share in any benefits, both during the study and later when results were generalized to populations in which the interventions had not been studied. In addition, conditions more prevalent among, or disproportionately affecting, minority group members or women can simply go unstudied, and unintended harm may result from the failure to recognize specific group correlated factors.

To avoid the abuses of the past there are now some codes and guidelines which regulate research. Moreover, there are ► ethical committees to approve research protocols.

Different challenges are raised when research uses available health data in epidemiological studies. Acquisition and use of health data is a necessary condition for a government to organize, within the reasonable limits of its resources, its most cost-effective health services, and its activities in ways that best prevent illness and disability, and promote health among its population.

High quality data are needed to provide more effective clinical care, to assess the quality and cost effectiveness of health services, to monitor fraud and abuse, to track and evaluate access to health services and patterns of morbidity and mortality, to research the determinants, prevention, and treatment of diseases. Health ► data acquisition and protection are strictly interlinked, since the right to privacy and confidentiality has to be respected. Legal, ethical, and human rights principles support some levels of individual control over circumstances in which their identifiable health data are acquired, used, disclosed, or stored. One of the main methods used in public health for health data acquisition is surveillance. It implies reporting to health authorities not only notifiable diseases but also patients' names. It has been so with many infectious diseases, like sexually transmitted diseases and tuberculosis, in the effort to monitor, to plan and to intervene in such threats. Things changed with HIV/AIDS, mainly because, from the very beginning, a social stigma was attached to the condition. In the USA the debate on whether to disclose or not to disclose names lasted almost 20 years, until the Centres for Disease Control (CDC) in 1999 reluctantly accepted that there could be case reporting without using names. Data are also collected through registries, mainly hospital records, which can help to better understand specific conditions. In these cases, data acquisition is not strictly considered research. When those data are to be used for research purposes, the issue of confidentiality comes out very strongly, since, if disclosed, they carry the risk of bringing harm to the individual at different levels (psychological, employment, family, insurance, housing, and social).

In contrast to the obligation to keep some information confidential, researchers have also the responsibility of sharing results with the participants, because they helped contribute to the study, and with the community at large. Though research findings are typically presented as aggregated data that do not reveal the identities of the individual participants, nonetheless, they may also have some negative consequences on the community as a whole, which could be stigmatized if results are negative.

Data acquisition and protection come into conflict also when dealing with the field of genetics. At times, genetic interventions involve specific ethnic groups or individual conditions that may be the object of social stigmatization and therefore may bring harm to those involved. If a public health intervention based on genetic screening could bring some benefits to the individual and to the community, which would justify it, then the ethical question would be one of equitable access to services. As a consequence, in the case of public health genetics, all these three aspects should always be taken into consideration for any screening program: population benefit, individual interests and distributive justice. Additional ethical aspects have to be considered when research is done at an international level; then we also have to deal with issues raised by the local culture (► ethics and culture) (language, beliefs, social values, relationship between individual and community) and by religious attitudes (► ethics, religious aspects), all components which may vary considerably the meaning and the role of informed consent and autonomy, beneficence and non-maleficence, and of justice.

Different Approaches to Ethical Dilemmas in Public Health

Moral principles and values influencing personal choices and actions can find their justification in a personal religious faith or value system. This is not the case when we talk about ethics in public health practice, where many stakeholders are involved and many issues clash.

Politicians, lawyers, government departments, public representatives, social groups, etc. can all be stakeholders in public health and they can all have, at times, different ways of looking at things, different points of reference, and, therefore, different ethical perspectives. From a health economics point of view, for example, one may aim at attaining the best average level of health care services, while from a social justice point of view one may aim at achieving a situation in which there are the smallest feasible differences among individuals and groups.

Many issues have to be considered in public health ethics: issues of autonomy and coercion, of common good and individual freedom, of human rights and social justice, of research norms, of cultural and behavioral changes and of multi-cultural values and environmental issues on a global scale.

Moreover, in public health, several different types of political and moral theories overlap, converge, and contend with one another, including liberalism, utilitarianism and communitarianism, together eith widespread ethical subjectivism and relativism and ethical absolutism.

Liberalism stresses human rights and individual opportunities and protecting the individual from the abuses which have taken place in the past in the name of the common good. Human rights refer to a body of international law that originated in response to the egregious affronts to peace and human dignity committed during World War II. The main source of human rights law within the United Nations system is the International Bill of Human Rights comprising the United Nations Charter, the Universal Declaration of Human Rights, and two International Covenants of Human Rights. Human rights are also protected under regional systems, including those in American, Europe, and African countries. Human rights are often divided between those that protect civil and political rights on the one hand and economic, social, and cultural rights on the other, including the right to a standard of living adequate for the health and well being of the individual and of the family, including food, clothing, housing and medical care and necessary social services. (Considerable disagreement, however, exists as to whether "health" is a meaningful, identifiable, operational, and enforceable right, since this would suggests that states possess binding obligations to respect, defend, and promote that entitlement.)

Liberalism justifies opposing ► drug law restrictions, limits on abortion, motorcyclist's helmet requirements, and so on.

Utilitarianism looks at the consequences of a decision, specifically at the effect on the sum total of individual well being, or at the greatest happiness of the greatest number of people. However, dispute arises when trying to define well being, of which health, after all, is but one dimension. Subjective utilitarians assert that well being is best defined by each individual's personal experience, objective utilitarians want to centralize the assessment process and have a group of experts define an index that embodies the "rationally knowable" components of well being, and would rely on an expert-determined index of health status – like Quality-Adjusted Life Years (QALYs) or Disability-Adjusted Life Years (DALYs) – to measure the consequences of alternative decisions. The utilitarian approach is used by epidemiologists when studying risk factors, or by economists when conducting a cost-benefit analysis. It can be of some help when there are many factors or possibilities to be taken into consideration.

Utilitarianism, however, by looking at the well being of the greatest number, can lead to unfairness and to approaches which can conflict with society's views on moral conduct, or even justify, in the name of the future benefits to the population, immoral actions – as in the case of the Nazi experiments on humans and of the Willowbrook State School (a New York State institution for mentally defective children, all subjects from 1963 to 1966, were deliberately infected with the hepatitis virus; during the course of these studies, Willowbrook closed its doors to new inmates, claiming overcrowded conditions. However, the hepatitis program continued to admit new patients. Thus, in some cases, parents found that they were unable to admit their child to Willowbrook unless they agreed to his or her participation in the studies). History teaches us that often the happiness of the majority has been built at the expense

of the minority, or that, at times, the happiness of the most powerful group was achieved at the expense of the majority.

Communitarianism would stress social order and social connectedness where individuals are part of a community. It has a longer history than utilitarianism and liberalism. It goes back to a time when Greek philosophy guided thought in Europe and neo-Confucianism guided thought in Asia. A basic question for communitarians is who decides what is good for the community. One view is that every community defines its own norms which should, then, be respected. Things become complicated when we try to define "community", since at times the term refers solely to the majority group, ignoring the interests of any minority groups. Universalist communitarians, by contrast, believe in a single true form of good society and its associated virtues. They believe that certain behaviors and cultural patterns can be justified by their health consequences (e. g. not smoking in public) and that rights (e. g. female literacy) should be promoted in all societies, regardless of local cultural norms, because they are good in themselves, as part of a superior form of social organization. Globalization with the advent of new perspectives is bringing about new challenges to universal communitarians who now have to consider such things as coexistence, tolerance, mutual learning, openness, dialogue and respect of differences, which should exist among individuals and societies, being sources of mutual enrichment.

Ethical subjectivism considers that moral beliefs have no rational nor interpersonal bases; they are subjective and, therefore, will differ from one person to the next. Relativism, a closely related notion, states that there are no universal standards of right and wrong; what is right for one person, or society, is not necessarily right for another person or society. For both, subjectivists and relativists, having a reasoned discussion about ethics is questionable, since dialogue, persuasion, and agreement about ethics and values are impossible.

At the other extreme are the ethical absolutists, who also do not see the point of an ethics discussion because they already know the right answer and do not wish to defend their beliefs by giving reasons or making themselves open to other views; usually their beliefs are strongly based in a religious perspective. Even here globalization is bringing new challenges. However secure people may be in their own religious faiths and beliefs, or ethical perspectives, they still must live with others in a and pluralistic society where it is important to at least be open to other points of view and to communication with others.

Each of these approaches, as we have seen, has some positive aspects, though none of them can be used as an absolute point of departure for public health ethics.

Tools for Public Health Ethics

It is not always easy and straightforward to get all the stakeholders involved in public health to agree on solutions for the ethical dilemmas associated with some interventions. However, there are some tools which can be helpful in finding a way forward and in protecting against some abuses.

A very important tool is law. Though there is often debate on whether governments should intervene to protect the public's health and safety when doing so will diminish a personal freedom or economic interest, the fact remains that law is a primary means used by governments to bring about conditions for people to lead healthier and safer lives. Law creates goals for public health authorities, assigns their functions, and specifies the manner in which they may exercise their authority. Law is a tool in public health work which can influence the norms of healthy behavior, set and enforce health and safety standards in order to protect and promote the health, safety and general welfare of the population. Examples include: laws on the use of safety belts in cars and helmets for motorcyclists; smoking restrictions; licensing of people, institutions or businesses; inspection of institutions or businesses (checking for unsanitary conditions, impure products or unsafe environment); closing down a business, condemning a building, confiscating dangerous goods or fining for pollution.

In order to identify and respond to health threats laws have been made to make it mandatory to report some diseases, set up immunization programs, provide isolation and confinement in specific cases and treatment of particular diseases.

In some other instances, laws have assimilated ethical principles, as in the case of restrictions on access to health information and the maintenance of privacy.

In the case of working environment hazards, a lot has been done in the last few decades to protect workers, both, in terms of their right to know about hazards in

their workplace, and in terms of instigating occupational health and safety laws.

Ethical issues in occupational health, as for other public health fields, are a concern for many stakeholders: occupational health professionals (occupational health doctors and nurses, factory inspectors, occupational hygienists and psychologists, specialists in ergonomics, rehabilitation, working environments, accident prevention, and occupational health and safety researchers), workers, employers, and those who are supposed to denounce shortcomings, lawyers. As a consequence, the need for a code of ethics specific to this field of public health has become compulsory. The International Commission on Occupational Health has adopted the "*International Code of Ethics for Occupational Health Professionals*" which has become a point of reference. It covers issues on duties of occupational health professionals (which aim at protecting the life and health of workers, respecting human dignity and promoting the highest ethical principles in occupational health policies and programs), and on their obligations (which include integrity in professional conduct, impartiality, confidentiality, privacy).

Another very good tool in the hands of public health workers and stakeholders involved in public health is the "*Code of Ethics for Public Health*" formally adopted by the American Public Health Association in 2002. It is the first broadly accepted document of its kind. It lists 12 principles of ethical practice of public health, 14 values and beliefs which inspired the principles, and includes some notes to better understand them. It confirms that public health should address disease prevention and health promotion; affirms people's right to resources necessary for health; stresses the interdependence between people and their environment; emphasizes the importance of the public's trust in institutions; accents the need for collaboration among all stakeholders involved in public health; underlines the need for research; affirms community contribution to public discourse; demands distributive justice; asserts the duty of public health institutions to protect confidentiality; and to implement policies and programs in a way that respects diverse beliefs in the community, and so on.

The code of ethics for public health practice is a very good tool; however, it is just a starting point, since it will need to be updated as society and medicine evolve; moreover, the process of globalization implies that many cultures unite in one community, making it difficult to have one code of ethics to cover all eventualities.

Philosophers, policy makers and others first turned their attention to the ethical practice of research after the atrocities of medical experiments during World War II were revealed. Since then, much of the agenda in the field of ethics has been driven by the dilemmas presented by advances in medical technology and by research on human subjects. As a consequence, there are quite a number of guidelines on the ethical conduct of clinical research. Some of them were written in response to a specific event, and, therefore, they each focused on the instigating issue, emphasizing some specific aspects of research while leaving others out.

For instance, the "*Nuremberg Code*" was part of the judicial decision condemning the atrocities of the Nazi physicians and so focused on the need for consent, freedom from coercion and a favorable risk-benefit ratio.

The "*Declaration of Helsinki*" was developed to fill up the gaps in the Nuremberg Code, especially as related to physicians conducting research with patients, and so focuses on favorable risk-benefit ratio and independent review; the Declaration of Helsinki also emphasizes a distinction between therapeutic and non-therapeutic research that is rejected or not noted by other documents.

In the USA, the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research in their document known as the "*Belmont Report*", underlined three basic principles to be used to generate specific rules and regulations in response to US research scandals such as Tuskegee and Willowbrook; those principles are: respect for a person's autonomy (e. g. informed consent), beneficence (e. g. favorable risk-benefit ratio), and justice (e. g. to ensure that vulnerable populations are not targeted for risky research).

The Council of International Organizations of Medical Sciences (CIOMS) and the World Health Organization (WHO) prepared in 1991 a document addressing public health and epidemiological research ("*International Guidelines for Ethical Review of Epidemiological Studies*"), and in 1993 endorsed a revised "*International Guidelines for Biomedical Research Involving Human Subjects*". The CIOMS guidelines consist of a description of general ethical principles and fifteen recommendations with commentary addressing the application of ethical standards and the establishment of mechanisms

for ethical review of human subjects research in developing countries where local standards for scientific conduct may differ from those in Western industrialized nations.

In 2002, the Nuffield Council on Bioethics published the "*Ethics of Research Related to Healthcare in Developing Countries*". This document provides specific recommendations for ethical issues related to standards of care, informed consent, obligations of researchers to individuals and communities, and independent ethical review.

In 1991, the US Department of Health and Human Services (HHS) issued revised "*Regulations on Human Subjects Research*", which has come to be referred to as the Common Rule. According to the regulations, in order for people (or their legally authorized representatives) to give "legally effective informed consent," the researchers seeking participation must describe the research and its purposes, its foreseeable risks and expected benefits, possible compensation in case of injury, must disclose appropriate alternatives, and must state that confidentiality will be maintained and that participation is voluntary. Concerning research with children, the "Common Rule" gives detailed specifications, stating that research should not involve greater than minimal risk, other than when it could be of direct benefit to the individual subjects; or when the research involves greater than minimal risk and presents no prospect of direct benefit to individual subjects, then it should be directed to yielding generalizable knowledge which is of vital importance for the understanding or amelioration of the subjects' disorder or condition.

Other tools exist at international or national levels and some organizations and institutions have developed their own guidelines to help in dealing with ethical dilemmas within public health.

Conclusions

Privacy or surveillance? Liberty or isolation? Coercion or freedom? Autonomy or common good? It is difficult to find solutions to ethical dilemmas in public health that can be supported by everyone. How can the tension between conflicting values be broken?

The issue of public health ethics is just one facet of a more general step forward that each person and society as a whole are asked to make as mankind evolves. In the beginning, man was forced to accept some social obligations in order to remain within a social group or clan which provided survival security, since life outside the clan was not viable.

Greek philosophy brought a new understanding of man: it underlined the value of the individual but acknowledged the conflict created between his need to belong to a group and need to be recognized as an individual with specific characteristics. Aristotle, in particular, stated that the essence of a human being is not only his rationality but also his capability of relating to others, since man is naturally meant to live in a community.

Since then, a balance has been sought between these two characteristics. Unfortunately, history has shown how this tension has brought about very negative consequences: in the name of the common good some atrocities have been committed against individual freedom and dignity; in the name of individual rights society has been considered by some individuals as a system that frustrates fulfillment of needs and expectations causing them to opt out. By considering how both excesses have their limits and their pitfalls society is learning to value and respect the dignity of the individual, while the individual is discovering that society is not just for the reception of benefits, but is the right place to fully express and fulfill himself as a human being in a state of interdependence.

Interdependence is the complement of autonomy; an individual has a social role which, if carried out, prevents the development of an extreme individualistic perspective that is inconsistent with the true nature of human beings. We all understand that a society where individuals are free to do whatever they want would not last long. Many of the collective goals in society that benefit the whole community are achieved by sacrificing some degree of independence and freedom; maybe not every individual agrees with this social contract, but we all experience the collective benefits.

On the other hand, a public health perspective should aim at protecting individual rights and effectively eliciting the voluntary co-operation of individuals. Such efforts are desirable because, by reducing the necessity of invoking the coercive power of the state, they enhance the public's health without burdening privacy and liberty. One way of evoking voluntary co-operation is community consultation and community participation in decision making. If public health stakeholders were encouraged, or even required, to consult with members of the communities in which they conduct

interventions, their health services might better fit the actual needs of community members. If there is an inevitable clash between public health and civil liberties, then the situation must be open to public debate, the elements of the conflict should be made explicit, and rigorous, critical reasoning should be brought to bear on the relative benefits and burdens of a particular policy or intervention. Such consultation might help to restore trust and promote a collaborative relationship between service providers and members of the public. In many situations, the question is not whether to act, but how to act. Community consultation could reinforce the goals of the protection of well being and the promotion of self-determination. Playing a part in decisions does not guarantee to both parties that things will go the way each of them wants, but if the participatory process is genuine, the people who are affected by the decision will be less likely to feel abused or neglected by the policy makers and less resistant to those who carry out the policies; at the same time, it could help public health authorities to re-consider their approach, maybe trying ways that are more voluntary and less coercive.

At the dawn of the third millennium the development of new public health practice ethics can only be the result of the evolution of the relationship between the individual and the community. The individual should give up being totally self-interested and open up to the needs of the community, in order to be a "person", interdependent with other persons, and therefore part of a "people". The community, as a result, should create the proper conditions for the individual to be helped to grow into a person.

In this process the new public health has a vital role to play.

Summary

The modern approach of public health practice in the Western world, aimed at maintaining or improving the health of populations through health promotion and disease prevention, is only a few centuries old; however, its roots go much further back in the history of mankind. The 20th century has seen very fast changes: socio-economic, political, technological, medical and ethical changes. Public health practice has also been affected by these innovations and has became more and more comprehensive. The concepts of preventing diseases and promoting health have broadened and evolved to encompass even population-level issues such as social determinants of health and social justice. As the authority of medicine and the paternalistic approach of physicians and public health officials started to be questioned, bioethics updated its code applying four principles: beneficence, non-maleficence, autonomy and justice. These four principles have strongly influenced public health decisions over the last decades, following the argument that, while directed to the whole population, public health activities interact with individuals. Though public health should not overlook the rights, interests, and freedom of the individual, it is also true that public health looks at the well being of the entire population; therefore the principles and values applied in bioethics, which follow an individualistic orientation, cannot be used as a point of reference. Public health practice should find its own answers for ethical dilemmas linked to its population-based perspective. Many stakeholders are involved in public health, and each of them may have a different approach, particularly when interventions act directly on the individual's freedom, since in public health ethics one core question is whether the individual should be subordinated to the common good or whether the autonomy-focused and antipaternalistic approach should serve as a point of reference for public health activities. This dilemma is involved in most health programs: from prevention of diseases to infectious disease control, from health promotion to research. There are some points of reference which can help to find a way forward and to protect against some abuses; very important points of reference are laws, different codes of ethics (Code of Ethics for Occupational Health Professionals, Code of ethics for public health) and guidelines on ethical conduct of clinical research. However, the goals and strategies of the new public health in the third millennium call for a new public health ethics to respond to the new challenges, a new ethics where the individual and the community are not in tension but in relation.

Cross-References

- ► Data Acquisition and Protection
- ► Drug Law
- ► Ethical Principles
- ► Ethical Values
- ► Ethics, Aspects of Infectious Disease Control
- ► Ethics, Aspects for Prevention

- ▶ Ethics, Aspects of Public Health Research
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Ethics, Aspects of Infectious Disease Control

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Definition

Strategies for infectious disease control programs have been traditionally based on the ▶ harm principle, on ▶ utilitarianism and on ▶ paternalism. In the last few decades, a strong influence on public health practices, has been the right of the individual to exercise full ▶ autonomy and self-determination. This has resulted in a tension between the concepts of individual freedom/privacy and common good, which has brought about new ethical challenges in the approach to infectious disease control.

Basic Characteristics

One of the main tasks of public health practice has been infectious disease control, which includes various methodologies: ▶ screening for the disease, surveillance and name-based reporting, ▶ contact tracing, ▶ treatment monitoring, ▶ isolation (the separation of individuals known to be infectious) and ▶ quarantine (the restriction of the activities of healthy individuals who have been exposed to a communicable disease).

During the 20th century, screening for the presence of disease and at times occult infection has been a central feature of public health practice. Often such screening was imposed, as in the case of screening couples for venereal diseases prior to marriage, screening children for entry into public schools, screening newborns for specific genetic conditions, screening for tuberculosis in schools and workplaces.

One of the main methods used in public health infectious disease control programs is ► surveillance. It implies reporting to health authorities notifiable diseases, including patients' names. It is used in many infectious diseases, like sexually transmitted diseases and tuberculosis, in an effort to monitor, plan and intervene.

A very typical example of the use of coercion in infectious diseases control programs is given by the isolation and quarantine applied in the name of the common good. In those cases, though the rights of the individual are overruled, the intervention is usually accepted when the course of the disease and the timeframe of the treatment are known. Things become more complex when isolation and quarantine are used to avoid infectiousness in cases where knowledge about the diseases and their treatments are lacking. A case which posed very dramatic dilemmas from many points of view, included the ethical one, was the world wide threat of severe acute respiratory syndrome (SARS); because of the "unknown", governments took steps, towards protecting the people's health, which did not consider individual freedom, using isolation and quarantine as a tool for controlling the spread of the disease. Although dealing with infected cases was mostly accepted, many queries were raised when it came to dealing with suspected cases or with individuals suspected of being exposed: the number of people put into isolation escalated very rapidly. Things became more balanced once more knowledge about the course of the disease was acquired.

What could have been a supportive element in the above-named interventions is that the individual had no direct responsibility in contracting the disease. Things drastically changed with the advent of HIV/AIDS. From the very beginning the HIV/AIDS epidemics posed new ethical dilemmas to public health institutions because it is a lethal, sexually transmitted disease, which has a latent period of incubation, during which the partner or the community in general, or even the very infected individual, are not aware of the danger; at the same time, from the onset HIV/AIDS was related to individual behaviors and bore a very strong social stigma.

Following the traditional name-based case reporting would have allowed public health officials to single out infected individuals and to counsel them in order to prevent further transmission, and would have permitted monitoring of the incidence and prevalence of the infection; the antagonists of name based reporting argued that social hostility and HIV-related hysteria could lead to changes in policy, that would permit breaches in confidentiality with serious consequences for those appearing in the reports, in terms of losing their jobs, their housing and perhaps their liberty. The already strong gay men organizations influenced the decision of public health policy makers on management of HIV/AIDS epidemics by framing the whole issue into the human rights perspective. From a public health perspective, then, the HIV/AIDS concern became a socio-political-moral-health issue. For the first time a new "exceptionalist" approach to an infectious disease epidemic was promoted, which rejected coercive measures that might "drive the epidemic underground" and focused on mass health education to bring about behavioral changes, voluntary testing and counseling, following the principle that no public health policy which violated the rights of individuals could be tolerated as a controlling method to prevent the spread of HIV.

The ethical implications of the debate concerned all aspects of infectious disease control strategies which interfere with one of the most important principles of biomedical ethics, the right of the individual to exercise his autonomy and freedom. How, then, to protect individual freedom and ► privacy, while protecting any partner or other community members from infection?

In the USA the debate between the two different approaches lasted almost 20 years, until the Centres for Disease Control (CDC) in 1999 reluctantly accepted that there could be case reporting without the use of names.

The "harm principle" has been the ethical point of reference for various programs aiming at preventing some contagious diseases, including immunization campaigns. Children should be vaccinated not only to prevent their own infection but also the infection of others not yet immunized. Vaccination of children for some infectious diseases has been compulsory in many countries, and has brought about a significant reduction in the incidence of these diseases. In some states exceptions are accepted for religious or philosophical reasons, which, true, involved a very small number of children, however, they pose the ethical question of whether parents have a right to place at risk not only their own children but others who could be infected by them.

With the falling-off of some of those infectious diseases, the problem of vaccine side effects comes to the fore: when many children are dying because of a certain disease, it is easy to accept that a few of them get some side effects; once there are few cases of the disease, then those who get the side effects become more evident; as a result, parents refuse to have their children immunized because of the fear of harming them. The ethical dilemma in these cases is sharpened by what is called "herd immunity": immunization involves both a direct benefit to the individual child as well as to those in the community who remain un-immunized and benefit from the immunization of the vast majority. An ethical principle which can help here is the one of ► justice, as fair distribution of risks and benefits.

Some countries are trying to replace compulsory vaccination for some diseases which are now very rare, with an effective health education of parents; the conviction is that by showing them all the risks (which are anyhow less and less) and all the benefits of vaccination, the number of parents vaccinating their children will not drop.

Cross-References

► Autonomy
► Contact Tracing
► Harm Principle
► Isolation in Public Health
► Justice
► Paternalism
► Privacy
► Public Health Surveillance
► Quarantine
► Screening
► Treatment Monitoring
► Utilitarianism

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Ethics, Aspects for Prevention

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Definition

Disease prevention (► prevention and health promotion) is a strategy to protect health by reducing or avoiding risks of ill-health. To achieve this we can use different methods at different levels. At a personal level we act by avoiding illness (through vaccination, etc.) or by detecting illness at an early stage through screening; at the behavioral level we act by reducing/avoiding risks through information on health issues, health education, health counseling, health training and through social support; at the structural level we aim to reduce/avoid risks through protection of work and community environments. Each method presents some ethical issues because it interferes with individual freedom and behavior.

Basic Characteristics

In a constant endeavor to prevent diseases and promote health, after contributing to the great achievements in fighting infectious diseases through immunization and drugs (at least in the Western world), public health practice began to give more attention to specific conditions such as cancer, heart disease, disability, aging, obesity and diabetes. Nowadays, thanks also to the development of epidemiology and biostatistics, public health deals with patterns of disease, aiming at gaining some more understanding of their causes, and putting in place collective and institutional interventions to alleviate the risk or burden of disease at the general population level. Prevention of diseases and injuries has, therefore, become more broad in application. It embraces a number of aspects:

- interventions for primary prevention (aiming at preventing a healthy person getting a certain disease), ► prevention, primary;
- screenings for secondary prevention (aiming at diagnosing a disease before it becomes clinically evident), ► prevention, secondary;

- programs for tertiary prevention (to prevent complications and to rehabilitate), ► prevention, tertiary.

It is not always easy or straightforward to get all stakeholders in public health to agree on solutions because of the ethical dilemmas involved. However, there are some tools which can help in finding a way forward and in protecting against some abuses.

A very important tool, which has been used, especially for primary prevention interventions, is law. Together with creating a mission for public health authorities, assigning their functions, and specifying the manner in which they may exercise their authority, the legal system is a primary means used by government to bring about conditions for people to lead healthier and safer lives. Examples are laws on the use of car safety belts and helmets for motorcyclists, on smoking restrictions, on environmental regulations (to reduce health hazards in the living and working environment due to environmental pollution), on occupational health and safety standards, on regulating some activities by licensing people, institutions or businesses, on the inspection (checking for insanitary conditions, impure products or unsafe environments) or even the closing down a business, or condemning a building, or confiscating dangerous goods, or fining for pollution. Furthermore, in order to identify and respond to health threats, laws have been put in place to make it mandatory to report some diseases, instigate immunization programs, provide ► isolation and confinement for individuals suffering from specific diseases, and provide treatment for patients with particular diseases.

Though everybody agrees that public health should have as a goal the well being of the whole population, there is often debate on whether governments should intervene to protect the public's health and safety when doing so will diminish a personal freedom or economic interest. Some interventions have to be compulsory and universal in order to be effective; for example, standards for public amenities (such as air and water quality, food safety and waste disposal, road and building safety) and regulations to safeguard the environment against damage caused by hundreds of chemicals, have all been imposed. Nevertheless, they are easily accepted by the people and their imposition is not seen as violating demands for individual consent and ► autonomy, because of many factors:

- they are supported by officially proclaimed rights (e. g. the United Nations Commission on Human Rights made in 2001 proclaimed that everyone has the right to live in a world free from toxic pollution and environmental degradation);
- it is well-known at this stage that damage to human health can be caused by hundreds of chemicals, and, therefore;
- it is actually seen by many people as an ethical duty of all those directly involved in public health to safeguard both the environment and humans from them;
- they do not act directly on the individual's freedom and lifestyle;
- individuals cannot judge those standards for themselves.

Things change when public health interventions act directly on the individual's freedom. In these cases there is always someone who disagrees with a certain policy and therefore will feel coerced.

In the case of cigarette smoking, for example, government interventions (like high taxes on cigarettes), were more accepted (both on the basis of protecting non-smokers and discouraging adolescents from taking up smoking) only after evidence was provided that cigarette smoking was a health hazard; restrictions on smoking in public places were also accepted after scientific evidence proved that passive smoking caused harm. Anti-smoking campaigns emphasized not only the financial burden put on the whole community, but also underlined the life-saving benefits to the individual smokers themselves.

Concerning regulations on motorcyclists' helmets, some people objected, quoting Mr Mills, that "the only purpose for which power can be rightfully exercised over any member of the civilized Community, against his will, is to prevent harm to others … over himself, over its own body and mind, the individual is sovereign;" after all, the carelessness of the individual would just do harm to himself. Things changed when it became clear that "harm to others" could be construed as the financial burden on society, due to accidents and diseases which could have been prevented, and that this could justify the application by governments of the "► harm principle" whereby interventions could be put in place. However, from an ethical point of view, we ought to protect motorcyclists from the hazards of un-helmeted riding not just because they may impose costs on the community in the event of accidents or because they are too young to appreciate the

hazards entailed, but because we are morally bound to prevent avoidable suffering and death.

The "harm principle" has been the ethical point of reference also for other programs aiming at preventing some contagious diseases, as in cases of compulsory vaccination. Children should be vaccinated not only to prevent their own infection but also to avoid infecting other non-immunized children. In many countries vaccination for children for some infectious diseases has been made compulsory, and this has brought about a significant reduction in the incidence of these infections. Some states, however, have made exceptions due to accepted religious or philosophical reasons, which, true, involve only a very small number of children, but they pose the ethical question of whether parents have a right to place not only their own children but others at some risk. With the falling-off of some of these infectious diseases, the problem of vaccine side effects becomes more important: when many children are dying, it is easy to accept that a few will get some side effects, but, once there are few cases of the disease, then those who get the side effects become more of a concern; as a result, parents are more likely to refuse to have their children immunized because of the fear of harming them. The ethical dilemma in these cases is sharpened by what is called "► herd immunity": immunization involves both a direct benefit to the individual child as well as to those in the community who remain un-immunized and benefit from the immunization of the vast majority. An ethical principle which can help here is the one of ► justice, as fair distribution of risks and benefits. Some countries are trying to replace compulsory vaccination for some diseases, which are now very rare, with an effective health education of parents; the conviction is that by informing them about all the risks (which are anyhow less and less) and all the benefits of vaccination, the number of parents having their children vaccinated will not drop.

In the case of working environment hazards, a lot has been done in the last few decades to protect workers, both, in terms of the workers' right to know about hazards in their workplace, and in terms of occupational health (► occupational and environmental health) and safety laws. Ethical issues in occupational health, as for other public health fields, are a concern for many stakeholders: occupational health professionals (occupational health doctors and nurses, factory inspectors, occupational hygienists and psychologists, specialists in ergonomics, in rehabilitation, in the improvement of working environments, in accident prevention, occupational health and safety researchers), workers, employers, those who are suppose to denounce shortcomings, lawyers. Since it is not always easy to find a common perspective when looking at occupational health ethical dilemmas, the need for a code of ethics specific for this field of public health has become compulsory. The International Commission on Occupational Health has adopted the "*International Code of Ethics for Occupational Health Professionals*" which has become a point of reference. It covers issues on the duties of occupational health professionals (which aim at protecting the life and health of workers, respecting human dignity and promoting the highest ethical principles in occupational health policies and programs), and on their obligations (which include integrity in professional conduct, impartiality, confidentiality, privacy).

In the context of disease and risk prevention, a very important turning point has been the application of the ► precautionary principle, which implies that when an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. The precautionary principle is embodied in the very tradition of public health. A significant example was the control of cholera in the 19th century through improvement of public sanitation systems before scientific evidence could show any causal link between cholera and poor sanitation. The precautionary principle provides a starting point for the ethics of risk management.

One of the most sensitive aspects of disease prevention concerns ► genetics. Unlike public health interventions directed at the entire population, genetic interventions are at their core individually focused, requiring the collection of individual-specific data and often targeting individuals and groups at risk for genetic conditions; thus, by their misuse, they have the potential of causing or increasing social harms, especially when the targeted individuals or groups have been vulnerable in the past to discrimination or social stigmatization because of race or ethnicity. If a public health intervention based on genetic screening could bring some benefits to the individual and to the community, which would justify it, then the ethical question would be on equitable access to services. As a consequence, in the case of public health genetics, all these three aspects should always

be taken into consideration for any screening program: population benefit, individual interests and distributive justice. Genetic studies, due to their nature, pose ethical considerations on individual autonomy, ► privacy, and ► confidentiality; they can also bring about genetic discrimination: people with genetic defects, not all of which show up as dysfunctions, may be denied life insurance, health insurance, and access to schooling or to jobs (an employer could hire only those people whose genes indicate they are resistant to the health hazards of the work place, which is a cheaper alternative to making the work place safe for all). For these reasons, some critics maintain that few, if any, government-sponsored public health genetic interventions are appropriate. Only a few countries have introduced explicit legislation on genetic screening. In some countries, the focus for genetic screening programs has been on pregnant women and newborn children. ► Informed consent is not necessary for a newborn screening test, only for those disorders which are treatable. For those disorders for which newborn screening is available but the tests have not been validated or shown to have clinical utility, written parental informed consent is required prior to testing, even though requiring consent will likely lead to a decrease in both population and individual benefits because some infants will not be screened.

Prenatal screening, when provided, may be confined to conditions for which termination is offered. This approach involves all the ethical conflicts about pregnancy termination.

Primary prevention of genetic conditions includes the concept of "► eugenics", which can bring extreme pressure on people to make childbearing decisions on the basis of genetic information; mating between those with valued genes may be encouraged while mating between two people with dangerous recessive traits may be discouraged or even prohibited. Women carrying fetuses with genetic abnormalities may be encouraged to abort. As we have seen, in disease prevention activities, public health workers are dealing with the conflict between individual autonomy and common good. However, the principles (► ethical principles) included in the "► Code of ethics for public health" may help find a way forward.

Cross-References

► Autonomy
► Code of Ethics
► Confidentiality
► Ethical Principles
► Eugenics
► Genetics
► Harm Principle
► Herd Immunity
► Informed Consent
► Isolation in Public Health
► Justice
► Occupational and Environmental Health
► Precautionary Principle
► Prevention and Health Promotion
► Prevention, Primary
► Prevention, Secondary
► Prevention, Tertiary
► Privacy

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Ethics, Aspects of Public Health Research

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Synonyms

Research; Investigation; Study; Exploration

Definition

The term "research" refers to a class of activities designed to develop or contribute to generalizable knowledge. Generalizable knowledge consists of theories, principles or relationships, or the accumulation of information on which they are based, that can be corroborated by accepted scientific methods of observation and inference. In the present context we refer to ► biomedical research to indicate its relation to health; it includes medical and behavioral studies pertaining to human health. Research ethics include both, the moral problems encountered in connection with scientific or other academic research (by the researcher, their subjects or their social environment) and the ► ethical principles which should be a guide when dealing with those problems.

Basic Characteristics

Research is an integral component of public health practice. Public health research includes the study of inanimate substances (such as water and air quality), biological processes not involving humans (e. g. the natural history of arthropods that are disease vectors) and questions that involve humans. There are ethical concerns in each of these types of research, but the majority involve research using human subjects.

Research involving human subjects include:

- studies of a physiological, biochemical or pathological process, or of the response to a specific intervention (whether physical, chemical or psychological) in healthy subjects or patients;
- ► clinical trials of diagnostic, preventive or therapeutic measures in larger groups of people, designed to demonstrate a specific generalizable response to these measures against a background of individual biological variation (for example, new vaccines and medicinal drugs, before being approved for general use, must be tested on human subjects);
- studies designed to determine the consequences for individuals and communities of specific preventive or therapeutic measures; and
- studies concerning human health-related behavior in a variety of circumstances and environments.

Most of ethical aspects in public health research involving humans are similar to those in clinical medical research (► ethics in clinical medicine), because both have to address issues like ► informed consent, individual right to ► privacy, to ► confidentiality, and to ► autonomy; other ethical facets involve matters of race and racism, appropriate study design and research hypotheses. Some more ethical considerations are involved in ► international research; then we also have to deal with problems raised by the local culture (► ethics and culture) (language, beliefs, social values, relationship between individual and community) and by religious aspects, all components which may vary considerably the meaning and the role of informed consent and autonomy, ► beneficence and ► non-maleficence, and of ► justice. While public health researchers should be sensitive to local customs, they are never authorized to conduct research without regard to potential risks and without attempts to seek individual consent from potential study participants. In particular, public health researchers working in international settings must avoid the exploitation of non-Western populations in research that would not be allowed in the investigators' home countries.

Ethical questions can occur at any time during the research process, from the design of the study to the recruitment of subjects, to the data acquisition (► data acquisition and protection) and publication. Just to give but few examples:

- the recruitment of subjects should be exempt from coercion, that is, subjects should not feel as though they cannot refuse to participate;
- in qualitative design, potential ethical conflicts exist in regard to how the researcher gains access to a group of patients, privacy may not be respected through the data collection process that mainly consists of observing or interviewing the subjects in their natural environment, and, furthermore, the concepts of relationship and power between researchers and participants are very prominent in qualitative designs;
- the danger of breaching confidentiality increases in ► longitudinal studies, when data collection happens at different points in the lifetime of the individual, who, therefore, needs to be identified by the researcher;
- issues surrounding randomized controlled clinical trials (RCT) offer a myriad of potential ethical

dilemmas, for example, in the conflict between the RCT and the therapeutic obligation;
- methods of data collection may raise ethical issues of confidentiality and anonymity of the research subjects if the method of data collection uses the Internet or email; the same ethical concerns are embedded in a method of mailed questionnaire imprinted with a code to retrace subjects that did or did not answer the questionnaire;
- researchers have the obligation to share the findings with the larger society; though research findings are typically presented as aggregated data that do not reveal the identities of the individual participants, they may also have some negative consequences on the community as a whole, which could be stigmatized if results are negative.

Let us look closer at some of the issues.

A much debated aspect of research, which requires extra precautions, is involvement of ► vulnerable groups or individuals. By "vulnerable" we mean that they may be more than usually susceptible to exploitation in the process of research, either because they may be more likely to be pressured to participate, or to fail to understand the full implications of participation and may therefore be misled into taking part. This principle would also apply to those who are extremely poor and therefore would find it very hard to turn down a reimbursement for a study procedure despite of being informed of the risks. In these cases even the signed informed consent may not be meaningful.

Furthermore, some people believe that signing a consent form means that they are waiving their rights, including those to sue if something goes wrong, and that the primary purpose of a consent form is to protect doctors and hospitals from legal liability; in addition, the forms may be incomprehensible to them, it is therefore impossible for them to fully understand what they have agreed to. At times, to avoid these kinds of problems, vulnerable groups have been excluded from research to protect them from the research-associated risks, but this also means that they are less likely to share in any benefits, both during the study or later when the results are generalized to other populations in which the interventions had not been studied. In addition, conditions more prevalent among, or disproportionately affecting, minority group members or women could simply go unstudied, and unintended harm could result from the failure to recognize specific group correlated factors.

Of course, in reality, a variety of individuals may be rendered vulnerable by virtue of various situational or persistent social factors. People who are sick or in pain, frightened, or overwhelmed by information or "bad news" may be vulnerable by virtue of these circumstances.

Those who lack the education, emotional maturity, or language and communication skills to understand and appreciate what is disclosed to them during an informed consent process may also be vulnerable to inappropriate pressure to participate (or, instead, to reject precipitously the option of research participation that might benefit them). Those who feel disempowered by virtue of the social roles they occupy, or who lack economic resources to investigate the proposed research or alternatives to it, may not feel free to refuse participation.

In the case of prisoners, researchers must take precautions to prevent the impression that participation or nonparticipation will in any way affect the duration of prisoners' incarcerations.

The process of informed consent can be improved by providing information, both written and spoken, in terms that can be easily understood, and by giving the participants time to make a decision about their participation in research, and to consult family members or make more inquiries about what they are being asked to do.

Parents of minors are required to give consent for their children to participate in a study. If children are old enough to understand the risks and benefits of participation, they are usually required to give their own consent in addition to the consent of their parents. However, there are limits to the level of risk to which parents can give consent.

Research involving human subjects may also make use of existing records, as in the case of ► surveillance or registries data (► disease registry). The use of these sources implies that data obtained from these records will remain confidential (► data acquisition and protection), since they carry the risk of causing harm to the individual at various levels (psychological, employment, family, social). However, in some countries, studies which involve no more than minimal risk to participants are freely reviewable, and some studies (e. g. surveys, observations, or studies of existing data) are exempt from informed consent requirements.

Significant ethical dilemmas arise when research concerns ► genetics. At times, genetic research affects specific ethnic groups or individuals suffering from certain conditions that may be subjected to social stigmatization and therefore may bring harm to those involved.

Research with human subjects should be carried out only by, or strictly supervised by, suitably qualified and experienced investigators and in accordance with a protocol that clearly states: the aim of the research; the reasons for involving human subjects; the nature and degree of any known risks to the subjects; the sources of recruitment of subjects; and the means proposed for ensuring that subjects' consent will be adequately informed and voluntary. The protocol should be scientifically and ethically appraised by ► ethical committees.

Different approaches to ethical dilemmas can influence researchers: ► utilitarianism may justify a research project on the basis that it will produce good consequences for the care of patients and be beneficial for the care of future patients, whereas a deontological ethical theory would judge the nature of the study as being right or wrong within itself regardless of its consequences.

Philosophers, policy makers and others turned their attention to the ethical practice of research on human subjects after the atrocities of medical experiments during World War II were revealed. As a consequence, there are quite a number of guidelines on the ethical conduct of clinical research. Some were written in response to a specific event and, by focusing on the instigating issue, only emphasize certain specific aspects of research while excluding others.

For instance, the "*Nuremberg Code*" arose from the judicial condemnation of the atrocities committed by Nazi physicians and so focused on the need for consent, freedom from coercion and a favorable risk-benefit ratio.

The "*Declaration of Helsinki*" was developed to fill gaps in the Nuremberg Code, especially in relation to physicians conducting research with patients, and so focused on the favorable risk-benefit ratio and independent review; the Declaration of Helsinki also emphasizes a distinction between therapeutic and non-therapeutic research rejected or not noted by other documents.

In the USA, the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research in their document known as the ► "*Belmont Report*", underlined three basic principles to be used to generate specific rules and regulations in response to US research scandals such as ► Tuskegee and ► Willowbrook State School; those principles are: respect for autonomy (e. g. informed consent), beneficence (e. g. favorable risk-benefit ratio), and justice (e. g. to ensure that vulnerable populations are not targeted for risky research).

► *Respect for persons* incorporates at least two fundamental ethical considerations, namely:

a) respect for autonomy, which requires that those who are capable of deliberation about their personal choices should be treated with respect for their capacity for self-determination; and

b) protection of persons with impaired or diminished autonomy, which requires that those who are dependent or vulnerable be afforded security against harm or abuse.

Beneficence refers to the ethical obligation to maximize benefits and to minimize harms. This principle gives rise to norms requiring that the risks of research be reasonable in the light of the expected benefits, that the research design be sound, and that the investigators be competent both to conduct the research and to safeguard the welfare of the research subjects. Beneficence further proscribes the deliberate infliction of harm on persons; this aspect of beneficence is sometimes expressed as a separate principle, *nonmaleficence* (do no harm).

Justice refers to the ethical obligation to treat each person in accordance with what is morally right and proper, to give each person what is due to him or her. In the ethics of research involving human subjects the principle refers primarily to distributive justice, which requires the equitable distribution of both the burdens and the benefits of participation in research.

The Council of International Organizations of Medical Sciences (CIOMS) and the World Health Organization (WHO) prepared in 1991 a document addressing public health and epidemiological research ("*International Guidelines for Ethical Review of Epidemiological Studies*"), and in 1993 endorsed a revised "*International Guidelines for Biomedical Research Involving Human Subjects*". The CIOMS guidelines consist of a description of general ethical principles and fifteen recommendations with commentary addressing the application of ethical standards and the establishment of mechanisms

for ethical review of human subjects research in developing countries where local standards for scientific conduct may differ from those applied in Western industrialized nations.

In 1991, the US Department of Health and Human Services (HHS) issued revised "*Regulations on human subjects research*", which has come to be referred to as the Common Rule. According to the regulations, in order for persons (or their legally authorized representatives) to give "legally effective informed consent," the researchers seeking participation must describe the research and its purposes, its foreseeable risks and expected benefits, possible compensation in case of injury, must disclose appropriate alternatives, and must give a statement about the maintenance of confidentiality and that participation is voluntary. About research with children, the "Common Rule," gets into detailed specifications, stating that research should not involve greater than minimal risk, otherwise it should present the prospect of direct benefit to the individual subjects; if research involves greater than minimal risk and no prospect of direct benefit to individual subjects, then it should likely yield generalizable knowledge about the subject's disorder or condition which is of vital importance for the understanding or amelioration of the subjects' disorder or condition.

In 2002, the Nuffield Council on Bioethics published the "*Ethics of Research Related to Healthcare in Developing Countries*". This document provides specific recommendations for ethical issues related to standards of care, informed consent, obligations of researchers to individuals and communities, and independent ethical review.

These are but few of the many relevant documents and guidelines concerning ethical aspects of research. Some of them are by international bodies, some are at national level. All guidelines are meant to smoothen the conflict between individual rights and the common good.

Generally, legal, ethical, and human rights principles strongly support the rights of people to control the circumstances in which their identifiable health data are acquired, used, disclosed, or stored. However, the value of individual privacy regarding health information is not absolute. Sharing identifiable health data may be justified where they are needed to promote communal good and communal values (e. g. public health, human research), or where it is necessary to prevent harm to others (e. g. duty to warn requirements). Particularly in the public health setting, the access, use, and disclosure of individual health data is needed to survey the population's health and protect against actual or potential threats to community health.

Community consultation has been proposed as a tool with multiple benefits for public health research and practice. It is suggested that if researchers and public health practitioners were encouraged, or even required, to consult with members of the communities in which they conduct research and offer interventions, their research questions and health services might better fit the actual needs of community members. Such consultation might help to restore trust and promote a collaborative relationship between researchers or service providers and members of the public. And, depending on the degree of influence that community members exerted (or were recognized to have), community consultation could reinforce the goals of the process of obtaining individual informed consent – namely, the protection of well being and the promotion of self-determination.

Cross-References

- ▶ Autonomy
- ▶ Belmont Report
- ▶ Beneficence
- ▶ Biomedical Research
- ▶ Clinical Trials
- ▶ Confidentiality
- ▶ Data Acquisition and Protection
- ▶ Disease Registry
- ▶ Ethical Principles
- ▶ Ethics in Clinical Medicine
- ▶ Ethics Committee, EC
- ▶ Ethics and Culture
- ▶ Genetics
- ▶ Informed Consent
- ▶ International Research
- ▶ Justice
- ▶ Longitudinal Study
- ▶ Non-Maleficience
- ▶ Privacy
- ▶ Public Health Surveillance
- ▶ Respect for Persons
- ▶ Tuskegee
- ▶ Utilitarianism
- ▶ Vulnerable Groups
- ▶ Willowbrook State School

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Ethics in Biomedicine

► Ethics in Clinical Medicine

Ethics in Clinical Medicine

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Synonyms

Ethics in biomedicine; Bioethics

Definition

Ethics in clinical medicine concerns principles (► ethical principles) and values (► ethical values) applied to decision making affecting the well being of the individual patient and to the personal relationship between the health worker and the patient.

Basic Characteristics

► Ethics, in general, is a discipline derived from philosophy. Some authors identify ethics with morals, as the beliefs and standards of good and bad, right and wrong, that people hold and should follow in a society; others refer morality to individual behavior and ethics to social rules; others define ethics as the systematic study of morality: ethics, in other words, is the theory and morality is the practice. Every profession has ethical dimensions, ► professional ethics, concerned with the ethical practice of the profession, such as the code of conduct for health professionals; doctors, indeed, cannot insulate their practice of medicine from their personal moral beliefs and, at the same time, cannot allow their personal morality to overrule their professional obligations (a typical example being the case of a woman requesting an abortion from a doctor who is personally against abortion on moral grounds).

Ethical concerns in medicine are as old as medicine itself. A universal basic code of conduct for physicians is known as the ► hippocratic oath, which originated in the fourth century before Christ, when the main task of the doctor was to cure using remedies known at that time, which rarely caused harm. The oath states: "I will use treatment to help the sick according to my ability and judgment, but I will never use it to injure or wrong them … And whatsoever I shall see or hear in the course of my profession … I will never divulge, holding such things to be holy secrets." Ethics consisted, therefore, of three, clear principles: ► beneficence, ► non-maleficence, ► confidentiality.

Ethical dilemmas in clinical medicine in the past were few at a time when the physician's paternalistic approach was acceptable. Nowadays, ► paternalism is seen in a very negative light and is very much criticized because it interferes with patient liberty and freedom. However, originally, it was regarded in a positive light; in a fatherly way, the doctor took decisions on behalf of patients and withheld information from them or their legal guardians as he considered best. A classic exam-

ple of the paternalistic approach is the case of a physician not revealing to a patient that he has cancer, thinking that in this way he leaves the patient with some hope, while, maybe, sharing the information with the patient's relative or friend. In other cases, the physician with a paternalistic approach may perceive his patients, due to their condition, as being in states of psychological and emotional instability which could have affects on their ability to make rational decisions, and so he will not allow them to exercise their rights to autonomy/freedom, because they might refuse treatment that could preserve their lives, prevent disability or ameliorate pain. Unfortunately, in the name of paternalism, some abuses have happened both in clinical practice and in research.

Since the second half of the 20th century the authority of medicine and the paternalistic approach of physicians has decreased because of certain factors:

- the discovery of new treatments and new technologies has enormously increased the chances of cure along with the risk of causing harm;
- the growth of patients' knowledge in general and on medical issues in particular has given them more power;
- the place of the individual has gained more ground in society, and government policies and laws, being informed by ► autonomy and ► human rights issues, have evolved towards protecting the individual.

At the same time:

- the increased costs of health care has brought along disparities in its distribution and accessibility within a specific population and among different populations;
- searching for a new code of conduct for health professionals has become more complex because, due to ► globalization, patients are of different nationalities and backgrounds, with varying cultural values;
- the old one-to-one doctor–patient relationship, based on patient trust and doctor beneficence, has deeply changed with the modern multidisciplinary approach to patient care.

As a consequence, medical ethics' body of study and research has increased; therefore, a more inclusive term for ethics in clinical medicine is "► bioethics". Bioethics has found a strong point of reference in the ► patient-centred approach and has given clinicians clear guidelines, which broaden the Hippocratic Oath rules and embody four basic principles: beneficence (doing good), non-maleficence (not doing harm), autonomy (respect for the person and individual rights), and ► justice (distributing benefits, risks and costs fairly).

In this evolution, the physician's duty to preserve confidentiality has become, in various states, a patient's right regulated by specific laws. However, exceptions to the right to confidentiality are found in infectious diseases control programs, which required some conditions to be reported to health authorities in order to protect the common good. An inconsistency to this form of state paternalism occurs in HIV/AIDS epidemics, where the patient's right to confidentiality has been enhanced.

The first two principles (beneficence and non-maleficence) in contemporary ethics have been enriched by other components. Non-maleficence, for example, implies that the doctor should continually improve his medical knowledge, or, if needed, should consult other specialists; beneficence now even includes health promotion (► health promotion, ethical aspects) and risks reduction, linked to the principle of utility, which requires that risks of harm should always be weighed against possible benefits, in order to maximize the latter and minimize the former.

The essay "On Liberty", by the 19th century philosopher John Stuart Mill, describes the principle of autonomy very clearly. He states: "The only purpose for which power can be rightfully exercised over any member of the civilized Community, against his will, is to prevent harm to others. His own good, either physical or moral, is not sufficient warrant. He cannot rightfully be compelled to do or forbear because it will be better for him to do so, because it will make him happier, because in the opinion of others to do so would be wise or even right. These are good reasons for remonstrating with him or reasoning with him or persuading him or entreating him but not for compelling or visiting him with any evil in case he does otherwise … In the part which merely concerns himself, his independence is, of right, absolute."

A very important and practical consequence of the principle of autonomy is the concept of ► informed consent, which has to be voluntarily given by a competent patient. It implies that:

- written permission should be given by patients when undergoing invasive procedures or when enrolling as subjects for medical research;
- for an adequate understanding of what is going to happen to them, proper and sufficient information

should be given to patients about certain treatments and their risks;
- transmission of medical personal records to another party should be only formally permitted.

Though they may sound straightforward points, this may not be so in daily practice. Should we give patients all the available information, taking the risk of confusing them, or should we just tell them what any reasonable person would like to know in such circumstances? Paternalism or patient autonomy? Both approaches can be justified or condemned when seen from differing theoretical points of view; it depends on the perspective and on the specific case. Neither can be the absolute answer when we take into account every day clinical realities. One way of solving the problem is to become involved in patients' lives in a way that enhances their personal growth and development without necessarily contravening their wishes. After all, there are many studies confirming the importance of the doctor–patient relationship and the therapeutic effects of all its dimensions. The key point is to look at patients as people, and how a course of action would affect all aspects of their lives as individuals.

The above-named four principles have also strongly influenced public health decisions in the last decades, based on the argument that, while directed to the whole population, public health activities impact on individuals. In particular, the principle of autonomy is at the root of the conflict in public health ► ethics between common good and individual freedom and liberty.

Though public health should not overlook the rights, interests, and freedom of the individual, it is also true that public health looks at the well being of the entire population; therefore the ethical principles and values applied in bioethics, which follow the individualistic orientation, cannot be used as an absolute point of reference.

If we just take the principle of autonomy, we can see how difficult it is to apply it in some public health interventions which have to be compulsory and universal in order to be effective. For example, standards for public amenities, such as air and water quality, food safety and waste disposal, road and building safety, have to be imposed. Because they are organizationally external to the health care system, their imposition is not seen as violating demands for individual consent and autonomy that have been so prevalent within medical ethics. By contrast, we can allow some variability in the standards to which consumer goods are produced. Yet here too we accept some compulsion in setting uniform safety standards, because we know that individuals cannot judge the safety of complex products for themselves. Only in marginal cases, where the effects of individual consumption are wholly on that individual, and where consumption is optional — high-tar cigarettes, safety helmets for cyclists — may we sometimes think it enough to warn and educate. Even in these cases there is constant debate as to whether health education and health promotion, which preserve individual autonomy and avoid compulsion (at least for adults) are enough.

It is clear that public health ethics should find their own answers to dilemmas linked to the population-based perspective.

Cross-References

► Autonomy
► Beneficence
► Bioethics
► Confidentiality
► Ethical Principles
► Ethical Values
► Ethics
► Globalization
► Health Promotion, Ethical Aspects
► Hippocratic Oath
► Human Rights
► Informed Consent
► Justice
► Non-Maleficience
► Paternalism
► Patient-Centred Approach
► Professional Ethics

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Ethics Committee, EC

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Synonyms

Independent Ethics Committee; IEC; Internal review board; IRB

Definition

According to the Glossary of the ► international conference of harmonization (ICH) ► harmonized tripartite guideline for ► good clinical practice E6 (1.27) an Independent Ethics Committee (IEC) is:

"An independent body (a review board or a committee, institutional, regional, national, or supranational), constituted of medical professionals and non-medical members, whose responsibility it is to ensure the protection of the rights, safety and well-being of human subjects involved in a trial and to provide public assurance of that protection, by, among other things, reviewing and approving/providing favorable opinion on, the trial protocol, the suitability of the investigator(s), facilities, and the methods and material to be used in obtaining and documenting informed consent of the trial subjects.

The legal status, composition, function, operations and regulatory requirements pertaining to Independent Ethics Committees may differ among countries, but should allow the Independent Ethics Committee to act in agreement with GCP as described in this guideline."

Basic Characteristics

History

The development of ethical standards leading to the development of ethical committees is strongly linked to German history in good and bad times. Apart from ethical standards from Greek and Roman history in medicine (nil nocere, Hippocratic oath), the earliest provisions concerning medical research ethics, in a modern sense, were regulated for the first-time in Germany by the Prussian Ministry of Education in 1900 as advice to the heads of hospitals (Minister der geistlichen, Unterrichts- und Medizinal-Angelegenheiten 1900/1). This document states, that only adults with full contractual capabilities giving informed consent are allowed to participate in medical research involving humans (► healthy subjects). However, therapeutic, diagnostic or prophylactic studies of ► patients were not covered by this legislation. In 1931, in new German legislation (Richtlinien für neuartige Heilbehandlungen und für die Vornahme wissenschaftlicher Versuche am Menschen, Reichsminister des Innern vom Februar 1931), the principles of informed consent were confirmed and expanded to patients being treated with new and not well-known treatments or participating in therapeutic, diagnostic or prophylactic studies. Furthermore, provisions for ► vulnerable populations (e. g. minors) were introduced in this legislation.

Unfortunately, this legislation did not prevent German physicians conducting cruel and, on the basis of this legislation, clearly illegal experimentation on humans, apart from other massive violations of human rights and genocide, during the time of the Nazi regime. These criminal offenses led to the Nürnberg Physician Trial 1946/7 which ended with the drawing up of the Nuremberg Code (Nuremberg Code 1949) (Fig. 1) by the 1st American Military Court of Justice concerning permissible experimentation on humans. This codex (listed below) reinforced the principle of informed consent (Weindling 2001), required a ► risk–benefit-evaluation, allowed the participants to terminate their participation during the trial should they so decide, and required prerequisites to limit potential harm or risks for the par-

Ethics Committee, EC, Figure 1 (on the facing page) The Nuremberg Code – reinventing the principles of the ethical conduct of clinical trials concerning human subjects after the Second World War.

The Nuremberg Code

From "Trials of War Criminals Before the Nuremberg Military Tribunals Under Control Council Law No. 10", Vol. 2, Nuremberg, October 1946 - April 1949. (Washington, DC: US Government Printing Office, 1949). pp 181-182.

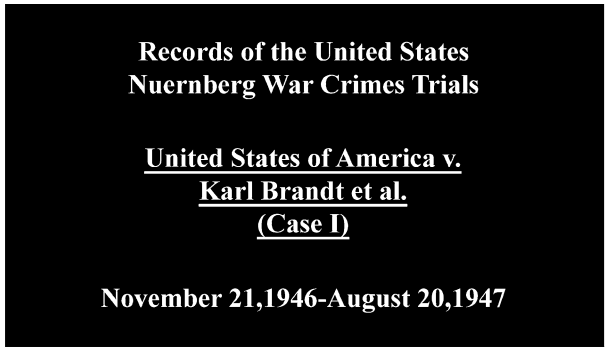
The great weight of the evidence before us is to the effect that certain types of medical experiments on human beings, when kept within reasonably well-defined bounds, conform to the ethics of the medical profession generally. The protagonists of the practice of human experimentation justify their views on the basis that such experiments yield results for the good of society that are unprocurable by other methods or means of study. All agree, however, that certain basic principles must be observed in order to satisfy moral, ethical and legal concepts.

1. The voluntary consent of the human subject is absolutely essential. This means that the person involved should have legal capacity to give consent; should be so situated as to be able to exercise free power of choice, without the intervention of any element of force, fraud, deceit, duress, overreaching, or other ulterior form of constraint or coercion; and should have sufficient knowledge and comprehension of the elements of the subject matter involved as to enable him to make an understanding and enlightened decision. This latter element requires that before the acceptance of an affirmative decision by the experimental subject there should be made known to him the nature, duration, and purpose of the experiment; the method and means by which it is to be conducted; all inconveniences and hazards reasonably to be expected; and the effects upon his health or person which may possibly come from his participation in the experiment.

   The duty and responsibility for ascertaining the quality of the consent rests upon each individual who initiates, directs or engages in the experiment. It is a personal duty and responsibility which may not be delegated to another with impunity.

2. The experiment should be such as to yield fruitful results for the good of society, unprocurable by other methods or means of study, and not random and unnecessary in nature.
3. The experiment should be so designed and based on the results of animal experimentation and a knowledge of the natural history of the disease or other problems under study that the anticipated results will justify the performance of the experiment.
4. The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury.
5. No experiment should be conducted where there is an a priori reason to believe that death or disabling injury will occur; except perhaps, in those experiments where the experimental physicians also serve as subjects.
6. The degree of risk to be taken should never exceed that determined by the humanitarian importance of the problem to be solved by the experiment.
7. Proper preparations should be made and adequate facilities provided to protect the experimental subject against even remote possibilities of injury, disability, or death.
8. The experiment should be conducted only by scientifically qualified persons. The highest degree of skill and care should be required through all stages of the experiment of those who conduct or engage in the experiment.
9. During the course of the experiment the human subject should be at liberty to bring the experiment to an end if he has reached the physical or mental state where continuation of the experiment seems to him to be impossible.
10. During the course of the experiment the scientist in charge must be prepared to terminate the experiment at any stage, if he has probable cause to believe in the exercise of the good faith, superior skill and careful judgement required of him that a continuation of the experiment is likely to result in injury, disability, or death to the experimental subject.

a



b

The crimes charged in the Brandt case consisted largely of medical experiments performed on defenseless concentration camp inmates against their will; "euthanasia" carried out on the mentally defective, the physically sick, the aged, and ethnic and racial groups; and the murder of concentration camp inmates for the express purpose of collecting skulls and skeletons for the Anatomical Institute of the Reich University of Strassburg. The following medical experiments were conducted:

1. High altitude: to investigate effects of low pressure on persons.
2. Freezing: to test human resistance to extemely low temperatures.
3. Malaria: to develop controls over the recurring nature of the disease.
4. Mustard gas: part of a general research program in gas warfare.
5. Sulfanilamide: to test the efficacy of the drug in bone muscle and nerve regeneration and bone transplantation.
6. Seawater: to test methods of rendering seawater potable.
7. Epidemic jaundice: to develop an antitoxin against the disease.
8. Sterilization: to test techniques for preventing further propagation of the mentally and physically defective.
9. Typhus: to investigate the value of various vaccines.
10. Poison: to test the efficacy of certain poisons.
11. Incendiary bomb: to find better treatment for phosphorus burns.

The prosecution alleged and the judgment confirmed that these experiments were not isolated acts of individual doctors and scientists on their own responsibility but that they were the result of high-level policy and planning. They were carried out with particular brutality, often disregarding all established medical practice. Consequently, large numbers of the victims died in the course of or as a result of the experiments.

Ethics Committee, EC, Figure 2 Accusations in the Nuremberg physicians' trial

ticipants to the largest possible extent. Furthermore, the responsible person (principal investigator) was required to terminate trials if any unforeseen risks arose during the conduct of the investigation.

The prosecution alleged and the judgment confirmed that these experiments were not isolated acts of individual doctors and scientists on their own responsibility but that they were the result of high-level policy and

planning. They were carried out with particular brutality, often disregarding all established medical practice. Consequently, large numbers of the victims died in the course of or as a result of the experiments.

This German experience paved the way for the ► Declaration of Helsinki (World Medical Association 1964) and later the introduction of independent ethical committees.

Even though the exact provisions of ethics committees are regulated by national legislation, the duties and expectations of the work to be done (Parvizi et al. 2007) are agreed on globally – even though the answers to global imbalances in development are under discussion (Benatar 2002, Kirigia et al. 2005, Dhai 2005, Hyder et al. 2004) – and are fixed in international guidelines.

But, even today, discussion on ethical issues in research and how they should be integrated and handled evoke powerful emotions (Baer and Nelson 2006, Hueston et al. 2006) and will inevitably lead to further developments and adaptations by ethics committees.

Usually, independent ethics committees are responsible for ensuring the proper treatment of vulnerable subjects and upholding the rights and well being of individuals participating in clinical trials, whereas, regulatory authorities are responsible for ensuring that risks are minimized and safety guaranteed for participants before granting an IND (investigation of a new drug) permit.

The independent ethics committees and institutional review boards have to ensure the safety and rights of subjects participating in biomedical research. Furthermore, apart from these research-bound ethics committees, councils exist, which handle decisions of ethical relevance to individual patients in medically critical situations (e. g. termination of dialysis, artificial respiration, parenteral nutrition in critically ill patients).

Responsibilities of IEC

It is the responsibility of an independent ethics committee to ensure the safety, well being and the individual rights of all subjects participating in clinical trials. In addition, special attention should be drawn to the participation of vulnerable subjects (e. g. minors, pregnant women, people unable to give consent [e. g. in emergency situations, psychiatry], people unable to decide freely [e. g. military personnel, prisoners]) in clinical trials. If in these circumstances, prior consent of the subjects, or their legally acceptable representatives, is impossible, the ethics committee should determine if the documentation provided for this specific trial addresses all relevant ethical concerns and meets all applicable regulatory requirements for the specific trial.

The ethics committee has to obtain the documentation of the proposed study including, ► trial protocol with – if applicable – amendments, ► investigators brochure with additional safety information, written ► informed consent forms, including information regarding payments and/or other compensation offered to subjects for study participation together with proposed subject recruitment procedures, and documents concerning the qualification of the investigator who will be conducting the requested study. Also, the ethics committee may request any additional documents it deems necessary to fulfill its responsibilities.

The ethics committee should review this documentation within a reasonable timeframe and document its opinion concerning the proposed study, clearly describing the reviewed trial, the reviewed documents, modifications of the documents it required (e. g. additional information for the participating subjects) prior to its approval/opinion concerning the proposed study. The ethics committee should approve or disapprove or give a favorable or negative opinion on the proposed study and the qualifications of the investigator who shall be conducting the trial.

During the running of each trial, the ethics committee should conduct a continuing review at appropriate time intervals – depending on the degree of expected risk for participating subjects – with a minimum of once per year.

Composition of Ethics Committees (Minimal Requirements)

An independent ethics committee should consist of a reasonable number of members who have, as a board, the qualifications and experience to evaluate the scientific, medical and ethical aspects of the proposed investigation. Usually an ethics committee should include a minimum of five members with at least one member being independent of the institution and/or trial site proposed for the conduct of the trial. Furthermore, at least one member of the board has to be a layman/laywoman (i. e. someone who does not have specialized knowledge of the area of research).

Only the members of the ethics committee who are independent of the investigator and the sponsor of the proposed study should vote or provide opinion concerning trial related matter. A list of the ethics committee members and their qualifications has to be maintained for each meeting of the board.

Operations of Ethics Committees

An independent ethics committee should operate according to written ► standard operating procedures (SOPs) and has to maintain written records of its activities and minutes of its meetings. It has to comply with the guidelines concerning Good Clinical Practice (GCP) and with the applicable regulatory requirements for the location of operation.

An ethics committee should make its decisions, in adequate time, at an announced meeting at which at least a quorum (as stipulated in the applicable regulatory requirements and/or the written standard operating procedures) is present. Only those members involved in the review of the documentation and its discussion should vote, give their advice or provide their opinion.

Investigators involved in the research project may provide, either during the meeting or during the review process, information concerning all aspects of the study but they are not allowed to participate in the evaluation or voting, or express an opinion concerning their project.

Ethics committees may invite nonmember specialists, with expertise in special areas relevant to the trial, to give assistance, if such expertise cannot be supplied by members of the board.

The ethics committee must retain all relevant records for an appropriate period of time after the completion of a trial and, upon request, make them available to competent regulatory authorities.

The ethics committee should also provide, upon request, its written procedures, statutes and membership list to investigators, sponsors or competent regulatory authorities.

Statutes of Ethics Committees

Ethics committees should establish and or work according to the statutes and legal requirements. The statutes should include the composition of the board (names and qualifications of the members) and the authority to which the board is assigned, the time intervals between meetings and the procedures of notification prior to meetings, instructions on the conduct of the initial and continuing reviews of ongoing trials, and circumstances in which expedited review procedures might be used.

In addition, the statutes should state that no subject should be included in trials prior to a written approval or the obtaining of a favorable opinion for the concerned trial, and that deviations from or changes to the protocol should only be enforced after written approval from the ethics committee with an appropriate amendment to the documentation. Exceptions are only permissible to ensure the safety of the subjects participating in the trial when unforeseen hazards arise or for minor administrative changes to the trial (change of address, phone number, Monitor).

All investigators involved in a specific trial must report unforeseen hazards arising from the trial, changes in the risk–benefit evaluation, and serious and/or unexpected adverse drug reactions (► SAE, ► SUSAR – usually as ► CIOMS report) to the concerned ethics committee. Correspondingly, the ethics committee has to ensure that the investigators are informed whenever trial-related decisions are made, the reasons of such decisions and the procedures for appeal against such decisions.

Cross-References

► CIOMS Report
► Declaration of Helsinki
► Good Clinical Practice (GCP)
► Healthy Subjects
► Informed Consent Form
► International Conference of Harmonization ICH Harmonized Tripartite Guideline
► Investigator's Brochure
► Layman
► Patients
► Risk–Benefit Evaluation
► SAE
► Standard Operating Procedures
► SUSAR
► Trial Protocol
► Vulnerable Populations

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Ethics and Culture

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Synonyms

Culture: customs; Lifestyle; Civilization

Definition

Culture is a system of shared beliefs, values, behaviors and practices common to a particular group or population that results from group experience interpreted in light of beliefs about the purpose and meaning of life. With regard to health and well being, culture includes:

- ideas about definitions and causes of health and illness;
- beliefs about how to protect and improve health; attitudes about when, how, and from whom to seek help;
- appropriate ways of expressing (or not expressing) symptoms or suffering.

Public health ► ethics include the principles (► ethical principles) and values (► ethical values) that help guide interventions within a specific population which has its own culture and ethics. The encounter between public health ethics and culture, often, generates some conflicts.

Basic Characteristics

Generally speaking, we are influenced by a kind of ► ethnocentrism: we consider that our own patterns for behavior are "normal", and we often describe people from another culture as "different", "strange", "weird", "primitive", revealing an underlying attitude in us that our own culture is superior, more advanced and preferable; it is not just different, but better. Actually, our own individual cultural codes and values are like glasses with distorting lenses: the things, events, and relationships we assume to be "out there" are, in fact, filtered by our own "cultural lenses". Cultural influences affect clinical medicine and public health practice. Much of medical practice is influenced by the predominant Western techno-medical culture; therefore, the health professionals must be careful not to impose their own cultural categories on others in a sort of "medical imperialistic" way. At the same time, from the patient's side, cultural factors usually surface as specific ethnomedical beliefs (assumptions, expectations, interpretations, attitudes) that concern the body, its normal functions, the self, the family and social network, causes and consequences of sickness, patho-physiology, help seeking activities and treatment choice, compliance, satisfaction, and many related issues. These beliefs may influence coping with sickness and response to care, because from them patients "learn" ways of being ill; as a consequence, while "► disease" can be catego-

rized as abnormalities in the structure and function of body organs and systems, "► illness" behaviors vary from culture to culture and from individual to individual, being influenced by the individual's experience of disease.

Though clinicians have guidelines for their interaction with the patients based on clear principles (► beneficence, ► non-maleficence, ► autonomy and ► justice), they still have to adapt those principles to the individual patient's culture. Let us take the example of ► informed consent, based on the principle of autonomy. For the consent to be "informed" it is important that what the informant (health worker, researcher, etc.) has said is actually understood by the recipient of the information. Things become more complex when a person lives in a culture where deference to authority figures or elders and non-individual decision-making is the cultural norm.

In research (► ethics, aspects of public health research), a major concern about obtaining informed consent is the ability of the potential study participant to truly understand the study and the risks and benefits that may be experienced; to understand this is to be truly informed. Other ethical aspects are encountered when research is done at the international level, or in a culture where studies are not common, or where Western scientific thinking is not dominant; here the local culture (language, beliefs, social values, relationship between individual and community) or religion, may vary considerably the meaning of the concepts of informed consent, autonomy, beneficence, non-maleficence, and justice. In such instances, researchers need to expend extra effort to gain an understanding of the culture and motivations of the study participants and how best to communicate with them about the study. The researchers also need to enable the potential study participants to understand the culture of the investigators, especially as it pertains to scientific inquiry.

The problem of balancing universal and local standards for ethical conduct in public health research is challenging for investigators facing the very real constraints of implementing a study in an area in which traditional customs may be in conflict with international ► guidelines and ► policies. These issues are particularly complex when public health research is implemented in areas known for human rights violations. Public and professional debates concerning health research in international settings often center around notions of cultural relativism and beliefs about cultural universalism. ► Cultural relativism refers to the notion that because human, social and psychological characteristics are culturally produced, the diverse representation of these characteristics across human groups is relative to cultural variability. From this perspective, the moral standards of different cultures cannot be rank ordered in terms of a common criterion of comparison; such standards are "incommensurable" with one another; as a consequence, neither internal critique of a malfunctioning culture nor outside critique on the basis of universal human standards – such as human rights – are possible; the only normative judgment that is possible is one that recognizes the equal worth of culturally different moral standards. Thus, transcultural standards for the ethical assessment of cultural practices or human conduct are not objective or rationally valid, but always represent the imposition of one set of cultural values on another. Indeed, the term ► ethical imperialism has been used to refer to the application of Western ethical standards particularly in developing nations with different cultural norms. Genocide, racism, violence against women and children, war crimes, and the like are highly problematic implications of cultural relativism.

► Cultural universalism implies the existence of overarching principles, such as notions of human rights, that are applicable cross-culturally and, therefore, could be used to determine the rightness or wrongness of specific cultural beliefs and practices. Some authors, from a perspective of autonomy, support basic ► human rights and their global applicability, while others consider notions of the "common good" as a foundation for human rights. In some cases it might be appropriate to consider cultural differences in the application of those principles.

Public health communication campaigns have been part of the strategy of health promotion (► health promotion, ethical aspects) and disease prevention (► prevention and health promotion). The production of messages to promote public health has used a wide range of communication strategies in order to achieve public health goals. Messages on how to improve health may not appear as ethically problematic, yet they may create subtle but real ethical dilemmas, especially when addressed to a multicultural population or to a population having a culture which is different from the Western one. This situation, which is very common in a multi-ethnic society like ours, poses the ques-

tion whether public health promotion messages should respect or indeed challenge cultural norms that appear to clash with Western values or even with human rights. There is no straightforward answer. The point is that things should not be taken for granted, and a culture sensitive ethical analysis should be applied to each phase of the communication activity, with imaginative thinking, open to different ethical approaches, because communication interventions that are sensitive to ethical and cultural concerns are more likely to be better executed and to be trusted by intended populations.

An integral constituent of the discipline of public health ethics is ► professional ethics which concerns the ethical dimensions of a specific profession. More and more, the professional ethics of different countries conform to universally accepted values. This may give the apparent impression that some values and ethical concerns transcend culture; "apparent" because while there may be common ethical concerns between cultures, the cultural context of the underlying values may create very different meanings and result in different practices. In the case of health professionals, for example, the values and ethical concerns embraced by members from different cultures make reference to competence, respect for the patient as a person (► respect for persons), responsibility (to the patient, family, physician and institution/employer), relationship and connection, the importance of the family, caring, good death, comfort, truth-telling, understanding the patient/situation, etc.; however, although these ethical concerns are common to various cultures, the related ► background meanings and consequent actions are often different between these cultures.

What then when cultures mix? In increasingly multi-ethnic populations, diversity has only highlighted the role of culture in defining health needs, appropriate services, and even, at the individual level, in influencing appropriate diagnosis and treatment. As a consequence, ► cultural competence and related education are recommended in order to improve public health professionals' recognition and understanding of the importance of culture in health-related activities and the history, beliefs, values, and practices of members of the specific communities they serve.

It is important to point out that as individuals, however secure we feel in our own cultures, we all live within a worldwide pluralistic society with people from diverse cultures. It is necessary to respect and, at least try to, understand the values of these different cultures, even if we do not share them; we must all learn to find some common ground and some shared ideas so that we can communicate with one another; the values of one single culture, religion or ethical perspective, cannot be just imposed on everyone, it is imperative that we find common acceptable values despite our diversities.

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Cross-References

► Autonomy
► Background Meanings
► Beneficence
► Cultural Competence
► Cultural Relativism
► Cultural Universalism
► Disease
► Ethical Imperialism
► Ethical Principles
► Ethical Values
► Ethics
► Ethics, Aspects of Public Health Research
► Ethnocentrism
► Guidelines
► Health Promotion, Ethical Aspects
► Human Rights
► Illness
► Informed Consent
► Justice
► Non-Maleficience
► Policy
► Prevention and Health Promotion
► Professional Ethics
► Respect for Persons

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Ethics in End-Stage Disease

► Ethics in Palliative Medicine

Ethics and Hospice

► Ethics in Palliative Medicine

Ethics in Palliative Medicine

Synonyms

Ethics in end-stage disease; Ethics and hospice

Definition

From the ethical point of view patients with advanced chronic diseases should receive palliative care well before the point they are near to death (WHO, 2006). They should be supported with information, education and counseling about their diagnosis and the actual and future stages of their diseases. As patients with life-threatening diseases are now living longer and as they are getting more complex treatment, palliative caregivers have to develop new models of practice and a flexibility of attitude to be able to cater to individual needs. Thus, ethically, palliative medicine demands both physical and psychological support from the time of diagnosis of the incurable disease through to its terminal stage. The patient's autonomy and freedom of choice has to be respected. In palliative care the focus is directed to quality of life, which means there has to be good symptom control. In palliative medicine it is our **moral, legal and professional duty** to help patients achieve understanding, so that they have a clear idea of the options available and are able to give consent to examinations and therapies.

Ethics and Religious Aspects

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Synonyms

Meaning; "Arising from habit"; Morality

Definition

Ethics forms one of the main aspects of ► philosophy. It provides criteria for good and bad behavior and makes judgment on those motives with resulting consequences.

The principle of reason forms the main standpoint on which ethics, as a philosophical discipline, is based. It differs from the classical understanding of ► theological ethics in that it embraces the moral principles in God's Will and its belief in the prophecy used in God's name at the forefront.

A single definition of ► religion does not exist. It influences human thought and behavior. It also affects human values, which, due to varying cultures and their historical backgrounds, differ from one another.

Basic Characteristics

History

Ethics became a philosophical discipline under ► Aristoteles (384–322 BC) but ethics had been at the center of philosophical thinking since the time of ► Socrates (469–399 BC).

For Aristoteles, understanding of the term ethics required the scientific study of human customs and practices, and their moral standing and beliefs. He determined that ethics as a philosophical discipline should encompass the whole of human behavior, the meaning of which needed to be defined by utilizing philosophical terms to provide a normative value that, through this method, could be applied practically based on the detail provided.

General

Many of the earlier religions based well being and living together on specific ethical terms, their values of

which still exist today. This system included beliefs in what was right or wrong, good or bad, and how members of specific religions were to behave and conduct their affairs.

Through historical development, these beliefs are to be found in most other religions, which have similar principles with religious obligations. These should provide for a friendly relationship between various religions that share common goals and should have a positive influence on ► society and ► politics.

As in all worldly affairs, there is in religion a conflict between theoretical claims and their practical application. Whilst misunderstanding (misuse of political power) during the middle ages and earlier modern times was based on religious grounds by society, today there is an obvious trend away from this approach.

Sometimes, fundamentalism may lead to the formation of pseudo religious groups and their desire to carry out ► terrorist activities. These brutal actions (crusade, witch-hunt, and persecution of the Jews) and ► religious wars in the name of God have brought about the breakdown of religious ethical norms.

Ethics (Monotheism Religion)

The view of western society's philosophy with regard to ethics is based on the ► hebrew bible (old and ► new testament). ► Judaism and ► christianity share the same ethical terms with regards to their thoughts about the end of this life period. During their present life, believers obey rules decreed by God in order that they may receive, at some future time, a just reward for their endeavors.

Christian ethics are grounded in three virtues: Grace, Compassion, and ► forgiveness. All ► moral guidelines found in the New Testament follow one of these God-given instructions e. g. "Love thy neighbor as thy self." ► Augustine provided just two aspects of ethics, which became enriched through his philosophical renderings. Later, church principals took on those aspects. It was not until the middle ages that there came a strict separation between Ethical and Moral ► theological issues.

The earlier works by Aristoteles won favor in the deliberations of ► Albert Magnus and ► Thomas Aquinas. In his writings on the "Summa contra Gentiles", Thomas Aquinas treats the whole of the issue of ethics in a purely philosophical context. Even today, his works provide a never-ending source of information to philosophers and theologists of the Catholic faith.

Jewish ethics take on a middle stance between Jewish and traditional western philosophy. Similar to other forms of theology and religious ethics, the Jewish stance confines itself mainly to questions and answers regarding matters of a moral nature. The ethics of the Islamic faith deals strictly with the Commandments as laid down in the book of ► koran. The collective responsibility for good and bad is of the utmost importance.

The monotheistic religions have different beliefs concerning birth, death, and self-determination. For Christians, life begins with siring; i. e. within the moment that egg and spermatozoon unite. Death is a point in time that is determined by God himself; it cannot be determined by man without man becoming guilty.

In the Jewish religion, life begins with the first breath. This explains the position of Jewish scientists concerning stem cell research and its legality. Life's end is determined by God as it is in Christianity and the human being has no right to foil God's plans.

Muslims believe that the moment of insemination is the beginning of life, as Christians do. In contrast to Christianity and Jewry, ending your life in order to defend your religion is desired and will be rewarded in the afterlife by a thousand virgins.

Ethics (Asian Religion)

The religious faiths of ► buddhism, ► hinduism and perhaps ► daoism also demand their followers to base their activities on ethical principles; for example, the overcoming of hate, greed, untruth, or uncontrolled violence. The rules were formed on a worldly premise based on cosmological reasoning. Transgression of the rules was only marginally sanctioned by the religious community. In the main, such transgression would have a negative consequence for the individual at a later time.

Ethics (Early Modern Times)

Since the beginning of this period, questions on ► evolution or ethical matters no longer remained the domain of religion. They also became the responsibility of both the ► natural science and ► humanity bodies. This development (► secularization) occurred alongside the ► industrial revolution during which economic, social, and cultural changes and changes in the justice system were being undertaken.

The slogan "God is dead", made by ► Friedrich Nietzsche, resulted in the decline in ethical standards. This became evident in everyday life, in that individuals chose free expression on the premise that in the absence of God, everything is permitted.

In the late nineteenth century and during the whole of the twentieth century, Christianity within Europe lost its influence in social and political issues. There was a general decline in people attending churches, synagogues, and other forms of religious establishments. This trend was notable in England, France, and Germany alike. This occurred despite the fact that churches were in the public domain and available to all. However, since the beginning of the previous century and on a parallel with Fundamentalism, there has become a much deeper and knowledgeable involvement in church life, particularly by 'laymen' and groups of young people in search of the 'sin of life', seen through religious ► tradition or by choice in the development of newly formed religious groups. In part, but beyond the boundaries of Europe, religion is showing an increase in popularity. For example, China's religion has an estimated one million supporters, having been subjected to strict stately controls for centuries (► atheism).

Conclusion

Ethics is the contemplation of philosophical morals. The way in which we live is more important than the moral judgment made when dealing with our daily affairs, either good or bad. All ► christians should conduct themselves in the interest of their ► neighbor and not from the standpoint of seeking personal gain for later reward. Their conduct should reflect the need for brotherly love, without prejudice towards others. Does the bible provide the foundation for ethics today? The bible provides a source of information of both a spiritual nature and on matters associated with our everyday affairs. It reminds us constantly of the way we should live. In the bible, one finds the answers to the meaning of ethics; how we should deal with our affairs. This is independent of any individual spiritual needs. In the Ten Commandments, we find, through Jesus Christ, the method in which we should behave and conduct ourselves. These Commandments were formed by dedicated people who also demonstrated a form of 'spiritual love' towards their fellow men; therefore, they should not be seen as just an alphabetical list. According to ► Luther, the benefit to others is through the sinful manner in which we behave in our dealings with them.

Cross-References

► Albert Magnus (1200–1280)
► Aristoteles
► Atheism
► Buddhism
► Christianity
► Christian (Neighborly Love)
► Daoism
► Evolution
► Forgiving
► Friedrich Nietzsche
► Hebrew Bible
► Hinduism
► Humanity
► Industrial Revolution
► Judaism
► Koran
► Martin Luther
► Monotheism
► Moral
► Natural Science
► New Testament
► Philosophy
► Politics
► Religion
► Religious Wars
► Secularization
► Society
► Socrates
► St. Augustine
► Terrorism
► Theological Ethics
► Theology
► Thomas Aquinas
► Tradition

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Ethnic

Synonyms

Indigenous; Native; National; Traditional

Definition

Term refers to a member of a particular ► ethnic group, especially one who maintains the language or customs of the group.

Ethnic Affiliation

Synonyms

Ethnic association

Definition

Ethnic affiliation refers to individuals' assertions about their own group membership, and the character of that group as defined by its members. It focuses on how people develop their own feelings of ► ethnic identity.

Ethnic Association

► Ethnic Affiliation

Ethnic Group

Synonyms

Nation

Definition

An ethnic group is a segment of a population within a society whose members identify with each other and share common descent, attitudes and behavior, as well as cultural and physical characteristics, and who perceive themselves as a distinct group. Ethnic group may be considered as a cultural community. Recognition by others as well as specific name for the group contribute to definition.

Cross-References

► National Identity

Ethnic Groups

► Indigenous Health Care Services

Ethnic Identity

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Synonyms

Ethnicity; Cultural identity

Definition

► Ethnicity is a complex construct that involves biology, but may also involve history, cultural orientation and practice, language, religion, and "lifestyle", all of which may affect health.

Basic Characteristics

Ethnicity

► Ethnicity is a complex construct that involves biology, but may also involve history, cultural orientation and practice, language, religion, and "lifestyle", all of which may affect health (Durie 1995). It differs from the concept of "► race" which has been commonly defined in terms of biological differences between groups which

are assumed to be genetic (Pearce et al. 2004). However, human races are not and never were 'pure' (Templeton 1999), and broad 'continental' groupings of 'races' explain little in terms of the overall genetic variation of humanity. This is not to say that there are no genetic differences between "races", but very few differences have been found which directly relate to health (Cooper 2003). Those that have been demonstrated are usually not absolute; rather, they involve differences in the percentage of people that have particular gene types. Furthermore, most known genetic variants that are health-related are random mutations in sub-populations, or result from regional selection, and are not related to continental race (Cooper 2003).

The change from 'race' as a research variable to that of 'ethnicity' (Durie 1995) has been explained as being as much about a closer alignment with social reality through recognizing a person's right to self-identify (Robson and Reid 2001) as it is with realizing the limited scientific credibility of the term 'race' (Jenkins 1977). The strength of 'ethnic identity' as a social construct is in its ability to accommodate change – it reflects a fluidity in how people see themselves or are 'seen' which may change over time. However, it is also recognized that identity is not entirely self-constructed and that:

"Individual decisions about who we are and our lifestyle choices, while appearing to be unbounded and therefore, solely a consequence of agency, are, in reality, made within social constraints" (Karlsen and Nazroo 2002, p 4).

Social structures, internal and external factors, national (► nation) and international movements (► national identity), have all influenced the consideration of ethnicity as identity which has also come to have important connotations in terms of the political process of ► ethnic affiliation (Karlsen and Nazroo 2002). This has definitely been a feature of indigenous calls for self-determination and recognition of indigenous rights.

Ethnicity and Health

The fact that racial categorization based on genetic criteria is inaccurate and misleading (Schwartz 2001), does not change the historical reality of the effects of colonization on indigenous/First Nations peoples, nor the realities of indigenous health today. It does however change our interpretation of the causes of high mortality and morbidity in indigenous peoples, which primarily involve issues of ethnicity, rather than of race or genetics.

For example, the European colonization of the Pacific and the Americas after 1492 saw indigenous populations decimated by imported communicable diseases (Foliaki and Pearce 2003). In the Pacific indigenous people experienced high mortality from imported infectious diseases mainly when their land was taken, thus disrupting their economic base, food supply and social networks. When land was not taken in large amounts by European settlers the death rate was relatively low.

Access to health care is also of major importance for ► ethnic differences in health. A recent editorial (Ibrahim et al. 2003) argued that issues of access to care involve a complex mix of cultural factors and individual preferences of patients, characteristics and practices of health care professionals (e. g. racism, stereotyping, bias, discrimination, and lack of cultural safety), and the system of delivery of health care (e. g. composition of the workforce, location of facilities, costs of access) and involvement of different ► ethnic groups in shaping health policy and allocation of resources. It argued that "racial and ethnic disparities in health and health care are rooted in historic socioeconomic inequalities that persist today." Thus "race" may be more important in terms of the perceptions of health care workers, rather than in terms of the underlying disease aetiology.

Conclusions

In the past race has often been evoked as an explanation for health inequalities and in particular, as a reason for the greater incidence of disease and illness among ethnic minorities (or majorities in the case of colonial societies such as South Africa, Zimbabwe and Mexico). At its most basic and popular form it has been expressed as a kind of social-Darwinism. It was seen as inevitable that "weaker" races would die out following contact with "fitter more advanced" peoples. Assumptions about the importance of biological race as a risk factor for disease have in some instances been strengthened by the recent emphasis on genetic determinants of disease, despite the evidence that racial categorization based on genetic criteria is inaccurate and misleading. The concept of ethnicity avoids some of the most troubling and dangerous pitfalls of the use of the outdated

concept of race; in particular, "race" is a biologically-based concept, whereas the concept of "ethnicity" is much broader. This concept has increasing meaning in the international context particularly in terms of recognizing peoples right to self-identify. Barriers to health care may make an important contribution to ethnic differences in health in which the structure and delivery of health care and specific government policies play a crucial role.

Cross-References

- ► Ethnic
- ► Ethnic Affiliation
- ► Ethnic Group
- ► Ethnicity
- ► Nation
- ► National Identity
- ► Native
- ► Race

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Ethnicity

Synonyms

Ethnic identity; Cultural identity; Cultural ethnicity

Definition

Concept of ethnicity refers to a shared cultural identity that has a range of distinctive behavioral and possibly linguistic features, passed on through socialization from one generation to another. Focus is upon the connection to a perceived shared past and cultural traits (such as language, religion, etc.). This term may be confused with "► race". Many regard ethnicity as it is naturally determined. However, there are no distinct boundaries, cultural or geographic, that mark the limits of ► ethnic groups.

Cross-References

- ► Ethnic Identity

Ethnocentric Strategy

- ► Ethnocentrism

Ethnocentrism

Synonyms

Ethnocentric strategy

Definition

Ethnocentrism is a bias based on the assumption that one's own culture is superior to other cultures. Other cultures are seen as inferior and as sources of (all) problems. Ethnocentrism is a rather common pattern. The 'ethnocentric strategy' – even in migrant health care – combines two features. On the one hand, diversity is limited by restricting access, and, on the other hand, diversity is reduced by forced cultural assimilation. The idea of cultural superiority thereby ignores the possibilities to reflect one's own cultural assumptions and to manage cultural difference in a constructive way – based on a culture relativistic position and perspective. 'Ethnocentrism' is derived from the Greek term 'ethnos', which means people or culture (compare ► parochialism).

It also means considering that our own patterns for behavior are "normal", while describing people from another culture as "different", "strange", "weird", "primitive" – as already mentioned – it reveals an

underlying attitude in us that our own culture is superior, more advanced and preferable; it is not just different, but better.

Ethnology

► Culture

Ethnomedicine

► Indigenous Health Care Services

Etiological Factor

► Risk Factors and High Risk Groups

Etiology

Definition

The word etiology is derived from a Greek word which means "pertaining to causes". It is used in different fields. In medicine it refers to causes of a disease.

Eugenics

Definition

Eugenics is included among primary prevention measures (► prevention, primary). It applies to making childbearing decisions on the basis of genetic information. It can be also part of a pre-marriage counseling program.

EU Legislation and the Delivery of Services to Patients

Definition

The European Community has not yet adopted any specific legislation on health care delivery issues, but has developed a system for the coordination of national social security systems – regulations EC No. 1408/71 and 574/72. These regulations allow for reimbursement of costs for certain types of cross-border care. Patients can also obtain prior authorization to obtain medical treatment in another Member State. Many issues remain unsolved considering free movement of patients: the reimbursement of health care costs, authorization for care abroad, assurance of quality of health care and guarantees for medical devices, and legal liability across borders. The assurance of quality of health services is of prime importance, including clinical standards and protocols, accreditation of professionals to similar standards, and accreditation of health institutions.

EUnetHTA Project

Definition

The project "European Network for Health Technology Assessment", supported by the European Commission, was started in January 2006. In the project, 27 European countries are represented by 36 HTA institutions. EUnetHTA is the successor of the ► ECHTA/ECAHI project with a new, further-developed objective. The three-year-project should lay the basis for the systematic exchange of information in the European setting and there shall be a stable European network in excess of the project period.

EUPHA

Definition

The European Public Health Association (EUPHA) is an umbrella organization for public health associations in Europe. EUPHA was founded in 1992. EUPHA is an international, multidisciplinary, scientific organization, bringing together around 12 000 public health experts for professional exchange and collaboration throughout Europe. The organization encourage to a multidisciplinary approach to public health.

EUR-ASSESS

Definition

In the early 1990s, discussion between members of a group of European HTA agency heads culminated in a decision to submit an application to the EU's

BIOMED Programme DGXII for funding for a project aimed at promoting coordination of HTA in Europe. Following an unsuccessful bid in 1992, a successful application was made in 1993, which led to the project on Coordination and Development of Health Care Technology Assessment in Europe (EUR-ASSESS). The aims of EUR-ASSESS, funded between 1994 and 1997, were to improve methods of priority setting, to develop and formulate HTA methodologies, to ensure that effective dissemination strategies were being used throughout European agencies, and to improve decision making by stimulating wider use of technology assessments.

European Community Health Indicators (ECHI)

Definition

The general strategy and approach on ► health indicators – the European Community Health Indicators (ECHI) projects – is conducted under the Health Monitoring Programme of the European Commission. The ECHI-1 and ECHI-2 projects have developed a comprehensive list of indicators, including approximately 400 items/indicators by March 2003. The aim of the projects was to serve as a basis for the European health information and knowledge system. The information on health that should be collected includes health-related behavior of the population (e. g. data on lifestyles and other health determinants); diseases (e. g. incidence and ways to monitor chronic, major, and rare diseases); and health systems (e. g. indicators on access to care, on quality of the care provided, on human resources, and on financial viability of health care systems).

Eustress

Definition

Eustress is a healthy or positive form of ► stress. The demand and the available resources of the affected person are equivalent.

Euthanasia

Synonyms

Intentional killing; Medicide

Definition

Euthanasia is defined as the intentional killing by act or omission of a dependent human being for his or her alleged benefit. One has to differentiate:
Voluntary euthanasia: When the person killed has requested to be killed. **Non-voluntary euthanasia:** When the person killed made no request and gave no consent.
Involuntary euthanasia: When the person killed made an expressed wish to the contrary. **Assisted suicide:** Someone provides individuals with the information, guidance, and means to take their own lives with the intention that they will be used for this purpose. When it is a doctor who helps another person to kill themselves it is called "physician assisted suicide." **Euthanasia by action:** Intentionally causing a person's death by performing an action such as giving a lethal injection.
Euthanasia by omission: Intentionally causing death by not providing necessary and ordinary (usual and customary) care or food and water.
Justifications given for euthanasia are that no one should have to suffer unbearable pain, that one has the right to commit suicide and that people should not be forced to stay alive if they do not wish to do so (http://www.euthanasia.com/definitions.html).

Evaluation

Synonyms

Assessment

Definition

Evaluation is the systematic determination of merit, worth, and significance of something or someone. It is a process that involves assessing the relevance, effectiveness, and impact of activities in the light of their objectives. As defined by the American Evaluation Association, evaluation involves assessing the strengths and weaknesses of programs, policies, personnel, products, and organizations to improve their effectiveness. Evaluation is the systematic collection and analysis of data needed to make decisions. Process evaluations describe and assess program materials and activities, while outcome evaluations study the immediate or direct effects of the program on participants.

Evaluation of Infectiological Data

► Outbreak Management and Surveillance of Infectious Diseases

Evaluation, Models

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Synonyms

Assessment; Appraisal; Estimation; Quantification; Audit; Controlling; Revision

Definition

Evaluation has several distinguishing characteristics relating to focus, methodology, and function. Evaluation assesses the effectiveness of an ongoing program in achieving its objectives, relies on the standards of project design to distinguish a program's effects from those of other forces, and aims at program improvement through a modification of current operations. Evaluation with regard to health promotion evaluation is an assessment of the extent to which health promotion actions achieve a valued outcome (WHO 1998).

Basic Characteristics

General

Evaluation is based on the methodology of the social and economic sciences. By definition, evaluation is the systematic examination of benefit and value of objects, e. g. programs (► summative evaluation), projects, products (► summative evaluation), measures, organizations or political issues.

► Health promotion outcomes, conclusions or recommendations are also validated based on qualitative and quantitative empirical data. The term evaluation has its origin in Latin ("evaluare") and means "be strong." Evaluation elements play a significant role in ► quality assurance, ► quality management and objective assessment in the context of health promotion interventions. Evaluation aims at improving strategies as well as providing measurements to give assistance in reaching decision about the prolongation and course of projects. Furthermore, evaluation is directed towards measuring project outcomes.

In relation to health promotion, evaluation contributes to both the course of projects (implementation of empowerment or participation) and providing results at the end of projects. It is a basic element of ► quality assurance and contributes to the success of a health promotion intervention which means that evaluation is an essential part of each intervention. Surveillance of goal attainment, formulation of reachable and observable goals, and identification of target groups, documentation, legitimization and improvement in the course of projects are fundamental elements. Evaluation increases the understanding of the causes of success or failure of a project and validates intervention ideas. Planning of an intervention and evaluation of a project are closely and mutually connected.

In relation to health promotion intervention, the following main evaluation criteria are needed for measuring the outcome as well as the quality of a project:

- Criteria of acceptance – Did the intervention reach the target group and how was the behavior changed?
- Criteria of learning process – How do the participants understand the intervention and how do they reflect it?
- Criteria of transfer – How was the behavior influenced by the intervention?
- Criteria of outcome – How can the changes in health behavior of the participants be measured?

Evaluations of health promotion activities may be participatory, involving all those with a vested interest in the initiative; interdisciplinary, involving a variety of disciplinary perspectives; integrated, incorporated into all stages of the development and implementation of the health promotion initiative; and enhancing, helping build the capacity of individuals, communities, organizations and governments to address important health problems (WHO 1998).

Types of Evaluation Models

Evaluation is methodologically diverse using both qualitative and quantitative methods, including case studies, survey research, statistical analysis, and model building amongst others. It is estimated that more than 100

approaches of evaluation measures exist. In the following an overview of the most important evaluation types is provided.

The classification of evaluation types depends on their use in different stages of a project. Evaluation can be relevant for assessing context, (prerequisites), structure and process and outcome of a project (► formative evaluation, ► summative evaluation, ► transfer evaluation, ► impact evaluation). Evaluation measures can also be classified according to who evaluates the project, i. e. the initiators or external institutions. Great benefit can be derived from evaluating both the process and the results. Which process and outcome related evaluation measures are used depends on the type of methodology, organization models and the role of the ► evaluators in the research context. A range of well-known methods are used for obtaining data throughout the course of projects and assessing project outcomes by evaluation measures: for example, structured questioning, questionnaires, observations as well as analysis of project material are carried out, aided by systematic procedural methods and documentation.

In an evaluation, data are systematically organized and documented in order to reconstruct and review the project procedure and results. Internal and external data sources are available for this kind of evaluation measure. Internal evaluation involves implementation as well as observation and documentation of project activity. Close involvement with the project being examined can be an advantage in internal evaluation; the factors which are influencing the project's course are well known. However, closeness might also be detrimental as objective evaluation may be impaired. This disadvantage is eliminated in external evaluation and, hence, a higher legitimacy may be achieved for the evaluation outcomes if this method is adopted.

Further evaluation models are subdivided with regard to their experimental character. Experimental evaluation models evaluate the effect of an intervention by comparing the results of two groups in their achievement of a certain number of defined target variables; an experimental intervention group's results are compared with a non intervention group's results. The results measure the absolute effects between these two groups. Analysis includes comparison of data by the means of statistical testing procedures and comparison with regard to time. Aspects of confounder and bias have to be considered and improbabilities excluded using standardized measuring instruments. This action is also called goal attainment and describes rational and purposeful implementation of standardized instrumentation. In conclusion, the following basic questions have to be considered in the preparation of planning a health promotion project:

- Program attainment – Does the activity reach the target group?
- Participant satisfaction – Are participants satisfied with the activity?
- Program activities – Has the activity been successfully implemented?
- Performance of materials and other components – Are the materials and components of the activity of good quality?
- Ongoing quality improvement – What can be changed in order to improve the quality of the activity?

Cross-References

► Evaluator
► Formative Evaluation
► Health Promotion Outcomes
► Impact Evaluation
► Quality
► Quality Assurance
► Quality Management
► Summative Evaluation
► Translation

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Evaluator

Definition

Specification of ► quality criteria, determination of quality standards, investigations empirical data and the decision on the quality of an intervention as well as acceptance of measures belong to the scope of evaluators' work.

Event

Synonyms

Event; Outcome; Dependent variable; Response

Definition

An event or outcome (typically the patient state at a given point in time) is chosen to be assessed to ascertain whether an intervention is effective. The endpoints should be sensitive to treatment effects and be clinically relevant. *The primary outcome variable* or *endpoint* is a measure capable of providing the best evidence directly related to the primary objective of the trial. It is important that the primary outcome variable be measured without bias in a reliable manner using validated instruments with adequate sensitivity to detect a real change in each patient's health status. A *surrogate endpoint* can be used in situations in which short-term measures of response to treatment may provide reliable indicators of long-term patient outcome. With responder or threshold analyses, we can re-express continuous or ordinal variables into categorical or dichotomous response variables. *Secondary outcomes* are either supportive measures to help interpret the primary results, or response variables related to secondary objectives or hypotheses. In recent years, clinical evaluation has included more complex experimental designs and used multiple response variables or *multiple endpoints*.

Evidence

Definition

In scientific research, evidence is accumulated through observations of phenomena that occur in the natural world, or which are created as experiments in a laboratory. *Scientific evidence* is evidence that serves to either support or counter a scientific theorem or hypothesis.

Evidence-Based

Definition

Diagnostic or therapeutic procedures are based on estimates of the risks of benefit and harm derived from population based high-quality research.

Evidence-Based Clinical Practice/Healthcare/Practice

► Evidence Based Medicine

Evidence Based Medicine

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Synonyms

Evidence-based clinical practice/healthcare/practice

Definition

There are a number of definitions of Evidence-Based Medicine/Healthcare/Practice. According to the Centre for Evidence-Based Medicine (CEBM.net), the following definitions are among the most commonly cited:
Evidence-Based Medicine (EBM) according to the standard definition is "the conscientious, explicit, and judicious use of current best ► evidence in making decisions about the care of individual patients" (Sackett et al. 1996).
Evidence-Based Clinical Practice (EBCP) is "an approach to decision making in which the clinician uses the best evidence available, in consultation with

the patient, to decide upon the option which suits that patient best" (Muir 1997).

Evidence-Based Healthcare (EBHC) is "the conscientious, explicit, and judicious use of the current best evidence to make a decision about the care of patients" (Marwick 1997).

Evidence-Based Practice (EBP) is "an approach to health care wherein health professionals use the best evidence possible, i. e. the most appropriate information available, to make clinical decisions for individual patients" (McKibbon 1998).

Basic Characteristics

Responding to the limitations of traditional expert recommendations that act as a guide to clinical practice, evidence-based medicine has presented a ► paradigm shift in the way clinicians learn and practice medicine.

The practice of EBM calls for the integration of individual clinical expertise with the best available external evidence from systematic research. Individual clinical expertise is the proficiency and judgment that individual clinicians acquire through clinical experience and clinical practice. The best available external evidence is derived from clinically relevant research. Good doctors use both individual clinical expertise and the best available external evidence (Sackett et al 1996).

The concept of ► number needed to treat (NNT) has increasingly become part of EBM. NNT is a numerical indicator of the effectiveness of a therapy.

The purposes of EBM are as follows:

- Keeping skills up to date (EBM provides clinicians with the tools they need to find important new medical research quickly and easily.);
- Saving time (Computer indexes to the medical literature such as MEDLINE allow clinicians to do computer searches for the information they need quickly and easy.);
- Saving lives (A detailed and exact knowledge of the outcomes of different treatments, derived from research, can often save lives.);
- Supplementing clinical judgment (The computer only gives one of many elements that will enter into clinical decision – information about how other patients in similar situations have responded. It is up to the clinician to judge how applicable that information is to their patient and to decide on a course of action.).

History of EBM

Because of the scientific basis of medical research, evidence-based medical practice has been around for centuries. In the 1970s an astute British epidemiologist, Archie Cochrane, who is best known for his influential book 'Effectiveness and Efficiency: Random Reflection on Health Services', stressed the importance of using evidence from ► randomized clinical trials (RCTs), because these were likely to provide much more reliable information than other sources of evidence. His challenge led to the establishment of an international collaboration to develop the Oxford Database of Perinatal Trials in the 1980s. The explicit application of evidence, as EBM, to problem solving in clinical medicine began simultaneously in the late 1980s at McMaster University in Canada and at Oxford University in the United Kingdom. The term "evidence-based medicine" first appeared in the medical literature in 1992 in a paper published in JAMA by the Evidence-Based Medicine Working Group (Gyatt et al. 1992). In the same year, the Cochrane Centre in Oxford was opened, and in response to Archie Cochrane's call for systematic and up to date reviews of all healthcare related RCTs, the ► Cochrane Collaboration was developed in 1993 (Mayer 2004).

Steps in Practicing EBM

There are five steps in the process of EBM that practicing clinicians should take:

1. Convert the information need into answerable clinical questions – **PICO**, which stands for:
   Patient (population or clinical problem of interest);
   Intervention (exposure, test, or treatment);
   Comparison (what you think the intervention is better or worse than); and
   Outcome of interest (ideally, the one of interest to the patient).
2. Search the medical literature and find the best evidence with which to answer these questions.
3 Perform a ► critical appraisal of the evidence found for its validity (how close the evidence is to the truth) and its usefulness (how the results will help in caring for patient), by using one of eight published EBM guidelines (therapy, diagnostic testing, overview, prognosis, causation/harm, clinical measurement, quality of care, and economic evaluation) (► EBM Literature Guides).

4. Integrate the results of this appraisal with clinical expertise and apply the results in clinical practice, with an understanding of the patient context and values.
5. Evaluate (► evaluation) the performance after applying the evidence to practice.

In summary, evidence-based practice requires clinical expertise, common sense, understanding of the circumstances and values of the patient, and judicious application of the best available evidence.

Hierarchies of Evidence

The key idea of EBM is a "hierarchy of evidence". There are several published hierarchies for classification of research studies.

There are systems that grade studies by their overall quality, such as the following system developed by ► U.S. Preventive Services Task Force, which is the hierarchy that is the basis of the current grading scheme for clinical studies (Haris et al. 2001).

- Category I: Evidence from at least one properly designed randomized controlled trial.
- Category II-1: Evidence from well-designed controlled trials without randomization.
- Category II-2: Evidence from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.
- Category II-3: Evidence from multiple times series with or without intervention or dramatic results in uncontrolled experiments such as the results of the introduction of penicillin treatment in the 1940s.
- Category III: Opinions of respected authorities, based on clinical experience, descriptive studies and case reports, or reports of expert committees.

Another classification scheme, developed at the ► Centre for Evidence-Based Medicine at Oxford University, uses levels A through D to designate the strength of the evidence, where Grade A is the strongest evidence and grade D the weakest. These levels of evidence are cataloged for articles regarding therapy or prevention, etiology or harm, prognosis, diagnosis, decisions, and economic analysis (Mayer 2004).

Criticism of EBM

Commonly cited limitations of EBM are as follows:

- Shortage of coherent, consistent scientific evidence;
- Difficulties in applying evidence to the care of individual patients;
- Barriers to the practice of high-quality medicine;
- The need to develop new skills;
- Limited time and resources; and
- Paucity of evidence that EBM "works".

The first three limitations outlined here are not unique to EBM but are universally encountered in the practice of medicine.

EBM, like other models of care, has limitations, and further innovation and study are required to resolve the issues raised by its critics. In particular, efforts need to be directed toward improving clinicians' access to evidence at the point of care; developing better methods of describing evidence to patients in order to facilitate shared decision-making; and conducting studies to test whether and how EBM affects the processes of care and patient outcomes (Straus and McAlister 2000).

Cross-References

► Centre for Evidence-Based Medicine
► Cochrane Collaboration
► Critical Appraisal
► EBM Literature Guides
► Evaluation
► Evidence
► Number Needed to Treat (NNT)
► Paradigm Shift
► Randomized Clinical Trials
► U.S. Preventive Services Task Force

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Evidence Based Medicine Database

► Cochrane Library

Evidence Based Medicine, in HTA

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Definition

Evidence-based medicine (EBM) applies scientific methods to medical practice. According to the father of EBM, ► Sackett, David: "Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." In 2000, Sackett corrected his own definition to state that EBM is "the integration of best research evidence with clinical expertise and patient values", because he saw that there is some fear that evidence-based medicine will be hijacked and misused by purchasers and managers to cut the costs of health care.

Basic Characteristics

Overview

EBM uses techniques from science and ► statistics, such as various types of clinical and ► non-clinical trials, ► meta-analysis of scientific literature, and ► risk-benefit analysis, etc. It aims for the ideal that healthcare professionals should make "conscientious, explicit, and judicious use of current best evidence" in their everyday practice. Generally, there are two main areas of EBM. The first aim is to treat individual patients with acute or chronic pathologies by treatments supported by the most scientifically valid medical literature. Thus, medical practitioners would select treatment options for specific cases based on the best research available for each patient they treat. The second area is the systematic analysis of medical literature to evaluate the best studies on given topics. This process can be very human-centered or highly technical using computer programs and information techniques such as ► data mining.

History

Although testing medical interventions for ► efficacy and ► effectiveness has been carried out for many decades, it was only at the end of the 20th century that this effort evolved to impact on the fields of health care and policy. The work of Professor ► Cochrane, a Scottish epidemiologist, caused increasing acceptance of the concepts behind evidence-based practice. The explicit methodologies used to determine "best evidence" were mainly established by David Sackett. The term "evidence-based medicine" first appeared in the medical literature in 1992, in a paper by Guyatt et al.

Qualification of Evidence

In evidence-based medicine, different types of clinical evidence are categorized, compared to earlier approaches to systematize evidence, and ranked (see list below). This ranking refers to the grade of absence of various ► biases that beset medical research. The strongest evidence for therapeutic interventions is provided by randomized, double-blind, ► placebo-controlled trials involving a well defined, homogeneous patient population and medical condition. In contrast, cohort studies, case-control studies, case reports, and even expert opinions have lower scientific value. Practicing evidence-based medicine implies not only clinical expertise, but expertise in retrieving, interpreting, and applying the results of scientific studies, and in communicating the risks and benefits of different courses of action to patients or, in the context of health technology assessment, to policy makers.
The concept of ► number needed to treat (NNT) has increasingly become part of evidence-based medicine (McQuay and Moore 1997). The NNT is a numerical indicator of the effectiveness of a defined therapy. For example, an NNT of 10 means that if 10 patients were treated, only one would respond. Therapies with an NNT of 1 are the most effective as this means that every patient treated responds. However, an NNT of 20 to 40, or even more than 100, can still be considered as effective. The limit at which a therapy is considered as effective is the subject of political discussion

in the healthcare system. The opposite of the NNT is the ► number treated needlessly (NTN).

Many systems to stratify evidence by quality have been developed, all of them with only minor differences in the naming of the classes, i. e. I to IV, or A to D. In Europe, the system of rating available evidence that was published in 1996 by Hadorn et al. 1996 is widely used:

Ia at least one ► meta-analysis of properly designed randomized controlled trials
Ib at least one properly designed ► randomized controlled (clinical) trial
IIa at least one properly designed controlled trial without ► randomization
IIb quasi-experimental ► cohort-studies
III non-experimental ► case control studies
IV ► case series, expert opinions, ► consensus conferences, ► descriptive studies

Limitations of Available Evidence

It is recognized that, due to various reasons, not all evidence is made accessible by authors, and this can limit the effectiveness of any approach. Therefore, efforts to reduce ► publication bias and retrieval bias are required.

Failure to publish negative trials is the most obvious and important gap in the literature. Efforts to establish registers of clinical trials (► clinical trials, register) at the outset, with the obligation to pursue their results, are underway all over the world. In future, changes in publication methods, particularly related to the Internet, may reduce the difficulty of obtaining publication for a paper on a negative result of a trial. Treatment ► effectiveness reported from clinical studies is normally higher than that achieved in later routine clinical practice due to the closer patient monitoring during trials that leads to much higher compliance rates. More research is needed to identify the extent of the proven clinical outcome in everyday practice.

Criticism of Evidence-Based Medicine

Critics of EBM say lack of evidence and lack of benefit are not the same, and that EBM applies to populations, not necessarily to individuals. The knowledge gained from clinical research does not necessarily or directly answer the primary clinical question of what is best for the patient. Other critics suggest that proponents of evidence-based medicine discount the value of clinical experience.

Although evidence-based medicine is quickly becoming the standard for clinical practice and ► treatment guidelines, there are a lot of reasons why many current medical practices do not have a strong literature base supporting them. First, the types of trials considered to be "gold standard" (i. e. randomized double-blind placebo-controlled trials) are expensive, therefore funding sources play a role in what gets investigated. For example, public authorities tend to fund preventive medicine studies to improve public health as a whole, while pharmaceutical companies fund studies intended to demonstrate the ► efficacy and safety of their own, patent pended drugs. As a dramatic result, there are nearly no studies on old (generic) drugs conducted, with the consequence of limited evidence and, in the worst cases, exclusion of these substances from medical care. Second, in an increasing number of cases, conducting randomized controlled trials would be unethical, although ► observational studies are designed to address these problems to some degree. Third, certain patient groups have been under-researched, and as a result the literature is sparse in areas that do not allow for generalization. Fourth, the studies that are published in medical journals may not be representative of all the studies that are completed on a given topic (published and unpublished), or may be misleading due to conflicts of interest (i. e. ► publication bias). Thus, the extent of evidence available on particular therapies may not be adequately represented in the literature. Since a 2004 statement by the International Committee of Medical Journal Editors that they will refuse to publish clinical trial results if the given trial was not recorded publicly at its outset, this may become less of a problem. Additionally, the ► CONSORT-Statement (Consolidated Standards of Reporting Trials), published in 1996, is an approach that could improve the publication of evidence, rather than the quality of evidence itself.

Large randomized controlled trials are useful for examining discrete interventions for carefully defined medical conditions. The more complex the patient population, the conditions and the intervention, the more difficult it is to separate the treatment effect from random variation (► significance). A number of studies therefore obtain non-significant results, either because there is insufficient ► power to show a difference, or because the groups are not sufficiently balanced.

In some healthcare systems (such as Germany), evidence-based guidelines have been used as a basis for denying insurance coverage for some treatments that are believed by the physicians involved to be effective, but are not yet supported by published results from randomized controlled trials. A prominent example of the limitations of the EBM approach is that coverage for substitution of vitamin E in cystic fibrosis has been denied because nobody is funding a randomized controlled trial of this cheap, generic product.

Cross-References

- ▶ Bias
- ▶ Case Control Studies
- ▶ Case Series
- ▶ Clinical Trials
- ▶ Clinical Trials, Register
- ▶ Cochrane, Archibald
- ▶ Cohort Studies
- ▶ Consensus Conference
- ▶ CONSORT-Statement
- ▶ Data Mining
- ▶ Descriptive Studies
- ▶ Effectiveness
- ▶ Efficacy
- ▶ Meta-Analysis
- ▶ Non-Clinical Trials
- ▶ Number Needed to Treat (NNT)
- ▶ Number Treated Needlessly (NTN)
- ▶ Observational Studies
- ▶ Placebo Controlled
- ▶ Power
- ▶ Publication Bias
- ▶ Randomization
- ▶ Randomized Clinical Trials
- ▶ Risk-Benefit-Analysis
- ▶ Sackett, David
- ▶ Significance
- ▶ Statistics
- ▶ Treatment Guidelines

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Evidence Based Recommendations

E

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Definition

The quality of evidence for a health intervention is usually categorized according to an ▶ evidence hierarchy. The strength of recommendation can be assessed using different scales; however, a consensus on the most appropriate scale does not currently exist.

Basic Characteristics

The identification of strong evidence for the ▶ effectiveness of an intervention does not necessarily lead to the formulation of strong recommendations for or against its implementation in the health care system.

Clinical Recommendations

Evidence of the effectiveness of health technology is only one part of the picture when considering recommendation. Clinical recommendations consider (for the most part) only the benefits and drawbacks of one or more specific interventions. Focusing exclusively on clinical recommendations, the evidence must be searched systematically to answer each part of the research question. Wherever possible the ▶ sensitivity, ▶ specificity, ▶ likelihood ratio (LR), and incremental ▶ cost-effectiveness ratio should be calculated.▶ Relative risk and ▶ odds ratios should be estimated for risk factors and co-morbidities.

Integrated Recommendations

Focusing only on the clinical aspects of a research question is often not appropriate. Other parts of the picture, such as the impact on organization of the system, resources available, responsiveness, and equity, also play a determinant role in the decision for or against

the introduction or implementation of a health intervention or technology. Even with strong evidence of health benefits from an intervention, recommendations from a health technology assessment (HTA) may be against its implementation. With consideration of other factors like cost and cost-effectiveness issues, the burden of disease, needs and priorities, barriers to implementation, features of the health care system, and cultural issues etc., implementation can appear to be improper in a given context.

Normally, health technology assessment explicitly considers such factors. However, for the assessment of these factors the highest place in the hierarchy of evidence is not taken by randomized controlled trials (RCTs), since such study design is not appropriate to answer relevant questions besides clinical efficacy. In addition, the epidemiological approach is not always the appropriate method in these cases. Therefore, evidence obtained with empirical, social, or political science methods needs to be considered in a HTA.

A consensus by the WHO Regional Office for Europe agreed a new definition of evidence in the context of HTAs: "findings from research and other knowledge that may serve as a useful basis for decision-making in public health and health care" (WHO Regional Office for Europe 2004). This emphasizes the prospective relevance and validity of different study designs and research forms. It also goes further, acknowledging the value of evidence obtained with methods that – within the scope of some scientific discourses – are not considered scientific.

Cross-References

- ► Cost-Effectiveness Ratio
- ► Effectiveness
- ► Evidence Hierarchy
- ► Likelihood Ratio
- ► Odds Ratio (OR)
- ► Relative Risk
- ► Sensitivity
- ► Specificity

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Evidence Hierarchy

Definition

Not all evidence is judged to be of equal value. There are hierarchies of research design that are evaluated to have different strengths and different levels of value in the decision-making process.

The hierarchy of levels of evidence is briefly:

1.	A	Systematic reviews/ meta-analyses
	B	RCTs
	C	Experimental designs
2.	A	Cohort control studies
	B	Case-control studies
3.	A	Consensus conferences
	B	Expert opinions
	C	Observational studies
	D	Other types of study e. g. interview-based or local audit
	E	Quasi-experimental, qualitative designs
4.		Personal communications

Evolution

Definition

The beginning of the beginning and its continued state of existence.

Examination Survey

Definition

An examination survey is designed to collect data that are not well suited to be included in health interviews but are measured more reliably using medical methods. It may comprise the measurement of height and weight, drawing of blood and urine samples, tests of motor skills or medical interviews. The examinations are usually done by medical (or at least medically trained) personnel in the homes of the survey participants or in mobile field work units. Because of their rigorous standards, examination surveys provide the most objective data on the health status of a sampled population.

Exanthem Subitum (ES)

► Erythema subitum

Excessive Substance Use

► Substance Abuse

Exercise

Definition

Planned, structured and repetitive bodily movements, performed to improve or maintain one or more components of physical fitness. Exercise may be classified in one of two categories, anaerobic and aerobic, depending on where energy is derived from depending on intensity and duration.

Cross-References

► Physical Activity

Expansion of Morbidity

Definition

A hypothesis that assumes an increase in longevity will increase the number of years lived in bad health.

Expenditures On Health Care

► Health Care Costs

Experimental Studies

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Synonyms

Intervention studies

Definition

Experimental study is "study in which conditions are under the direct control of the investigator" (Last 2001). It is employed to test the ► efficacy of a preventive or therapeutic measure.
Experimental studies can provide the strongest evidence about the existence of a cause-effect relationship.

Basic Characteristics

Types of Experimental Studies

There are two different types of experimental studies: *therapeutic* and *prevention studies* (Webb et al. 2005).
In *therapeutic studies* (*clinical trials*), different medicines or medical procedures for a given disease are compared in a clinical setting.
Trials that are conducted on healthy or apparently healthy individuals with the aim of preventing future morbidity or mortality are called *preventive studies*. Preventive studies include *community study*, in which the intervention is applied to groups, and *field study*, in which the intervention is applied to healthy individuals at usual or high risk of developing a disease.
Clinical and field studies ideally take the form of a *randomized controlled trial (RCT)*, in which the intervention is compared with a control and the allocation to experimental or control group is randomized. The RCT represents the "► gold standard" for epidemiologic research.

The Protocol

The aims and methods of the study should be described in detail in a protocol document. The protocol should also include a clear statement about the following: therapeutic or preventive measures to be used, the characteristics of the subjects to be recorded at the start of the study, assessment of endpoints (► outcome), entry criteria and treatment allocation, whether the total group is to be stratified, frequency of follow-up, the circumstances under which patients will be withdrawn from the study, times at which data from the study will be analyzed, strategy for the statistical analysis, and ethical aspects (Bhopal 2002).

Selection of Subjects

The first step in any study is to define the reference population suitable for the investigation, i. e. people with

disease for clinical trials or without disease for preventive trials.
In the next step, the experimental population in which the study is to be conducted is selected. Inclusion/exclusion criteria are used to identify appropriate subjects but not to reject people personally. It is essential to choose an experimental population that is sufficiently large, with a sufficient number of outcomes of interest within a reasonable period of time, and with a high rate of follow-up.
Then, subjects must be informed about the purposes of the trial, the study procedures, and the possible risks and benefits.
The last step is to divide the study population into two or more groups by simple or complex (block or stratified) randomization (Gordis 2004).

Randomization

Once subjects have been recruited and have signed an ► informed consent form, they are divided into experimental and control groups by random allocation, usually through the use of a table of random numbers or a computer-generated randomization list.
The main purpose of randomization is to create study groups that are comparable in every way except for the intervention. Randomization can only guarantee balance for large studies (Dawson, Trapp 2001).

Simple Randomization

Simple randomization is a method of random assignment in which every subject has an equal probability of being selected for the study groups (Gordis 2004).

Blocked Randomization

When the ► sample size is relatively small, block randomization is used to achieve balance between groups. In block randomization, subjects are first subdivided into homogeneous blocks that are the same size as the number of treatments, and then subjects from each block are randomly assigned to different treatment groups (Friedman, Schron 2002).

Stratified Randomization

If study groups are different in characteristics known to be related to outcome, then stratified randomization is used.

Stratified randomization means that participants are first divided into groups (strata) of similar characteristics (e. g. sex, age, etc.) and then randomized to treatment and control groups within each stratum. The groups are then bound to be comparable, at least for the factors that have been dealt with in this way (Gordis 2004).

Nonrandomized Experimental Studies

Nonrandomized experimental studies are studies that do not use randomized assignment. These studies are open to many sources of bias.

Parallel Designs

In parallel design, subjects are allocated to study or control groups and stay in the allocated group until the end of the study

Factorial Designs

In a factorial design, two or more interventions are carried out at the same time with minimal increase in cost (Gordis 2004).

Crossover Designs

The main advantage of crossover design is smaller sample size. In planned crossover, half of the subjects would receive the intervention followed by the control, and the other half the reverse. In such crossover, each subject serves as his or her own control. An unplanned crossover refers to a switch of subjects to different treatment conditions for various reasons.

Uncontrolled Experimental Studies

These are studies without a control group.

Experimental Studies with Historical (External) Control

In these studies, the experimental group is compared with patients who were exposed to the preexisting standard form of therapy (historical group) (Dawson, Trapp 2001).

Experimental Studies with Self-Control

In these studies, the same group of subjects is used for both the experimental and control group (Dawson, Trapp 2001).

Sample Size

An important step in designing a study is determining a sufficient ► sample size. Sometimes it would take too long to enroll the desired study group if the investigation were limited to one institution or one area. In this situation, the best solution is to set up a *multi-centric trial* (► multi-centric study).
Factors which are considered in the calculation of sample size for dichotomous outcome studies are event rate in the control group, expected benefit from the intervention, level of adherence to the groups, power to detect a real difference (► beta error), and α error (► alpha error) (Dawson, Trapp 2001).

Blinding (Asking)

Blinded studies prevent the introduction of ► placebo effect and ► observer bias in the assessment of outcomes, but ► open trials do not.
In a *single blind study*, only the participant is unaware of the administered treatment.
A *double blind study* is a trial in which the participant and the investigator do not know which individuals are in the experimental and control groups.
A *triple blind study* is a trial in which not only the participant and the investigator but also those responsible for data analysis do not know the group to which the participant has been assigned. In this type of study, the code is broken only after the entire study, including the analysis of data, is complete (Gordis 2004).

Placebo

When ► blinding is possible, it is usually accomplished by means of placebo. A placebo is an inactive treatment that is intended to be similar to the active treatment – in physical appearance, color, taste, odor, etc.
In therapeutic studies, the use of a placebo has caused ethical concerns. Comparison of a new treatment with an old treatment is often more appropriate. One way to avoid the use of placebo is to compare different doses or durations of a specific intervention (Fraceschi, Plummer 2005).

Adherence (Compliance) Bias

This bias (► bias, confounding and interaction) occurs when subjects do not comply with the assigned treatment. On one hand, subjects may stop taking the treatment assigned without admitting this to investigator. On the other hand, they may take the treatment assigned to the other group.
A variety of techniques (i. e. frequent contact, reminders, single-dose of medication, providing continuity of care, monitoring, etc.) to maintain good adherence are used to increase the statistical power of a study to detect any true effect of the study intervention (Friedman, Schron 2002).

Withdraw

Reasons why participants must be withdrawn from analysis are concomitant therapy usage, poor adherence to the protocol, poor quality or missing data, and loss to follow-up.

Outcome of Trials

When the ► outcome of a trial is dichotomous, such as being alive or dead, it is unlikely that patients will be misclassified. There is a need for explicitly stated criteria for all outcomes to be measured in a study (Gordis 2004).

Statistical Analysis

Various statistical analyses of follow-up data from intervention studies can be used. The risks of death or developing the disease or complication in each group can be calculated. The ► efficacy of an agent being tested can be expressed in terms of the rates of developing disease in the study and placebo groups (Fraceschi, Plummer 2005).

Ethical Issues

Many ethical issues arrive in the context of trials. It is well known that the benefits of participation in an experimental study must clearly outweigh any possible risks to the subject.
Another ethical problem is that experimental design requires that medication be withheld from people who might benefit from it. Because of this issue, experimental and control subjects are closely monitored to determine the outcome of an intervention. If the intervention produces improvement in the patients' condition, then it is given to members of the control groups as well (Friedman, Schron 2002).

Cross-References

- ► Alpha Error
- ► Beta Error
- ► Blinding
- ► Efficacy
- ► Gold Standard
- ► Informed Consent Form
- ► Multi-Centric Study
- ► Observer Bias
- ► Open Trial
- ► Outcome (Health Economics)
- ► Placebo Effect
- ► Randomized Controlled (Clinical) Trials
- ► Sample Size

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Expert Dominance

Synonyms

Elitism; Technocracy

Definition

Expert dominance refers to a tendency for the expertise of the specialist to influence unduly the outcome of decision-making and policy development. There is a correct place for the salient influence of experts. However, as the expert becomes less likely to bear the full brunt of the consequences, it increasingly becomes a matter of allowing for other perspectives in the various processes. This is especially true of complex situations that preclude complete competence on the part of experts in various functional specialties. Additionally, due to the position that they occupy in a social structure, it can be the case that the expert gains undue political or social power. In such instances, they may exert influence beyond the circumscribed limits of their knowledge and skill. This can be observed easily when famous experts in one field are asked for their opinions in another field without reference to their actual abilities in that second field.

Explicit Knowledge

Definition

Explicit knowledge is the abstract, symbolic type of knowledge present in documentations of knowledge such as textbooks or guidelines, procedural guides, reports, strategies etc. It is applicable to both specific and generic problems and relies on explicit reasoning mechanisms. This type of knowledge can be communicated on paper or electronically, without person-to-person contact.

Exploration

- ► Ethics, Aspects of Public Health Research

Exposure

Definition

Exposure could be defined as a contact with a source of a disease agent in such a manner that harmful effects of the agent may occur. It is the process by which an agent comes into contact with person in such a way that the person may develop the particular disease. Exposures may of course be beneficial rather than harmful, e. g., exposure to immunizing agents.

Exposure Assessment

Synonyms

Exposure quantification

Definition

Exposure assessment identifies specific agent(s), determines the route of exposure, and quantifies the amount and duration of exposure. Once a suspect substance is identified, scientists conduct studies to estimate the amount of the substance a particular population is exposed to. Exposure assessment is a third step in a ► risk assessment procedure. In the exposure assessment, uncertainties arise because it is difficult to measure the amount of a ► hazard over time, and how much is taken in by individuals.

Exposure assessment in occupational health means the estimation of workers' exposures on an individual or group level. Accurate exposure assessment is a great challenge in almost every occupational health setting. Over the years methods for occupational exposure assessment have been developed; modeling of occupational hygiene data, experts' exposure ratings, specific questionnaires. Biological markers may also provide valuable information for occupational exposure assessment. This process has become even more crucial, although many of the major occupational risk factors are now identified, proper knowledge is still needed on the effects of low level exposures present in complex workplace environments.

Exposure Levels

Definition

Evaluating exposure to toxic substances requires the calculation of exposure levels for comparison with standards in set by law or other guidelines. The data needed for these calculations comes from monitoring the presence of hazardous physical, chemical and biological agents in the workplace (► Workplace Hazards).

When an exposure level to a specific agent for a worker or group of workers has been determined, it can in some cases be compared with a standard or guideline to determine whether the exposure is within acceptable limits. There are many agents present in workplaces whose health effects are not fully understood. There are also many for which no legislated or recommended standard exists.

Exposure Quantification

► Exposure Assessment

Exposure to Stimuli

Definition

The nature and degree to which a system is exposed to stimuli.

Exposure at Work

► Workplace Exposure

Expression

► Communication

Ex situ Treatment

► Composting

Externality of Consumption

Definition

Externalities of consumption exist if one individual's consumption of a good or service has positive or negative consequences for the ► utility of another person. A positive externality increases the utility of the other individual – although he or she does not pay for it (e. g. immunization). A negative externality decreases the utility of the other individual (e. g. smoking).

External Motivation

► Extrinsic Motivation

Extra-Welfarism

Definition

Extra-welfarism acknowledges that a wide range of characteristics are relevant for individual welfare – not just the consumption of health care services and health in itself. It also refers to relative changes in consumption or work patterns as direct sources of ► utility or

disutility. In contrast to ► welfarism, extra-welfarism acknowledges the processes and transitions of life.

Extremely Low Birth Weight Infants

Definition

Extremely low birth weight infants are born weighing between 500 to 999 gm, measured within an hour of birth.

Extrinsic Motivation

Synonyms

External motivation

Definition

The desire or push to perform certain behavior based on the potential external rewards that may be received as a result.

Factor Analysis

Definition

Factor analysis (FA) is an advanced statistical method for examining the relationships between a set of variables without identifying a specific response variable. FA is based on a model that assumes that correlations between pairs of measured variables can be explained by the connections of the measured variables to a small number of non-measurable (latent) but meaningful variables, which are termed factors. The aims of FA are to (a) reduce the number of variables and (b) detect structure in the relationships between variables, i. e. to classify variables. For example, FA is often used in survey research to see if a long series of questions can be grouped into shorter sets of questions, each of which describes an aspect or factor of the phenomena being studied. A distinction can be made between two different types of FA – explanatory and confirmatory. Explanatory FA identifies relationships among variables that are often far from obvious in the original data. The purpose is to summarize and concisely describe the data by grouping correlated variables together. Confirmatory FA is a version of FA in which specific hypotheses about structure and relations between latent variables that underlie the data are tested. It is used to confirm the existence of these hypothetical constructs in a fresh set of data and has strong similarities to structural equation modeling.

Factors that Influence Health

► Health Determinants

Faculty of Medicine

► Medical School

Failure (Patient)

Definition

A patient is scored as a failure if he or she suffered the outcome of interest. If the patient failed, the length of follow-up is the time between diagnosis and failure. The sort of untoward ► events that could be studied include myocardial infarctions, leukemia relapses, strokes, metastatic developments, and death from one of a certain set of specified causes (ignoring deaths from other causes). In all of these cases, the design principles and statistical methods are virtually the same: the times at which each patient who suffers the event of interest does so are observed and analyzed.

Fair Information Practice

Definition

"Fair information practice" is a set of principles that define the responsibilities of an organization that holds confidential information about individuals. It was incorporated into the Federal Privacy Act of 1974 in the US. ► Consumers are guaranteed the right to have access to information about them and to correct this information to the extent allowed by law. According to this practice, confidential information collected by public health organizations should be relevant to public health, must have written consent from the patient who provided them, and may be used strictly according to the

stated purpose. Furthermore, the information in the system must not be lost, altered or destroyed, and access to information must be made on a "need-to-know" basis – i. e. allowed to a small number of health professionals who have adequate need for the information.

Faith

► Religion

Familial Motor Neuron Disease

► Motor Neuron Diseases

Family Composition

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Synonyms

Family structure

Definition

Family composition discusses the role of ► family structure (e. g. single parent, married couple, married couple parents, kin co-residence); ► union formation (i. e. marriage, divorce and cohabitation); and ► marital quality on various health-related outcomes.

Basic Characteristics

► Family structure shapes the mental health, physical well-being and longevity of children, adolescents and adults. Major themes have typically been developed based on studies in industrialized countries. They address: 1) children's emotional and developmental well-being; 2) adolescent problem behaviors; and 3) the health and longevity of married couples.

Children's Emotional and Developmental Wellbeing

In both industrialized and industrializing nations, population-representative surveys strongly associate nonmarital childbearing with infant mortality, low birth weight, and delayed cognitive development. In industrialized nations, single parenthood (particularly when determined by divorce) is related to the highest levels of childhood emotional and behavioral problems (Dawson 1991).

Two mechanisms are most commonly used to explain the relationship between family composition and children's physical and mental health. First, there are differences in social and economic resources (► social resources) by family structure. Studies have found that economic factors such as poverty strongly mediate the relationship between non-martial childbearing, infant death, and low birth weight (Schor, Menagham 1995). Health insurance coverage often changes with changes in family structure (particularly divorce). Furthermore, in both the industrialized and industrializing nations, maternal education is a primary determinant of health utilization.

Secondly, family composition indirectly captures the psychosocial stress and disruption associated with divorce. Divorce is associated with increases in emotional distress, independent of changes in social and economic resources (Seltzer et al. 2005). The role of emotional distress appears to be strongest among the youngest children (i. e. preschool age), and to diminish within several years; however, it is noteworthy that studies of birth cohorts in the U.S. and the U.K. have observed differences in the mental health and social well-being of adults who experienced divorce as children (Seltzer et al. 2005). Current and emerging research uses information from birth cohorts in the U.S. and Europe to understand the role of family composition over the life course, and the mechanisms interrelating family dynamics with child and later-life well-being.

Adolescent Problem Behaviors

The research considering adolescent ► problem behaviors is closely linked with the research studying children's emotional well-being. In this context, not only is family structure considered in relationship to health, but also the correlates of family structure, such as the quality of the parent-child relationship. The literature in this area is commonly situated in an industrialized nation context. For example, a recent population-representative survey of U.S. high school students (ages 14–19 years) found that teenage smoking, drinking, weapon-

related violence, and sexual intercourse were all significantly more prevalent among students living in two-parent households than single parent households (Blum et al. 2000). Scholars are beginning to describe, however, how globalization and mass marketing are shaping changes in adolescent behavior and ► family formation patterns in industrializing countries (Lloyd 2005).

Adolescent problem behaviors, like child emotional problems, are related to family composition through differences in resources and psychosocial stress. In addition, differential access to adult role models provides an important mechanism linking dynamics in the family with adolescent well-being (Schor, Menagham 1995). Recently, the involvement of nonresident fathers has been found to mediate differences in family structure and adolescent behavioral outcomes (Carlson 2006).

Health and Longevity of Couples

In adulthood, family composition is related to the physical and mental health of men and women in complex ways. Marital status is associated with longer life, better physical and mental health, more health-promoting behavior, reduced health risk-taking and accidents, lower suicide, violence, homicide and even different immune regulation (Umberson 1992; Kiecoltglaser et al. 1993). However, there are also reciprocal relationships between health and family formation, which make causal inference particularly challenging (Lillard, Waite 1995; Rogers et al. 2000). Moreover, aspects of family composition such as marriage, kin co-residence, and family size may have both positive and negative influences on health, depending on factors such as the quality of relationships and the relative balance of family financial and emotional stressors to family resources (Rogers et al. 2000).

Family formation can influence the health of adults through pathways similar to those of children, involving differential resources and psychosocial stressors. For example, the role of financial resources has been identified as particularly important for women and not men in determining the positive relationship between longevity and marriage (Lillard, Waite 1995).

In addition, as active participants in the family formation process, adults (in contrast with children) are particularly influenced by aspects of partnership such as the degree of marital conflict, the extent of social monitoring and reinforcement, and even selection into and out of partnerships. The social support of a marital partner is independently associated with better medical outcomes following medical treatment associated with heart disease and cancer (Case et al. 1992). Similarly, spouses' contribution to monitoring and positively (or negatively) supporting each other's health behaviors is used to explain the differences in health and longevity upon divorce or widowhood (Umberson 1992).

New studies have begun to explore the quality of marital interactions. In controlled study settings, immune function has been shown to negatively correlate with marital conflict (Kiecoltglaser et al. 1993). Moreover, studies have highlighted how correlates of health (in particular attractiveness and poor health behaviors) may select individuals into and out of marriage in a manner which biases the positive relationship observed between marriage and longevity (Rogers et al. 2000).

F

Cross-References

► Family Formation
► Family Structure
► Marital Quality
► Problem Behavior
► Social Control
► Social Resources
► Union Formation

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Family Doctor

► General Practitioner

Family Formation

Definition

The process of creating relationships between one's self and at least one other individual that allow the exchange of resources and responsibilities. Family formation follows from ► union formation and typically involves child rearing. The patterns of family formation, when studied at a population level, involve the intersecting changes in the timing and likelihood of such activities as parenthood, cohabitation, marriage, divorce, remarriage, and grandparent co-residence.

Family Health

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Introduction

The family is a private sphere of social life with intimacy and mutual interdependence. It offers a substantial means of insulation in the face of societal stress. Unfortunately, the private space of family life is also an arena of violence and abuse, especially to wives and children. Patriarchal domination still exists in most families and may be one cause of gender inequality in health. Civil law plays an interventionist role in supervising relationships, particularly concerning marriage and parenthood.

Health and illness have a great impact on families, and family has a powerful effect on health. Family health refers to the concept that each individual can affect the health of all other family members. This is evident for infectious diseases. However, any disease of a family member may have a negative social and psychological effect on individuals, especially children, regardless of whether or not they contract the disease themselves. Life-threatening and stigmatizing diseases such as ► HIV/AIDS may be particularly oppressive. On the other hand, social support from family members, e. g. through communication and cooperation, is health promoting. Marriage is the most influential family relationship on health for adults. It is important to consider that negative, critical family relationships have a stronger influence on health than positive, supportive relationships. In order to be highly effective, family health programs have to incorporate activities that promote behaviors directly related to physical health as well as improve communication within the family. In contrast to family therapy, which has been clearly demonstrated to improve family functioning and the emotional health of family members, there is much less evidence that family interventions can improve the physical health of family members (Campbell 2004).

Children with chronic illness and disabilities have to rely on family support to cope with their situation successfully. Vice versa, families have to balance the burden of the child's illness with other family needs. Both child and adult chronic illnesses can often dominate family life and affect relationships within the family. Family interventions for chronic childhood disorders may be effective in improving medical and psychosocial outcomes.

A growing number of the elderly must rely on family members for care. Family support and care giving may improve adherence to medical treatments, but exert a heavy toll on family members, who consequently show higher rates of mental illness and mortality compared with non-caregivers. Family support groups and intensive psychoeducational interventions that provide specific problem solving and coping skills may prevent increased morbidity in family caregivers. Family health

professionals should be part of health care teams and offer support for family members.

Unhealthy behaviors or risk factors tend to cluster within families: family members tend to share similar diets, engage in similar physical activities, and use or abuse drugs. The initiation and quantity of smoking, which remains the number one public health problem in much of the world, is influenced by whether and how much other family members smoke. The fact that partner support is important for smoking cessation greatly illustrates how family involvement may be important in the promotion of healthy lifestyles.

Family health may be divided into several subdisciplines: family demography, family health policy, gender differences in health, perinatal health, child health, adolescent health, women's health, men's health, reproductive health, and health of the elderly. Tobacco use and sexually transmitted diseases affect families to such a great extent that they both merit special consideration.

Family Composition

► Family composition shapes the mental and physical health and well-being of all family members, including children, adolescents, and married couples.

Infant mortality and delayed cognitive development in children seem to be strongly associated with nonmarital childbearing. The growing prevalence of childhood emotional and behavioral problems in developed countries may be the consequence of single parenthood, particularly when determined by divorce (Dawson 1991). Social and economic resources depend on the family structure, e. g. health insurance coverage often changes after divorce. Emotional problems in children and adolescent problem behavior are more prevalent in individuals experiencing psychosocial stress (e. g. due to divorce).

Maternal education is a primary determinant of health service utilization in children around the world. This highlights the importance of education not only for the mother's health but also as a proxy for the physical and mental well-being of her dependents. Not only does the family structure per se have an impact on health, well-being, and behavior of individuals, but also the quality of relationships within the family. The quality of relationships even determines whether factors like marriage or family size have a positive or negative influence on the health of adults.

In general, marriage is associated with better outcomes concerning physical and mental health; social, risk-taking, and health promoting behavior; and longevity. Married people of both sexes have death rates well below the rates of unmarried people. However, the relationship between family status and health of men and women is very complex. The degree of marital conflict, social support of a marital partner, and support of each other's health behavior are major determinants in this relationship. Of course, gender differences within the couple also interact with some correlates of health.

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Demographic Perspectives on Family Health

Family demography is the study of changes in family composition due to entrances into and exits from families. Family demography is deeply intertwined with family health.

Despite the overall progress in life expectancy and health worldwide, new and re-emerging health threats have the potential to reverse this progress. Population aging and changing family structures create additional challenges for societies, in particular to already disadvantaged families and children ► demographic perspectives on family health.

In the developed world, infant and child mortality has been low since the middle of the 20th century. Prevention of cardiovascular disease, especially in the elderly population, has recently increased the length, but also the quality, of life. In developing countries, life expectancy has risen over recent decades. Vaccination and other means of prevention of infectious diseases have been especially effective in increasing infant and child survival. Unfortunately, the HIV epidemic has slowed progress in child health. Countries that are strongly affected by the HIV/AIDS epidemic, such as Southern Africa, countries in Eastern Europe, and the former Soviet Union, have seen mortality reversals. Conditions like obesity and diabetes have the potential to reduce life expectancy in many countries of the world.

Another major demographic trend of the 20th century is the considerable decline in fertility rates throughout the world, although desired fertility remains high in many poor countries, and many women continue to have limited access to family planning. Falling family sizes are partly due to family planning efforts, which have been developed to improve living standards in developing

countries and to reduce maternal and infant mortality. As total fertility rates have fallen well below replacement levels throughout Europe and in parts of Asia, and low fertility may cause economic and societal problems, policy concerns have shifted to increasing fertility rates in many countries.

The HIV/AIDS epidemic is today's most important family health crisis. Families have to compensate for loss of wages and organize care for sick adults. In addition, the burden of caring for orphaned children falls to the extended family, often grandparents, who are not in good health either.

Population aging poses an additional demographic challenge. Wealthy countries debate how to fund pension and health services for the elderly as there are fewer working-age adults to support the welfare state. In developing countries in Latin America and the Caribbean, welfare systems that can support the elderly have not yet been established. If societies cannot take care of the elderly, the responsibility falls instead to families. Moreover, rising rates of divorce and nonmarital fertility weaken families. Children raised in single-parent families are often socioeconomically disadvantaged. Divorce and single parenthood may have an impact on children's health and well-being for their whole life.

Gender Differences and Health

Women, on average, have lived longer but less healthy lives than men have in developed countries since the turn of the last century. Gender shapes differences in health behavior and health service utilization that are important for health, development, and longevity. Scientists are currently exploring complicated gene-environment interactions that are fundamental to the understanding of gender differences in health ► gender differences and health.

Smoking has been identified as the primary determinant of the convergence in mortality differentials between men and women in industrialized nations over the later part of the 20th century. At the beginning of the century, smokers were mainly male as tobacco was a luxury and it was not considered socially acceptable for women to smoke. Consequently, rates of smoking related deaths were much higher in men than in women. With relaxing of social norms, which began in the 1920s, and especially young women's increasing aspiration for independence outside of the home, the proportion of female smokers rose. Consistent with the trends in smoking, rates of cancer-related deaths began to increase among women over the later half of the 20th century. Due to current delays in smoking cessation among women compared with men, lung cancer mortality is still increasing in females but no longer in males in the US population (Pampel 2002).

All over the globe, men consistently show higher rates of accident and violence related mortality compared with women. There are even three times as many fatalities caused by road traffic injuries among men aged 15 to 44 years than among women in the same age category (WHO 2002c).

Differences in the social habits of men and women are related to higher mortality among men and higher morbidity among women. Changes in feminine social norms, especially concerning women's work outside the home, have been related to increased psychosocial stress, as women have to bear responsibilities both at home and at work. This increased psychosocial stress may explain the rise in women's morbidity. The feminine role of caregiver also hinders women from leaving abusive relationships in many cases. Physical and psychological violence against women is often legitimized by a woman's failure in a feminine social role and can be related to unsuccessful achievement of masculine social roles by men (Lorber 2005).

Child Health and Development

Child health includes developmental aspects from birth to young adulthood as well as children's physical, mental, and social health (► child health and development). Health in childhood is an important determinant of health in adolescence and adulthood. Malnutrition and its potential lifetime consequences on health (e. g. blindness, stunted growth) affects about 250 million children worldwide (Blair et al. 2003). Nutrition is necessary for children's metabolism, growth, development, health, and well-being. Nutrition during the first few years of life has a critical impact on cognitive development and growth (National Research Council 2000). Breastfeeding should be promoted, especially in the first 6 months of life, and even longer in developing countries where access to sanitized water is limited. Although the contents of breast milk depend on the mother's food supply and environment, nutrients

are mostly well balanced. Breastfeeding also provides fat and water-soluble vitamins, minerals, hormones, enzymes, and anti-infective and anti-inflammatory substances. Breastfeeding has negative effects for the child if the mother is HIV positive, drinks alcoholic beverages, or is or was exposed to pollutants such as DDT or PCB. Children are one of the subpopulations for which it is most important to follow a balanced diet in order to prevent chronic diseases such as diabetes and cardiovascular disease.

Children of low socioeconomic position, immigrants, refugees, and those living in war torn countries are most vulnerable due to lack of adequate nutrition, shelter, and healthcare. Parents' feelings of depression, anxiety, and low self-esteem, which are to a greater proportion present in poor than in wealthy families, increase children's risk of living in unstable homes (Blair et al. 2003). Children's social environment (e. g. parental participation, violence in the home and community, and abuse or neglect) is critically influential in the development of language, scholastic achievements, social behavior, and physical and mental health.

The physical environment has a great impact on child health. Efforts that have been made to prevent childhood injuries are far from sufficient. Injuries still represent the most common cause of physical disability. Motor vehicles are not only responsible for the majority of childhood injuries worldwide, but also emit hazardous chemicals. Children who live in high traffic areas, near industrial parks, and are in contact with indoor pollutants, such as cigarette smoke and asbestos, are particularly at risk of acute and chronic respiratory diseases. Lead poisoning from lead pipes and paint cause partially irreversible neurological damage. Contaminants and pollutants in food, water, and the immediate environment are particularly harmful to children as their diet is less diverse and their food and water consumption in relation to their body weight is higher than that of adults (Blair et al. 2003).

In developed countries, child mortality and morbidity are at their lowest levels in recorded history due to decreasing fertility rates and improvements in water supply, nutrition, housing conditions, and quality and acceptance of vaccinations. Prosperity also leads to lifestyle changes responsible for the dramatic rise in chronic conditions that have typically not been seen until adulthood: e. g. type II diabetes, obesity, joint disease, and headache. The consequences of these changes play out over the lifespan, as unhealthy children typically grow up to be unhealthy adults. Low quality nutrition (prepackaged food high in fat and sugar, etc.) and lack of physical exercise (less outdoor activity, and increased television and video game use) are equally responsible for these new aspects in child health (Blair et al. 2003).

Approximately 85 percent of the world's children live in developing countries, where infectious diseases – mostly diarrheal diseases and respiratory infections – remain the primary cause of childhood death. Progress in health care is limited to urban areas in most developing countries. While childhood HIV infections are declining due to prevention efforts in mother to child transmission, children are still commonly left to head the household after losing their parents to the disease (Blair et al. 2003).

Emotional and behavioral problems during childhood are common. Depression, attention deficit hyperactivity disorder (ADHD), and conduct disorders are linked with developmental delay (Morris 2003).

Adolescent Health and Development

Adolescence is the period in life in which physical growth, pubertal maturation, cognitive transitions, and psychological and social maturation happen. There is great variation in the paths of development within and across cultures. Physical growth, changes in body composition and physiology cause an increase in body strength on the way to adulthood. Sexual maturation physiologically leads to functionality of reproductive organs and development of secondary sexual characteristics. Adolescents may start becoming sexually active. Cognitive advances that emerge during adolescence include increased knowledge, multi-dimensional thinking, and the shift from concrete to abstract thinking. Social acceptance and integration in larger peer groups, as well as formation of close, intimate friendships, become salient. Moreover, adolescents deal with psychological transitions such as development of identity, autonomy, intimacy, and sexuality. The process of individuation and increasing autonomy can be the basis of potential conflict with authority figures. ► adolescent health and development.

Health compromising behaviors during adolescence may critically influence individuals, societies, and economies in the long term. Alcohol, tobacco, and drug

use, engagement in unprotected sexual intercourse, lack of physical exercise, and overcalorific nutrition often emerge in this period. Major causes of mortality and morbidity in adolescents are behavior related and therefore preventable: unintentional injuries (mostly from motor vehicle accidents), violence, homicide, suicide, teenage pregnancy, and sexually transmitted diseases.

Mental illness in youth causes a major burden of disability worldwide. Poverty, violence, and trauma contribute to mental illness. Mental, behavioral, and addictive disorders are associated with educational and social problems and should be prevented more aggressively. These conditions do not only affect individuals, but may have far reaching consequences on family life and the adolescent's future.

There are different approaches to help young people navigate successfully through the transitions of adolescence and enable positive health and development in youth. Interventions should take into account individual factors, immediate relationships, environmental influences concerning the school and neighborhood, for example, and societal forces, in order to be successful. Moreover, it is evident that healthy development and education on healthy behaviors that begins in childhood promotes and sustains health and development in adolescence and throughout the whole life.

Women's Health

► Women's health does not only imply pregnancy and reproductive health but also focuses on health issues across women's life-span and possible consequences arising from the multiple roles women frequently have to play (mother, wife, caregiver, worker, etc.). Women's health is significantly associated with not only biological differences between men and women, and women's reproductive role, but also with gender inequality in social, educational, cultural, and economic status. Several diseases are unique to women, more prevalent, or more serious in women. Risk factors and the effectiveness of interventions may also be different in women compared with men.

Women experience greater morbidity, but higher life expectancy compared with men. Particularly in older age, women have clear survival advantages (UN 2005). Infectious diseases like HIV/AIDS and malaria as well as maternal conditions are the leading causes of death for women worldwide. In developed countries, women's leading causes of death are cardiovascular disease and cancer. Being the most frequently diagnosed malignancy in women, breast cancer is one of the leading health concerns for women. Nevertheless, breast cancer mortality is still second to lung cancer mortality. Early detection of breast cancer through mammographic screening is able to reduce the burden of breast cancer in the female population and should be promoted worldwide.

Women are more vulnerable to infection with sexually transmitted agents, due to social inequalities between women and men concerning knowledge of STD prevention, influence on sexual relationships, and availability of health care services.

Cardiovascular disease shows different features in women compared with men. It occurs later in life, has higher case-fatality rates, and seems to be undertreated in women.

Another condition that greatly influences women's health-related quality of life is osteoporosis, a condition that significantly increases the risk of fractures which may be deadly, especially in older women. Prevention efforts have to begin in early life in order to be effective, as peak bone mass, which is critical for the risk of later osteoporosis, is mostly achieved during adolescence.

Reproductive health is the state of complete physical, mental, and social well-being in all matters relating to the reproductive system. Access to adequate healthcare services for pregnant women is a prerequisite for adherence to women's rights. Pregnancy and childbirth are major life events in which healthy behavior and a healthy environment, e. g. concerning exposure to smoking, alcohol, nutrition, physical activity, and positive relationships, are essential for the health of the mother and the newborn.

The decline in fertility rates worldwide is partly due to the development of contraceptive strategies. Contraceptive prevalence is 67% worldwide and is much higher in industrialized countries compared with the least developed countries. Unfortunately, there are still millions of women with unmet contraceptive needs in developing countries (UN 2005). The abortion rate is directly related to the prevalence of modern contraceptive methods and restrictiveness of abortion policies. Legalization of abortion reduces the number of illegal abortions, which are often conducted under unsafe conditions, and consequently decreases health risks for the mother.

Violence against women has a significant negative impact on women's health both directly and indirectly by reinforcement of social inequalities. Domestic violence, especially intimate partner violence, is the most important cause of homicide in women and a great burden to the female population worldwide.

Men's Health

► Men's health as a distinct area of critical intellectual and practical concern in the domain of public health has relatively recently been recognized in the Western World. Networks are only recently beginning to be formed across multiple sectors and disciplines (Hayes 2003). Regarding research, government policy, and programs, men's health remains a relatively minor area of concern. Existing efforts concentrate on men's reproductive health or men's engagement in anti-social and risk-taking behavior. Resources are often not assigned adequately to research on male conditions. Although the mortality rates are roughly equivalent in industrialized nations, research funding for the diagnosis and treatment of prostate cancer significantly lags that of breast cancer in women.

Men in general are considered to be incapable of experiencing and expressing emotions adequately or of engaging in appropriate self-care. These kinds of prejudices are popular and tenacious. In addition, Western societies often ignore the economic and political significance of the processes of socialization that prepare men to fight in wars or work in hazardous industries. Only recently, men have become less pathologized and men's health is taking a more positive primary health care and health promotion approach.

Increasing rates of workforce redundancy for men over 50 years of age, and decreased opportunities for nonconsumerist leisure options for males of all ages, necessitate public health interventions that create opportunities for men to maintain their social connections. Men's mental and physical health may benefit from maintained or increased social connectedness.

Life expectancy for males at birth is lower compared with women in various regions of the world. Globally, the leading causes of death for all males are related to cardiovascular disease (27%), non-respiratory infections and parasitic diseases (20%), malignant neoplasms or cancers (13%), followed by unintentional or intentional injuries (12%), respiratory infections, and other respiratory disease (WHO 2002b).

Prostate cancer is the most common noncutaneous human malignancy, and the second most lethal tumor among men. However, men tend to die with prostate cancer rather than because of it. Therefore, diagnosis leading to treatment of prostate cancer may not improve men's lifespan or health-related quality of life. As its natural history is often prolonged, survival benefits of early detection and local therapy in low-risk tumors are not easy to achieve. The large majority of prostate cancers are detected via prostate-specific antigen (PSA) screening. Discussion about the quality of screening methods is still ongoing. Appropriate disease management, particularly risk assessment, is necessary to avoid overtreatment for patients with indolent disease and to avoid undertreatment for those with aggressive prostate cancer. Even if prostate cancer screening is eventually demonstrated to provide benefit for asymptomatic persons, psychological and physical harms of treatment, including impotence and incontinence, must be taken into account. In general, men are more reluctant to accept screening compared with women; therefore, the usefulness of secondary prevention needs to be particularly emphasized.

Elderly and Health

Both the absolute number and relative proportion of older people in the general population are on the rise. By 2002, the population of individuals aged 60 years and over reached 626 million, or 10 percent of the total world population. By 2050, the older population is projected to be more than triple its current size. The majority of the elderly population is female in most of the world. In addition, it is projected that more than three-quarters of the world's older people will be living in developing countries by 2050 (UNPD 2003). Population aging is the result of the combination of reduced fertility and improved living conditions, together with successful innovations in public health and progress in medicine ► elderly and health.

Health in later life is influenced by various biomedical, environmental, and social factors. In general, physical and mental capacities weaken in older age. Aging populations have higher rates of chronic disease and disability. Chronic diseases may contribute to the gradual loss of quality of life and are a heavy burden to the

elderly as well as to the health care system. In the prevention of disabilities, a healthy lifestyle that includes regular physical and cognitive activity, a nutritious diet, and avoidance of tobacco is key. Societies need to prepare for the increasing health and social service needs of the elderly.

Changes in family structure and population aging result in decreasing availability of young family members who are able to provide care for the elderly in need. Around the globe, spouses are the main caregivers for both men and women, even in older age. Only a small percentage of older people live in institutions for long-term care. Community and home care services as well as the possibility of living in flat-sharing communities allow the elderly to remain in their own homes and reduce feelings of loneliness and reclusiveness.

Fertility

Reproduction is essential to the survival of societies as population size depends on survival, migration, and reproduction. ► Fertility describes the ability to conceive and produce a live birth. Human fertility is directly influenced by coital frequency, methods of birth control, sterility, lactational amenorrhea, and fetal loss. Endocrinological, nutritional, cultural, economic, and social factors have indirect effects on fertility. Natural fertilization is achieved when mature sperms penetrate the ovulated egg on its journey from the ovary to the uterus, and cell division begins in the fertilized egg. In this early stage, progress of the pregnancy depends on successful implantation of the embryo into the wall of the uterus where it develops into a fetus. To conceive a child naturally, the male and female reproductive organs must function without any abnormalities or disruptions.

Fertility rates are measured in terms of the number of live births per woman-year of exposure for a given period of time, usually one year. Fertility replacement is defined as the level at which a cohort of women has enough children on average to replace themselves and their partners in the population.

Over the last decades, global fertility levels have changed dramatically. Declines in fertility rates are visible in all regions of the world, although patterns of decline may vary across and within regions. Fertility decline first started in Europe in the late 19th and early 20th centuries. In the less and least developed countries, fertility decline began much later (1960s to 1970s). In North America, Europe, and East Asia, rates are below fertility replacement (see "► fertility", Fig. 1). This trend leads to fewer at-risk pregnancies and, consequently, to decreased mortality and morbidity in mothers and children.

There are several stages in the demographic transition from high to low fertility levels. The early stages show fertility declines among older childbearing-aged women, which typically exceed fertility reductions due to rising age at marriage among younger women. Delayed childbearing among women in their twenties and the growing proportion of women having none, or only one or two children, are responsible for further reduction of fertility toward below-replacement levels.

Contraception, abortion, poor nutrition, infectious diseases, and sexually transmitted infections are major factors influencing fertility. The latter factors are disproportionately present in developing countries, where ► HIV infection is an important reason for sub-fecundity in sub-Saharan Africa and malaria increases the risk of fetal loss in pregnant women.

Contraception is considered one of the major public health achievements of the last century. Worldwide, more than 60% of women of reproductive age who are married or in a union are using contraception. However, the proportion of women using contraception varies considerably across countries. Some of the most populous countries in the world, such as India, Pakistan, Nigeria, and much of sub-Saharan Africa, register low levels of use. Oral contraceptives and condoms are the most widely used methods in developed countries, and female sterilization and intrauterine devices (IUDs) in developing countries.

Pre-conceptional measures such as contraception help to assure that every pregnancy is intended. Worldwide, an estimated 38% of pregnancies occurring each year are unintended and approximately 60% of these end in an induced abortion (WHO 2005). Consequences of unsafe abortions account for 13% of maternal deaths and are therefore a major public health concern. Unsafe abortions should be entirely prevented. Research on fertility-regulating methods has led to the development of oral treatment regimens, such as mifepristone or misoprostol, which effectively terminate early pregnancies and seem to be safer compared with invasive abortion during the first weeks of gestation.

Infertility

► Infertility refers to the inability to produce a live birth, usually after one or two years of regular, unprotected sexual intercourse. In contrast, the terms infecundity and sterility describe the inability to become pregnant. Infertility is used in reference to any point in the fertility process, including the inability to conceive, become pregnant, carry a pregnancy to term, or produce a live birth. There are two types of infertility: primary infertility, which is the inability to produce any live birth, and secondary infertility, which is the inability to produce a live birth after the birth of a child.

Approximately 10% of couples are affected by infertility during their reproductive lives. Infertility is especially high in developing countries, with up to one-third of all couples trying to conceive without success in some countries in Central Africa. A baseline of 5% of all couples is estimated to be sterile, irrespective of nationality. Female factors, male factors, or conditions related to the couple as a whole can cause infertility. Male-factor conditions are present in at least half of all infertile couples. Non-preventable conditions leading to infertility including anatomical, genetic, hormonal, and immunological problems that prevent a successful pregnancy, are responsible for the core 5% of infertile couples and do not vary much across or within populations. Infections, environmental, and occupational factors are preventable causes of infertility that show significant variation around the world. Sexually transmitted infections (STIs) related to infertility include *Chlamydia*, gonorrhea, trichomoniasis, and syphilis. Prevention of asymptomatic STIs is difficult, as infection is often not detected until permanent damage, such as pelvic inflammatory disease and tubal occlusion, has occurred. Other infectious and parasitic diseases associated with increased risk of infertility include HIV infection, tuberculosis, schistosomiasis, and malaria. Women in developing countries face higher risks of nosocomial infections causing infertiliy than women living in industrialized countries. Permanent damage of the reproductive tract may be the result of postpartum infection, septic abortion, or infection following the insertion of an IUD. These conditions are mostly due to unhygienic practices in health care. The prevalence of harmful sexual initiation rites and subsequent complications varies significantly across countries, cultures, and religions. Preventable environmental exposure mostly affects sperm quality and quantity. Exposure to arsenic, aflatoxins, pesticides, and also consumption of tobacco and alcohol can cause infertility.

Infertility is a serious reproductive health problem that can have far-reaching effects on individuals and communities. In many cultures, infertility is highly stigmatized. It can result in discrimination, exclusion, ridicule, and even abuse. Even if childlessness is socially acceptable, infertile couples may still struggle with feelings of inadequacy, shame, and depression. Women usually carry the heaviest burden of the problem.

Helping individuals achieve their reproductive intentions will have profound effects on population health and societal well-being.

Worldwide, there has been a marked increase in the demand for infertility services, including advanced reproductive technologies. Assisted reproductive procedures are expensive, produce a higher number of multiple births, and result in at-risk pregnancies. Nevertheless, *In Vitro* Fertilization (IVF) is considered as one of the greatest achievements of reproductive medicine and extending assisted reproductive technology to the developing world is a global reproductive health priority (WHO 2002a). In cultures where traditional healers are commonly consulted, treatments can be painful, ineffective, and potentially harmful. Efforts to prevent infertility must be emphasized, as they are less expensive, more effective, and may avoid inappropriate treatment.

Perinatal Health

The external and the in-utero environment both influence birth outcomes. Pregnancy is a critical period for the health of the newborn as well as for long-term health and development of the infant. ► Perinatal health particularly covers preterm birth, low birth weight, intrauterine growth retardation of the fetus, and perinatal mortality.

Preterm birth occurs in approximately 10% of births, and continues to increase in most developed countries. It is associated with increased morbidity, and is the major cause of all perinatal mortality. As risk factors for preterm delivery are multiple and overlapping, advances in prevention have only been modest. Sociodemographic and biologic risk factors include maternal age, race and ethnicity, socioeconomic status, stress, drug abuse, family genetics, poor nutrition-

al status, multiple gestations, anatomic anomalies of the uterus, bleeding, and infection. Infants that survive preterm delivery are at higher risk of damage to the central nervous system. Timely detection of early labor is important to allow transport of mothers to qualified delivery facilities and initiate effective treatment such as antibiotic treatment of bacterial sexually transmitted diseases.

Fetuses that show intrauterine growth retardation are exposed to the same risks as babies born preterm. The growth restriction is caused by an inadequate supply of nutrients and/or limited oxygen supply to the fetus, which may be caused by fetal malformations or infections, maternal smoking, or inadequate nutrition. Early detection and management of fetuses experiencing growth restriction is crucial to determine optimal timing and method of delivery. Prevention strategies should continue to focus on prevention of smoking during pregnancy, maternal nutrition, and, in developing countries, malaria prophylaxis during pregnancy.

Low birth weight infants are born weighing 2500 grams or less. Low birth weight is the second leading cause of perinatal morbidity and mortality. Its incidence is much higher in developing countries. Any complication that limits oxygen and alters nutrient supply of the fetus may be a risk factor for low birth weight. These conditions include chronic hypertension in the mother, glucose metabolism and chronic cardiorespiratory disorders, maternal malnutrition, multiple pregnancies, infections, and anomalies in the fetus, placenta, or umbilical cord.

Ways to prevent low birth weight include improved access to adequate prenatal care to improve detection of small-for-date babies, identification of the causes of fetal growth restriction, and counselling mothers on risks associated with stress, smoking, alcohol and drug use, as well as inadequate nutrition during pregnancy.

Perinatal mortality includes stillbirths, fetal deaths after 20 weeks gestation, and mortality within the first 29 days after delivery. Almost 75% of deaths occur in the first week of life and the highest risk of mortality is in the first day of life. The main causes of neonatal deaths are preterm births (28%), infections (26%), asphyxia (23%), tetanus (7%), congenital abnormalities (7%), and diarrhea (3%) (Lawn et al. 2005). Maternal health and health care utilization are important determinants of neonatal health. The intrapartum period has the most significant impact on neonatal survival.

Sexually Transmitted Diseases (STDs) and Family Health

STDs are a broad category of infections that can be transmitted from person to person through sexual contact and from mother to child before or during birth. The Human Immunodeficiency Virus (HIV) can also be transmitted through breastfeeding. Sexual partners may be infected during the incubation period of the disease, i. e. before the occurrence of symptoms. Another barrier to effective prevention and treatment of STDs is the so-called "ping-pong effect", which describes the repeated reinfection of sexual partners with the same STD. That is why partner treatment is essential and public health professionals have to make assiduous efforts to convince patients of its necessity ► sexually transmitted diseases and family health.

Cesarean section delivery, in contrast to vaginal childbirth, can prevent most mother-to-child infections, e. g. with Herpes simplex II virus and *Chlamydia* bacteria; both of these infections can lead to serious health consequences for the child. Syphilis microbes, however, infect the fetus after the first three months of pregnancy. The existence, availability, and acceptance of high quality obstetric care services are critical for the primary prevention, early detection, and effective treatment of infections during pregnancy and delivery.

The prevalence of HIV infection has risen steadily since the 1980s and is still increasing. In 2005, the number of people living with HIV exceeded 40 million (United Nations Programme on HIV/AIDS 2005). As the mother is generally the main caregiver in the family, an HIV infection in her particularly has the greatest social and psychosocial impact on the family. Children living in poverty have even more difficulties coping with the mother's illness. It can be argued that HIV positive individuals may still be in good health and are still able to take care of the family. On the other hand, over 30% of HIV infected women show clinical levels of anxiety and depression, which are risk factors for poor parenting and poor family support in general. The mother-child relationship, in particular the quality of communication between the infected mother and her children concerning the disease, plays another major role in child adjustment. Children are at risk of contracting the virus themselves and of becoming orphaned through the loss of their parents. Orphans experience high rates of poverty and receive less schooling, both of which can have life-

long implications for health and well-being (Murphy et al. 2006).

To date, there is still a lack of knowledge about how to provide services more effectively to families affected by HIV infection, as the motivation and cooperation of several family members, as well as a substantial amount of resources, are necessary (Murphy et al. 2006).

Smoking and Family Health

Smoking of family members has negative consequences on the health and the financial welfare of the whole family.

Active but also passive smoking increases both female and male factor infertility. The likelihood of pregnancy complications such as ectopic pregnancy, low birth weight, and prenatal death is greatly increased in pregnant smokers. Even non-smoking women exposed to tobacco smoke during pregnancy have to be aware of their increased risk for complications. For example, secondhand tobacco smoke is causally associated with low birth weight and pre-term delivery. Smoking is the most important preventable cause of poor pregnancy outcome in developed countries ► smoking and family health.

The number of children and adolescents exposed to secondhand smoke in their homes is alarming: worldwide, almost 50% of middle-school students report such exposure. (Global Youth Tobacco Survey Collaborative Group, 2002) Unlike adults, who can choose whether to be in a smoky environment, babies have no choice and children have little choice. Maternal smoking is usually the largest source of tobacco smoke exposure for children because of the cumulative effect of pregnancy and close proximity to the mother during early life. The health of children of smoking parents is not only affected by secondhand smoke of their parents, but children of smokers are also more likely to take up the habit themselves. Maternal smoking, during and after pregnancy, is causally associated with Sudden Infant Death Syndrome (SIDS). Moreover, the frequency of bronchitis and pneumonia, as well as common respiratory symptoms like cough, is increased in children's first year of life if the parents smoke. Parental secondhand smoke during childhood years reduces children's maximum level of lung function, which may impair their whole life. In addition, studies have found a significant increase in childhood asthma and otitis media if the mother or both parents smoke (IARC 2004).

The non-smoking spouse also suffers from negative health consequences. Non-smoking women married to cigarette smokers have an estimated increase in the risk of lung cancer of 24%. Exposure to secondhand smoke is also associated with coronary heart disease and may play a role in the development of chronic respiratory symptoms and decrement in lung function (IARC 2004).

Active smoking is a major cause of lung cancer, heart disease, stroke, cancers other than lung, chronic bronchitis, peripheral vascular disease, and other circulatory disease. About half of individuals who start smoking as teenagers and continuously smoke are killed by tobacco in middle or old age. This excess burden of death falls particularly heavily upon individuals aged 45–64 years who are typically working and involved in raising children (WHO 2002b). Illness and death can therefore result in direct financial and emotional distress in families. Financial costs for families due to smoking include money spent on cigarettes, increased health care costs for the smoker as well as for his/her family members, and lost wages caused by illness.

In many countries, public health policies have successfully reduced exposure to secondhand smoke in the workplace. There is also an increased awareness of the negative health consequences due to secondhand smoke, resulting in voluntary bans in households. Unfortunately, homes remain a primary location of tobacco smoke exposure. Public education and intervention programs as well as stronger public smoking restrictions can further improve family health in the future.

Family Health Services

► Family health policies and the nature and budget of health care systems vary across countries and in some cases within countries across sub-national units. Family health services depend on the social, political, economic, and institutional situation in the country or region. In developed countries, attention paid to family health prevention programs, especially concerning maternal and child health, is on the rise. Reductions in infant mortality rates are mostly due to improvements in health services for postnatal care and immunizations (OECD 2005). Health policies often target the fact that

health problems are more likely and health-supporting resources are less likely to be found in poor families. Family health policies aim to improve access and quality of health care and health promoting services, protect the poor from financial risk concerning health care costs, and reduce socioeconomic disparities in health outcomes among population subgroups.

Summary

Family health is among the major disciplines in public health. Family health has never lost relevance, and attention paid to subdisciplines like maternal and child health is on the rise. In all likelihood, improvement in family and child health will continue in the decades to come. However, the challenge will be to avoid leaving disadvantaged families behind. Mortality and fertility declines have improved quality of life for children and families in most cases. Changing family structures, population aging, and the burden of caring for family members hit by the HIV/AIDS epidemic create challenging future public health issues.

Cross-References

- ► Adolescent Health and Development
- ► Aging and Health
- ► Child Health and Development
- ► Demographic Perspectives on Family Health
- ► Family Composition
- ► Family Health Policy
- ► Fertility
- ► Gender Differences and Health
- ► HIV/AIDS
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- ► Infertility
- ► Men's Health
- ► Perinatal Health
- ► Sexually Transmitted Diseases and Family Health
- ► Smoking and Family Health
- ► Women's Health

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Family Health Policy

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Synonyms

Health care policy; Child health policy

Definition

Governmental programs, rules, and regulations affecting the public or private provision of health care, health insurance, and other health-related services to children and their parents. The focus, comprehensiveness and design of these policies vary across countries and in some cases within countries across sub-national units.

Basic Characteristics

Family health policy is a general term capturing a range of actions taken by government to affect the amount, type, nature or cost of health care and health-promoting services received by children and their parents. These policies may involve a range of policy tools, such as: the public provision of health care services; subsidizing health care costs for some populations (► health subsidies); the regulation of health care services provided either publicly or privately; incentives for health care providers to provide particular types of care or work in certain locations; financing of public information campaigns to promote healthy behaviors; and the establishment of outreach efforts focused on particular communities or health problems. Since countries, and even sub-national units, set their own policies, the precise definition of family health policy – and the services associated with it – varies across countries. Often these policy choices are shaped by the social, political, economic, and institutional context in the country – with the design of health policies usually mirroring other ► social welfare policy provisions in the country.

Public Role in Health Care

The size and nature of the overall health care systems varies a great deal across countries. According to the Organization for Economic Cooperation and Development (OECD 2005), among advanced industrial countries, the percent of gross domestic product spent on health ranges from approximately six percent in Korea and the Slovak Republic to more than eleven percent in Germany, Switzerland, and the United States. Also varying is each country's proportion of these health expenditures that are public rather than private. In Korea, Mexico and the United States the majority of health expenditures are private (65 percent, 57 percent, and 57 percent respectively). In contrast, public expenditures paid through government programs and policies cover the majority of health care costs in the other 27 OECD countries with the government paying 80 percent or more in the Czech Republic, Iceland, Japan, Luxembourg, Norway, Slovak Republic, Sweden, and the United Kingdom. For the majority of OECD countries these public health care costs are due to publicly-financed health insurance coverage or direct public financing of care. Through these health care policies, in most advanced industrialized countries access to good quality physician services is ensured at relatively low and sometimes no cost. However, even within these ► publicly-financed health systems, access to specialist care still tends to be skewed by income – with lower-income people having less access (Doorslaer et al. 2004). In fact, equity in health care is a primary policy issue in OECD countries, along with questions of the effectiveness of spending and cost containment.

Even larger gaps by economic resources are seen when comparing rich and poor nations. In fact, the OECD countries account for less than 20 percent of the world's population but are responsible for almost 90 percent of the world's health spending (WHO 2003). In middle-income countries between three and seven percent of national income is spent on health, while only one to three percent of gross domestic product is spent on health in the poorest countries. In these countries, due to the low overall income and wealth, this amounts to per capita spending of approximately two to five U.S. dollars (versus between $75 and $550 in middle-income countries and $1,000 to $4,000 in high-income countries; WHO 2003). Among non-OECD countries, there is tremendous variation in the proportion of health

expenditures that are public versus private. More than 75 percent of the health costs are borne by private parties in: Armenia, Azerbaijan, Brundi, Cambodia, Congo, Georgia, Guinea, India, Myanimar, and Taijkistan, while public spending covers over 75 percent of the health costs in more than twenty other low- and middle-income countries (WHO 2006).

Promoting Public Health and Prevention

All OECD countries are seeing rising health care costs that are putting pressures on public budgets. In response, additional attention has been shifted to preventing health problems through investment in ► public health programs. On average, only three percent of health expenditures are devoted to prevention – although this varies from less than one percent of health expenditures in Luxembourg and Italy to more than five percent in the Netherlands and Canada. Countries are experiencing success in reducing some health problems and their associated costs. Much of this attention has been paid to maternal and child health issues. A notable example is the problem of infant mortality. All OECD countries have seen reductions in infant mortality rates in recent decades. This has been credited to overall improvements in economic and social conditions, as well as improvements in health services for post-natal care and immunizations (OECD 2005).

General public health interventions are particularly critical in developing countries where preventable and treatable diseases take an enormous toll on the world's poorest people (Carr 2004). For example, in Africa, infectious and parasitic diseases accounted for more than half of all deaths in 2001, compared with 2 percent of deaths in Europe (WHO 2002). An estimated 1.7 million people die annually from diseases linked to unsafe water, sanitation, and hygiene (WHO 2002). Government policies to improve these conditions or to provide community-based education on how to reduce illness within this context have great potential to promote health.

Addressing Health Disparities Among Families

A key finding in research on maternal and child health is the persistent relationship between income and health status – with health problems more likely and health-supporting resources less likely to be found among poor families, as well as the poor more generally (► health disparities). This pattern is found within both rich and poor countries and is often the target of health policies. Carr (2004) classified these policy approaches into three categories: health-service approaches, health-financing approaches, and socioeconomic approaches. Health-service approaches reform the health care delivery system to improve access and quality of health care. Examples of a health-service approach to reduce disparity are targeting health care services toward the most disadvantaged, ► governmental regulations or purchasing of services, and the development of ► public-private partnerships. Health-financing approaches can provide governmental services free of charge or subsidize the health care costs of low-income families. Similarly, ► risk sharing plans or insurance can protect the poor from financial risk. Socioeconomic family policies typically focus on sectors outside of health as a response to the substantial socio-economic disparities in health outcomes. Examples of policy interventions are: improving access to education and job training; promoting healthier workplaces, homes, and cities; reducing threats posed by environmental hazards; and promoting social safety nets and other protections against impoverishment.

Conclusion

Family health policies can be defined broadly to capture the range of governmental actions affecting access to and the nature of health-promoting services. These actions can be focused in the health sector, on other sectors, or on ► cross-sector efforts. Great variation is seen among countries in the size of their health budget, the importance of public versus private expenditures, the focus on preventive care, and the nature of policy interventions used to promote better overall health, as well as decreasing disparities among population sub-groups.

Cross-References

► Cross-Sector Efforts
► Governmental Regulations
► Health Disparities
► Health Subsidies
► Public Health Programs
► Publicly-Financed Health Systems
► Public-Private Partnership
► Risk Sharing Plans
► Social Welfare Policy

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Family Interventions for Physical Health

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Definition

A field of inquiry and clinical practice that uses systems theory to understand the interactions between families or family variables and health processes and outcomes. Of particular interest are the impact of health and illness on families and how families can influence physical health.

Basic Characteristics

Research has demonstrated that families influence physical health, including both morbidity and mortality (Kiecolt-Glaser, Newton, 2001) and that social support, particularly from the family, is health promoting. Four broad conclusions can be made from this research (Campbell 2004):

- Families have a powerful effect on health, equal to traditional medical risk factors, such as smoking.
- Emotional support is the most important and influential type of support provided by families.
- For adults, marriage is the most influential family relationship on health.
- Negative, critical, or hostile family relationships have a stronger influence on health than positive or supportive relationships.

While this observational research is robust in its findings, research on family interventions is less definitive, yet critical for the advancement of the field. While ▶ family therapy has been clearly demonstrated to improve family functioning and the emotional health of family members, there is much less evidence that family interventions can improve the physical health of family members.

Childhood Chronic Illness

Patterson (1991) has identified nine aspects of family process which have been consistently associated with good outcomes in children with chronic illness and disabilities: 1) balancing the illness with other family needs, 2) maintaining clear boundaries, 3) developing communication competence, 4) attributing positive meaning to the situation, 5) maintaining family flexibility, 6) maintaining family cohesiveness, 7) engaging active coping efforts, 8) maintaining social supports, and 9) developing collaborative relationships with professionals. Many of these attributes have been targeted by family interventions for pediatric illnesses.

Mendenhall (2002) identified twelve randomized controlled trials (RCTs) of family interventions for insulin dependent diabetes mellitus, ten of which used hemoglobin A1C as an outcome measure, an excellent measure of chronic blood sugar control. Seven of ten studies demonstrated a significant improvement in diabetic control with a family intervention. A Cochrane review of three RCTs of family therapy to improve asthma control in children, concluded "There is some indication that family therapy may be a useful adjunct to medication for children with asthma." (Panton, Barley 2002) Similar results have been found for children with cystic fibrosis.

Adult Chronic Illness

Despite the evidence that adult chronic illnesses tend to dominate family life and affect marriage, few studies have examined the impact of couple interventions for chronic illness in adults. Several studies have shown that involving spouses of newly diagnosed adult diabet-

ics in diabetes education programs improves diabetic control. However, studies of spouse involvement in cardiac rehabilitation programs have shown mixed results with only some of the studies demonstrating improved physical outcomes. Twenty years ago, Morisky and colleagues (1983) demonstrated that educating and involving the spouses of low income patients with poorly controlled hypertension improved treatment adherence and lowered blood pressure and overall mortality. The study has never been repeated, but has resulted in broad recommendations that families be utilized as a support for adherence to medical treatments.

Chronic Disease in the Elderly

With the aging of the population, the rising incidence of disabling conditions in the elderly, and fewer resources for ► professional care-giving, a growing number of older individuals must rely on family members for care. Such care-giving exerts a heavy toll on family members. Family caregivers have much higher rates of depression and overall mortality than age matched controls. A number of effective interventions for the caregivers of patients with dementia have been developed and tested.

An excellent example of an effective, family ► psychoeducational intervention for family caregivers of Alzheimer Disease (AD) patients has been developed and tested by Mittelman and colleagues (1996). These families attended individual and group instructional and problem-solving sessions where they learned how to manage many of the troublesome behaviors of patients with AD. They also attended an ongoing ► family support group and could access a crisis intervention service to help them with urgent problems. In Mittelman's study, the caregivers who received the intervention were less depressed and physically healthier than those that did not, and AD patients were able to remain at home for almost a year longer than in the control group. The savings in nursing home costs were several times the cost of the interventions.

Sorensen and colleagues (Sorensen et al. 2002) conducted a meta-analysis of 78 caregiver intervention studies representing six different types of interventions for different illnesses. They found a significant improvement across all six outcome variables ► caregiver burden, depression, subjective well-being, perceived caregiver satisfaction, ability/knowledge and patient symptoms). The effects were the smallest for caregivers of dementia patients and most consistent with the psychoeducational interventions. Group interventions had smaller improvements than individual interventions.

These studies of family interventions for family caregivers suggest that providing education and support for family caregivers is necessary, but not sufficient to reduce their burden and improve their emotional health. Family caregivers need more intensive interventions that include skills training and assistance with problem solving. Similar interventions for caregivers of patients who have suffered strokes have improved outcomes.

Prevention of Chronic Disease

Over one-third of all deaths in the United States can be directly attributable to unhealthy behaviors, particularly smoking, lack of exercise, poor nutrition and alcohol abuse. These behaviors account for much of morbidity from chronic illnesses, such as heart disease, cancer, diabetes and stroke. Health habits usually develop, are maintained, and are changed within the context of the family. Unhealthy behaviors or risk factors tend to cluster within families, since family members tend to share similar diets, physical activities, and use or abuse of unhealthy substances, such as smoking.

Several large trials have shown that family interventions can promote healthy lifestyles and improve cardiac risks within couples and families. In a meta-analysis of couple involvement in obesity treatment, Black et al. (1990) found a small, but significant improvement in weight loss for those individuals whose partners participated in treatment, but that the effect disappeared on long term (1–3 years) follow-up. Studies of childhood obesity are more encouraging. Parental involvement in these weight reduction programs show clear superiority over individual treatments.

Smoking remains the number one public health problem in much of the world and is strongly influenced by the family. The initiation of smoking is influenced by whether other family members smoke. Smokers tend to marry other smokers, to smoke the same number of cigarettes, and to quit at the same time. Smokers married to non- smokers or to supportive partners are more likely to quit. Nine randomized controlled trials involving over 1700 subjects have examined the impact of partner support in smoking cessation. These

studies add a social support intervention to a traditional smoking cessation program which include nicotine replacement, behavioral therapy, and relapse prevention. The results have been disappointing, and a meta-analysis found no overall impact of partner support on smoking cessation (Park et al. 2002). In most of these studies, the amount of partner support reported by the smokers continued to predict successful smoking cessation, but few of the interventions had any impact on the level of partner support. These results suggest that partner support is important for smoking cessation, but that it is difficult to increase levels of support.

Conclusions

Effective family interventions have been developed and tested for some physical disorders and there are promising ones for others. Family interventions have not been developed or tested for many chronic physical illnesses. Family psychoeducation which provides both specific problem solving and coping skills is the most effective type of family intervention. It has wide appeal and applicability to numerous disorders. There are too few studies of ► family therapy for physical disorders to comment on its effectiveness, although family therapy is likely to be directed to a much more limited group of ► dysfunctional families.

Family interventions are most effective at each end of the life cycle when medical care is provided by family caregivers. The most successful family interventions have been in the treatment of family caregivers of dementia patients. These interventions have saved money as well as improved outcomes. Family interventions for childhood disorders, especially diabetes and asthma, are effective in improving medical as well as psychosocial outcomes. Family involvement for health promotion and disease prevention programs offers great promise.

This research suggests that family professionals have an important, but unmet role in the research and treatment of physical illness. Very few of these studies have been designed by family researchers, and much more research is needed. Family professionals should be a part of health care teams, offering support and interventions for family members. The field of families and health is a promising one with multiple research and clinical opportunities for family professionals.

Cross-References

► Caregiver Burden
► Dysfunctional Family
► Family Support Group
► Family Therapy
► Professional Care Giving
► Psychoeducational Intervention

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Family Medicine

Synonyms

Family practice

Definition

Family medicine is concerned with the provision of continuing and comprehensive health care for the individual and family. Family medicine integrates the biological, clinical, and behavioral sciences and it comprises all ages, sexes, and organ systems and every disease entity.

Family Physician

► General Practitioner

Family Planning

Definition

Family planning is the deliberate effort by couples or by individuals to plan reproduction and family building prior to ► conception. These efforts include decisions about desired family size, the timing or spacing of births, and whether to adopt or to give birth naturally. Methods of family planning include those designed to prevent pregnancy, as well as those designed to assist reproduction. Family planning programs assist couples and individuals achieve their family planning goals.

Family Practice

► Family Medicine

Family Structure

Definition

The structure of relationships between persons living in the same household who recognize themselves as a single, inter-connected unit. The structure may include biological relationships determined by shared genes (e. g. biological mother and child) as well as non-biological relationships (e. g. husband and wife, or stepbrother and stepsister). The composition of these relationships denotes the family structure and it may range in complexity from a single-parent household to a multi-generational family with adopted and fostered children.

Family Support Group

Definition

Family support group refers to an organized group of families which share similar medical, psychiatric or other problems and meet regularly to provide emotional and/or instrumental support for each other. Family support groups may be led by a professional or lay person.

Family Therapy

Definition

Family therapy is a form of psychotherapy where the focus is on the family and the goal is to improve family relationships. Family therapy is often used when an individual's symptomatic behavior (e. g. eating disorder) is thought to result from family dysfunction ► dysfunctional family).

Family Tree

Synonyms

Pedigree

Definition

Drawing of the family history over at least three generations by use of clear and consistent symbols to document genetic information.

Family Violence

► Intimate Partner Violence

Fatal Occupational Accident

Definition

A fatal occupational accident is defined as an accident which leads to the death of a victim within one year of the accident. The limit of one year after the accident is accepted in a number of countries but there is a huge variation among countries in this field. Some countries use the term only for occupational fatalities before

contact with the medical service. For those resulting in death of the victim after contact with the medical service, they use the term "occupational accident with fatal outcome" which is quite similar to the original definition of fatal ► occupational accident. Therefore, to avoid misclassification in international data comparisons, one must check the exact meaning of fatal occupational accident in the countries compared.

Fault

Synonyms

Blame

Definition

Fault is a legal term under private liability law. It applies under contract liability as well as under tort law liability. It indicates whether a person is responsible under private law for a certain act or omission and its respective results. If a person acted at fault, the outcome of his doing is attributable to him under private liability law. Fault has several potential manifestations. The term includes "intentional acts and omissions" as well as involuntary "negligent acts and omissions".

Fault-Based Liability

Synonyms

Fault liability

Definition

The term indicates a particular type of liability under private law. For most liabilities under private law, a person must have acted at fault. Liability under tort law and contract liability are to the largest part fault-based liabilities. ► Fault.

Fault Liability

► Fault-Based Liability

Favoritism

Synonyms

Discrimination

Definition

Favoritism refers to unfair treatment of a person or group on the basis of some kind of prejudice.

Cross-References

► Confounding and Interaction
► Prejudice

F

Febrile Seizures

Synonyms

Febrile convulsions

Definition

Febrile seizures are cerebral convulsions, which appear in connection with a febrile illness, in most cases during a rapid rise of body temperature. Of all children between the ages of six months and five years 2.5–4% develop febrile convulsions at least once; the recurrence risk is about 30%. Usually, febrile seizures are characterized by a loss of consciousness and tonic-clonic movements of the extremities. In general, the prognosis is very good, febrile seizures only rarely develop into epilepsy (about 1% in the absence of further risk factors like complicated seizures or a positive family history for epilepsy). Therapeutic measures include the administration of antipyretics (for example paracetamol or ibuprofen) and diazepam as an anticonvulsant drug. The risk of recurrence can be reduced by the use of diazepam in cases of febrile illness.

Fecal-Orally Transmitted Diseases

Synonyms

Smear infections; Infections by contaminated food; Food-Borne infections

Cross-References

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Fecundability

Synonyms

Monthly chance of pregnancy

Definition

Fecundability represents the probability that a woman will conceive during a menstrual cycle. It can either refer to an individual (measured over time) or to a population (measured as the number of conceptions occurring in one month).

Fecundity

Synonyms

Fertility

Definition

Fecundity represents the physiological capacity to conceive.

Fee-for-Service

Synonyms

FFS

Definition

Physician income in fee-for-service systems is determined by the number of services multiplied by the price of services.

Cross-References

► Indemnity Insurance Plan

Fee-for-Service Indemnity Health Insurance

Definition

Fee-for-service indemnity health insurance refers to conventional private health insurance in the US, although this type of health insurance can be found in other countries as well. Fee-for-service indemnity health insurers place few restrictions on the choice of providers and, maybe more importantly, remunerate physicians by paying a fee for service.

Fee-for-Service Payment

Definition

Fee-for-service payment is a payment method of physicians in which they receive their income according to fixed fees per service. Each health care service provided corresponds to a specific payment by the health insurance. The fees per service are subject to negotiation between the insurance companies and the physicians. The payment system of physicians is seen as a mechanism to achieve policy objectives such as controlling health care cost or improving ► health care quality. Under the fee-for-service payment physicians may have the tendency to provide more services than needed to improve their income. For cost containment reasons, insurances try to keep the fee per service as low as possible.

Fee-for-Service Population

Definition

Fee-for-service population in healthcare describes the part of population that pays physicians on a fee-for-service basis for the delivery of health care services. Demand for these health care services is individually driven by the advent of a generally acute disease. In contrast to the fee-for-service population there is the part of the population receiving health care services according to disease management programs or other managed care arrangements. In these cases health care services are delivered by a form of managed care organizations (► health maintenance organizations, ► disease management organizations) that coordinates and controls health care services with their own provider network.

Feeling of Itchiness

► Itching

Female

► Sex/Gender

Female-Factor Infertility

Definition

Female-factor infertility is the kind of infertility in which the cause or causes can be attributed to the female partner. Most often female-factor infertility is a result of ovulation disorders or the conditions of the fallopian tubes, uterus, or cervix.

Cross-References

► Infertility

Female Genital Cutting

► Female Genital Mutilation

Female Genital Mutilation

Synonyms

Female genital cutting

Definition

Female genital mutilation comprises all procedures involving excision or tissue removal of any part of the female genitalia for cultural, religious or other non-medical reasons. The most common type of female genital mutilation is excision of the clitoris and the labia minora, accounting for up to 80% of all cases; the most extreme form is infibulation (excision of part or all of the external genitalia and stitching/narrowing of the vaginal opening), which constitutes about 15% of all procedures. Immediate complications are severe pain, shock, hemorrhage and infections. Long-term consequences include keloid scar formation, urinary incontinence, dyspareunia, cysts, abscesses and childbirth complications.

Female Health

► Women's Health

Femininity

► Sex/Gender

Fertility

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Synonyms

Fecundity

Definition

Fertility is the ability to conceive and produce a live birth. The term, initially applied to females, increasingly refers to males also, as reproductive mechanisms of both men and women become better understood. Human fertility is influenced by a wide range of factors. Direct influences include coital frequency, birth control practice, voluntary and involuntary fetal loss, lactational amenorrhea, and primary and secondary sterility. All other factors, such as endocrinological, nutritional, cultural, economic, or social – work indirectly through these proximal influences. Fertility rates are measured in terms of the number of live births per woman-year of exposure for a given period of time, usually one year. Variation in the quantity and timing of births has been the subject of extensive study, and the consequences of reproductive patterns are linked to many public health concerns.

Basic Characteristics

Physiology

The process of natural fertilization is achieved when the male and female reproductive organs are functioning without any abnormalities or disruptions. To conceive a child, a woman must release a mature egg from one of

her ovaries through a process called ovulation, and her male partner must ejaculate millions of mature, motile sperm. A woman is most likely to be fertile 10 to 14 days after the start of the menstrual cycle. A sperm must reach and penetrate the egg as it travels from the ovary to the uterus. Once the egg has been fertilized, cell division begins; the embryo drifts down the fallopian tube, reaches the uterus and anchors itself to the wall of the uterus where it develops into a fetus.

Measurement

The expanded availability of census, survey and vital registration data since the 1970s has improved the accuracy and availability of multiple fertility measures. The most commonly used one, the ► total fertility rate (TFR), is defined as the average number of live births a woman would have if she were subject to, throughout her reproductive life, age-specific fertility rates observed in a given year. The ► age-specific fertility rate (ASFR) is the annual number of births to women in a particular age group per 1000 women in that age group. The TFR is the sum of the ASFRs over reproductive ages. ► Fertility replacement is defined as the level at which a cohort of women on average have only enough children to replace themselves and their partner in the population – for example, a TFR of 2.1 children replaces the couple with some allowance for early child loss.

While TFR estimates are not affected by a population's age structure, they can appear to change more quickly when calculated for different periods than when calculated for specific age cohorts. This is because a birth cohort's actual fertility rates usually change more slowly than those prevailing at different points in time which are then applied synthetically to derive the period TFR. Examples of measures of the timing of fertility include mean ages at first and last birth and average birth interval length.

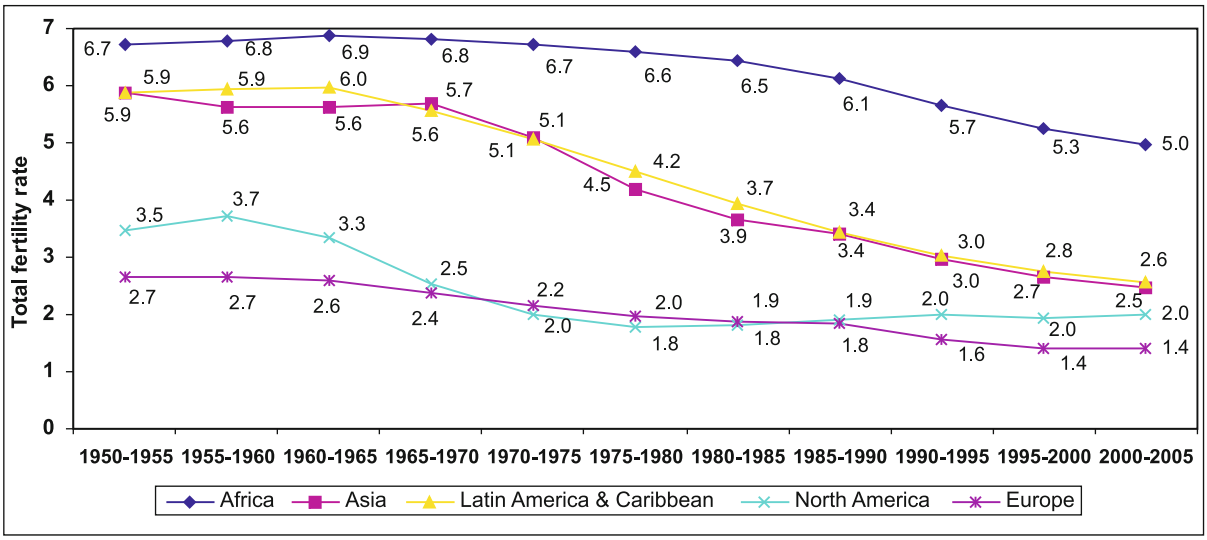
Levels and Trends

Reproduction is essential to the survival of societies, and over the past half century global fertility levels have changed dramatically. The declines visible in all regions of the world historically began as far back as 300 years ago for Europe, in the 1960s for some Asian countries and as recently as the 1990s for a few sub-Saharan African countries. Most countries in this latter region have yet to experience a fertility transition, and several have plateaued unexpectedly. Figure 1 illustrates the trends in fertility since 1950, at which time North American and European TFR levels were already below an average of 3 children per woman. Over the past decade, below replacement fertility in these regions and East Asia has continued to decline slowly, from 1.8 children per woman in 1985–1990 to 1.6 children per woman in 1995–2000. The average TFR for less developed regions as a whole declined from 6.0 in 1950–55 to 3.1 children per woman in 1995–2000. These average declines conceal large differences across regions (UN 2003). Striking is the correspondent pattern of fertility declines for Asia and the Latin American regions, with their very different socio-cultural settings.

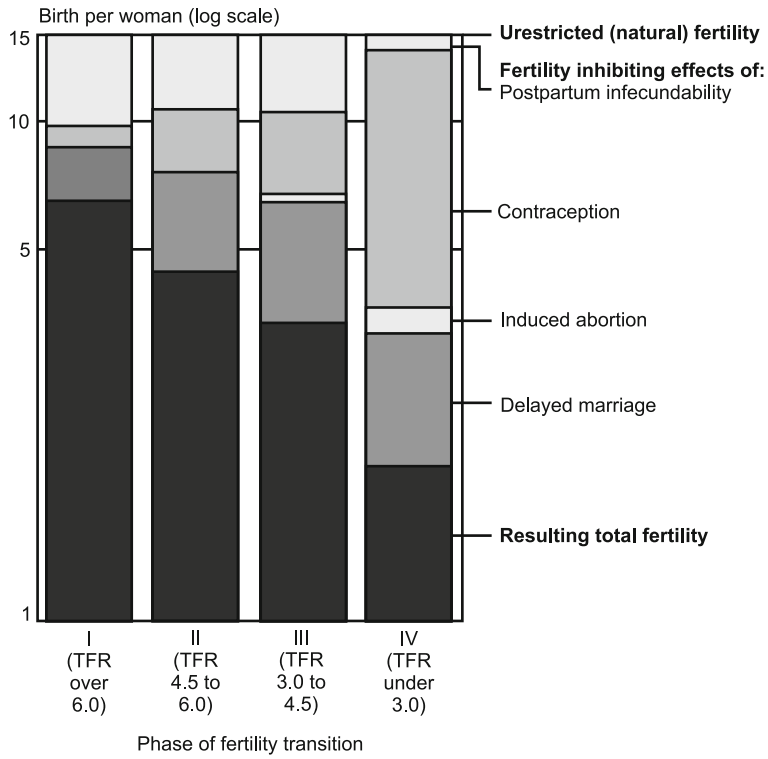
During the early stages of the transition, fertility tends to decline first among older childbearing aged women, lowering the mean age of childbearing. This drop tends to offset and exceed fertility reductions due to rising age at marriage among younger women. Several African countries serve as exceptions to this pattern, with fertility declines equally distributed across the prime childbearing ages (UN 2003). The shift toward below-replacement levels reflect delayed childbearing among women in their twenties (a tempo effect) and an increased proportion of women limiting childbearing at parities 1 and 2 (a quantum effect). The reproductive and child health consequences of the fertility transition are substantial, with fewer at-risk pregnancies resulting in maternal and child mortality and women spending less of their reproductive years pregnant. Some researchers wonder if the increased menstrual cycling of low-parity (► parity) females does not also raise the risk of some reproductive cancers, e. g., ovarian and uterine.

Factors Influencing Fertility

Bongaarts (1982) observed that as countries pass through the demographic transition from high to low fertility and mortality levels, four "proximate determinants" of fertility account for most of the difference between natural and observed reproduction – proportion of women married, contraception, induced abortion, and postpartum infecundability (► fecundability) due to breastfeeding. In this framework the relative importance of these factors varies with the phase of the fertility transition (see Fig. 2). It is through these direct



Fertility, Figure 1 Fertility levels in major world regions, 1950–2005. *Source:* UN Population Division (2005) World Population Prospects: The 2004 Revision



Fertility, Figure 2 Conceptual model of the changing contribution of contraception and other proximate determinants to fertility decline. *Source:* Bongaarts J (1982)

or proximate factors that external forces – industrialization, poverty, education, urbanization and other social changes – indirectly influence fertility.

► Contraception, as a means of fertility regulation, is considered one of the major public health achievements of the last century. Of the estimated 6.2 billion people living on the planet, approximately one billion are women aged 15 to 49 who are married or in union and more than three-fifths (61%) of these women are using contraception. Contraceptive use has risen historically in much of the developing world. It is already at ceiling levels of 80% in some countries and it will continue to

rise in many others. However, the pattern is uneven geographically, and a few of the most populous countries, such as India, Pakistan, and Nigeria and much of the sub-Saharan Africa, register low levels of use. A large majority (approximately 90%) of women using contraception rely on modern methods, with oral contraceptives and condoms being the most widely used methods in developed countries and female sterilization and intra-uterine devices (IUDs) in developing countries.

While abortion is not a method of contraception, whether it is a means of family planning is a matter of social definition. Worldwide an estimated 38% of pregnancies occurring each year are unintended, and approximately 60% of these end in an induced abortion (WHO 2005). Unsafe abortions, which are entirely preventable, account for 13% of maternal deaths. Abortion levels and trends are challenging to assess in settings where the procedure is not legal or carries a heavy social stigma. Research on fertility-regulating methods has also led to the development of treatment regimens, such as mifepristone or misoprostol, in the form of pills that terminate early pregnancies but, in the case of the latter, also manage postpartum hemorrhage during delivery. Because every ► pregnancy carries some mortality risk for the mother and fetus, pre-conceptional measures such as contraception assure that every pregnancy is intended, while access to adequate obstetric services ensures that every birth is safe. These are essential for good reproductive and public health.

The threat of reproductive impairment and loss from exposure to poor nutrition, infectious disease and sexually transmitted infections, especially HIV/AIDS, is disproportionately present in the developing world. In high HIV prevalence countries in sub-Saharan Africa, infected women become sub-fecund often at young ages and pregnant women affected by malaria show higher rates of fetal loss.

Infertility in the developed world has a different face of treatment. In Vitro Fertilization (IVF) is heralded as one of the greatest achievements of reproductive medicine. Still there are many aspects of IVF that have been both praised and criticized, and its legal, ethical and social repercussions have generated major debate and controversy. The capabilities of assisted reproduction are exemplified by the 2005 case of a 66-year-old Romanian woman, who after undergoing fertility treatment for almost ten years before being artificially inseminated, gave birth to a baby girl by caesarean section (BBC 2005). Today extending assisted reproductive technology to the approximately 80 million individuals in the developing world affected by infertility is a global reproductive health priority (WHO 2002).

Conclusion

Over the past decades, fertility trends in developing and developed regions of the world have changed dramatically. Low-fertility industrialized countries have adopted pro-natalist policies, while higher fertility developing countries have implemented anti-natalist policies. The specter of rapidly aging and even declining populations have brought forth contentious debates about international immigration policies in much of Europe.

Effective contraception has separated coitus from conception, enabling individuals to enjoy the former with minimal risk of the latter. Advances in reproductive medicine also have assisted persons with reproductive impairments or without lifetime partners to fulfill their desires for biologic parenting. Thus, contra-ception and pro-ception planning have entered the repertoire of mainstream reproductive behavior in many countries.

Small differences in fertility have large ramifications for the world's population. Projections show that a small difference in average family size – 2.5 vs. 2.0 children – in 2000 can translate into a difference of 1.7 billion additional people in the world's population by 2050 (PRB 2004). Aggregate population size depends intrinsically on individual decisions governing reproduction, survival and migration. Helping individuals achieve their reproductive intentions will have profound effects on overall fertility, population health, and societal wellbeing.

Cross-References

► Age-Specific Fertility Rate (ASFR)
► Contraception
► Crude Birth Rate (CBR)
► Fecundability
► Fecundity
► Fertility Replacement
► General Fertility Rate (GFR)
► Gravidity
► Gross Reproduction Rate (GRR)
► Net Reproduction Rate (NRR)
► Parity
► Parity Progression Ratio

► Pregnancy
► Sex Ratio at Birth
► Total Fertility Rate (TFR)

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Fertility Rate

Definition

Fertility rate is defined as the total number of live births in an area to the female reproductive population of that area. It is typically expressed per 1,000 women of reproductive age, 15–44 years.

Fertility Replacement

Definition

Fertility replacement is defined as the level at which a cohort of women on average have only enough children to replace themselves and their partner in the population. For example, a TFR of 2.1 children replaces the couple with some allowance for early child loss. Replacement level fertility is said to have been reached when NRR=1.0 (► net reproduction rate (NRR)).

Fetal Death

► Intrauterine Mortality

Fetal Mortality

Synonyms

Still births or fetal death

Definition

Fetal mortality is defined as a still birth or death after 20 weeks gestation.

Cross-References

► Intrauterine Mortality

Fetal Mortality Rate

Synonyms

Stillbirth rate; Fetal death rate

Definition

Fetal mortality rate is the number of fetal deaths (death after the 20th or 28th week of gestation) per one thousand of the total number of births (live births plus fetal deaths) in the same year. This rate is considered a good measure of the quality of health care in a country or a medical facility. Fetal mortality rate is higher in certain ethnic groups and among mothers with health problems during pregnancy. It can be decreased by good prenatal care.

Fever

Synonyms

Elevated body temperature

Definition

Fever is an elevation of the body temperature, which is caused by an increase in the heat regulatory set-point (which is located in the thermoregulatory center in the

hypothalamus). Fevers can be classified as: sub febrile temperatures from 37.5–38.0 °C; moderate fever up to 38.9 °C; and high (septic) fever above 39 °C. Fever can develop for a number of reasons, like infections, destruction of cells or immune reactions. In fevers, biochemical reactions run faster, increasing the effectiveness of the defense mechanisms. The cause of the fever influences its course. Fevers can be classified as sustained or continuous, intermittent (daily temperature elevation that returns to normal), remittent (daily fever that returns to a baseline which lies above normal), undulating (wave-like) and recurrent or relapsing fever. Relapsing fever is characterized by short periods of fever interrupted by several days free from fever.

► Therapy of Infectious Diseases

Fever Attacks in Malaria

Synonyms

Course of fever in malaria; Temperature curve in malaria

Definition

In malarial infections, the duration of a fever attack depends upon the type of infecting plasmodia species; *Plasmodia ovale*, *P. vivax* and *P. malariae* 8–12 hours, *Plasmodium tropica* 16–36 hours, sometimes even longer. During the fever-free interval the asexual reproduction of the plasmodia takes place. The release into the circulatory system induces the next fever attack. Due to a synchronization of the reproduction, a characteristic rhythm of fever attacks is found during the course of the disease – except for infections with *Plasmodium tropica*, which do not synchronize their development. The fever-free interval lasts 48 hours in case of infection with *Plasmodia ovale* and *P. vivax*, and 72 hours for *Plasmodium malariae*. Due to the lack of synchronization there is no characteristic temperature curve in infections with *Plasmodium tropica*.

FFS

► Fee-for-Service

Fifth Disease

► Erythema Infectiosum

First

► Indigenous

First-Aid Services

Synonyms

First aid at work

Definition

First aid is the immediate care given to victims of accidents before trained medical workers arrive. Its goal is to stop and, if possible, reverse harm. It involves rapid and simple measures such as clearing the air passageway, applying pressure to bleeding wounds or dousing chemical burns to eyes or skin. The critical factors which shape first aid facilities in a workplace are work-specific risk and availability of definitive medical care. First aid is a fluid concept not only in *what* (how long, how complex) must be done, but in *who* can do it.

First aid is a part of the total health care for workers. First aid and emergency treatment in cases of accident and indisposition of workers at the workplace are listed as an important part of the functions of the occupational health services in the ILO Occupational Health Services Convention and related Recommendation.

Different institutions may be involved in the organization of first aid and providing assistance following an accident or illness at work include the following: the occupational health service of the enterprise itself, other occupational health entities and, other institutions which may provide services, such as ambulance services, public emergency and rescue services, hospitals, clinics and health centers, both public and private; private physicians, poison centers, civil defense, fire departments and police. According to OHS legislation first aid provision is employer responsibility.

In some branches of the economy, like underground mining, there are rescue squads usually staffed by specially trained employees and emergency technicians

that provide first-aid services in confined spaces, mines, etc.

First Aid at Work

► First-Aid Services

First Nations/People

► Indigenous Health Care Services

First Peoples

► Indigenous Peoples

Fisher LSD

Synonyms

Least squares method; Post hoc test; Multiple comparisons

Definition

A method of fitting a straight line or curve based on minimization of the sum of squared differences (residuals) between the predicted and the observed points.

Fisher's Exact Test

Definition

This test is applied in 2×2 ► contingency tables analysis when the sample size is too small to use the ► chi-square test (see essay Analysis of frequencies). The test has no formal test statistic and critical value, and directly computes the probability of observed data. Calculation of probabilities in this test is based on hypergeometric distribution. The test procedure consists of calculating the sum of exact hypergeometric probabilities associated with the observed table frequencies and all the more extreme table frequencies under the null hypothesis. If this sum of probabilities is equal to or less than the specified significance level, the null hypothesis is rejected and it is concluded that there is a significant relationship between the two dichotomous variables. If the sum of probabilities is greater than the specified significance level, the null hypothesis cannot be rejected.

Fisher's Test

Definition

An exact significance test to analyze 2×2 tables for any sample size. It is a misconception that it is suitable only for small sample sizes. This arises from the demanding computational procedure for large samples, which is no longer an issue. It is the only test for a 2×2 table when an expected number in any cell is smaller than 5.

Fissure Sealing

► Dental Sealant

Fitness

► Physical Activity

Fitness for Work

Synonyms

Work capacity; Work ability

Definition

Fitness for work is an individual's capacity to do the work tasks he/she is required to do. This includes the ability to maintain physiological equilibrium when working at these tasks. To meet this requirement certain functional, anatomical, psychological, educational, and social characteristics are necessary to fulfill the demands of a specific job performance. Work ability cannot be measured only by the actions of a worker as factors related to the community, environment, organization and management of the work determine how a person is coping.

Evaluating workplace capacity involves assessing the ability of the body's biological features to meet the specific demands of a job. The evaluation of the fitness for work is a continual, dynamic, and permanent process,

and includes measuring workers' capacities to work at specific workplaces without endangering their health.

Cross-References

► Working Capacity

Fitness for Work Assessment

► Assessment of Work Ability

Fixed Dental Prosthesis

Synonyms

Fixed partial denture

Definition

A dental prosthesis that is cemented screwed or otherwise securely retained to natural teeth, tooth roots, or dental implant abutments.

Fix Heritability Recurrence Risk

► Recurrence Risk

Flu

► Influenza
► Influenza and Avian Influenza

Fluid Balance of the Organism

► Body Fluid Balance

Fluid and Electrolyte Balance of the Organism

► Body Fluid and Electrolyte Balance

Fluid Therapy

► Rehydration
► Rehydration Solution

Folklore

► Culture

Folk Medicine

► Indigenous Health Care Services

Food Allergies

Definition

A food allergy is an allergic reaction to a particular food. Many different foods can cause allergic reactions. Most commonly they are triggered by certain nuts, peanuts, shellfish, fish, milk, eggs, wheat, and soybeans. Additives such as, monosodium glutamate, metabisulfite, tartrazine can cause allergy. Allergic reactions to foods may be severe and sometimes include an anaphylactic reaction. Allergies may start during infancy. They are most common among children whose parents have food allergies, allergic rhinitis, or allergic asthma. Food allergies are sometimes blamed for such disorders as hyperactivity in children, chronic fatigue, arthritis, poor athletic performance, and depression. Food intolerance differs from a food allergy in that it does not involve the immune system. Instead it involves a reaction in the digestive tract that results in digestive upset.

Food-Borne Diseases

► Food Safety

Food-Borne Infections

► Fecal-Orally Transmitted Diseases

Food Decay

Synonyms

Food rot; Food spoiling; Food going bad

Definition

Besides the influence of air, water and light, microorganisms play an important role in food decay. Germs like bacteria and fungi do not only rot food, they can also cause diseases when the contaminated food is eaten. If food is improperly stored or kept too long, chemical changes of the contained fats take place inducing an unpleasant smell or taste. Furthermore, food qualitiy is influenced by the effect of enzymes, which are still active in the foodstuff. Microorganisms, which make food rot, are bacteria, yeasts and molds. When food goes bad, not only is there a change in taste but sometimes poisonous substances, toxins, are produced.

Food Hygiene

► Food Safety

Food Safety

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Synonyms

Food hygiene; Foodborne diseases; Foodstuffs safety

Definition

Food safety presents a major health problem in the world. There are more than 250 food-borne diseases registered. Serious outbreaks of food-borne disease have been documented on every continent every year, illustrating the public health and social significance of this problem. Food-borne diseases may affect all levels of the population, but the most susceptible are children, pregnant women, the elderly, and those with chronic diseases. Modern farming methods, globalization of the food trade and the higher accessibility of food produce a challenge for food safety and the prevention of the spread of food contaminants worldwide. Food safety programs are focusing on the farm-to-table approach as an effective means of reducing food-borne hazards. ► hazards may emerge from microbiological, chemical or physical contamination of food. Health significance of these hazards is estimated through ► risk assessment method, and thus hazards are regulated, controlled and kept under surveillance.

F

Basic Characteristics

Microbiological Hazards

Food-borne diseases caused by microorganisms present a major health issue. The most frequent infections are caused by *Escherichia coli, Salmonella, Campylobacter jejuni, Listeria monocytogenes*, parasites like *cryptosporidium, cryptospora, trematodes* and viruses. According to WHO data almost 1.8 million children die each year in developing countries (excluding China) from diarrhoeal disease caused by microbes which are present in food and water. In the USA each year some 100 million cases are attributed to food-borne illnesses, resulting in 325 000 hospitalizations and about 5000 deaths. Health experts estimate that the yearly cost of all food-borne diseases in the USA is 5 to 6 billion dollars in direct medical expenses and lost productivity. Infections with the bacteria *Salmonella* alone account for $ 1 billion yearly in direct and indirect medical costs (NIH 2005).

Five most frequent food-borne diseases are:

- Botulism
- Campylobacteriosis
- *E. coli* infection
- Salmonellosis
- Shigellosis

Botulism is a disease caused by *Bacillus botulinum*, an agent emerging from soil. The most common sources are canned meat and vegetables and the production of toxin can be regulated by controlling the acid pH of food.

Campylobacteriosis is an infectious disease caused by *Campylobacter* bacteria. *Campylobacter jejuni*, *C. fetus*, and *C. coli* are the types that usually cause campylobacteriosis in people. *C. jejuni* causes most cases of the illness. Infection can be caused by handling raw poultry, eating undercooked poultry, drinking nonchlorinated water or raw milk, or handling infected animal or human feces. Most frequently, poultry and

cattle waste are the sources of the bacteria, but feces from puppies, kittens, and birds also may be contaminated.

Escherichia coli* infection** is caused by different strains of ***E. coli bacteria. Harmless strains of *E. coli* can be found widely in nature, including the intestinal tracts of humans and warm-blooded animals. Disease-causing strains, however, are a frequent cause of both intestinal and urinary-genital tract infections. Several different strains of harmful *E. coli* can cause diarrheal disease. A particularly dangerous type is called enterohemorrhagic *E. coli*, or EHEC. EHEC often causes bloody diarrhea and can lead to kidney failure in children or people with weakened immune systems.

In 1982, scientists identified the first dangerous strain in the United States. The type of harmful *E. coli* most commonly found in this country is named O157:H7, which refers to chemical compounds found on the bacterium's surface. This type produces one or more related, powerful toxins which can severely damage the lining of the intestines. This strain is now found worldwide and present one of the most toxic bacterial sources to be found in food and water.

Salmonellosis, is usually provoked by *Salmonella typhimurium* and *S. enteritidis*. *Salmonella* bacteria can be found in food products such as raw poultry, eggs, and beef, and sometimes on unwashed fruit. Food prepared on surfaces that previously were in contact with raw meat or meat products can, in turn, become contaminated with the bacteria. This is called cross-contamination.

With the spread of organic farming new cases are recorded from eating raw alfalfa sprouts grown in contaminated soil. Salmonella infection frequently occurs after handling pets.

Shigellosis, also called bacillary dysentery, is an infectious disease caused by *Shigella* bacteria. Four main types of *Shigella* cause infection: *Shigella dysenteriae*, *S. flexneri*, *S. boydii*, and *S. sonnei.* It is commonly transmitted by food service workers who are sick or infected, but have no symptoms, and who do not properly wash their hands after using the toilet.

Listeria monocyotogenes is a bacterium that can cause a serious infection in humans called listeriosis. Food-borne illness caused by *L. monocytogenes* in pregnant women can result in miscarriage, fetal death, and severe illness or death of a newborn infant. Others at risk for severe illness or death are older adults and those with weakened immune systems. Listeriosis is now attributed to ready-to-eat foods and deli products.

Food-borne Viruses

Diarrhea can be caused by viruses present in food and water such as: caliciviruses, rotavirus, astrovirus, and hepatitis A virus. Norwalk virus (a particular calicivirus) caused a number of outbreaks of food poisoning at buffets and caterings. Current studies are trying to produce new vaccines including edible vaccines against Norwalk virus and hepatitis. Recently, inactivated vaccine for hepatitis A virus infection has been developed.

Prions. Mad Cow Disease is the commonly used name for Bovine Spongiform Encephalopathy (BSE), a slowly progressive, degenerative, fatal disease affecting the central nervous system of adult cattle. The exact cause of BSE is not known but it is generally accepted by the scientific community that the likely cause is infectious forms of a type of protein, prions, normally found in animals cause BSE. In cattle with BSE, these abnormal prions initially occur in the small intestines and tonsils, and are found in central nervous tissues, such as the brain and spinal cord, and other tissues of infected animals experiencing later stages of the disease. There is a disease similar to BSE called Creutzfeldt–Jacob Disease (CJD) that is found in people. A variant form of CJD (vCJD) is believed to be caused by eating contaminated beef products from BSE-affected cattle. To date, there have been 155 confirmed and probable cases of vCJD worldwide.

Chemical Hazards

Chemicals are a significant source of food-borne diseases, but it is sometimes difficult to link them to particular food. Chemicals include: natural toxicants such as ► mycotoxins and marine toxins, environmental contaminants such as mercury, lead, radionuclides and ► dioxins, but, also, naturally occurring chemicals in plants, such as glycoalkaloides in potatoes. Migration from packaging material has, also, been investigated and Acrylamide as a chemical compound that migrates is widely studied. Food additives and nutrients such as vitamins and minerals, pesticides and veterinary drug residues are used deliberately in order to increase food supply, but assurance that they are safe must be obtained prior to their use. Chemical contaminants may affect health through single use, but most commonly

they act after long-term exposure. Risk assessment must be performed in order to assess the potential for causing diseases after exposure to chemicals in food and water.

New Technologies

Genetic engineering, irradiation of food, ohmic heating and modified atmosphere packaging are used to increase agricultural production, extend shelf life or make food safer. Potential for causing ► food allergies should be carefully examined, as well as other possible changes. Food produced from or using ► genetically modified organisms (GMO) must be proven to be equivalent to conventionally produced food in terms of nutritional value and safety.

Control of Food Safety

Control over food safety must be performed through the whole food chain. It combines ► good agricultural practices (GAP) in basic production of food commodities, with ► good manufacturing practices (GMP) and ► standard sanitary operating procedures (SSOP) in food processing premises. The best way of controlling hazards in food production proved to be ► hazard analysis and critical control point (HACCP) – a preventive approach to identification and control of all possible hazards to be found in production of a certain foodstuff.

Conclusion

Access to safe food is one of the basic human rights. In spite of this, food-borne diseases still present major health problem both in developing and industrialized countries. Contaminants may be naturally occurring, but due to new agricultural techniques and demands for certain qualities and extended shelf-life of products, new pathogens are discovered along with classic ones. A holistic approach to food safety requires control of potential hazards throughout the food chain and this preventative approach should be fostered instead of the classic method of spot checking and analyzing of final products.

Cross-References

- ► Dioxins
- ► Food Allergies
- ► Genetically Modified Organisms (GMO)
- ► Good Agricultural Practices (GAP)
- ► Good Manufacturing Practices (GMP)
- ► Hazard Analysis and Critical Control Points (HACCP)
- ► Hazards
- ► Mycotoxins
- ► Risk Assessment
- ► Standard Sanitary Operating Procedures (SSOP)

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Food-Safety and Fecal-Orally Transmitted Infectious Diseases

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Synonyms

Smear infections; Infections by contaminated food

Definition

In fecal-oral infections germs, which had been expelled with the feces of an animal or another human being, are swallowed. Most frequently, the pathogens are transmitted by contaminated foodstuff or polluted water; transmission is also possible by close contact with a chronic carrier of the organisms or by self-infection (re-infection).

Transmission of Diseases by Foodstuff

Humans feed on animal and vegetable products. Thus they are omnivores. To be suitable as a foodstuff, a product has to be edible. From edible food one has to distinguish substances, which are inedible but do not cause any harm and those, the ingestion of which is harmful or even toxic. A foodstuff, which in general is edible, not only can become unpalatable through ► food decay, but also can become damaging to one's health if eaten. Moreover, the ingestion of particular products can be dangerous for certain groups of persons, for example, due to their age (in case of babies) or due to underlying diseases. In the case of poisonous substances in foodstuff (toxins), two forms are identified: toxin-building microorganisms – like *Clostridium botulinum* (► *Clostridium botulinum* infection) or ► molds – where the toxin is already present in the foodstuff at the moment of ingestion, and microorganisms which set free toxins in the intestines – like *Salmonellae* or *Clostridium perfringens* (► *Clostridium perfringens* infection, enteral). A number of pathogens can be transmitted by foodstuff. These pathogens can be viruses, bacteria, ► protozoa or ► parasites (particularly worms). The germs, which had been shed with human or animal excrements (feces), are taken up orally with the food and lead to a fecal-oral infection, which – in most cases – manifests in the gastrointestinal tract. Gastrointestinal diseases with diarrhea are very common in childhood; worldwide, they are the cause of death in about 2 million children under the age of five years. Foodstuff can be contaminated by pathogens in different ways. To begin with, the meat and other products can come from an already infected animal. Food can also come into contact with fecal germs from fertilizers or water used in the growing process, or by washing with contaminated water in the production process. Moreover, persons, who shed pathogens with their stool – either in an acute phase of the disease or as ► permanent shedders – can transmit pathogens to food because of poor personal hygiene. Transmission of pathogens onto foodstuff is also possible by insects, especially flies, which have come into contact with feces. Due to the close contact with each other and the disregard of hygienic rules, young children face a special risk of fecal-orally transmitted infectious diseases and this age-group tends to suffer repeated self-infections (re-infections).

Prophylaxis of Fecal-Oral Infections

Different microorganisms play an important role in food decay. As diseases can be caused after ingestion, rotten food should not be eaten. The shelf life of foodstuff can be lengthened by various means of preservation (► preservation of food). In general, hygienic rules should be followed when dealing with food, like washing the hands with water and soap before preparing a meal. "Cook it, boil it, peel it, or forget it" – this phrase is of decisive significance in developing countries. Travelers especially should follow this recommendation. Boiling and frying kills pathogens; but one has to make sure that sufficient temperatures are also reached in the center of the foods. Pathogens, which are present in milk, can be killed by ► pasteurization; young children should not drink raw milk. Only washing foods like fruits or vegetables may not be sufficient; on the contrary, if contaminated water is used, germs can even be transmitted by this procedure. Pathogens on the surface can be eliminated by peeling. Regarding the storage of food, one should pay attention to avoiding the transmission of germs onto other foods (salad, other vegetables, fruits). Minced meat should be used immediately, in case of frozen meat the melting water should be disgarded. To avoid spreading fecal germs, hands should be washed with water and soap after using the toilet, and even a disinfection of the hands may be necessary. The same hygienic rules have to be followed after contact with possibly contaminated objects (e. g. diapers) or surfaces. In the case of a professional dealing with foodstuffs, strict hygienic instructions have to be kept to avoid infections. On the one hand, these regulations serve to protect the employ-

ees; on the other hand, they are important for the security of the consumers. At a work place where there is a risk of transmission of infectious diseases, protective clothing, hygienic regulations and measures of disinfection, as well as the prohibition of the consumption of food, can help to minimize the staff's risk of infection. According to special regulations within the industrialized countries, people with confirmed or assumed fecal-orally infectious diseases are not allowed to work in the production, treatment or distribution of foodstuffs, or where there is an open contact with the food. Further regulations concern work in communal services and special sectors of the health care system. Fecal-orally transmitted infectious diseases have to be reported to the responsible public health institutions.

Viral Gastrointestinal Infections

The most important viral pathogens, which cause infections of the gastrointestinal tract, are rotaviruses, Noro-(Norwalk-) viruses and adenoviruses. The most typical symptoms are stomach ache, vomiting and diarrhea, fever and malaise can also be present. The amount of fluid loss (dehydration) determines the severity of the disease. As antibiotics are not effective in viral infections, therapy is restricted to a re-establishment of the ► body fluid balance. In mild cases, this can be achieved by the administration of an ► oral rehydration solution; in severe forms, parenteral fluid therapy may be necessary. Worldwide, rotaviruses are the most common reasons for gastrointestinal infections in children between the age of 3 and 24 months. The hygienic status does not play any role as the incidence of the infection is the same in developing and in industrial countries. Rotaviruses are highly contagious and outside the macroorganism the virus can survive on objects and surfaces. After oral intake, the virus becomes adherent to the mucous membranes of the intestines. As intestinal cells are destroyed diarrhea results. Lethal cases of the disease primarily occur on the Indian subcontinent, in African countries and in South America. Due to the high incidence of rotavirus diseases, the health care systems of industrial nations face considerable costs. The most effective means of prevention is active ► rotavirus vaccination. Like the rotavirus, the Noro-(Norwalk-) virus, which was first detected in 1972, is spread worldwide. Infection primarily concerns young children and older people. In most cases, the virus is transmitted by fish and seafood. After an incubation period, from a few hours to a couple of days, the characteristic symptom of sudden onset of diarrhea occurs. In general, the gastrointestinal symptoms lasts for 2–3 days. Although severe cases are possible, a deadly outcome is very rare. Unfortunately, vaccination against Norovirus is not available. Depending on the serotype, adenoviruses cause different clinical pictures. The serotypes 1, 2, 5, 6, 40 and 41 are responsible for gastrointestinal symptoms. Most frequently, children between the age of 6 months and 5 years are concerned, the incubation period lasting 2–10 days. Severe cases are rare and the infection is self-limiting. Vaccination against adenoviruses is not available.

Hepatitis A

The worldwide spread hepatitis A virus (HAV) causes an inflammation of the liver, which frequently is asymptomatic. The incubation period lasts 2–9 weeks. Every year there are about 2 million new cases, which, fortunately, leave the infected patients with lifelong immunity. In general, transmission takes place by the ingestion of contaminated foodstuff (most commonly oysters, other seafood or crawfish) and drinking water; infection can also be transmitted as a smear infection, during sexual intercourse or by blood transfusions. In warm countries with an insufficient hygienic status, there is a high risk of infection. Typical symptoms of hepatitis A-infection are malaise, headache, rheumatic pains, stomach ache and jaundice (icterus); sometimes there is a strong itching. The urine is dark-colored, while the stool becomes light-colored. Diagnosis is confirmed serologically by the detection of antibodies. Two weeks before and 1–2 weeks after the onset of the disease or the icterus, the infected person is assumed to be contagious. Usually, the symptoms disappear within 2–3 weeks, chronic courses or deadly outcomes are rare. As medicinal therapy is not possible, treatment is reduced to measures like confinement to bed and a carbohydrate-enriched and low-fat diet. The most effective prophylactic measure is the active hepatitis A vaccination (► hepatitis A immunization, active).

Campylobacter Infections

Besides *Salmonellae*, *Campylobacter* (*C. jejuni*, *C. coli*, *C. lari*) are the most common causes of bacterial gastrointestinal infectious diseases. Ingestion of more

than 500 pathogens gives rise to infection. The germs, which are found in the intestines of animals, predominantly poultry, can get into the meat during slaughtering. The infection cannot only be transmitted by poultry, but also by minced meat, unpasteurized milk, or contaminated drinking water. Moreover, transmission is possible by direct contact with infected animals. If bacteria are shed in the feces, foodstuff or inshore waters can be contaminated. Thus, an infection can also appear after bathing in polluted water. Following an incubation period of 2–5 (1–10) days, diarrhea, fever, headache and rheumatic pains appear. Most frequently, it is children under the age of five years who are affected but people who have a close contact with animals face an increased risk of infection.

Infection with *Salmonellae* / Salmonellosis

Among others, diseases which are caused by *Salmonellae*, are typhoid (► typhoid fever), ► paratyphoid and salmonella enteritis. The latter is primarily caused by *Salmonella enteritidis* and *Salmonella typhimurium*. The sources of infection lie in farm animals, wild animals, sea-birds and fish. As for *S. enteritidis*, most frequently the infection is transmitted by poultry, eggs, mussels and fish. *S. typhimurium* can primarily be found in products of cattle, calves and pigs. Following an incubation period of 5–72 hours, watery, often slimy and sometimes bloody, diarrhea occurs along with stomach ache, vomiting and fever. The pathogens are detected in the stool. In general, therapy is restricted to the substitution of fluid losses. Usually, antibiotics are not administered as their administration lengthens the interval of germ shedding.

Enterohemorrhagic Escherichia Coli Infection (EHEC)

Escherichia coli (*E. coli*) bacteria are part of the natural intestinal flora. Therefore, coli bacteria are used as so-called indicator-germs to check for pollution of drinking water and foodstuff by fecal pathogens. Different strains of *E. coli* can cause intestinal diseases (enteritis infectiosa), which are characterized by diarrhea. One of these strains are enterohemorrhagic *E. coli* (EHEC), which can produce cellular toxins (shigatoxin or verotoxin). EHEC, which were detected in 1977, are resistant against environmental influences (low pH-value, drying out, high salt concentration); furthermore, they and highly contagious. EHEC 0157 can cause an infection even if as little as 100 germs are ingested. Natural reservoirs of EHEC are found in the intestines of cattle, sheep and goats. Infections are primarily caused by the ingestion of foodstuff of animal origin; but transmission can also take place by polluted drinking water or vegetables which were contaminated by dung. Moreover, transmission is either possible directly from an animal to a human or from one human to another (by the hands), or indirectly by contaminated objects or surfaces. The incubation period lasts a few days and contagiosity 5–20 days. A severe complication is the occurrence of ► hemolytic uremic syndrome (HUS). Usually, no antibiotic therapy is performed in EHEC-infections as the interval of germ shedding would be lengthened and the building of toxins would be stimulated.

Yersinia Infection / Yersiniosis

Yersinia are transmitted by contaminated foodstuff or direct contact with infected animals (primarily pigs, cats and dogs), their feces or other contagious body fluids. The incubation period is 1–14 days and bacteria can be detected in the stool. *Yersinia enterocolitica* causes an acute enteritis with watery, often slimy and sometimes bloody diarrhea. Moreover, stomach ache, vomiting and fever are present. Diarrhea can last up to 20 days, with an average of 9 days. After diarrhea has stopped, bacteria can still be shed in the stool for several weeks. *Yersinia pseudotuberculosis* causes an inflammation of the mesenterial lymph nodes (lymphadenitis mesenterialis), which can imitate the symptoms of acute appendicitis. Reactive arthritis is a complication, which occurs with a frequency of 1–3%, and primarily involves the joints of the lower extremities. In general, therapy of yersiniosis is restricted to the substitution of fluid losses, but antibiotics are administered in septic cases. Effective drugs are cotrimoxazole, 3rd generation cephalosporines and aminoglycosides.

Infection with *Listeria* / Listeriosis

Listeria – named after the British surgeon Jopeph Lister – are gram-positive rods, which can be present in the intestines of humans and animals; they are shed with the stool and can be found anywhere in the environment. The strain, which is pathogenic for humans, is *Listeria monocytogenes*. The transmission of the bacteria takes place through the ingestion of food of animal origin. It

has to be considered that the germs can survive even low temperatures (in the refrigerator). Often, the infection is asymptomatic. After an incubation period of up to 8 weeks, fever and diarrhea can appear. Severe forms of the infection are primarily observed in young children and immunocompromized people. They are characterized by a septic course and an inflammation of the meninges or the brain (meningitis, encephalitis); lethality reaches 30%. Infection during pregnancy or birth can cause a ► congenital listeriosis. Infections with *Listeria* are treated with antibiotics.

Cross-References

► Body Fluid Balance
► Clostridium botulinum-Infection
► Clostridium perfringens Infection, Enteral
► Congenital Listeriosis
► Food Decay
► Hemolytic Uremic Syndrome (HUS)
► Hepatitis A Immunization, Active
► Molds
► Parasites
► Paratyphoid
► Pasteurization
► Permanent Shedders
► Preservation of Food
► Protozoa
► Rehydration Solution
► Rotavirus Vaccination
► Typhoid Fever

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http://www.stayinginshape.com/3osfcorp/libv/p29.shtml
http://en.wikipedia.org/wiki/Fecal-oral_route
http://en.wikipedia.org/wiki/Food_safety

Foodstuffs Safety

► Food Safety

Food Typical for Certain Culture

► Traditional Food

Forgiving

Definition

The Christian religion provides forgiveness, through the will of God, for the individual who may have committed a sin. The individual should first admit the sin (repent) and seek forgiveness. In general, this will be accepted in the belief that the individual would refrain from committing further sin.

Formal Channels

Definition

Formal channels of communications have explicit rules that primary researchers must follow to enter information into such channels. They place restrictions on the kind or quality of information that is admitted to the system. The five major formal channels are professional conferences, paper presentations, personal journal libraries, electronic journals, and research report reference lists.

Formation of the Soil

► Pedogenesis

Formative Evaluation

Synonyms

Process evaluation

Definition

Formative evaluation is also called as process evaluation and it is conducted while measures are in progress. The role of formative evaluation is to discover deficiencies or successes in the intermediate version of the program. Process evaluation provides a continuous assessment of projects and their organization.

Fowl Pest

► Avian Influenza
► Influenza and Avian Influenza

Fowl Plague

► Avian Influenza
► Influenza and Avian Influenza

Frambesia

► YAWS

Free-Rider Behavior

Definition

The term free-rider behavior refers to the behavior of individuals who consume specific goods without contributing to the costs of provision of the specific goods.

French Letter

► Condom

Frequency

Definition

Frequency is the number of times a certain value of an observation occurs. This number is also called count or frequency count. Dividing the frequencies by the total number of observations results in relative frequencies, which is equivalent to empirical ► probability. For qualitative variables, frequencies are given for a specific category, for discrete quantitative variables for specific numerical value, and for the continuous quantitative variables frequencies are given for class intervals (class frequency). ► Frequency distribution summarizes these counts in tabular or graphical format.

Frequency Based Analyses of Selection

Definition

These make use of models to predict the expected distribution of ► allele frequencies for a locus under conditions of strict neutrality in a panmictic (non segregated) population of constant size. Natural selection can cause deviations between the predicted and observed allele frequencies by selecting for or against particular allele(s). Frequency based tests for selection include: The Hardy Weinberg equation, Tajima's D test, Fu and Li's D and F tests, the McDonald and Kreitman test, the Ewen Watterson test on observed homozygousity, Fay and Wu's H statistic and Weir and Cockram's FST.

Frequency of Death

► Mortality

Frequency Distribution

Definition

A frequency distribution describes the frequencies or counts of observations when the values of a variable are ordered according to their magnitudes. A grouped frequency distribution is a frequency distribution when the values of the variable are grouped into class intervals.

A relative frequency distribution is obtained by dividing the frequency distribution by the total number of data. A cumulative frequency distribution is obtained by the successive adding of the frequencies of single groups or class intervals. A cumulative relative frequency distribution is obtained by dividing the cumulative frequency distribution by a total number of data. Distribution of frequencies can be presented by a frequency table or by graphical representation. The frequency table contains the values of the variables in the first column (names of the categories, discrete numerical values or class intervals), and in the remaining columns it contains frequencies and relative frequencies. Appropriate graphical representation for frequency distribution of discrete quantitative data is a bar chart, and for frequency distribution of continuous quantitative data a histogram, frequency polygon, and/or stem-and-leaf plot.

Cross-References

► Descriptive Statistics

Frequency Rate

Definition

The frequency rate is the number of new cases of injury during the calendar year divided by the total number of hours worked by ► workers in the examined group during the year, and multiplied by 1,000,000. The frequency rate is similar to the ► incidence rate, the numerator is the same and the only differences are in the denominator and constant. One might assume that the frequency rate is a bit more precise than the incidence rate due to the fact that the frequency rate denominator comprises number of workers as well as of number of hours worked.

$$F = \frac{NC}{H} \times 1.000.000$$

F = Frequency rate
NC = Number of new cases of injury during the calendar year
H = Total number of hours worked by workers in the examined group during the year

Frequency Weighting

Definition

Sound level meters may use four different filters, A, B, C, or D, in order to weigh sound pressure levels as a function of frequency. Sound pressure levels in the weighted scales are expressed in decibel units with an associated letter indicating the weighing circuit, for example, dB (A). The A-weighting curve is most widely used in the community setting as it correlates very well with the frequency response characteristics of the human auditory system for pure tones. This reduces the low frequency response and some of the high frequencies, whereas the mid-frequency range is emphasized. The D-weighting curve is used for the measurement of single event aircraft noise. Another weighting, which is useful in estimating attenuated noise when personal hearing protectors are used is the C-weighting network. B-filters are used to match the auditory system response curves at moderate loudness levels.

Friction Cost Method

Definition

The friction cost method is a method to estimate the ► indirect cost due to productivity loss. The friction period is the time until another worker from the pool of unemployed has fully replaced the individual who is absent due to an illness. The value of the indirect cost is approximated by the value of an average individual's future earning over the friction period. The friction cost method reflects the true cost of productivity loss for employers. Over a long-term perspective, the friction cost method estimates lower indirect costs compared with the human capital approach.

Friedman Test

Definition

This non-parametric test is an extension of the Wilcoxon matched pairs signed ranks test, and is concerned with more than two time periods of data collection or conditions and groups of three or more matched subjects.

F

Frostbites

Synonyms

Congelatio

Definition

Frostbite is an acute damage to the skin and underlying tissues of peripheral parts of the body (fingers, nose, and ears) caused by extreme cold. Frostbite is distinguishable by the hard, pale, and cold quality of the skin. The area is likely to lack sensitivity to touch, although there may be an aching pain. As the area thaws, the flesh becomes red and very painful. If only the skin and underlying tissues are damaged, recovery may be complete. However, if blood vessels are affected, the damage is permanent and gangrene can follow, which may require amputation of the affected part.

Fugitive

► Refugee

Functional Ability

Synonyms

Functional limitation; Functional capability

Definition

Functional ability is the actual or potential capacity of an individual to perform the activities and tasks that can be normally expected. A given function integrates biological, psychological and social domains. It becomes increasingly important to measure the functional ability of an individual, especially related to ► long term care, because functional ability is a key factor in determining the individual's quality of life and it correlates to physical and mental health. The need for long-term care or rehabilitation services, including eligibility for funding, is often measured by the individual's ability to perform different functional activities. Especially in older people, measurement of functional ability is commonly either done by assessing the ability to perform "activities of daily living" (ADLs) or by measuring the ability to perform "instrumental activities of daily living" (IADLs). The measurement is done by questioning the individual or by observing the individual carry out an activity (e. g. getting up from a chair).

Functional Capability

► Functional Ability

Functional Food

Definition

Functional food means food which is enriched with added ingredients. Therefore, these products are enhanced with a positive effect to their original nutritional value (nutrient content and taste value) concerning preservation and advancement of health, physical capability or well being.

Functional Limitation

► Functional Ability

Functional Somatic Syndromes (FSS)

Definition

Group of disorders involving alterations in mind-brain-body interactions.

Functioning

Definition

Umbrella term encompassing all body functions, activities and participation.

Functions of Public Health

Definition

Public health is defined as the organization and analysis of ► medical knowledge in such form that is applicable

to health related issues by society. Three core functions of public health are: 1. surveillance of the health status of the population, assessment of quality of health services provided, and analysis of disease and injury patterns in a population, 2. policy development in the health sector and specific intervention projects, and 3. assurance that interventions are performed in an adequate way and for an adequate population.

Fundamentals of Genetics

► Genetic Principles and Genetic Variations

Fusion Inhibitors

Synonyms

Drugs to treat AIDS; AIDS-therapeutics; Anti-HIV medications; Antiretroviral medications

Definition

Enfuvirtide (T-20, Fuzeon) was introduced as the first fusion inhibitor at the beginning of 2003. It works by blocking the cells' viral uptake. Disadvantages of fusion inhibitors are their production difficulties, high costs and the fact that they have to be administered subcutaneously.

Gangrenous Stomatitis

► Noma

Garbage

► Communal and Industrial Waste

Garbage Management

► Waste Management

Gas Gangrene

Synonyms

Infection with *Clostridia*

Definition

Gas gangrene is a serious wound infection, which is caused by toxins of different species of *Clostridia* (in 60–80% by *Clostridium perfringens*). Without treatment, the course is lethal within 48 hours. *Clostridia* is found in the soil, water, dust, foodstuffs and in the intestines of humans and animals. In earlier times, gas gangrene was a common infection in theaters of war. Nowadays, it still is a frequent infection in tropical regions, but it has become rare in industrial nations. Incubation period ranges between a few hours and 3 days. The first signs of an infection are sudden, severe pain in the wound and swelling. In the absence of oxygen (in an anaerobic milieu), gas is produced in the tissue causing a crackling sound. Brown, bloody or amber-colored fluid with a bad, sweetish smell is secreted from the wound. With the destruction of tissue and the spread of toxins, failure of the liver, kidneys and the cardiocirculatory system occurs. If therapy starts immediately, lethality can be reduced to 15–50%. Treatment consists of two components. On the one hand, antibiotics (penicillin, cephalosporines, chloramphenicol and erythromycin) are effective. On the other hand, surgical intervention is necessary to make the wound aerobic; necrotic tissue removed, the wound left open (no surgical suture).

Gastrointesitnal Disorders

► Gastrointestinal Problems

Gastrointestinal Problems

Synonyms

Gastrointesitnal disorders

Definition

A gastrointestinal disorder comprises symptoms arising in the mid or lower gastrointestinal tract that are not attributable to anatomic or biochemical defects. The symptoms include abdominal pain, early satiety, nausea, bloating, distention, and various symptoms of disordered defecation. The three most common functional bowel disorders are irritable bowel syndrome (IBS), constipation, and functional dyspepsia.

GAVI, Global Alliance for Vaccines and Immunization

Definition

The Global Alliance for Vaccines and Immunization (GAVI) was founded in 1999. The aim of GAVI is to reach 30–40 million children in the developing countries in order to carry out the necessary vaccinations. Governments, non governmental organizations, UNICEF, the World Bank Group, the WHO, the Bill-and-Melinda-Gates-Foundation, the International Federation of Pharmaceutical Manufactures Association (IFPMA) and research and technical health institutes are partners of GAVI.

GDP

► Gross Domestic Product

Gender

Definition

A social characteristic that differentiates people on the basis of socially constructed, individually internalized and individually externalized attributes. These attributes range from appearance to beliefs and behavior. Gender is often considered a continuous outcome, whereby individuals locate themselves (and are located by others) on a continuum from a more female to a more masculine presentation of themselves. However, it is most commonly operationalized as a dichotomous outcome (i. e. male or female).

Gender Differences and Health

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Synonyms

Sex differences and health

Definition

Researchers use ► gender to refer to the social construction of what it means to be a man or a woman in a specific culture (e. g. the roles, responsibilities, and norms about acceptable behavior for men and for women). Typically, ► sex is used to refer to the biological differences determined by whether a person carries an X or a Y chromosome. For example, studies that highlight the role of gender might examine why women, on average, have lived longer but less healthy lives than men in every industrialized nation since the turn of the century. Studies that highlight the role of sex might examine why an event such as preterm loss and infant mortality are higher when the infant is male than female, or why breast-cancer is higher in women than men.

Basic Characteristics

Gender and Health Behavior

Studies exploring gender differences in health and longevity have focused on the role of gender in shaping differences in health behavior, risk taking, and medical care utilization among men and women. Cigarette smoking is an excellent example of how gender shapes differences in health behavior important for health and longevity (Chapman Walsh et al. 1995). Throughout the later half of the twentieth century, cigarette smoking was the primary cause of mortality in the U.S. and U.K. At the beginning of the century, the rates of smoking-related deaths (especially lung cancer) were much higher for men compared to women. These higher rates of cancer are consistent with the changes in patterns of smoking among men and women. During the early part of the twentieth century, tobacco was a luxury that was not considered socially acceptable for women to smoke. Beginning in 1920s and continuing through to World War II, ► gender norms about appropriate behavior for men and women began to relax, and cigarette smoking became a symbol for many young women of their new independence outside of the home. Consistent with the trends in smoking, rates of cancer-related deaths began to increase among women over the later half of the twentieth century. Current delays in smoking cessation among women compared to men further underscore the inter-relationships between gender, health behavior, and environmental context, particularly as they relate to differences in stressful working conditions (Weden et al 2006). As a result of these trends in

cigarette smoking and cancer-related mortality, smoking has been identified as the primary determinant of the convergence in mortality differentials between men and women in industrialized countries over the latter part of the twentieth century (Pampel 2002).

Gender, Risk-Taking, and Unintended Injury

In contrast with the changes in gender norms which have shaped health behavior patterns over the last century, differences in gender norms about risk-taking and social protection appear to consistently predispose men to higher rates of accident and violence-related mortality. Globally, in nearly every period for which data is available, accident and violence-related deaths are higher among men than women (Preston 1976; WHO, 2002). Unintended injury is the primary cause of mortality in the ages 15–44, and road traffic injuries account for the largest sex differentials in this figure, with almost three times as many fatalities among men as women (WHO 2002). Differences in the ► socialization of men and women have been associated with the greater risks men take while driving (e. g. speeding, driving recklessly, driving under the influence of alcohol) that predispose them to traffic accidents (Waldron 1990). Similarly differences in the social acceptance of men's exposure to risks outside of the home (e. g. hazardous work) have been related to the higher rates of male mortality in these arenas (Waldron 1990).

Gender Socialization and Health

The differences in socialization of men and women (e. g. about appropriate roles, responsibilities, and behavior; ► gender inequality) that has been related to higher mortality among men has also been related to the greater degree of poor health among women (Lorber 2005). For example, uneven changes in feminine and masculine social norms over time have been associated with increases in poor health among women. Researchers describe how the loosening of social norms about women's work outside of the home in industrialized countries can be related to increases in psychosocial stress as women balance responsibilities at home and at work (► work-life balance) (Hoschchild 1989; Lorber 2005). Globally, researchers describe how physical and psychological violence against women is often legitimized by a woman's failure in a feminine social role (e. g. "good wife"), how battery can be related to unsuccessful attempts by men to achieve masculine social roles, and how difficult it can be for women to leave abusive relationships in light of socialization into the feminine role of caregiver (Lorber 2005). ► Sexism poses particular risks for women's reproductive health when norms legitimize male access to and control of women as sexual objects (Fugate Woods 1996).

Emerging Research

Historically, research on gender and health has considered, and discounted, biological aspects of male-female differences in isolation from the social constructions of femininity and masculinity. Recent research suggests that observed differences in longevity between men and women may involve complicated interactions between genes, biology and the social environment (Carey 1997). As scientists continue to explore gene-environment interactions, these relationships are emerging as a new area of research fundamental to the understanding of gender differences in human development, health and longevity.

Cross-References

► Gender
► Gender Inequality
► Gender Norms
► Sex
► Sexism
► Sexuality
► Socialization
► Social Stigma
► Work-Life Balance

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Gender Inequality

Synonyms

Gender difference

Definition

Gender inequality refers to differences in the distribution of rewards and/or exposures and risks on the basis of ► gender. These rewards, exposures and risks may be material, psychological, or social in nature. It is important to distinguish inequality from inequity. Inequality simply denotes a difference, whereas inequity denotes a difference that is morally or ethically unjust. In light of the fact that gender inequality specifies that there is a difference between groups according to a characteristic that is socially constructed, gender inequality is often considered an undesirable outcome that is synonymous with gender inequity.

Gender Norms

Definition

These are expectations shared by a group, at a given point in time, that reflect a commonly accepted set of activities and ways of presenting oneself as either a man or a woman. Adherence to the set of expectations (i. e. male or female) that are consistent with how a social group perceives a given individual is achieved through various mechanisms of social control, including ► social stigma and positive social sanctioning.

Gene Arrays

► DNA Microarray

Gene Chip

► DNA Microarray

General Anxiety Disorder (GAD)

Definition

A person with a general ► anxiety disorder suffers from chronic ($\geq$ 6 months' duration), permanent anxiety or worry, accompanied by multiple associated symptoms triggered by activating the central nervous system. These symptoms include muscle tension, easy fatiguability, poor concentration, insomnia, restlessness, and irritability. The person is unable to control these feelings which extend to all areas of life (e. g. work, personal finance, relationships). Sufferers experience these worries and the constant, high-level tension that comes with it as excessive, but still realistic. In Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) an essential feature of generalized anxiety disorder is that the anxiety and worry cannot be attributable to the more focal distress of ► panic disorder, ► social phobia, ► obsessive-compulsive disorder, or other conditions.

Cross-References

► Anxiety Disorders

General Assembly

► United Nations General Assembly

General Fertility Rate (GFR)

Definition

General fertility rate (GFR) is the number of live births per 1000 women ages 15–19 in a given year. It can be calculated using the vital registration system for births

or may be estimated from national censuses or survey data using the child-woman ratio when birth statistics are not available. GFR relates births to the age-sex group at risk of giving births and it is a more refined measure than the ► crude birth rate (CBR) to compare ► fertility across populations – it approximately equals four times the CBR.

General and Generalized Linear Model

Definition

This is a specific model formulation which relates a response variable, Y, to a set of explanatory variables, X_1, X_2, …, X_k. The basic relationship is written as: $y = \beta_0 + \beta_1 x_1 + \ldots + \beta_k x_k + e$, where y is the observed value of Y corresponding to an observed set of values for the explanatory variables, x_1, x_2, …, x_k and the βs are regression coefficients, which are usually to be estimated. It is further assumed that: $E(Y) = \beta_0 + \beta_1 x_1 + \ldots + \beta_k x_k$ and therefore, that $E(e) = 0$. Many standard statistical models fall into the class of general linear models. These include the models used in linear regression (simple), ► multiple linear regression, analysis of variance, and analysis of covariance. The general linear model is a special case of a generalized linear model (GLM), a term used to refer to a regression model that relates a function of the mean of a response variable to a linear function of explanatory variables. Beside Gaussian linear regression, they include logistic regression (► logistic regression analysis) and loglinear models (► loglinear analysis) for count data. The GLM modeling scheme can be summarized as having three components, a random component, a systematic component and a function, which links the two. Within one paradigm, there are both an integrated conceptual framework and an emphasis on the explicit analysis of data through a model-building approach, allowing the estimation of the size of effects, predictions of the response variable, and the construction of confidence intervals.

Generalized Infection

► Bloodpoisoning

General Physician

► General Practitioner

General Practice

► Primary Care

General Practitioner

Synonyms

Family doctor; Family physician; General physician; Primary care physician

Definition

A General Practitioner (GP) is the first point of contact for health related services that are non-emergency cases and thus provides ► primary care. They are supposed to cover and coordinate all the basic medical care needs of the population and often act as gatekeeper to authorize referrals of the patient to ► secondary care providers like specialists or hospitals. The GP treats acute and chronic diseases and has an important role in providing ► prevention and ► health education for all ages and both sexes.

Generic Drugs

► Generics

Generic Instrument

Definition

Generic instruments for the measurement of health-related quality of life are instruments that measure general aspects of health and quality of life. They do not capture disease specific aspects. Generic instruments allow the comparison of health care interventions for different health problems and different sectors of the health care system, such as preventive interventions, acute care, and emergency care.

Generics

Synonyms

Generic drugs

Definition

Generics are ► drugs that are developed after the patent protection for a drug has expired. They include exactly the same active ingredients and dosage as the original drug. As they can be developed without any research and development, the prices of generic drugs are much lower than the original drugs. In the context of cost containment, generics are often prescribed to lower the cost of drugs.

Gene Therapy

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Definition

Gene therapy refers to the clinical application of different gene transfer technologies. The practice of gene therapy involves the transfer of one or more genes or nucleic acid elements to a patient in order to counteract a naturally occurring deficiency in gene function. The vehicle which is used to introduce the genetic element of interest to human cells is called the gene ► vector, which may be either a viral vector or a non-viral vector. This genetic element is known as a ► *trans*-acting gene or transgene if non-integrating, and a ► *cis*-acting gene if it integrates into the chromosomal DNA.

Introduction

Traditionally, genetic defects amenable to gene therapy have been single in nature (i. e., the single gene / single protein model of Beadle & Tatum), but complex genetic diseases are also subject to gene therapy. For example, early work in gene transfer involved the transfer of a gene to correct defects in adenosine deaminase (ADA) or interkeukin-2 receptor gamma chain (X-SCID) in patients suffering from these inherited forms of immune deficiency (Hacien-Bey-Abina et al. 2002). Results of early gene therapy experiments have been mixed, with some reconstitution of the defects in patients but also the possibility of untoward insertional effects such as malignancy (Hacien-Bey-Abina et al. 2003). Despite the lack of definitive results in early human gene therapy experiments which began in the 1990's, clinical trials are currently underway for a variety of different conditions, which include cancer and neurological disorders such as Canavan disease (Janson et al. 2001) and Parkinson's disease, as well as diverse inherited metabolic diseases. As more genes are correlated with human diseases, the challenge of gene therapy will be to find the optimal tools to introduce disease-modifying genes, either singly or in combination, and to attain adequate levels of long-term gene expression in a tissue or cell-specific manner. The study of population genetics is also critical to the future of gene therapy, because detailed gene-mapping and functional genomics will be required to determine the best genetic targets for clinical applications. There are significant public health implications for human gene therapy, since many common diseases are known to have a genetic component which may be modified or treated by gene transfer. The theoretical study of gene function and regulation as well as the more practical study of gene transfer technologies thus encompasses the future of this exciting field of clinical practice.

Basic Characteristics

Following the discovery of the rudimentary structure of DNA in the 1950's, it took nearly three decades for the promise of gene therapy to be realized. The modern era of gene therapy began with the discovery of recombinant DNA in the 1970's, which raised the theoretical possibility of replacing defective DNA through splicing with restriction endonuclease enzymes. Studying SV40 virus, Paul Berg discovered that DNA could be specifically spliced and reintroduced to another organism (Jackson et al. 1972). Herbert Boyer and Stanley Cohen expanded upon this work through the use of bacterial plasmids to shuttle DNA between species (Morrow et al. 1974). Later, Richard Mulligan made human gene therapy possible when he modified a SV40 virus to express a bacterial gene in mammalian cells (Mulligan

and Berg 1980) and also developed a murine retrovirus ► vector to express genes in mammalian hematopoietic cells (Williams et al. 1984). In parallel, other investigators such as Philip Felgner have developed nonviral, liposomal systems for stable delivery of genes to mammalian cells. In summary, rapid progress in technical issues surrounding gene manipulation occurred from 1970–1990, which was the foundation for further work in vector design and gene targeting experiments.

Population genetics is the study of genetic variation in human populations. A variety of mathematical tools are informing the discovery of genes and their function (Haines and Pericak-Vance 1998). It appears likely that functional genomics, or the study of gene function on a large scale, will contribute to the ultimate success of gene therapy through the provision of new material for study, and will also be informed by gene transfer technology (Janson and During 2001). At this time, population level studies of genes continue to find new targets for cancer, mental disorders, and many medically important complex diseases such as Alzheimer's and diabetes. Gene therapy has much to contribute to public health as the role of genes are elucidated and gene delivery techniques are further refined.

Cross-References

► Cis-acting Gene
► Trans-acting Gene
► Vector

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Genetically Modified Microorganisms

► Genetically Modified Organisms (GMO)

Genetically Modified Organisms (GMO)

Synonyms

Genetically modified microorganisms

Definition

GMO are bacteria, yeasts or filamentous fungi in which the genetic material has been changed through modern biotechnology in a way that does not occur naturally by multiplication and/or natural recombination. The introduction of foods produced with the aid of GMOs into the food supply brings potentially new issues of ► food safety. The safety assessment should involve: the characterization of the genetic modification, including deletion or insertion of DNA sequences, characterization of recipient microorganisms, the ultimate donor organism, the vector(s) used in the construction of the GMO, the construct and the GMO itself, natural habitat, history of use, gene transfer, genetic stability, pathogenic potential, characterization and verification of the expected protein expression product of the novel DNA, composition of the food containing the GMO, safety and nutritional assessment (including potential toxicity and nutritional aspects).

Genetic Constitution

► Genotype

Genetic Counseling

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Definition

Genetic counseling deals with problems associated with the fear of a disorder that may be hereditary. This type of counseling helps an individual or a family understand medical and genetic information, consider different options and make decisions best suited to the given individual situation.

It is an interactive process providing information in a manner which is accessible to the person seeking advice. There are many different aspects involved (diagnostic, nature of the disorder, measures available for prevention and treatment, estimation of ► recurrence risks, communicative role, psychosocial issues and support).

Through genetic counseling responsible application of genetic knowledge in clinical practice can be guaranteed.

The ► consulter (propositus) is the individual primarily seeking advice. Genetic counseling is open to individuals and families worried about a disorder that may be hereditary.

The *index patient* is the individual through whom the family is ascertained. The *proband*, generally, is an affected individual.

The *genetic counselor* is a health professional with specialized education and experience in the areas of medical genetics and counseling. In Germany most genetic counselors are medical specialists in human genetics. In other countries counselors also enter the field from a variety of disciplines such as biology, psychology and social work.

Basic Characteristics

Aim and Basic Principles of Genetic Counseling

Genetic counseling aims to benefit the individual and the family. The consulter is enabled to make individual life decisions and consider aspects of family planning based on being well informed.

Counseling and genetic analyses are voluntary. The consulter should be informed in advance about the aims and course of action of the genetic counseling. Agreement (usually in written form) is necessary. There is a guarantee from the counselor of privacy, confidentiality and duty to inform patient.

► Non-directiveness is a central tenet of genetic counseling. Genetic counseling should ensure that individuals have the information that will enable them to make their own decisions. The importance of non-directiveness lies in allowing the individuals involved to make decisions right for their own particular situations. The counselor is required to respect the autonomy of the client.

Common Reasons for Genetic Counseling

As genetics has become increasingly relevant to all areas of medicine, the context in which genetic counseling occurs has expanded. Common reasons for genetic counseling are the following:

- possible genetic disorder in a child, a parent or a relative (child or other relative with inborn malformation or illness that is or might be heritable);
- advanced parental age;
- consanguinity;
- multiple pregnancy loss;
- stillbirth;
- infertility;
- distinctive features diagnosed before birth;
- possible mutagenic and teratogenic exposure.

Contents and Course of a Genetic Counseling Session

The personal concern and the specific disorder set the stage for the dialogue in genetic counseling.

The personal conversation in genetic counseling usually takes at least 30 minutes but can take up to 90 minutes or more. Often a second meeting is offered.

A counseling session usually consists of the following:

- contracting: listen to the ► consulter's goals and personal questions;
- collecting and interpreting the medical history and medical records. Genetic counseling is based upon a thorough patient's and family history and evaluating medical records;
- collecting genetic information by drawing up the ► family tree (pedigree) over at least three genera-

Genetic Counseling, Table 1 Showing main symbols used in constructing family trees

	unaffected male, female
	gender unknown
	affected male, female
	three healthy males
	deceased (affected)
	no children
	consulter / propositus (affected)
	consanguineous marriage
	parentage uncertain
	abortion
	non-identical twins
	monozygotic twins
	heterozygote (in autosomal recessive disease)
	heterozygote (in X-linked disease)

tions. The use of clear and consistent symbols (see Table 1) allows genetic information to be set out clearly. Of note are years of birth, age and cause of death, illnesses or other distinctive features. In each generation all individuals, whether alive or deceased, are noted – stillbirths and abortions are important as well;

- performing a physical examination if relevant;
- making a diagnosis as exact as possible: a clear diagnosis is the essential basis for accurate genetic counseling. Often additional information is needed;
- describing and explaining the specific disorder: etiology, clinical symptoms, prognosis, therapy/prevention, diagnostic options and their limitations;
- offering further support (e. g. patients' support group);
- explaining the genetic basis of the disorder and specific risk assessment;
- discussing genetic testing options;
- helping the consulter to reach the decision which is right in the given individual situation. Considering personal, familial, religious and psychosocial aspects;
- helping the consulter to deal with existing problems or problems arising from genetic testing;
- explaining general genetic risks;
- writing a letter summarizing the main points of the consultation. The letter is written in easy-to-understand language and is addressed to the consulter and, if the consulter requests, to the attending physicians.

G

Estimation of Genetic Risks in Genetic Counseling

In order to provide precise genetic advice it is essential to have an accurate diagnosis. It is one of the main tasks of the counselor to make this basis as firm as possible. However, genetic risks are rarely absolute, mostly one works in terms of probabilities or odds. Risk estimates may be based on different sorts of information.

For single-gene-disorders, following Mendelian rules of inheritance, a theoretical risk can be given. A 'prior' genetic risk, based usually on Mendelian inheritance, may be modified by 'conditional' information. Such modifying information may drastically alter the risk estimate (e. g. several unaffected brothers and CK-level in a possible carrier of Duchenne muscular dystrophy or age of a so far unaffected person at risk for Huntington's disease).

Theoretical predictions are not possible in multifactorial disorders. But for most of the more common non-Mendelian and chromosomal disorders empiric risk estimates are available.

This empiric risk estimate is based on observed data from many families in the same situation. Most empiric risks really fall into the category of composite risks. Due to heterogeneity of a disorder it can be impossible to distinguish to which group a special case belongs, so an intermediate risk will be given.

The results of special investigations may greatly alter the risk estimates (e. g. alpha-fetoprotein in amniotic fluid, carrier detection, linked DNA markers). The results of these investigations require combination with the prior genetic risk along with other modifying information.

Genetic Diagnostics and Genetic Counseling

In clinical medicine diagnostics is performed to clarify existing symptoms. Partly this is the case in genetic diagnostics as well (diagnostic testing). But partly genetic diagnostics is performed in persons at risk free of any symptoms or physical discomfort (e. g. predictive testing, heterozygosity testing). Here the impact of information and its consequences is far reaching. Therefore this kind of genetic diagnostics should be embedded by genetic counseling to safeguard informed consent and understanding of consequences.

Facing the results of genetic testing without genetic counseling has its risks; especially before prenatal and predictive genetic testing the person being analyzed must be informed in detail about the nature, power and possible consequences of the analysis. In the context of severe or untreatable disorders psychological support is recommended. After the genetic test the result has to be interpreted and consequences have to be explained. The person to be analyzed should know from the beginning that they can withdraw at any time.

International guidelines for predictive genetic testing have been drawn up (e. g. Huntington's disease). Requirements are: genetic counseling, full age, time to consider of at least four weeks between counseling and taking of the blood sample, involvement of psychological support and written informed consent.

In principle, predictive testing in children is to be considered critically and should only be performed when direct consequences concerning prevention or therapy will result.

Cross-References

- ► Consulter in Genetic Counseling
- ► Family Tree
- ► Non-Directiveness of Genetic Counseling
- ► Recurrence Risk

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Genetic Engineering

► Biotechnology

Genetic Epidemiology

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Synonyms

Statistical genetics; Epidemiological genetics Population genetics

Definition

Genetic epidemiology is a branch of science which deals with the "etiology, distribution, and control of disease in relatives and with inherited causes of disease in populations" (Morton 1982). Genetic Epidemiology is an interdisciplinary field which seeks to understand both genetic and environmental influences and how they interact in causing various diseases and disease related traits in humans.

Basic Characteristics

Genetic Epidemiology, a relatively recent branch of science, deals with studies of how genetic and environmental effects act together in producing various human diseases and disease related traits. One cannot study genes except as they are expressed in certain environments, and one cannot study environmental influences except as they affect people with certain genotypes. Indeed, the same gene(s) may express differently in different environments, and the effect of the same environment may vary by the person's ► genotype, which is known as *gene-environment interaction*. Genetic Epidemiology is thus an interdisciplinary field which arose at the interface of ► population genetics and ► epidemiology.

Genetic epidemiological studies are usually carried out in relatively large samples of individuals/families from select populations and, therefore, the population history and dynamics are relevant. Population dynamics alter the frequency and distribution of both genetic and environmental factors, and thus, also the disease/trait of interest. Certain population characteristics can be exploited for the purpose of finding genetic determinants of disease because the history has affected the genomic structure in a way that specific genotypes associated with disease can be identified more easily in certain populations.

Although "genetic epidemiology" and "statistical genetics" are often used as synonyms, the former is broader and includes the latter. Whereas statistical genetics largely deals with the statistical issues surrounding the analysis of genetic data, genetic epidemiology also deals with (or should deal with) the underlying biology and the distribution of the etiologic determinants in different populations, thus enabling an assessment of the population impact of causal elements. These differences are less relevant as long as biology is integrated into the science.

History

Up until the 1970's, etiologic studies of human disease were carried out largely in terms of unmeasured latent genotypes through statistical analysis of family data. Investigations pertaining to the genetic basis of human diseases have been confined to simple Mendelian diseases (► mendelian traits) which, for the most part, either did not involve environmental effects or the effects were simple. Thus, standard methods of genetics were enough for analysis of those data. Pioneering contributions of a number of epidemiological studies such as the Framingham Heart Study have demonstrated the importance of the environment in understanding the disease susceptibility. As emphasis shifted from simple Mendelian diseases to complex disorders such as coronary heart disease (► coronary artery disease), hypertension, and diabetes (► diabetes mellitus), to name a few, population geneticists faced new challenges because familial effects were no longer entirely genetic. Realization that complex disorders were caused by the interplay between genetic and environmental influences paved the way for what is now called *Genetic Epidemiology*. It was first introduced by Neel and Schull (Neel, Schull 1954) as "Epidemiological Genetics".

In a volume edited by Neel, Shaw, and Schull (Neel et al. 1965), Thomas Francis remarked: "So when the human geneticist turns to disease and disorder in the population as his basis of genetic analysis, he is promptly in epidemiology. And when he asserts the concept of multiple factors to produce an effect, he is in full cry epidemiologically. Conversely, where the epidemiologist seeks explanation for familial or other group aggregation of health or disease, he is immediately involved in genetic problems". By the late 1970's, the new field has made considerable progress in terms of developing new statistical methods necessary for analysis of ► multifactorial traits (Morton 1978). The growth of genetic epidemiology has been quite rapid and explosive ever since, culminating in a series of books and edited volumes (Morton et al. 1983; Ott 1991; Thomas 2004; Rao, Province 2001).

Genetic Epidemiology is Unique

Genetic epidemiology, which is derived from population genetics and epidemiology, is unique. It differs from population genetics because of its preoccupation with human disease. It differs from epidemiology because of its emphasis on familial causes of disease. Whereas genetics treats the environment as noise and epidemiology traditionally treated genes as unnecessary and unfamiliar complication, genetic epidemiology treats both as legitimate contributors to disease. Genetic epidemiology also differs from evolutionary genetics because the former deals with microevolution of human diseases while the latter deals with macro level evolution (distant past or distant future).

Methods of Genetic Epidemiology

Genetic epidemiological investigations of complex diseases use an array of methods of data analysis (see Table 1). These generally include: familial aggregation and heritability which quantify the magnitude of transmission within families; segregation analysis which examines how alleles at a gene segregate from parents to children; linkage analysis which examines whether a trait locus and a genetic marker co-segregate within families; and association analysis which tests if the trait locus and the genetic marker co-occur in individuals. More recent methods include simultaneous considera-

Genetic Epidemiology, Table 1 Standard and evolving methods for genetic epidemiological data analysis

Method	Brief description
Familial resemblance & heritability	Heritability quantifies the percent variance in a phenotype due to genetic (familial) factors
Segregation analysis and major genes	Evaluates how genes segregate from parents to children
Linkage analysis (co-segregation in families)	Examines whether a marker and a trait locus co-segregate in families
Assiciation analysis (co- occurrence in individuals)	Examines whether a trait locus and the genetic marker co-occur in individuals
Linkage disequilibrium (LD) mapping	Linear mapping of markers and trait loci based on pair-wise marker-marker and marker-trait locus correlations
Haplotype analysis	Simultaneous analysis of allelic combinations at a set of closely linked genes
Bayesian Network Analysis	Bayesian analysis of the interrelationships among a given set of variables (usually phenotypes, attributes, and genetic markers)
Pathway-based studies & systems biology	Analysis of multiple genetic markers by integrating pathway-based biological information

tion of multiple genetic polymorphisms (► haplotype analysis) and preferential co-aggregation of a particular trait allele with a particular marker allele (linkage disequilibrium).

Cross-References

► Coronary Artery Disease
► Diabetes mellitus
► Epidemiology
► Genotype
► Haplotype
► Mendelian Traits
► Multifactorial
► Population Genetics

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Genetic Exceptionalism

Definition

Genetic-specific laws or policies that afford ► genetic information an "exceptional" status by treating it differently from other personally-identifiable health information and typically establishing heightened protections.

Genetic Information

Definition

Information about a gene, gene product, or inherited characteristic of an individual derived from the individual, the individual's family history, or a genetic history.

Genetic Mutation

► Mutation

Genetic Polymorphisms

► Genetic Principles and Genetic Variations

Genetic Principles and Genetic Variations

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Synonyms

Principles of genetics; Fundamentals of genetics; Genetic polymorphisms

Definition

Genetic principles are the rules or standards governing the biological phenomenon of heredity, the transmission of characteristics from parents to offspring via information encoded biochemically using DNA, in units called genes. Genetic variations are portions of genetic information at the same genomic site across individuals that can differ between persons, with the size of the differing portions ranging from small single-nucleotide changes to differences extending across entire chromosomes.

Basic Characteristics

History

The transmission of biological information from parents to offspring that encode physiological features has been recognized since early recorded history. As long as 4,000 years ago, farmers in various parts of the world employed strategies of selective breeding of crops and animals in order to enhance desirable traits, such as crop resistance to an adverse climate and animal size and speed. Hereditary transmission of certain diseases in humans had also been observed, such as hemophilia, noted by the second century C.E. The first formal research on the genetic transmission of traits was initiated in the 1850s by Gregor Mendel, a monk living in the Czech town of Brno, who examined the patterns of transmission of observable traits in sweet peas, and characterized modes of inheritance (► mendelian modes of inheritance) for traits as a product of the transmission of ► alleles from parent to offspring (Mendel 1866), even before this terminology existed and before the biological process of reproduction had been characterized. It was not until the twentieth century that experiments by Avery, MacLeod and McCarty (Avery et al. 1944) characterized ► deoxyribonucleic acid (DNA) as the medium in which genetic information is encoded. Subsequent work by Francis Crick and James Watson (Watson and Crick 1953), who along with Maurice Wilkins were awarded the Nobel Prize in 1962, and with the help of Rosalind Franklin, determined the molecular structure of the encoding molecule DNA. Rapid advances in genetics beginning in the early 1970s resulted in the development of recombinant DNA technologies to study DNA functionality and eventually to characterize the structure and variation of the full library of a given organism's DNA, its genome. In humans, the Human Genome Project (HGP) was initiated in 1986 to map the human genome to the nucleotide or base-pair level, and attained 99% completion by 2003 (The National Human Genome Sequencing Consortium 2003) with revisions to the sequence still on-going. To the present, the HGP has sequenced approximately three billion base pairs and identified approximately 30,000 genes. Newer initiatives arising from the success of the HGP include the International HapMap Project (The International HapMap Consortium 2003); an effort to identify DNA sequence variants and common patterns of variation throughout the genome, which as of March 2006 has identified approximately six million ► single nucleotide polymorphisms (SNPs) (http://www.hapmap.org/).

The Structure of DNA

Individual units, or nucleotides, of the molecule encoding genetic information, DNA, consist of one of four nucleobases [Adenine (A), Cytosine (C), Thymine (T), or Guanine (G)] bound to a molecule of the sugar 2′-deoxyribose. These nucleotides are in turn bound to one another by covalent bonds between phosphate groups attached to the 5′ and 3′ positions of the ribose sugar backbone, and form a strand, going from 5′ to 3′. Each nucleic acid has a weak affinity for another nucleic acid (A for T, G for C, and vice versa), and aligns with another strand which has a 'reverse complement' of the sequence of the first strand. This double-strand relaxes to a low-energy state wherein the DNA coils and forms a 'double-helix.' Both double-strandedness and a helical structure serve to protect DNA from natural and enzyme-driven degradation.

The Molecular Superstructure of Genetics

Genetic information encoded in DNA strands comprise large sections of functional nucleotide sequences (such as genes and special sites for protein binding) and non-functional sequences. Long continuous DNA strands made up of these kinds of sequences and including hundreds to thousands of genes are referred to as ► chromosomes. In most bacteria, genes are encoded on one

large circular chromosome found in the cellular cytoplasm. In some bacteria and other single-celled organisms, as well as all multi-cellular organisms, genes are encoded on long, linear chromosomes, of which there may be multiple kinds encoding different genes, as well as multiple copies of the same chromosome, and these chromosomes are localized to the interior of a cellular organelle called the nucleus. The linear chromosomes of higher organisms also are part of additional structures. At certain times, the DNA strand is wrapped around a spherical bead-like protein complex composed of proteins called histones, which serve to pack DNA densely in a form called chromatin. Chromatin, in turn, is made up of loops that tightly coil all DNA into a dense structure when duplicated chromosomes are being segregating to new cells during a cellular process called ► replication. In humans, the observation of genomic DNA in a chromatin state has revealed that there are 22 unique autosomal chromosomes of which most cells possess two copies or 'homologues', and two sex chromosomes of which most cells possess either two copies of the X chromosome in females, and one copy each of an X and Y chromosome in males; because these cells have two homologues of each chromosome, they are said to be 'diploid.' This does not apply to reproductive (or 'germ') cells, eggs and sperm, which have only one copy of each unique autosomal chromosome and one copy of a sex chromosome, and because they have only one copy are said to be 'haploid.'

Genetics in the Cell Cycle: Mitosis and Meiosis

Each cell in which DNA is found undergoes a cellular cycle of DNA and cell duplication. In non-reproductive, or 'somatic' cells, the cell cycle consists of four separate phases: G_1, S, G_2, and M. G_1, the first growth phase, is a phase during which the cell readies itself to synthesize new DNA. During this period, a cell can enter a non-dividing or quiescent state called, G_0. S, the synthesis phase, is marked by the duplication of DNA via the process of replication. G_2, the second growth phase, is a preparation stage for cell division. These three phases are collectively called interphase, and account for 90% of the time spent in the reproductive cycle. M is the fourth phase and is called ► mitosis, a multi-step process by which the single, diploid somatic cell divides into two diploid daughter cells (46 chromosomes → 46 chromosomes). In germ cells, the cell cycle differs primarily in the M phase, which in this case is called ► meiosis. In contrast to mitosis, the first phase of meiosis witnesses an exchange of DNA sequence along the arms of homologous chromosomes through a process called ► recombination. Additionally, meiosis has two sets of cell division, a first meiotic division, whereby a diploid cell gives rise to two diploid daughter cells (46 chromosomes → 46 chromosomes), and a second meiotic division, where the two diploid daughters each produce two haploid daughter cells with only one copy of each homologous chromosome in each cell (46 chromosomes → 23 chromosomes).

DNA Activity over the Cell Cycle

During both mitosis and meiosis, DNA is tightly packed in its chromatin structure to facilitate transport to the nuclei of daughter cells. However, during interphase, DNA is unwound and spread throughout the nucleus, and is engaged in a number of biochemical processes, including ► transcription. During transcription, DNA is unwound from a double-helical state, and the open strand is used as a template for the construction of a single-stranded ribonucleic acid (RNA) molecular transcript. The sequence of the transcript serves multiple functions including (a) containing binding sites for transport of the transcript from the cell nucleus to the cytoplasm for protein production, and (b) a coding sequence for the ordering of amino acids into polypeptide chains that compose proteins. The process by which an RNA transcript brought to the cytoplasm is fed into a cellular organelle called a ribosome and used as a template sequence for the ordering of amino acids in constructing a polypeptide chain is called ► translation.

The Roles of Genetic Variations

The scheme by which cells use DNA to encode RNA, and RNA to encode proteins is called the Central Dogma of Molecular Genetics. The ordering of this scheme also helps to demonstrate how features encoded by genetics are manifested. Minute changes or errors in any of the processes with which DNA is involved may thus alter the types of protein products produced by cells, their functionality, or even the amounts in which they are produced. Changes to the DNA sequence of the genome that can occur include large-scale alterations

such as chromosomal abnormalities, but more commonly include small-scale alterations such as ► polymorphisms and ► mutations.

Chromosomal Abnormalities

Chromosomal abnormalities include both variations in the number of chromosomes as well as variations in the structure of transmitted chromosomes. Although normal human somatic cells are diploid, carrying 46 chromosomes or one copy of maternally – and paternally – contributed homologues ($n = 23$), failures in nuclear division can result in multiple complements of the full set of chromosomes ($3n$, $4n$). These mutations are uniformly lethal. More commonly, aneuploidy occurs where cells carry an extra copy or copies of a chromosome ($2n + 1$, $2n + 2$), or are missing a maternal or paternal homologue of one chromosome ($2n - 1$). Some potential causes include non-disjunction, the failure of chromosomes to separate during normal cell division processes, or anaphase lagging, the loss of chromosomes during cell division. These chromosomal number abnormalities affect all genes on the affected chromosomes, and thus can lead to multi-symptom syndromes, such as Down's syndrome, also called Trisomy-21 due to the possession of an extra copy of chromosome 21, in which affected persons typically have cognitive impairments and some abnormal physiological features, such as a tendency to ear infection. Other chromosomal abnormalities can include chromosomal rearrangements such as translocations, large-scale insertions and deletions, or inversions of chromosomal arms; these changes can result in errors of recombination whereby chromosomal arms exchanging DNA are incorrectly reconnected. In the case of some a translocations and inversions, there may be minimal or no effects on genetically-driven features if all of the misplaced or unordered genetic material is still present in the nucleus.

Polymorphisms and Mutations

Smaller-scale variations include local changes to the genomic sequence such as polymorphisms and mutations. Polymorphisms include common variants of particular segments of DNA and can vary in length from tens of nucleotides to a single nucleotide. ► Short tandem repeats (STRs) consist of small sets of nucleotides (usually two or three) repeated in several adjacent copies. Errors in the replication of DNA cause variation to arise by changing the number of short sequence repeats, so that the length of STRs may vary from individual to individual. This can potentially effect on proteins encoded from a DNA template as a varying number of repeats may affect the frame in which DNA coding is read when RNA is processed in translation. ► Single nucleotide polymorphisms (SNPs) are variations where a single nucleotide in the genome may differ from individual to individual. The effects of these polymorphisms may be nil, may alter protein functionality, or may directly change the sequence of encoded proteins. Single changes in the nucleic acid at a particular position may have effects on the single amino acid encoded, or no effects at all, whereas SNP insertion/deletion polymorphisms may shift the entire sequence of amino acids encoded by the DNA radically by changing the frame of reference in which the coding information is read. ► Mutations are another form of variation and may take several forms similar to the polymorphisms described above. Mutations identify changes in otherwise non-variant or differently-varying DNA within recent genetic history – a mutation can occur in a recent generation and be passed down to an individual, or can occur in the lifetime of an individual. Somatic cell mutations, due to errors in replication or DNA alterations by external stimuli, can be lethal and preclude transmission by affecting individuals' reproductive health; similarly, germline transmissions may affect a person's offspring without affecting the person themselves. However, as approximately 95% of DNA is noncoding, mutations at most points in the genome are unlikely to have any effect. Mutations are by nature infrequent, and can often be redefined to be polymorphisms if they achieve sufficient frequency in the population.

Conclusions

Genetic principles follow from the Central Dogma of Genetics – that DNA encodes RNA, which in turn encodes protein. Hence, several features exist in organisms to preserve and use DNA, and these also relate to several ways in which DNA can be altered to induce changes or differences between organisms of the same species. These differences in the genetic code between organisms of the same species can be characterized as genetic variations, of which there are several kinds,

including mutations, SNPs, and large-scale chromosomal abnormalities.

Cross-References

- ► Allele
- ► Chromosome
- ► Deoxyribonucleic Acid (DNA)
- ► Meiosis
- ► Mendelian Modes of Inheritance
- ► Mitosis
- ► Mutation
- ► Polymorphisms
- ► Recombination
- ► Replication (DNA)
- ► Short Tandem Repeat (STR)
- ► Single Nucleotide Polymorphism (SNP)
- ► Transcription
- ► Translation

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Genetics

Definition

Genetics is the study of heredity and how individual characteristics are transmitted by genes from parents to children.

Genetic Screening

Definition

Programs that identify persons within a subpopulation who may be at a higher risk for a genetic disease or condition.

Genetic Susceptibility

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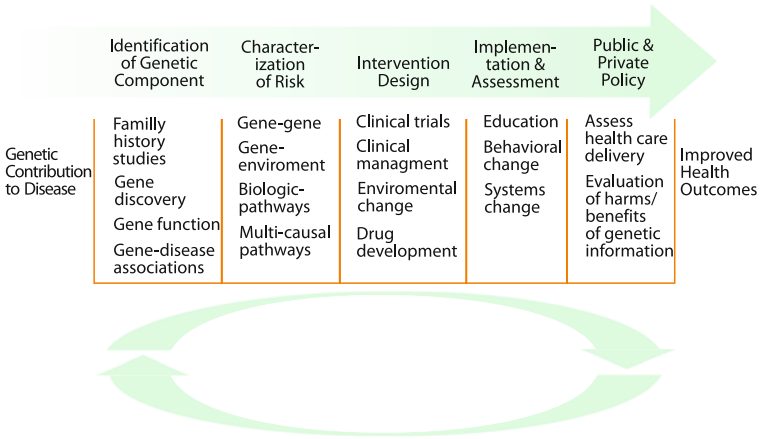
Definition

Genetic ► susceptibility is a condition in which changes in the genetic composition of organisms increase or decrease irritability to environmental factors like extreme temperature, high altitude, radiation, chemicals, air/water pollutants, occupational dusts, etc.

Basic Characteristics

Life, be it with or without ill-health, owes its existence to genes and their coincidental alterations. It is these genetic variations that have made evolution and life possible. Life forms continue to exist by virtue of steady streams of genetic novelties, which facilitate each organism's ► adaptation to extremes in environmental conditions. Adaptations originate from specific genetic determinants interacting with each novel environment. These genetic determinants may lead to favorable adaptation, or adverse consequences that in turn lead to less favorable disease processes. The latter circumstance is genetic susceptibility.

Gene mutations attract scientific attention immensely when their effects occur in the form of congenital diseases or disease susceptibilities, arising from deleterious genetic factors that are variants in nuclear and/or mitochondrial genomic sequences among individuals or populations. Genetic variations, depending on molecular dose, lead to the increase or decrease in susceptibility, which may be important particularly in chronic low-level exposures to environmental factors like air/water pollutants or radiation. With this in mind, researchers use genetic tools and strategies to identify individual susceptibility to environmental assaults. In brief, the essence of gene-gene and gene-environment interactions leading to various degrees of susceptibility patterns are illustrated by the following two flow charts; that is, general (Fig. 1) and specific (Fig. 2) flow charts entailing mechanisms that can raise public awareness and interest in disease susceptibility.



Genetic Susceptibility, Figure 1 Pathway illustrating translation of scientific findings into public health practices (Harrison et al. 2005). Permission to use this flow chart was obtained from Dr Karen Edwards, University of Washington and Editorial Assistant Sasha Ruiz, CDC

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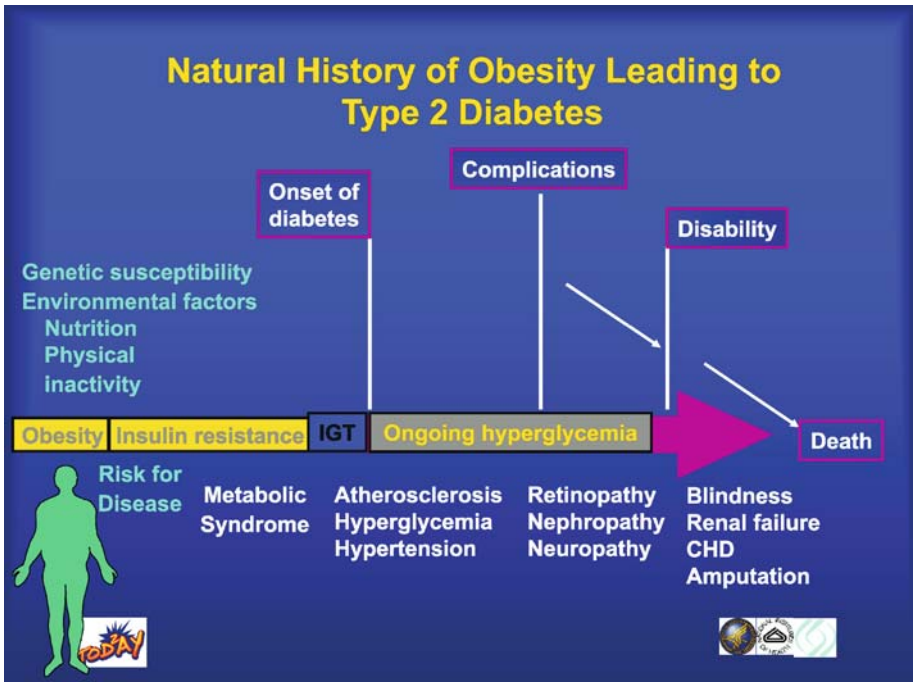
Changes Inducing Susceptibility to Disease

The identification of susceptibility genes is frequently complex, due to the contribution of multiple genetic factors; some have major effects and others have modulatory effects. For example, the genetic basis of type 2 diabetes (► diabetes mellitus) is quite a complex disease, which may evolve into different phenotypic outcomes of the disease. Atherosclerosis and retinopathy, for instance, are complications of type 2 diabetes that arise from different susceptibility genes. Environmental factors, such as nutrition and physical inactivity, contribute to the disease complexity and adverse consequences, like obesity and insulin resistance.

The development of diseases may depend more on one susceptibility gene than on another. In contrast, disease susceptibility may lead from an accumulation of environmental exposures in the face of a suite of genetic factors. Genomic variants inducing disease susceptibility are time-dependent determinants, being influenced by both acute and chronic environmental exposures. Classical examples with established genetic variants are acute lymphocytic leukemia and chronic lymphocytic leukemia. As an illustration, dioxin exposure has been suspected in leading to both acute and chronic leukemic processes (Bertazzi et al. 2001). When genetic variations are implicated, they may have originated from genetic alterations, such as deletion, insertion, inversion, duplication, substitution, and translocation. Any one of these disorders may be traced to several different genes and may account for acute and chronic disease conditions.

To date, more than 4.000 diseases caused by genetic variants are identified, and the majority of disease phenotypes arise when the gene is dominant (Bartoshesky 2004). This means that genetic changes may be: 1) Neutral, i. e., the change will have no effect on protein function or gene expression probably because the genes have low-penetrance; 2) Negative, i. e., there is a change in protein function or gene expression leading to an adverse health outcome; or, 3) Positive, i. e., there is a change in protein function or gene expression that is beneficial to the health of the individual. Genetic defects may be inherited often leading to a potential family history of disease. Alternatively, genetic defects can be coincidental arising from cells that are aging or are exposed to environmental factors such as diet, radiation, chemicals and some toxic pollutants. When cells fail to reverse or repair mutational changes, they develop susceptibility leading to diseases like cancers, diabetes, hypertension, and atherosclerosis. For example, lung emphysema from cigarette smoking, toxic effects from pesticide exposure and lead toxicity appear to be influenced by genetic susceptibility.

Industrialized societies appear to encounter greater number of chronic diseases that have multi-factorial origin. Gene-environment interactions constitute the primary cause for the development of common disease processes like chronic heart failure or skin cancer. Other environmental factors contributing to susceptibility diseases include diet, socio-economic status, age and gender. Susceptibility could also be induced by metabolism, and excretion or biotransformation of toxicants. In many susceptibility studies, it is noted that the number of genes involved in the biotransformation of toxicants and the cellular defense against toxicant-induced damage is growing.



Genetic Susceptibility, Figure 2 Adapted from "A Review Lecture on Type 2 Diabetes" by Dr. Jane L. Lynch, University of Texas. Permission to use this chart was obtained from Dr. Francine Kaufman, Children Hospital Los Angeles, CA, The Center for Diabetes, Endocrinology and Metabolism

Biological markers commonly signal events in specific biological systems. These markers fall into three categories: markers of ► exposure, markers of effect, and markers of ► susceptibility (Suk et al. 1987). Markers of susceptibility are now being used in the assessment of risk factors among individuals and populations. This assessment supplements epidemiological studies that can enhance early disease identification and prevention among the general population. Susceptibility differences in individuals, ethnic groups or populations confer either sensitivity or resistance to diseases. According to Suk et al. (1987), there are three categories of susceptibility markers expressing mainly individual variations:

1. Chemical alterations by enzymes leading to an increase or decrease in the ability of the chemical to interact with DNA, RNA or proteins.
2. Genetic differences of cellular capacity to repair DNA damage secondary to environmental insult.
3. Pre-existing hereditary defects that could be confined to one amino acid of a gene and increase the risk of chronic diseases like cancer.

Testing for genetic susceptibility through the use of DNA has now emerged to be an important tool for early warning and prevention of diseases. The need for such tests is, therefore, considered indispensable by laboratories, service providers, biotechnology firms, and scientists working in genetics. The assumption that it is possible to "fix" disease by "fixing" genes has become a plausible proposition.

Molecular Basis of Genetic Susceptibility

Hypotheses related to human evolution have been tested fairly accurately on molecular genetics of nuclear DNA, with 3×10^8 base pairs (inherited from both parents), and on mitochondrial DNA, with 16,569 base pairs (maternally inherited). However, the proportional density of base pairs involved in the process of gene expression is much greater for mitochondrial DNA than for nuclear DNA. The inheritance of variants in mitochondrial DNA is apparently the reason why some debilitating diseases of the nervous system pass from mother to offspring. Mitochondrial and nuclear DNA evolve independently with the rate of evolution being more rapid in mitochondrial than in nuclear DNA (Vawter and Brown 1986). Mitochondrial DNA is more sensitive to oxidative damage (e. g. resulting from increased exposure to radiation) compared with nuclear DNA (Morales et al. 1998). A primary source of biological aging is thought to result from damage in mitochondrial DNA leading to a decline in oxidative phosphorylation. Mitochondrial DNA levels are also significantly reduced in HIV-infected patients with hyperlactemia that is symptomat-

ic and nucleoside-related (Cote et al. 2002). In summary, mitochondrial DNA may be more susceptible to environmental insults than nuclear DNA.

It is occasionally observed that some diseases have common genetic determinants. For example, individuals with increased risk for Alzheimer's and ► coronary artery diseases have a common Apolipoprotein E epsilon-4 (APO E-e4) genotype (Rienzo and Hudson 2005). Likewise, many cancer-related genetic changes occur in the p53 tumor-suppressor gene, a mutant gene probably arising from exposure to carcinogens (Harris 1994). This genetic change is associated with a variety of tumors, and encodes a pleiotropic nuclear phosphoprotein that is involved in cell cycle control, DNA repair/synthesis and cell differentiation.

Negative mutations reflect molecular alterations in genes which can lead to diseases, given a specific environment exposure. Lung Cancer predisposition involves numerous genes and susceptibility loci that frequently require environmental exposure to cigarette smoke or air pollutants (Kiyohara et al. 2002). With respect to breast cancer, Ponder (2001) indicates that 13–40 susceptibility alleles account for all of the observed familial risks, including BRCA1 and BRCA2. Genetic susceptibility to ► asthma is attributable to multiple genes interacting with one another and the environment. Present findings indicate that genes near a major locus on chromosome 5q regulating serum cytokine levels lead to susceptibility to asthma (Hoffjan and Ober 2002). Asthmatic patients with this specific genetic susceptibility are more sensitive to the effects of common air pollutants, like ozone. Coronary Artery Disease (CAD) is caused by a complex series of factors consisting of genetic predisposition and environmental triggers. Most of these factors have their own genetic basis that may confer either susceptibility or protection to CAD. Many of the candidate genes implicated for CAD are associated with the regulation of low-density lipoproteins (LDL) and high-density lipoproteins (HDL). Susceptibility genes associated with CAD have been recently described (Watkins and Farrall 2006), and include CD14, toll-like receptor 4 (TLR4), and lymphotoxin-α 4H (LTA4H). Hypertension is attributable to a complex series of genetic susceptibility factors that appear to differ with respect to ethnic origin and the regulation of sodium homeostasis (Doris 2002). Type 1 diabetes is attributable to the sharing of alleles at susceptibility loci on chromosome 6 and at a minimum of 11 other loci on 9 different chromosomes (Todd 1995). Type 2 diabetes is a strongly familial condition associated with genetic and environmental factors. One susceptibility gene for type 2 diabetes is now identified to be HNF4a. HNF4a is understood to serve as a master switch for controlling many genes that function in the pancreas and liver (Touchette 2004).

In summary, the fact that individuals differ remarkably in their genetic susceptibility to diseases is epitomized by lung cancer. Although a majority of lung cancers are caused by tobacco, only a small fraction of all smokers develop lung cancer. According to Spitz et al (2003), one of the cellular processes explaining this inter-individual difference in risk is DNA repair capacity. In the future, early genetic susceptibility testing will serve as a major public health tool to avoid diseases and dramatically prevent morbidity and mortality.

Cross-References

► Bronchial Asthma
► Coronary Artery Disease
► Diabetes mellitus
► Environmental Tolerance
► Susceptibility

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Genetic Testing

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Definition

The term molecular genetic analysis encompasses all procedures to examine variations (► mutations, ► polymorphisms) of DNA (► deoxyribonucleic acid) or RNA, respectively. In the field of medical genetics, molecular genetic diagnostics (MGD) is performed to identify disease-causing (pathogenic) mutations which are transmitted through the germline (eggs, sperm) to the next generation (germline mutations) as opposed to somatic, non inherited alterations. At present, MGD is particularly relevant in the group of monogenic diseases (hereditary disorders). These diseases are rare, follow Mendelian inheritance (autosomal-dominant, autosomal-recessive, X-chromosomal) and are each caused by highly-penetrant mutations in a single gene (Table 1). MGD can only be performed if the underlying (affected) gene has been identified. To date, around 4000 monogenic ► phenotypes caused by mutations in around 2000 different genes are known. In the near future, it is expected that the genetic etiology of any monogenic disorder can be clarified. Comprehensive and updated descriptions of monogenic disorders are provided by GenTests/GeneReviews (www.geneclinics.org).

The major applications of MGD include diagnostic testing, ► heterozygosity testing, prenatal diagnosis and predictive testing. Due to the nature of genetic disorders MGD can be performed on any accessible body fluid or tissue; the most common specimen is whole blood, while amniocytes or chorionic villus samples are collected for prenatal diagnostics. MGD represents an important part of clinical medicine; usually, it is performed in affected individuals or in persons at increased risk due to family history (family-based approach). More relevant to public health, but controversially discussed, are genetic screening programs of an entire population or a certain (ethnic) risk groups not related to a family history (population-based approach).

Basic Characteristics

Diagnostic Testing

Diagnostic testing is performed on symptomatic patients for diagnostic confirmation or differential diagnosis and is thus similar to other areas of medical diagnostics. Diagnostic testing is of special importance in (monogenic) phenotypes characterized by genetic ► heterogeneity (e. g. neuromuscular diseases) or unspecific symptoms (e. g. mental retardation). The spectrum of MGD for heritable disorders currently offered in Europe is available via the Internet (www.eddnal.com).

Heterozygote Testing (Carrier Testing)

Autosomal-recessive disorders manifest in the homozygote or the compound-heterozygous state and are more frequently observed in consanguineous couples. Heterozygous ► mutation carriers are clinically unaffected, but can transmit the mutation to their children. Heterozygote testing is defined as the examination

Genetic Testing, Table 1 Selected monogenic disorders, the corresponding gene, penetrance, and age at onset

Monogenic Disease	Gene	Penetrance*	Age at onset (years)
Cystic Fibrosis (CF)	*CFTR*	variable**	1
Duchenne Muscular Dystrophy (DMD)	*DMD*	~ 100%	early childhood
Hemochromatosis	*HFE*	1–2% (?)	30–60
Polycystic Kidney Disease, Autosomal-Dominant	*PKD1, PKD2*	> 50%	> 20
Spinal Muscular Atrophy (SMA)	*SMN1*	> 95%	birth – > 30
Familial Adenomatous Polyposis (FAP)	*APC*	~ 100%	> 10
Hereditary Non-Polyposis Colon Cancer (HNPCC)	*MLH1, MSH2, MSH6*	70–80%	> 25
Hereditary Ovarian Cancer	*BRCA1, BRCA2*	30–40%	> 25
Hereditary Breast Cancer	*BRCA1, BRCA2*	40–80%	> 25
Huntington Disease (HD)	*HD*	~ 100%	40–50
Myotonic Dystrophy Type 1 (DM1)	*DMPK*	~ 100%	10–30
Spinocerebellar Ataxia Type 1 (SCA1)	*ATXN1*	~ 100%	5–65

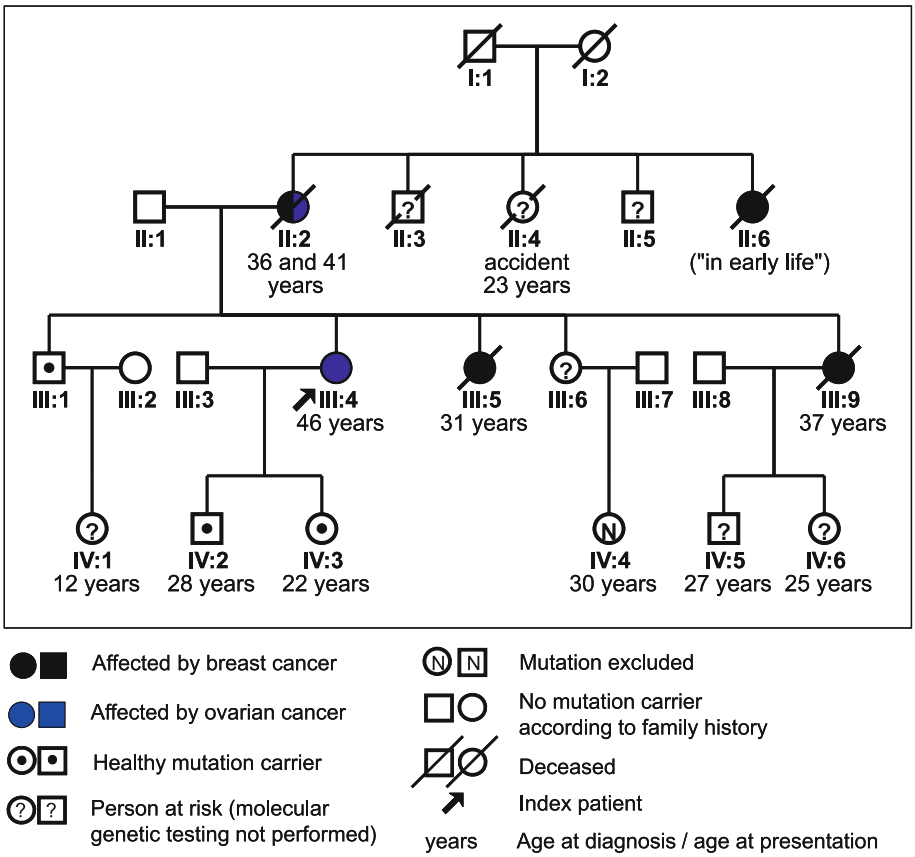
* Lifetime risk in untreated mutation carriers
** Dependent on genotype and clinical manifestation in the family

of healthy individuals for autosomal-recessive or X-chromosomal-recessive mutations in the heterozygote state. It is often requested because of a positive family history for an early-onset, severe, and non- or insufficiently treatable recessive disorder, such as cystic fibrosis or spinal muscular atrophy. Usually, a couple may wish to know what the chances are of their future children being affected by the condition that has previously affected other family members. Due to the mode of inheritance the recurrence risk is high (25%) in siblings of an affected person, but decreases rapidly in more distantly related relatives. It is advisable to primarily identify the disease-causing mutations in the affected person, otherwise a—generally slight—recurrence risk may remain in future children, even if the test results are negative, due to the incomplete mutation detection rate in most diseases. Assessment and communication of recurrence risks and their consequences are an important aspect of genetic counseling.

Predictive Testing

Predictive testing is defined as the examination of a presently healthy person for mutations that predispose to the development of a certain disease in future life. Although of great importance, it is not restricted to genetic analysis, as some other parameters also contain predictive information (e. g. HIV status, blood pressure, cholesterol level). Predictive genetic testing is primarily applied to healthy relatives (persons at risk) of patients affected by adult- or late-childhood-onset autosomal-dominant disorders (Table 1). To allow clear risk assessments, in most conditions, identification of the disease-causing mutation in an affected relative is required prior to genetic testing of persons at risk. If the known mutation is excluded the examined individual has no increased risk for the disease in question, otherwise the risk might be substantially elevated (Table 1, Fig. 1). However, the interpretation of a positive test result depends on the ► penetrance of the mutation and coexisting risk factors, it does not allow accurate prediction of age at onset or course of the disease. Therapeutic and prophylactic decisions must consider not only the genetic data, but also any other relevant findings in a patient.

Predictive DNA testing is the latest and most problematic molecular genetic application. It has opened a new area of medical diagnostics and offers tremendous service to many patients and their families, providing information and choices for their own lives and the life of their offspring. On the other side, there are numerous ethical and psychosocial issues that can arise since knowledge of an increased disease risk touches on sensitive private areas such as family planning. Predictive test results can relieve of a burden, but might also be accompanied by significant psychosocial distress.



Genetic Testing, Figure 1
Predictive testing exemplified in hereditary breast and ovarian cancer. Due to familial accumulation of cancer of a defined tumor spectrum (breast cancer, ovarian cancer) together with early age at onset, this family is highly suspicious for hereditary breast and ovarian cancer. All first-degree related females of an affected individual are persons at risk and should be admitted to an intense surveillance program. In the only affected female still alive (III:4), a pathogenic germline mutation in the *BRCA1* gene was identified, i. e. diagnosis of hereditary breast and ovarian cancer was confirmed by MGD. Thereupon, some of the persons at risk underwent predictive testing: in IV:4, the mutation was excluded, she no longer requires intensive surveillance, whereas IV:2 and IV:3 have to continue. Predictive testing has not yet been offered to IV:1 due to her young age

Every person has the right to know his or her genetic constitution, but also the right to ignore this information. Positive test results carry risks of stigmatization, discrimination, anxiety and depression. Important issues include the individual's right for genetic privacy from third parties (employers, insurers, the state) and communication of potentially relevant genetic information to relatives. In untreatable late-onset neurodegenerative disorders (e. g. Huntington's disease), many at-risk individuals opt not to be tested, preferring to live in a state of uncertainty.

To assure appropriate ordering for MGD, counseling and communication of test results, in Western societies, predictive genetic testing has been the area most stringently subject to standardized protocols, as paradigmatically developed for Huntington's disease. Voluntariness, specified informed consent, time for consideration, and strict confidentiality are prudent for predictive testing, which must be accompanied by pre- and post-test non-directive genetic counseling and psychosocial support services. These issues have been addressed in various ways by professional organizations in practice guidelines and recommendations.

Predictive genetic testing of children is controversially discussed. It is regarded appropriate for early-onset disorders that require surveillance or therapy in the near future (in particular, in a few familial cancer syndromes). It should not be offered in the context of late-onset (untreatable) conditions, as it prevents children from making their own decisions later on in life and thus interferes with the child's future autonomy and respect for confidentiality. This perspective is at least shared by professionals in Western countries but is not always accepted in other, less individualistic, societies.

Prevention

Predictive testing is of increasing importance to characterize certain risk groups who subsequently can be sub-

ject to specialized surveillance programs. In this context, hereditary tumor predisposition syndromes, such as hereditary non-polyposis colon cancer (HNPCC), familial adenomatous polyposis (FAP) or hereditary breast and ovarian cancer, are of outstanding relevance, since, on the one hand, the risk of developing cancer is high in carriers and, on the other hand, treatment of early tumor stages has proven to be very successful. Thus, surveillance procedures, like frequently performed colonoscopies or mammographies, are often very effective. Due to predictive testing, surveillance examinations can be restricted to mutation carriers with the high risk, while individuals at population-risk can avoid unnecessary investigations.

Prenatal Diagnostics (PD)

To detect abnormal growth and fetal malformations, prenatal ultrasound is routinely performed during pregnancy. The most common reason for invasive PD (amniocentesis, chorion villus sample) are age-related chromosomal aberrations such as trisomy 21 (Down syndrome). Non-invasive screening tests, like the First-Trimester-Screening, were introduced to avoid invasive procedures in case of negative results. MGD opened the field of PD for single-gene disorders: In principle, every monogenic disease that can be diagnosed by MGD postnatally can be tested prenatally as well. Usually, prenatal MGD is requested in case of a positive family history with respect to a severe, early-onset and untreatable condition, leading to termination of affected pregnancies. However, in some conditions, prenatal therapy can be offered. Normally, prenatal MGD is only reasonable if the parental ► mutation(s) of the disease in question have been identified.

The increasing application of (invasive) PD changed the perception of pregnancy by the parents and requires cumulative decisions regarding the appropriate spectrum of diagnostics and the consequences in case of conspicuous results. The increase of reproductive choices is accompanied by psychosocial stress and altered reproductive behavior. In particular, explanation of risk figures as well as interpretation of false positive and false negative test results is challenging. The conditions and the consequences of PD should be discussed with the parents prior to testing.

Preimplantation Genetic Diagnostics (PGD) involves single-cell genetic analysis performed on blastomere biopsy of embryos produced by in vitro fertilization (IVF). Due to technical complexity and costs, the procedure is restricted to a few specialized centers. Although discussed controversially in ethical respects, it has been successfully applied in pregnancies at risk for severe monogenic disorders such as cystic fibrosis, thalassemia and others (www.eshre.com).

Population-Based Screening

In the context of public health, population-based screening for genetic predispositions is of particular relevance. In Western societies, screening programs offered to large groups are considered to be justified only if therapeutic, prophylactic or reproductive consequences will follow from the results. Population-based approaches can be applied with two different intentions: 1. Screening to identify unaffected (healthy) carrier couples of (early-onset) recessive disorders (► heterozygosity testing) to offer prenatal diagnostics (reproductive population screening); 2. Screening to identify (as yet) healthy ► mutation carriers for severe (late-onset) monogenic diseases early in life so that preventive strategies or treatment can be initiated before irreversible organ damage occurs (predictive testing). Predictive population screening offers the chance of identifying at-risk individuals in the absence of any conspicuous family history. Whether or not a screening program is reasonable depends on several parameters, such as the heterozygote frequency in the population, the ► penetrance of the mutations, the ► predictive values, and the availability of a cost-effective, simple and valid test method.

Several heterozygote (carrier) screening programs for autosomal-recessive disorders have been successfully implemented in populations with a high carrier frequency: In some Mediterranean countries (Sardinia, Cyprus), thalassemia carrier screening is offered to couples since the health care system has been unable to guarantee appropriate therapy for the numerous affected individuals. In Israel, screening for population-specific severe metabolic disorders, such as Tay–Sachs disease, is widely accepted. The same is true for cystic fibrosis carrier screening in the United States. To date, the German Medical Association has refused population-based heterozygote screening because of several unsolved problems coming along with this procedure (see below).

The first and presumably most successful predictive screening program to be introduced for genetic disease is the newborn screening for some severe remediable autosomal-recessive disorders such as phenylketonuria. However, as with some other disorders (e. g. Tay–Sachs disease), biochemical testing is still preferred because it is more sensitive in case of mutational heterogeneity and more cost-effective than MGD.

Hereditary hemochromatosis is a late-onset monogenic disorder that serves as a particularly important model for preventive screening strategies relevant to public health. Untreated, hemochromatosis results in the accumulation of excess iron stores which lead to organ damage and life threatening complications. Periodic phlebotomy is a simple and effective preventive treatment that normalizes life expectancy if started in time. Thus, early identification of at-risk individuals through genetic screening is considered a major chronic disease prevention opportunity. However, epidemologic studies indicate low penetrance even for the hot-spot mutation in the HFE gene (low predictive value). Consequently, most of the individuals tested positive will be anxious due the genetic information, but may never develop any symptom of the disease. Especially due to this uncertainty regarding penetrance as well as the limited capacities for genetic counseling, universal population screening has not been generally recommended, so far.

Other predictive, often only regionally introduced, (newborn) screening programs include sickle cell disease, cystic fibrosis, Duchenne muscular dystrophy, or α-1-antitrypsin deficiency. These approaches are aimed to avoid unnecessary investigations and hospitalizations through early diagnosis, as well as costs and parental anxiety associated with having an ill but undiagnosed child. Some of these conditions may hopefully be influenced by early therapeutic or prophylactic intervention. However, the context of population screening for genetic disease is different from that of genetic counseling as a response to pre-existing family concerns, which has important ethical implications for professional practice in this area. All recommendations relevant to heterozygote, prenatal, or predictive testing in a family-based setting are by far more difficult to realize in a population screening program. Problems may arise particularly regarding appropriate information and counseling, informed consent, psychological support, and nondirective decision making. Established screening programs are vulnerable to routinization possibly resulting in a directive or even actively promoted procedure; thus, consent for entry into a screening program is often not based on careful considerations. The rate of uptake is critically dependent upon the way in which testing is made available, and the influence of structural and social factors on individual decision making about genetic tests is well known. Being identified as a carrier may have potential benefits (ability to make informed reproductive decisions, prophylactic therapy, clear diagnosis) and disadvantages (emotional impact, burden of future reproductive decisions, stigmatization in personal relationships, effects on an individual's sense of well-being and development). Against this background the question as to which of these tests should be made available as population screening must be carefully balanced.

To date, genetic testing usually includes only one or a few genes. However, the development and implementation of high-throughput technologies will allow comprehensive screening in the near future. From a technical point of view it is already possible to design assays for the detection of all known human mutations responsible for hundreds of diseases. Such methods can be introduced as predictive or prenatal population screening. However, only some of the diagnoses will have preventive consequences. The obvious ethical concerns in such scenarios have to be discussed.

Common Complex Disorders

In Western countries, most of the common disorders are caused by a multifactorial (complex) etiology (Table 2), i. e. they manifest by means of interactions between genetic predispositions and environmental factors. Due to their frequency and morbidity, the laborious treatment and corresponding health-care costs, these disorders are in the spotlight of preventive considerations and are extraordinarily relevant to public health. The search for underlying susceptibility ► alleles ('risk genes') has become one of the most active areas of biomedical research.

The most common predisposing genetic variants are ► single nucleotide polymorphisms (SNPs). However, only a statistical correlation exists between a certain SNP (genetic variant) and the ► phenotype. Usually, each of the underlying variants of a complex disorder is of low ► penetrance, contributing only little to disease manifestation (relative risk 1–5-fold). Research in

Genetic Testing, Table 2 Selected complex (multifactorial) disorders and the corresponding genes, in which risk associated variants (SNPs) have been described (not complete)

Complex Disease	Risk Associated Genes
Obesity	*GAD2, POMC, ACDC, ADRA, LEP, UCP, APOE, TGF-ß-1, ENPP1*
Cardiovascular Disease	*F2, ITGB3, GNB3, ACE, PDE4D, GPIIIa, MTHFR, AGT, AGTR1, ECE1, ADD1*
Type II Diabetes Mellitus	*CAPN10, HNF4A, NEUROD1, GLUT, IRS1, GPD2, TCF7L2*
Asthma	*ADAM33, GPRA, PHF11, DPP10, HNMT, AAA1*
Crohn's Disease	*CARD15/NOD2, SLC22A4, SLC22A5, DLG5*
Psoriasis	*CDSN, CMRF35H, RAPTOR, RUNX, HLA-B, HLA-C, OCT3*
Schizophrenia	*DAOA, NRG1, DTNBP1, SYN2, COMT*

complex traits is challenged by the difficulty in identifying susceptibility genes of modest effect, the large scale of the required family studies, and the extensive interactions between the different predisposing alleles at DNA, RNA or protein level and with the outside environment. Thus, our understanding of the genetic basis of complex diseases is still in its infancy and use of the data for prevention and treatment will require much more time than previously thought. Although identification of certain risk profiles in the future may contribute to an individual risk calculation in addition to traditional risk factors, to date, MGD in complex disorders is not reasonable in routine clinical practice. Despite these limitations, testing for SNP-based 'risk profiles' (e. g. for osteoporosis, cardiovascular disease, 'anti-aging'), associated with the hope of specific preventive options, is increasingly offered to the general public by commercial laboratories, particularly via the Internet. This trend should be seen very critically, as, apart from the lack of indications and low or absent ► predictive values of these analyses, professional quality standards of risk communication and counseling are often not guaranteed, leading to confusion, false reassurance or unnecessary anxiety.

One of the most promising fields is pharmacogenetics. Identification of genetic variants affecting the metabolism and impact of certain drugs may explain individual reactions and adverse effects. Although still at the early stages of their application in routine clinical practice, genotyping (► genotype) of relevant variants in pathways of drug metabolism may lead to an individualized drug therapy and drug design, increasing desired drug effects and avoiding complications. For example, screening for an activity-decreasing allele of the DPD gene is already recommended prior to chemotherapy with 5-fluorouracil to avoid severe side effects in carriers of the variant.

Conclusions and Perspective

MGD has increasing relevance for medical diagnostics and the prediction of individual or population-based disease risks. Virtually every patient undergoing diagnosis or treatment in the coming decades will be involved in some sort of molecular genetic procedure. However, MGD differs from conventional clinical laboratory analyses and genetic testing in other disease types (e. g. infectious diseases) in important ways. Therefore, specialized knowledge of human genetics is essential for appropriate interpretation and communication of results. A clear indication is required for any genetic test. The psychosocial and ethical implications of MGD vary substantially depending on the reason for testing: In particular, prenatal and predictive diagnostic procedures should be accompanied by genetic counseling as part of helping patients to understand and come to terms with possible implications. To date, MGD has limited clinical relevance for complex genetic disorders, although rapidly increasing knowledge on the underlying genetic factors and high-throughput, automated technologies (e. g. microarrays) allows ever more comprehensive genetic analysis. However, as the technical aspects of DNA tests have become easier, their interpretation becomes more complex and their limitations must also be kept in mind. In the future, MGD will not be restricted to medical genetics but will involve all areas of medicine (genetic or molecular medicine) and might play a major role in preventive strategies. The associated ethical and psychosocial issues will be challenging and will require new ways of risk communication and counseling.

Cross-References

► Allele
► Deoxyribonucleic Acid (DNA)
► Genotype
► Heterogeneity

- ► Heterozygosity/Homozygosity
- ► Mutation
- ► Penetrance
- ► Phenotype
- ► Polymorphisms
- ► Predictive Value
- ► Single Nucleotide Polymorphism (SNP)

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Genetic Variants

► Polymorphisms

Gene Vector

► Vector

Genital Warts

► Condyloma

Genome

Definition

The complete set of hereditary information contained in the DNA of an organism. This includes the full primary nucleotide sequence information for all the ► chromosomes, including introns, exons, coding, and noncoding sequences.

Genomics

► Transcriptomics

Genotype

Synonyms

Genetic constitution

Definition

The genetic content at a given locus (unit of genetic information). In diploid organisms like humans, the genotype is the combination of the two ► alleles of a certain gene or genomic/chromosomal position (locus) in an individual. More generally, the genotype describes the genetic constitution of an individual as a whole.

Genuine

► Native

Geographic Information System (GIS)

Definition

The geographic information system is a branch of ► health information system and ► public health information system developed for the capture, storage,

manipulation, analysis, and visualization of geographic data in public health. It provides analysis of spatial and temporal relationships between disease and the population. GIS software has been used in many ecological studies of disease, such as assessment of childhood leukemia in areas with different radon levels, clustering of respiratory cancer cases in areas with a steel foundry, and socioeconomic gradients in infant mortality. The GIS is a very useful tool for public health planning and surveillance purposes at local or national health departments.

Geomedicine

Synonyms

Medical geology

Definition

Geomedicine encompasses investigation of broader relationships between the natural geologic environment and the health or occurrence of disease in humans, animals, and plants living in the environment. Deficiency or anomalous distribution of trace elements is manifested as health problems in the form of enzootic or/and endemic geochemical disease. Living organisms that consume water and food grown in such areas can acquire various forms of disorders. In the beginning of the 20th century, only the importance of iron was known; however, in the following 20 years, Cu, Zn and Co were added as important trace elements. There are numerous examples of geographic variations in disease occurrence that may arise from geologic factors. The identification of a single significant geochemical characteristic from the dozens that vary simultaneously is complicated as the presence or abundance of one element modifies the effect of another.

Georemediation

Synonyms

Soil remediation; Soil cleanup

Definition

Remediation of soil uses principles of geology, physics, chemistry, and biology to degrade, attenuate, isolate, or remove soil contaminants in order to restore soil values and functions. There are two main strategies for soil remediation: *in situ* georemediation involves treating the contaminated soil at the site, while *ex situ* involves the removal of the contaminated material to be treated elsewhere. Examples of particular procedures are soil excavation and removal to a disposal site away from sensitive ecosystem contact, aeration of soils at the contaminated site (with risk of air pollution), extraction of groundwater or soil vapor with an active electromechanical system, and containment of the soil contaminants (by capping or paving over in place). Combined techniques used with bioremediation include landfarming, biostimulation, and bioaugmentation of soil biota with available microflora. The process of georemediation can be monitored indirectly by measuring the Oxidation Reduction Potential, or redox, in soil, together with pH, temperature, oxygen content, electron acceptor/donor concentrations, and concentration of breakdown products (e. g. carbon dioxide).

Geriatric Chaplain

► Hospice Chaplains

Geriatrics

Synonyms

Geriatric medicine

Definition

Geriatrics is the branch of clinical medicine focusing on health promotion among older people and the prevention and treatment of disease and ► disability in later life. Older people frequently have multiple co-morbidities and their presentation of symptoms is often different than the reaction of younger people to the same disease or condition.

Geriatricians are primary care physicians who are specially trained to detect and address the health concerns and care needs of older adults. In addition to general practitioners, professionals in the fields of nursing, social work, psychology, psychiatry, pharmacology, and physical and occupational therapy, among others, may specialize in geriatric care. Common areas

of concern in geriatrics include: complications due to co-morbidities and multiple medications, dementia and memory loss, delirium, frailty, incontinence, falls, and disabilities limiting the performance of activities of daily living.

German Measles

► Rubella

German Measles Immune Globulin

► Rubella-Vaccination, Passive

German Measles Immune Prophylaxis

► Rubella-Vaccination, Passive

Germs That Cause Malaria

► Plasmodia

Gerontology

Definition

Gerontology is a multi-disciplinary field encompassing the scientific study of aging and the application of knowledge in the design and implementation of programs that promote the well-being of older people. Researchers in gerontology use the methods of biomedical and social sciences to understand the biological, psychological, and sociological phenomena associated with old age in individuals and in populations. Gerontologists specialize in the study of aging within fields including: biology, demography, epidemiology, health services research and administration, nursing, psychology, and sociology, among others. Applied gerontologists work directly with older persons in programs providing health and social services and engage in education, communication, and advocacy with and on behalf of the older population.

Note that gerontology, the study of aging, should be differentiated from ► geriatrics, the branch of clinical medicine focusing specifically on the medical needs of older people.

Gestation

► Pregnancy

Gestational Diabetes

Synonyms

Diabetes mellitus that begins during pregnancy

Definition

Gestational diabetes is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy. It can develop in overweight, hyperinsulinemic, insulin-resistant women or in relatively thin insulin-deficient women. Diabetes during pregnancy increases fetal and maternal morbidity and mortality. Women with gestational diabetes are at risk of developing diabetes later in life. Without treatment gestational diabetes is a risk factor for eclampsia, fetal death (► intrauterine mortality), macrosomia, fetal hypoglycemia, and the development of ► obesity and diabetes in childhood and adolescence. Gestational diabetes should be prevented by changes in diet, increases in physical activity, and – if the foregoing are not successful – insulin replacement therapy.

Giardiasis

Synonyms

Infection with Giardia lamblia

Cross-References

► Lambliasis
► Zoonotic and Parasitic Infections

Gingivitis

Definition

Gingiva is the fibrous investing tissue, covered by epithelium, which immediately surrounds a tooth and

is contiguous with its periodontal membrane and with the mucosal tissues of the mouth. Gingivitis is a form of ► periodontal disease, an inflammation and infection that destroys the tissues that support the teeth, including the gingiva (gums), the periodontal ligaments, and the tooth sockets (alveolar bone). Gingivitis is caused by the long-term effects of plaque deposits. Plaque is a biofilm that develops on the exposed portions of the teeth, consisting of bacteria, mucus, and food debris.

Global Climate Change

► Climate Change

Global Health Policy

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Definition

Global health policy refers to a concept of health policy beyond national borders, thus being much broader than traditional health policy assuring only national health. The term "global" refers to the fact that health problems are no longer coming only from one's own country but also across borders and that the common understanding of the multiple health determinants has expanded. Global health policy is calling for health strategies that take the effects of globalization and global ► decision making into account. Lee and Collin define global health as an "issue when the determinants circumvent, undermine or are oblivious to the territorial boundaries of states and thus beyond the capacity of individual countries to address through domestic institutions." In this sense, global health policy addresses various global health risk by setting concrete ► health targets that are based on outcomes (e. g. child mortality rates) and processes (e. g. initiatives to eliminate certain diseases). The actors in global health policy are international organizations such as the United Nations, the World Health Organization, a grouping of national governments (e. g. European Union) following global health targets and a number of private corporations, foundations and non-governmental organizations with global reach.

Basis Characteristics

Development of the Notion of Global Health Policy

Global health policy is mainly concerned with health risks that can be characterized as 'global'. They include traditional infectious diseases such as tuberculosis and new emerging diseases with typically pandemic character such as HIV/AIDS and avian flu as well as chronic diseases which are traditionally of the wealthier societies but are slowly becoming also a burden for poorer countries. Other risks to health are environmental factors such as pollution, natural disasters, economic and social situation as well as war causing food insecurity and malnutrition, preventable morbidity and premature death. Especially the control of pandemic diseases is a major concern among the global community as all nations are vulnerable because of the potentially large economic and social impact. As these diseases may be aggravated by the constant increase of cross-border flows of people, goods and services, global action in addition to existing national protection programs is needed to control such pandemic diseases. The process of globalization is leading to the internationalization of health risks and strengthens the interdependence between countries. Therefore, global health policy requires cooperation and coordination of ideas and policy projects in order to protect and improve health as a global public good.

There is a wide variety of interlocutors engaged in global health policy: The United Nations (UN), the World Health Organization (WHO) as well as the World bank are playing a vital role in defining global health policy goals and in financing and administering policies to achieve these goals. But also international non-governmental organizations (NGOs) as well as other private corporations or donors are financing and realizing health activities around the world.

Global Health Targets of the World Health Organization (WHO)

Numerous governments in the Member States of the WHO European Region and in OECD countries utilize ► health targets as an instrument and guidance

for policy formulation and implementation. The WHO launched a strategy in 1977 called "Health for All by the Year 2000" to set global targets and to form a global vision of health amongst the member states. In May 1998, WHO adopted a resolution to continue global efforts under the "New Global Health for All" policy and formulated 10 global health targets that can be divided into three subgroups.

1. Four ► health outcome targets concentrating on health equity, survival, the reverse of the global trends of five major pandemics (tuberculosis, HIV/AIDS, malaria, diseases related to tobacco, and violence or trauma) and the elimination of certain diseases before 2020.
2. Two targets on determinants of health: the improved access to water, sanitation, food and shelter and measures to promote health enhancing lifestyles and to weaken health damaging ones through a combination of regulatory, educational, economic and community-based programs.
3. Four targets on health policies and sustainable health systems focusing on the implementation of national "Health for All"-consistent policies, on the improved access to health care, on the implementation of a global and national health information and surveillance system and on research for health.

This framework is a guideline for all member states. It has to be mentioned that member states implement and adjust these targets according to their own economic and social situation. The degree to which a country has already developed its own health system plays a major role in the relevance of the different goals stated by WHO.

Millennium Goals of the United Nations

In the year 2000, at the Millennium Summit the member states of the United Nations adopted the UN Millennium Declaration, committing their nations to a new global partnership to reduce extreme poverty and setting out a series of time-bound targets, with a deadline of 2015, that have become known as the eight Millennium Development Goals. Five of them are directly linked to global health:

- Eradicate extreme poverty and hunger
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability

On the basis of these goals, the UN publishes every year a report summarizing global action that has been taken in order to achieve these goals.

Opportunities and Risks of Global Health Policy

Because of the numerous actors in global health policy there are on the one hand a multitude of opportunities to realize global health goals, but on the other hand, there are many risks or problems inherent to such an undefined policy approach.

Key success factors for a large-scale health policy are clearly the following:

- Leadership: Political leadership on a national and international level is crucial to the achievement of global health policy goals not only in the poorer but also in the richer countries.
- Science: Scientific tools are needed to effectively treat and prevent diseases on the best available cost basis.
- Money: Sufficient sums of money over a long period of time are the basis to realize global health policy measures.
- Implementation: Good management of the policy programs as well as evaluation of programs on the ground necessary to use resources efficiently with regard to the results.

On the basis of the stated success factors, there are two main questions surrounding the effectiveness of global health policy:

1 Does the global community have the right institutions and systems to effectively achieve global health goals?
2 How can the private sector be more effectively engaged?

With respect to the role of research in global health it is estimated that less than 10% of research funds are spent on the diseases that account for 90% of the global burden of disease. Furthermore, research should always be an important part of the policy process providing evidence, laying out options for policy problems and measuring the effects of decisions. Unfortunately, policy ► decision making is often independent from research.

Since 2000, there is a considerable rise in the allocation of financial resources toward global health with the emergence of new private foundations and programs spending money for specific diseases. Neverthe-

less, the results are still disappointing as donors often fund projects on the basis of effort and not on the basis of results.

To sum up, global health policy making is complicated because of the proliferation of actors and institutions whose respective functions and purposes are both highly varied and often unstable. They operate in a confused and often contested domain. Some actors are present 'in the field' and while others will act temporarily on one specific issue. There is definitely a lack of relationship and cooperation with each other.

Example: Global Health Activities in the European Union

Europe's contribution to global health policy has been emphasized at the European Health Forum in October 2004 "Global Health, Global Healing". European Foundations working with the European Foundation Centre (EFC) have taken a range of initiatives with international and academic organizations attributing 5% of their spending outside Europe on global and development issues concerned by the UN Millennium Development Goals. The main strategic issues relating to global health are the following:

- Health and foreign policy: Europe's major role in preventing conflicts and assisting in post-war situations has to be strengthened.
- Health and sustainable development: Environmental changes as well as demographic changes in the European society need the collaboration of all actors which could be guided by the EFC.
- Health and economics: As global health issues such as pandemics could substantially affect the economic situation of the countries, the impact of industrial and research policy on health has to be assessed and clarified.
- Health and governance: The challenge of global health policy is to bridge the gap between the aspirations of the numerous actors and donors in this field and the actual results. The European Union could play an important role in the architecture of effective health governance.

Cross-References

► Decision Making
► Health Outcomes
► Health Targets

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Globalization

Synonyms

Increasing worldwide interdependence

Definition

Globalization is the process of increasing interconnections and linkages, within societies and across geographic areas, due to improved communication and expanded world trade. It limits the differentiation wrought by human cultural evolution, and homogenizes health practices, diets and lifestyles.

Globalization means an intensification of the processes of interaction involving institutional, social, political and economic dimensions that became a pervasive force for change in the last 2 decades of the 20th century. Social and institutional dimensions include the spread of education, literacy, scientific and technical expertise, democratic practice, civil and human rights, spread by free and open media and by capacity building in low-income countries. Economic and political dimensions of globalization include improvements for all society through privatization, de-regulation, flexible

labor marker, and free trade. However, these dimensions of globalization have a mixed impact on social well-being and population health; beneficial in industrialized countries, but producing enormous inequalities across the world in developing countries and often within each country.

Globalization is the process of increasing economic, political, and social interdependence, and global integration, that occur as capital, traded goods, people, concepts, images, ideas, and values diffuse across national boundaries. The benefits of globalization include the expansion of global markets, international savings, and technology transfers to many countries, which corresponds with increased human development, and supports the physical infrastructure, and microeconomic and macroeconomic policies. The effects of globalization on health are not easily predictable because they are mediated by income growth and distribution, economic instability, availability of health and social services, health policies, etc. For example, many African and Asian countries still have a high infant mortality rate (a key indicator of overall health), despite the implementation of highly efficient public health activities (e. g. vaccination programs).

Global Solar UV Index

► UV Index

Global Trade in Health Services

Definition

The impact of globalization on ► health services manifests in global trade in health services. It includes global cross-border delivery of health services, especially through electronic communication (► telehealth); movement of health professionals for the best education, employment or career opportunities; and the movement of patients from one country to another in order to get health services of the highest quality. The trade in health services is regulated by the General Agreement on Trade in Services (GATS), constituted by the World Trade Organization. The expected long-term consequence of these trends is improvement of ► health systems. This will be a result of the flow of financial resources, changes in health determinants and disease priorities, reorientation of health policies, and overall performance of health systems.

Global Warming

Synonyms

Greenhouse effect

Definition

The greenhouse effect is the process in which the absorption of infrared radiation by an atmosphere warms a planet. The effect occurs naturally to keep Earth's surface warm. However, the anthropogenic greenhouse effect results from gases, especially CO_2 emitted from human activities – such as fossil fuel burning, cement production and tropical deforestation. Elevated CO_2 levels increase global mean temperature by absorbing infrared radiation in the troposphere. Other greenhouse gases are methane, water vapor, ozone, nitrous oxide and halocarbons. The consequences of greenhouse effect are the increase of global temperature on the Earth, increase of sea levels; the melting of snow and ice layers on the North Pole, temperature abnormalities in the Pacific Ocean, resulting in El Niño events. Adverse consequences on agriculture, ecosystems and human health are expected. This in conclusion the greenhouse effect is the Absorption of infrared radiation emitted by the Earth's surface by the ► greenhouse gases in the atmosphere, trapping the heat within the surface-troposphere system and warming the Earth's surface.

Cross-References

► Greenhouse Effect
► Prospects for the Future

GNP (Gross National Product)

Synonyms

Gross National Income (GNI)

Definition

Indicators of national income and output are used in economics to estimate the value of goods and services produced in a political national economy. The GNP as

such is an indicator for the impact of the net product of a country and it is often used as a measurement to assess people's welfare. It is calculated according to the so-called national (domestic) concept. The GNP is the sum of the value of the income of all nationals during a specific period (1 year) drawn from work (employee's salary) and capital (company and assets' income) plus production and import fees, minus financial aids. Thus, the GNP is – within the economical overall calculation – an indicator expressed in money for the income of the nationals of a political national economy.

The relationship between Gross National Product (GNP) and Gross Domestic Product (GDP) – the indicator for the economic performance of a country – is as follows:

GNP = GDP + foreign income of nationals
– domestic income of foreigners.

Goitre

Synonyms

Struma; Thyreomegaly

Definition

Goitre is defined as enlargement of the thyrod gland that may be associated with changed function of the thyroid that can result from under-production or over-production of hormone or from a deficiency of iodine in the diet.

Gold Standard

Definition

We can calculate the sensitivity and specificity of ► screening tests only by comparing the results obtained by the screening test with results derived from some gold standard. A gold standard is an external source of truth regarding the disease status of each individual in the population. Sometimes this truth may be the result of another test that has been in use, which is very often a more invasive test (tissue biopsy, or cardiac catheterization). If the results from the screening test are the same as the results from the gold standard then the screening test would be 100% sensitive and 100% specific.

Good Agricultural Practices (GAP)

Definition

Good Agricultural Practices are applied on farms and they define elements for development of good management practices in production of fruit and vegetables. These practices are approved by major retailers and regulators worldwide. Farmers should be able to: maintain the consumers' trust in and expectations about the safety and quality of food, minimize undesirable effects on the environment whilst preserving nature and wildlife, reduce use of fertilizers, enhance the efficient use of natural resources, and have a responsible attitude towards health and safety of workers. GAP respects the preventative approach to ► food safety and helps maintain the required traits of raw material. GAP is a voluntary standard but it is being more and more accepted by regulators. Together with standards in food production it helps maintain the required level of food safety.

Good Clinical Practice (GCP)

Definition

Good clinical practice, when applied to pharmaceutical clinical trials, defines the most desirable way of running trials. Like good manufacturing practice (GMP, defines state of the art production of pharmaceuticals, conceived by the Pharmaceutical Inspection Convention and Pharmaceutical Inspection Co-operation Scheme [PIC/S]) and good laboratory practice (GLP, defines state of the art preclinical and analytical testing of pharmaceuticals, implemented by the Organization for Economic Co-operation and Development [OECD]), it regulates the general principles of developing and/or handling pharmaceuticals in any scientific area of interest. All these systems are regulated or handled by international organizations thereby providing a global framework for developing new pharmaceuticals.

Good Hygienic Practice

► Standard Sanitary Operating Procedures (SSOP)

Good Manufacturing Practices (GMP)

Definition

Good Manufacturing Practices describe methods, equipment, facilities, and controls for producing processed food. As the minimum sanitary and processing requirements for producing safe and wholesome food, they are an important part of regulatory control over the safety of the food supply. Many of the microbiological ► food safety problems can potentially be addressed through GMPs such as: proper employee hygiene, adequate training, and effective cleaning and sanitizing of the manufacturing equipment and environment. Rules for construction and maintenance of facilities and equipment, handling of water to be used in food production, storing of food, additives, cleansing utensils and materials are addressed through GMP practices. Chemical food safety problems are addressed by following good manufacturing practices, such as pest control and proper storage and use of chemicals.

Goodness of Fit Test

Definition

A goodness of fit test is a statistical test to determine whether there is a significant difference between the observed frequency distribution and a theoretical probability distribution (such as normal, binomial, poisson, etc.) that is hypothesized to describe the observed distribution. Various goodness-of-fit summary statistics can be computed for continuous and categorical dependent variables. Goodness of fit statistics for regression problems (for continuous variables) include mean square error, mean absolute error, mean relative squared error, and Pearson product moment correlation. Goodness of fit statistics for classification problems (for categorical variables) include Pearson Chi-square, G-square (maximum likelihood Chi-square), and Percent disagreement (misclassification rate).

Governmental Health Care

► Publicly-Financed Health Systems

Governmental Regulations

Synonyms

Collaborative initiatives; Cross-sector reallocation

Definition

Planning, funding, or service delivery strategies that engage key stakeholders across a range of governmental and private sectors. These efforts are often initiated to bridge the operations of distinct policy sectors whose actions have consequences for shared social goals – such as health maximization. These efforts may focus on linking units within the health care sector, linking the health care sector with other social service sectors, and/or linking seemingly unrelated policy sectors such as agriculture, education, fisheries and tourism.

Government Liability

► State Liability

Granuloma Inguinale

Synonyms

Donavanosis; Granuloma venereum

Definition

Granuloma inguinale, which can be found in tropical and subtropical regions, is caused by *Calymmatobacterium granulomatosis*. The incubation period lasts 1–12 weeks. The disease is characterized by small, painless nodules, which appear in the genital region. During the course of the disease these nodules ulcerate and slowly enlarge. A hematogenic spreading of the germs into the liver and the bones is possible. To avoid larger destruction of tissue, antibiotic therapy should be introduced quickly. The duration of treatment should be three weeks. Trimethoprim-sulfamethoxazole, azithromycin, erythromycin, gyrase inhibitors or doxycycline are effective drugs.

Graphical Representation

Definition

A graphical representation is a visual display of data and statistical results. It is often more effective than presenting data in tabular form. There are many different types of graphical representation and which is used depends on the nature of the data and the type of statistical results. An appropriate graphical representation of category frequencies is a pie chart, where each slice represent a different category and slice angles are proportional to the frequencies of the categories. Another graphical method used for category frequencies is a bar chart, where each bar represents a different category and the heights of the bars are proportional to the frequencies of the categories. Suitable graphical representation of frequency distribution of discrete quantitative data is also a bar chart, while for frequency distribution of continuous quantitative data convenient graphs are a histogram, frequency polygon, and/or stem-and-leaf plot. Suitable graphical representation of relationships between two variables is a scatter diagram (scatterplot). Other frequently used types of graphical representation are (a) line graphs for longitudinal data, (b) survival plots for cumulative probability of survival over time, (c) error bar for displaying central tendency, mean or median, and variability such as quartiles, standard errors or standard deviations, and (d) box-and-whisker plot for displaying minimal and maximal values, interquartile range and median.

Cross-References

► Descriptive Statistics

Gravidity

Synonyms

Gravidness; Pregnancy

Definition

Gravidity represents the number of pregnancies a woman has had whether or not they produce a ► live birth.

Gravidness

► Gravidity

Greenhouse Effect

Synonyms

Global warming

Definition

The greenhouse effect is a term for the chain of events caused mainly by the accumulation of certain gases (greenhouse gases) in the low atmosphere (troposphere). Permanent increases in the concentration of these gases in the atmosphere may be responsible for the remarkable changes of climate on Earth (► climate and microclimate). Greenhouse gases influence the ways that temperature is balanced on Earth and, due to increased absorption of radiation in the infrared spectrum, air temperature increases as it would inside a greenhouse. This means that these gases trap the infrared radiation, or heat, which is given off by the Earth's surface after receiving it from the sun, inside the troposphere. If humans continue to increase the concentration of these gases in the atmosphere it will inevitably lead to global warming of our planet to a dangerous degree as a final consequence of that process. Major gases responsible for global warming are carbon dioxide and methane, which are released into the troposphere by the burning of fossil fuels and farming practices, respectively. Besides water vapor, other greenhouse gases are nitrous oxides (NO_x), chlorofluorocarbones (CFC-11 and CFC-12), methyl chloroform, carbon tetrachloride, ozone, and even carbon monoxide. The main effects of greenhouse gas accumulation on the climate are as follows:

a) Increased mean air temperature, especially at high latitudes and near the poles,
b) Extreme weather disturbances – e. g. floods,
c) Increased air pollution in large human settlements (as a feedback effect), although the greenhouse effect is also a consequence of air pollution,
d) Increased annual global rainfall,
e) Increased incidence of vector borne diseases – malaria, leishmaniasis, tick-borne encephalitis, Lyme disease, and even dengue,

f) Seasonal changes – short cold seasons and long warm ones,
g) Unequal changes in plant growth – weeds may increase their growth but crops may not,
h) Thermal expansion of the oceans, and possible polar ice cover melting, leading to a substantial rise in sea level, and
i) Various adverse effects, unpredictable at present, on the whole society.

Possible adverse effects on human health are also difficult to predict but, unquestionably, urban thermal stress would claim many lives (Recently, an increased incidence of heat-related deaths have been registered in London, Belgium and Athens). Among several possible ways of dealing with the problem, the most obvious way is reducing the production of greenhouse gases, which means reducing the rate at which fossil fuels are burnt.

Cross-References

► Prospects for the Future

Greenhouse Gases

Definition

Gaseous constituents of the atmosphere that absorb and emit infrared radiation, responsible for the ► greenhouse effect. The primary greenhouse gases are: water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

Grippe

► Influenza and Avian Influenza

Gross Domestic Product

Synonyms

GDP

Definition

Gross domestic product is the total market value of all the goods and services produced within a country during a specified period of time.

Gross National Income (GNI)

► GNP (Gross National Product)

Gross Reproduction Rate (GRR)

Definition

Gross reproduction rate (GRR) is the average number of daughters that would be born to a woman during her lifetime if she passed through her child-bearing years conforming to the ► age-specific fertility rates (ASFR) of a given year. GRR is measured exactly like TFR except that it counts only daughters and measures "reproduction" – a woman reproducing herself in the next generation by having a daughter. Like TFR, GRR assumes that the hypothetical cohort of women passes from birth through their reproductive life without experiencing mortality. This assumption is satisfactory when one wants to compare levels of ► fertility and/or gross reproduction across populations and over time. However, for a more realistic assessment of the reproductive potential of a population, taking into account mortality, one needs to calculate the ► net reproduction rate (NRR) (► total fertility rate (TFR)).

Ground Water

Definition

Groundwater is freshwater, which can be found in natural cavities below the ground surface (in soil pore spaces and in fractures of geologic formations). It results from seeping precipitations (rain, snow water). The different layers of soil, through which the water passes, work as a filter system. When pollution is not too severe, this natural filter makes the groundwater free from harmful substances and pathogenic germs. Groundwater is a part of the water circulation; it occurs as springs, ponds or other surface waters. More than 80% of the drinking water comes from groundwater.

Group of Chronic Diseases with Hyperglycemia

► Diabetes mellitus

Grouper Software

Definition

Grouper software is an information technology software that is used to group medical records for inpatient care into ► diagnosis related groups (DRGs). The software needs health professionals to enter basic information on the diagnoses, therapeutic procedures, age, sex and the presence of ► co-morbidities to determine automatically the relevant DRGs.

Group Identity

► Social Identity

Growth Factor

Definition

Growth factor is a substance that stimulates and regulates the growth, division, organization, maturation and maintenance of cells and tissues.

Guidance Sheets

► Risk Management and Communication

Guidelines

Definition

Guidelines are published as an official document which gives an evidence based orientation on how to act in a specific situation. It is used to make actions more predictable and to assure a certain quality standard. Guidelines change according to new knowledge and best evidence and they are not compulsory.

Guilt

► Criminal Responsibility

Guinea Worm Infection

Synonyms

Dracunculiasis; Medina worm infection; Serpent worm infection; Dragon worm infection

Cross-References

► Water Quality and Waterborne Infectious Diseases

HACCP-Concept

Synonyms

Hazard analysis and critical control point (HACCP)

Definition

Microbiological, chemical and physical deficiencies in the fabrication, processing and distribution of food are ascertained and dangers are minimized in advance. Therefore, operating procedures have to be analyzed and documented. Thereby the delivery of food to the consumer is more transparent. To achieve ► food safety, the EU order (no. 852/2004) declares that all participants who are involved in food fabrication but also in processing and trade are obligated to self-control.

Haematopoietic Stem Cells

► Hematopoietic Stem Cells

Haemophilus influenza B (Hib) Vaccination

Synonyms

Haemophilus influenza B immunization

Definition

The ► vaccine against Hib was introduced in 1974 in Finland and the United States, and its effectiveness was improved over the following years. In the Federal Republic of Germany, the Hib vaccine has been authorized since 1990. Its rate of protection (90%) and its tolerance are good. From the third month of age, immunization is generally implemented three times as part of the 6-fold vaccination, or twice when no pertussis component is involved, at intervals of at least 4 weeks, followed by a further vaccination after 4–12 months. When vaccination begins after the first year of life, a single inoculation is sufficient to achieve an adequate immune response. Depending on the vaccine administered, the line is drawn between 14 and 18 months of age. Contraindications for the Hib vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccines or the carrier protein.

Haemopoietic Stem Cells

► Hematopoietic Stem Cells

Hallucination

Definition

Seeing objects or persons (i. e., visual hallucinations) or hearing voices (i. e. auditory hallucinations) when nothing or nobody is actually there.

Hamlet

Synonyms

Village; Small settlement

Definition

Hamlet is defined as a community of people smaller than a village. It may also refer to a settlement smaller than a town.

Hand Hygiene

Definition

Hand hygiene is the most important and basic means of reducing the spread of infections in healthcare settings. Hand hygiene is a general term that applies to hand washing (with plain soap and water), antiseptic hand washing (with water and soap or other detergents containing an antiseptic agent), application of an alcohol-based hand rub (alcohol-containing preparation applied to the hands to reduce the number of viable microorganisms), or surgical hand hygiene/antisepsis (an antiseptic hand wash or antiseptic hand rub undertaken by surgical personnel preoperatively). When healthcare personnel have hands that are visibly dirty, contaminated, or soiled, they should wash with soap and water. Hand rubs should be used when hands are not visibly soiled, to reduce bacterial counts. Hand hygiene is indicated before patient contact, and when donning gloves for the insertion of catheters or other invasive devices that do not require surgery. Hand hygiene is also indicated after any activity or contact that contaminates the hands, including following the removal of gloves.

Handicap

Definition

A handicap is a disadvantage for a given individual, resulting from an impairment or disability, that limits or prevents the fulfillment of a role that is normal, depending on age, sex, social and cultural factors, for that individual.

Cross-References

► Disability
► Impairment and Disability

Hand Surgery

Definition

Hand surgery is the field of medicine that consists of the investigation, preservation, and restoration by medical, surgical, and rehabilitative means of all structures of the upper extremity directly affecting the form and function of the hand and wrist.

Hansen's Disease

► Leprosy

Hanta Fever

Synonyms

Hemorrhagic fever with renal syndrome (HFRS); Nephropathia epidemica (NE); Korean hemorrhagic fever (KHF)

Definition

Hantaviruses are found in rodents, especially in mice and rats. The infection can be transmitted by breathing in contagious particles of feces or by ingestion of contaminated foodstuff. Hantavirus infections appear in Europe, Asia, Africa, North and South America, with the courses of the infection often being milder in Europe. One third of the infections are asymptomatic but in 20–30% a severe form has to be expected, with renal failure, shock and possible death. A vaccine is not available. The most important prophylactic measures are compliance to hygienic rules concerning food (► food safety and fecal-orally transmitted diseases) and the avoidance of contact with rodents.

Haplotype

Definition

A certain combination of ► alleles at a given set of linked genes.

Haplotype Structure

Definition

Haplotype refers to a set of ► alleles that are co-propagated, whether in an entire haploid ► genome or in a designated segment of that genome (such as a particular region of a chromatid). The independent segregation of ► chromosomes together with recombination between sister chromatids during meiosis will

tend to randomize the arrangement of alleles within the genome. Within a population the non random association of alleles at two or more loci is referred to as linkage disequilibrium and is measured by the indices D, D' and r^2.

Hard Tooth Structure

► Hard Tooth Tissue

Hard Tooth Tissue

Synonyms

Hard tooth structure

Definition

Hard tooth tissue comprises the firm substances of the tooth, including dental enamel, dentin, and tooth cement.

Harmful Substance Use

► Substance Abuse

Harmful Use

Definition

A pattern of psychoactive substance use that is causing damage to health. The damage may be physical (as in cases of hepatitis from the self-administration of injected psychoactive substances) or mental (e. g. episodes of depressive disorder secondary to heavy consumption of alcohol). Harmful use and abuse of substances are conceptualized as potential precursors for dependence.

Harmful Use (of Drugs)

► Drug Abuse

Harm Principle

Definition

The harm principle states that one person's freedom should not result in another person's harm (see the "On Liberty" by John Stuart Mill). It has been followed by institutions as an ► ethical principle when applying measures which have overruled the individual ► autonomy and freedom in the name of the common good.

Harvest Bug

► Chiggers (Burrowing Fleas)

Harvest Mite

► Chiggers (Burrowing Fleas)

Hazard

► Source of Potential Harm

Hazard Analysis and Critical Control Points (HACCP)

Definition

The HACCP is a science based and systematic system which identifies specific hazards and measures for their control to ensure the safety of food production and processing. It is used also in catering and retailing. HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing. Any HACCP system is capable of accommodating change such as advances in equipment design, processing procedures or technological developments. HACCP can be applied throughout the food chain. The application of HACCP systems can aid inspection by regulatory authorities and promote international trade by increasing confidence in ► food safety.

Cross-References

► HACCP-Concept

Hazard Identification

Definition

Hazard identification evaluates the weight of evidence for adverse effects in humans based on assessment of all available data on health impact and mode of action. It aims to determine the probability that an individual receiving a specific dose of the contaminant (chemical, ► radiation, ► noise, etc.) will develop an adverse effect. This is done, for chemical hazards, by drawing from the results of toxicology, epidemiology and animal studies. For other kinds of ► hazard, engineering or other disciplines are involved. Hazard identification is a first step in the ► risk assessment procedure.

Hazard Information

► Risk Management and Communication

Hazard Management

► Risk Management and Communication

Hazardous Use (of Drugs)

► Drug Abuse

Hazard Preparedness

► Emergency Preparedness

Hazard Ratio

Definition

The hazard ratio is an estimate of the ratio of the hazard rate in the treated versus the control group or between two differently treated groups. In a clinical trial where disease resolution is the endpoint, the hazard ratio indicates the relative likelihood of disease resolution in treated versus control subjects at any given point in time. The hazard ratio, which is derived from the Cox proportional hazards model, provides a statistical test of treatment efficacy and an estimate of relative risk of ► events of interest to clinicians. The hazard ratio may be used for purposes of statistical hypothesis testing and as one indication of amount of benefit (an increase in the odds of healing), but other measures must also be applied to understand the full importance of the study.

Hazard Reduction

► Risk Management and Communication

Hazards

Synonyms

Source of potential harm

Definition

Hazards are biological, chemical or physical agents in, or condition of, food with the potential to cause an adverse health effect. Hazard analysis is the process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for ► food safety and therefore should be addressed in the HACCP plan. Hazards should be minimized to the lowest possible level by the introduction of preventive measures which are applied at a number of control points. Control points which are the most important for the control of hazards and where hazards should be eliminated or lowered as much as possible are called Critical Control Points (► hazard analysis and critical control points (HACCP)). Preventive actions taken at critical control points must be documented as they form part of the documentation of the HACCP system.

Hazards, Natural

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Synonyms

Risk of natural disasters

Definition

Natural hazard – the possibility of occurrence of a potentially damaging natural event.

Basic Characteristics

There are a set of fundamental notions germane to natural hazard, risk, and disaster. Natural hazards can be defined as the possibility of occurrence of a potentially damaging natural event in a given area. Often, the above definition is rendered more quantitative by interpreting the possibility as a probability, or chance of occurrence, of a damaging event within a specified period of time, which can be expressed in per cent. The notion of risk contains the above concept of hazard and the notion of loss/damage/harm to human health (► human health aspects of disasters), property, or the environment. Natural disasters are consequences of a combination of natural hazards and human damage potential and vulnerability (► vulnerability concerns); an earthquake over a desert does not result in a natural disaster because the damage potential is not present.

Natural disasters are determined by the presence of destructive element (e. g. volcanic lava, earthquake force, fire, snow, mud, cold, strong wind, abundant water, or lack of needed water) in vulnerable places with high damage potential. Since the dawn of civilization, natural disasters have jeopardized people and their settlements.

There are several generating mechanisms of natural disasters, such as earthquake, volcano eruption, tsunami, storm, flood, drought, wild fire, landslide, avalanche, extreme heat wave, cold winter weather, blizzard, and meteorite fall. The probability of occurrence of a severe disaster in each of these categories depends on the geographical location.

Disasters are getting more frequent in the more overpopulated world, with busy traffic. In many areas of the world, natural disasters have recently become more destructive, causing material damage of tens of billions of Euros as well as human damage of tens of thousands of fatalities, annually. In particular, catastrophic weather events have exhibited a rapid upward trend: the average annual material damage, in inflation-adjusted monetary units, increased tenfold between the 1950s and the 1990s. A large proportion of the human population is exposed to a traumatic disaster in their lifetime.

Material damage, caused by natural disasters, has been increasing with time for a number of reasons, especially due to increasing ► exposure. For instance, humans have been massively encroaching flood-endangered areas, developing floodplains and coasts, and increasing damage potential by accumulation of population and wealth in flood-prone areas. High vulnerability to flooding accompanies urban squatting. Furthermore, urbanization has adversely influenced the flood hazard in many watersheds. Increase in the amount of impervious areas (roofs, yards, roads, pavements, parking lots, etc), reduction of storage, e. g. by the loss of natural inundation areas (lakes, wetlands, flood plains), deforestation, and regulation of watercourses result in faster and higher maximum river flow (water level) generated by intensive precipitation. Nowadays, less extreme rain (compared with the past) is needed to lead to a serious flooding disaster. In mountainous areas, development extends to hilly slopes, which are endangered by landslide and debris flows triggered by intense rains.

There have been many large natural disasters that have caused immense human and economic damage. Nearly every week, natural disasters occurring somewhere in the "global village" are reported by the media.

Many people have died of hunger caused by drought- and flood-related famines. For example, during and after the 1931 floods in China, the death toll was up to 3.7 million according to some sources (conflicting estimates). Hundreds of thousands of fatalities have been caused by cyclones (e. g. in the Bay of Bengal), tsunamis, and earthquakes. About 500,000 people drowned (and 100,000 went missing) during a coastal storm surge caused by the Bhola cyclone in East Pakistan and Bangladesh in November 1970, while another cyclone killed nearly 140,000 in Bangladesh in April 1991.

The tsunami disaster in December 2004, triggered by an earthquake (Richter magnitude 9.0 to 9.3) in the seabed off the Indonesian island of Sumatra, was unique in encompassing a very large area from Indonesia to

Africa, including numerous resorts packed with foreign Christmas holiday tourists. The number of dead and missing is evaluated as about 230,000, while the number of displaced was nearly 1.7 million. The height of the tsunami waves reached 30 meters. The furthest recorded tsunami-caused death occurred in Port Elisabeth (South Africa), i. e. 8000 km away from the epicenter.

The Great Kantō earthquake devastated Tokyo (Japan) in September 1923, killing 100,000–150,000 people. A more recent Tangshan earthquake in China (July 1976) caused a death toll of over 240,000. On 1 November 1755, an earthquake *cum* resultant fires devastated Lisbon, causing 15,000–40,000 fatalities.

Heat wave events are associated with marked short-term increases in mortality. In August 2003, a heat wave in Western and Central Europe caused between 27,000 and 40,000 excess deaths, while the death toll of a heat wave in the summer of 1980 in the United States (US) was between 1250 and 10,000.

Tens of thousands of people have been killed by single volcanic eruptions, such as the Nevado del Ruiz volcano in Armero, Colombia (November, 1985), with a death toll of 23,000–25,000. A large number of fatalities have been caused by landslides (e. g., 20,000 were killed in Peru in 1970), avalanches (10,000 fatalities in Tirol, Austria, in 1916), and blizzards, with over 300 people killed in one day in November 1950 in the Eastern US.

Disaster events that cause the highest economic losses are not necessarily the main killers. The most costly disaster ever was Hurricane Katrina in the US (August 2005), with – according to some estimates – up to 300 billion US $ in direct damage and 1 trillion US $ in total (i. e. including indirect) damage. Estimates of the death toll vary between 1,600 and 5,000 people. The material damage of the Kobe earthquake (Japan) in January 1995 was about 100 billion US $ (with over 5000 lives lost), while the material damage tag of the 1998 floods in China exceeded 30 billion US $ (and over 3600 fatalities).

According to some definitions, epidemics also belong to the category of natural disasters. It is estimated that in the 14th century, pests and famine killed 75 million people in Europe. In 1918–1919, the (pandemic) epidemic of Spanish flu killed 25–30 million. A more recent, and widely spread, infectious disease is HIV/AIDS, which has considerably challenged public health care systems worldwide. However, epidemics are not considered in the present field material.

Analysis of data for individual destructive flood events worldwide has led to the finding that, in general, the ratio of material losses to number of fatalities grows with the wealth level measured by the GNP per capita of a country. That is, more wealthy countries are more successful in saving lives, while material damages cannot be avoided.

Cross-References

► Human Health Aspects of Disasters
► Vulnerability Concerns

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Hazards, Technological

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Synonyms

Technological risk

Definition

Technological hazard – the possibility of occurrence of a potentially damaging event resulting from application of technology.

Basic Characteristics

The active presence of the rapidly growing population has added new hazard dimensions to the increasingly more crowded world. It is estimated that 7–8% of people who have ever lived on Earth are living right now. A category of disasters that are man-caused has emerged. Furthermore, in many areas, people have become more vulnerable (► vulnerability concerns) to some natural disasters (► hazards, natural).

Man-made disasters can be caused by accidents – unfortunate, undesirable, unplanned, and unforeseen events; which may, or may not, result from carelessness or ignorance. Accidents trigger loss, injury, or death, which are not necessarily due to any fault or misconduct on the part of adversely affected persons.

A technological hazard can be understood as the possibility of occurrence of a potentially damaging event in a given area, resulting from application of technology and capable of harming people, property, or the environment. The above definition can be rendered more quantitative by interpreting the possibility as a probability or chance within a specified period of time, which can be expressed in per cent. The notion of risk includes the above concept of technological hazard and the notion of loss/damage/harm to human health, property, or the environment. Technological hazards may lead to technological accidents when failure or loss occurring through the application of technology, as above, actually occurs.

Man-caused disasters can be classified into a number of categories. Many disasters have been related to human production activities: mining disasters, industrial disasters, chemical accidents, explosion or fire disasters, and nuclear accidents. Numerous man-caused disasters have been related to transport, oil spills, infrastructure failure – e. g. dam breaks, and terrorist attacks. One special category of man-caused disasters is war, which includes the two World Wars in the 20th century, with a legacy of greater than a hundred million victims – dead and wounded – and immense human suffering. Mismanagement-related disasters constitute a special category. The enforcement of the communist system (collectivization of agriculture) can be blamed, at least partly, for large famines in the ex-USSR, killing millions of people.

Technological disasters can be related to objects whose functioning involves the possibility of major hazards, such as chemical plants and nuclear, coal, and oil power production plants, etc.

Chemical accidents are related to introduction of an undesirable substance into the environment. Undesirable contact with noxious substances may cause adverse changes in the physical, chemical, or biological characteristics of the air, water, or land that can harmfully affect properties or the environment, adversely affecting health, survival, or activities of humans or other living organisms. Noxious substances accidentally released into the environment can cause acute or chronic disease or injury to the human body. For instance, heavy metals interfere with the respiration, metabolism, and growth of organisms.

Man-caused environmental disasters may also be linked to refuse, which poses a hazard to the environment or to human health when improperly handled; and can include carcinogenic (adversely transforming cells to replicate and form a malignant tumor), mutagenic, teratogenic, or phytotoxic wastes; wastes harmful to aquatic species; or poisonous wastes.

Nuclear hazard refers to danger to human health or the environment related to harmful effects of ionizing energy. This hazard is connected to the functioning of nuclear power plants or use, storage, and transportation of radioactive materials. In a nuclear power plant, a nuclear disaster may result from a rapid reaction of atomic nuclei, yielding high temperatures and the release of potentially dangerous levels of radioactive materials into the environment. In such an incident, the steel and/or concrete containment chamber that encloses a nuclear reactor may fail and radionuclides could escape into the environment, causing harm to human health and the environment.

A specific class of technological hazards is biohazards, which are related to the possibility of damage via personal, laboratory, and environmental exposure to potentially infectious agents, including applications of genetic techniques in the manufacturing process or in environmental management capable of harming persons, property, or natural resources. Biohazards must be contained in order to reduce the potential exposure of the laboratory workers, people outside of the lab-

oratory, and the environment to potentially infectious agents.

There have been man-caused disasters in the 20th century that have had considerable human health consequences. They include the Bhopal disasterin 1984 (7 thousand fatalities), mercury poisoning in Minamata, Japan, and Itai-itai disease, due to cadmium poisoning, in Japan. Disasters in nuclear power plants – the Three Mile Island and, in particular, Chernobyl accidents – are another category. Among the disastrous oil spills in the last decades were the catastrophes of the tanker ships Amoco Cadiz and Exxon Valdez, and, above all, the oil fires generated by the order of Saddam Hussein in Kuwait during the Gulf War. One of the most widely known man-caused environmental catastrophes, resulting from acute mismanagement of water resources, is the shrinking of the area and the volume of the Aral Sea.

Many catastrophes are related to the movement or collision of vessels, vehicles, or persons along a land, water, air, or space route – ship or ferry, rail, car or bus, and plane or spacecraft disasters. The sinking of the RMS Titanic in April 1912 caused over 1500 fatalities. In Poland, road traffic accidents during a single weekend may kill more people than floods do over decades. Transport disasters are particularly dangerous to the environment when transported goods create hazards (e. g. toxic, ignitable, corrosive, or reactive products or by-products of technological processes).

The terrorist attacks on 11 September 2001 were examples of "innovative" intentional mass killing. Passenger jets with many people on board, fully fuelled, were taken over by terrorists who crashed them against some of the most important buildings in the USA, with very high damage potential. The death toll of the terrorist attack on 9/11 exceeded 3000.

In China, a dam on the River Huang He was blown up in order to stop the Japanese invasion during the World War II. The dam break caused several hundred thousand fatalities. A large mining disaster in Honkeiko (China) in 1942 caused 1549 fatalities, while explosions in Greece in 1856 killed about 4000 people. A large fire in Sandoz works in 1986 caused the inflow of 30 tons of mercury pesticides into the Rhine, which devastated life in the river. In 1989, in Asha, Ufa, and Bashkiria, USSR, over 500 people were killed by explosions and fire caused by leakage in a long distance pipeline and sparks from passing trains.

Cross-References

► Hazards, Natural
► Vulnerability Concerns

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HDM

► House Dust Mites

Head Injury

► Traumatic Brain Injury

Head Lice

Synonyms

Pediculosis capitis

Cross-References

► Infectious Diseases in Pediatrics

Healing

Synonyms

Treatment; Cure

Definition

Healing is defined as any method by which an illness or injury is cured; specifically, the use of a technique which is not recognized within orthodox medicine and involves no form of physical therapy or manipulation. Sometimes prayer, visualization, meditation, or other methods are used by the patient, healer, or both to help focus beneficial thoughts and energy onto the illness.

Although touch may be used to transmit healing energies, some healers claim to be able to treat their patients from a distance. Controlled studies have shown the beneficial effects of positive thoughts and healing energies directed at bacteria, plants, cancer cells, and even animals such as mice.

Health

Synonyms

Well-being; Wellness

Definition

The preamble to the Constitution of the World Health Organization in 1946 defined health as "A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity". In 1984, this definition was revised and following definition was proposed that condensed to "The extent to which an individual or a group is able to realize aspirations and satisfy needs, and to change or cope with the environment; health is a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources as well as physical capabilities". This implies that individuals, families, and communities have some control over many determinants of their health. An alternative definition describes health as "A sustainable state of equilibrium of harmony between humans and their physical, biological and social environments that enables them to coexist indefinitely and to lead a socially and economically productive life."

Health Action Plan

► Health Strategy

Health-Adverse Life Styles

Definition

A health-related, i. e. health-adverse or health-promoting lifestyle, is defined as a collective pattern of behaviors with relevance to health that are based on routine choices people make about food, exercise, drugs, hygiene, safety, relaxation, and so on. This pattern is structured by specific needs, social norms, and constraints. Lifestyles are largely acquired through socialization, and they vary according to culture and social class. Importantly, a health-adverse Western lifestyle characterized by physical inactivity, unhealthy diet, smoking and alcohol consumption, among others, has been adopted more readily by less educated people, accounting for a relevant part of the social gradient of morbidity and mortality.

Health Advocacy

► Advocacy

Health for All

Definition

In 1977, the ► world health assembly decided that the major social goal of governments and WHO should be the attainment by all people of the world by the year 2000 of a level of health that would permit them to lead a socially and economically productive life. In 1981, the Assembly unanimously adopted a Global Strategy for "Health for All" by the Year 2000. Health for All means that resources for health are evenly distributed and that essential health care is accessible to everyone. It also means that health begins in several settings (at home, in schools, and at the workplace) and that people use better approaches for preventing illness and alleviating unavoidable disease and disability. Health for All means that people recognize that ill-health is not inevitable and that they can shape their own lives and the lives of their families, free from the avoidable burden of disease. Although it has been interpreted differently by each country in the light of its social and economic characteristics, the health status and morbidity patterns of its population, and the state of development of its health system, it has provided an aspirational goal, based on the concept of ► equity in health.

Health Anxiety

► Anxiety Disorders
► Hypochondria

Health Behavior

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Introduction

Health can be negatively defined as the absence of disease and injury, sometimes as a normative judgment referring to the average state of most people, and sometimes as a positive concept of well-being. Disability may be distinct form health or, together with health, represent different points on a continuum. From a medical perspective, people are healthy if they are uninjured and free of disease, but a person with risk factors for disease might be considered unhealthy. Health-related behavior is one of the most important elements in people's health and well being. Its has grown as nutrition and sanitation have improved and medicine has advanced. Diseases that were once incurable and fatal can now be prevented or successfully treated, and health behavior has become an important component of public health. The improvement of health behavior is central to public health activities.

► Behavioral patterns play a role in the leading causes of death, including chronic diseases such as heart disease, cancer and stroke. The most common behavioral contributors to mortality or death include the use of alcohol, tobacco, and motor vehicles, diet and activity patterns, sexual behavior and illicit use of drugs. Behaviors such as these contribute to almost half of the deaths in the United States and Northern Europe (McGinnis, Foege 1993) Those who are physically fit and have healthy habits are less likely to develop disability or die prematurely from chronic disease. People with high-quality personal relationships and supportive social networks tend to be more resistant to disease and to recover more quickly than those with poorer social relationships. Several epidemiological studies demonstrate that supportive social relationships reduce the risk of death form cardiovascular disease (Berkman 1995). The magnitude of the effect of social isolation on the risk of cardiovascular disease is comparable to that of elevated serum cholesterol or mild hypertension. Positive psychological states are associated with better coping with severe stress attendant to acquired immune deficiency syndrome (AIDS), cancer or arthritis (Folkmann 1997). Frankl (1992) demonstrated that a sense of purpose in life was associated with a greater likelihood of surviving Nazi concentration camps and psychological recovery from that experience.

A rising interest in preventing disability and death through changes in health behavior has emerged the 80th of the past century; particularly changes in lifestyle habits and participation in screening programs have been focused on. Much of this interest has been stimulated by the change in disease patterns from infectious to chronic diseases as leading causes of death, combined with the aging of the population, rapidly escalating health care costs and data linking individual behaviors to increases risk of morbidity and mortality.

Although there is more information about what constitutes healthy behavior and risk factors than ever before, this information has not always led to healthier behaviors. There have been some positive changes, however. Between 1988 and 1994, the average daily intake of dietary fat in the United States dropped from 36 per cent to 34 per cent of total calories; seat belt use increased from 42 per cent to 67 per cent; and the number of women over the age of forty who had breast examinations and mammographies doubled. Cigarette smoking has decreased among men by as much as 50 per cent in some countries. Unfortunately, during this same period, the number of obese adults rose, sexual activity among adolescents increased, more teenage girls began smoking, and the incidence of HIV (human immunodeficiency virus)/AIDS reached epidemic proportions.

Concepts of Health Behavior

Although the concept of positive health is clearly important, it presents several challenges. First, it is not clear whether positive health is incorporated into other definitions of health-particularly those that include both current function and prognosis. Most of the evidence supporting positive health per se is associated with better outcomes for those with healthy bodies, high-quality personal relationships, a sense of purpose, and high self-regard. Like people who refrain from smoking cigarettes or who have low serum cholesterol, those with positive psychological attributes could stay healthy longer than other people do or adapt better to health challenges.

Second, assessing positive health is difficult. Across cultures, socioeconomic status, and ethnic groups, people rate restrictions in activities associated with health conditions as less desirable than not having such restrictions (Patrick et al. 1985). The requirement to use a wheelchair is consistently rated as less desirable than is being able to walk freely. Such consensus is not evident, however, for attributes associated with good health. For example, there is much greater variability in ratings for the desirability of having a spouse, of participating in community activities, or of other aspects of social affiliation. There is considerable agreement regarding desirable aspects of physical functioning but there is little agreement regarding social components. There is also a difficulty with the definition of positive health. Current approaches regard optimal health as the condition of having no limitations on activity and being free of symptoms. The way in which positive and negative components interact to produce a given health status has not yet been described. There are many questions about health related behavior, or health behavior that are not yet well understood.

Health behavior encompasses a large field of study that cuts across various fields, including psychology, education, sociology, public health, epidemiology and anthropology. In the broadest sense health behavior refers to the actions of individuals, groups and organizations as well as their determinants, correlates and consequences, of these actions which include social change, policy development and implementation, improved scoping skills and enhanced quality of life. This is close to the concept introduced by David Gochman (1997) which includes not only observable, overt actions but also the mental events and emotional states that can be reported and measured. Gochman defined health behavior as those personal attributes such as beliefs, expectations, motives, values, perceptions and other cognitive elements; personality characteristics including affective and emotional states and traits; and overt ► behavioral patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement. Interestingly, this concept of health behavior emphasizes the actions and the health of individuals. By contrast, a public health perspective is concerned with individuals as part of a larger community. These perspectives are interrelated, as the behaviors of individuals determine many of the social conditions that affect all people's health.

Categories of Health Behavior

Gochman's definition of health behavior is consistent with the concept of specific categories of overt health behavior proposed by Kasl and Cobb (1996). Kasl and Cobb define three categories of health behavior:

1. Preventive health behavior involves any activity undertaken by individuals who believe themselves to be healthy for the purpose of preventing or detecting illness in a asymptomatic state. This may include wearing a helmet when riding a bicycle, using seat belts, or wearing a condom during sexual activity.
2. Illness behavior is any activity undertaken by individual who perceive themselves to be ill for the purpose of defining their state of health, and discovering a suitable remedy.
3. Sick-role behavior involves any activity undertaken by those who consider themselves to be ill for the purpose of getting well. It includes receiving treatment from medical providers and involves a range of dependent behaviors, and leads to some degree of exemption from one's daily duties.

The classic categories and definitions have been well established. However, there is some degree of overlap between them and there are also several categories of behavior that need specific definitions.

Behavior versus lifestyle. Health behavior can be something that is done once, or something that is done periodically – i. e. getting immunization or a flu shot. It can also be something that one does only to oneself, i. e. putting on sun screen, or a behavior that affects others, like putting up a shade cover in order to protect children in a playground from the sun. Other health behaviors are actions that are performed over a long period of time, such as eating a healthful diet, getting regular physical activity, and avoiding tobacco use. These latter types of behavior are sustained patterns of complex behavior that are named lifestyle behaviors. A composite of various healthful behaviors is often referred to as health lifestyle.

Self-care behavior. Self care behavior, a key concept in health promotion, involves taking actions to improve or preserve one's health. Self-care is often thought of in terms as prevention or self-treatment of definable health problems. Examples of self-care behaviors include seeking information (i. e. searching in the internet, attending classes, joining a self-help group), exercising, consulting a doctor regularly, getting more rest,

lifestyle changes, monitoring vital signs, and seeking advice through lay and alternative networks (Wagner and co-workers 2005). An important feature of self-care behavior is that it involves active participation in the health care process. Studies report that 80 to 95% of all health problems are managed at home through self-care and that most people who consult a physician have tried to treat themselves before seeking medical advice (Dean 1986). The seriousness of the health problem and the extent and type of disability, including its affect on daily activities, are the best determinants of whether an individual uses self-care practices or seeks help from a professional. In one study of older persons Norburn and co-workers (1995) observed that race, gender, education, place of residence, and socioeconomic status did not significantly influence self-care behavior. Persons with chronic health conditions often become more knowledgeable about their conditions than the average health care professional, and they frequently participate in group or community self-care educational and support programs.

Health care utilization behavior. Health care utilization behavior is a continuum that ranges from using preventive services, such as getting immunization or early detection and screening tests, to elective surgery or involuntary hospitalization after an injury. The study of trends in health care utilization provides important information on this behavior and may spotlight areas that may warrant future in-depth studies because of potential disparities in access to, or quality of, care. Health care utilization also has evolved as the population's need for care has changed over time. Some factors that influence health care utilization behavior include aging, sociodemographic population shifts, and changes in the prevalence and incidence of different diseases. As the prevalence of chronic conditions increases, for example, residential and community-based health-related services have emerged that are designed to minimize loss of function and to keep people out of institutional settings. New and emerging technologies, including drugs, devices, procedures, tests and imaging machinery have changed patterns of care and sites were care is provided. Multiple forces determine how much health care people use, the types of health care they use, and the timing of that care. Some forces encourage more utilization; others deter it. For example, antibiotics and public health initiatives have dramatically reduced the need for people to receive health care for many infectious diseases, even though overuse can also increase antibiotic resistant strains. Aging is associated with increased health care utilization (Mathers 1999).

Dietary behavior. Recent years have seen an epidemic in obesity in the United States and European countries (Mokdad et al. 1999, Prugger, Keil 2007). Although genetic factors are important diet contributes significantly to maintenance of appropriate body weight. The contribution of inactivity and detrimental dietary patterns has been ranked as the second leading factor contributing to mortality in the United States (McGinnis, Foege 1993). Studies show that dietary factors are associated with 4 of the 10 leading causes of death, including coronary heart disease, stroke, some forms of cancer and non-insulin dependent diabetes mellitus (CDC 1997, USDHHS 2000). Recommendations for healthful dietary behavior include limiting consumption of high-fat foods, having a high intake of fruit and vegetables, increasing fibre, and controlling calorie intake to prevent obesity. Although most American and Europeans know about the health consequences of unhealthful diets, many of the public health goals for dietary behavior have not been met. Dietary behaviors play a role in preventing or managing disease when they are sustained over the long term. Behavioral considerations are key to any attempts to promote healthful dietary behavior. Several core issues about dietary behavior have been recognized. First, most diet-related risk factors are asymptomatic and do not present immediate or dramatic symptoms. Second, health-enhancing dietary changes require qualitative change, not just changes in the amount of food consumed. Third, both the act of making changes and self-monitoring dietary behaviors require knowledge about foods. Thus, information acquisition and processing may be more complex for dietary change than for other changes in health behavior i. e. smoking and exercise.

Substance-use behavior. Substance-use behavior focuses on the use of both licit and illicit mood-altering substances. This category of substances, typically referred to as drugs includes tobacco, alcohol, marijuana, cocaine, heroin, amphetamine-derivates and prescription medications taken improperly. Substance abuse which occurs when substance use behavior is at an extreme and harmful level is often associated with addiction. There is widespread agreement in the public health and medical communities that both cigarette-

smoking and alcohol consumption are the biggest external (non-genetic) contributors to death in the United States: tobacco-related diseases account for more than 400,000 deaths amongst adults per year and approximately 100,000 deaths are related to alcohol consumption in each year (CDC 1995, USDHHS 2000). Compared with other threats to human health, alcohol causes the widest variety of injures (Rose 1992). By the first grade, or earlier, children show temperament and behavior traits that are predictors of their inclination to use and abuse alcohol and drugs in their teenage and adult years. Brook (1992) and Hops (1990) have identified not only childhood risk factors and behaviors that predict drug and alcohol abuse potential but also protective factors that may shield children from influences to use drugs.

Sexual behavior. Sexual relationships and practices are complex to investigate, but their study is important because infectious disease has always been a possible outcome of sexual relationships, as has unwanted pregnancy. Both are crucial public health issues. Concern about AIDS has been an important motivation for recent studies of sexual behaviors, including a large survey of sexual behaviors and attitudes (Laumann 1994). Most of the issues that arise in relating sexual behavior to risk of infection with the human immunodeficiency virus (HIV) pertain to many other, more common, sexually transmitted infections such as human papilloma virus, gonorrhoea, chlamydia, and genital herpes, which vary in the severity of their consequences. By contrast, HIV has made unsafe sex a matter of life and death. Behavioral means for prevention of sexually transmitted infections include delaying the onset of sexual activity, limiting the number of partners, abstaining from sex with people not known to be infection free, and using effective barrier contraception. Community-focused interventions also are useful in reducing sexually transmitted infections. Such interventions generally aim to change behavioral norms. Mass media campaigns have used reinforcing messages to increase knowledge about HIV infection and ways to prevent it. Because only a small percentage of adolescents receive any prevention information from parents, and because for most teenagers schools are the main source of information about sexually transmitted infections, school-based interventions can be significant in motivating young people to modify their behaviors (American Social Health Association 1996).

Models of Health Behavior

The best way to design programs to achieve positive changes in health behavior is to explore why people behave as they do and what might motivate them to change. Theories of health behavior (► health behavior, theories) can be useful during the various stages of planning, implementing, and evaluating interventions. Growing evidence suggests that effective programs to change individual health behavior require a multifaceted approach to helping people adopt, change and maintain behaviors. For example, strategies for establishing healthy eating habits in children and adolescents might be quite ineffective for changing maladaptive eating behaviors – that is, when they are used to substitute one pattern for another – in the same population (Jeffrey and co-workers 2000). Similarly maintaining a particular behavior over time might require different strategies than will establishing that behavior in the first place. Models of behavior change have been developed to guide strategies to promote healthy behaviors and facilitate effective adaptation to and coping with illness. The stages of change model concern an individual's readiness to change unhealthful behaviors. Its basic premise is that behavior change is a process and not an event, and that individuals are at varying levels of motivation, or readiness to change. This means that people at different points in the process of change can benefit from different programs for change, and the programs work best if matched to their stage of readiness.

Social relationships can be described by three aspects. First, social integration refers to basic quantitative features of social relationships such as the number of active relationships and frequency of contacts. Second, mostly conceptualized very close to integration, social networks can be defined as person-centered webs of social relationships; characteristics of such networks are elaborate measures such as their reciprocity, intensity, complexity, and density. Finally, a third aspect of social relationships has been termed functional or relational content, thus essentially referring to their quality. Three specific sub-dimensions in terms of different kinds of social processes are distinguished: regulation and control, demands and conflicts, and support. As noted, particularly the latter has been a focus in research on health and health behavior. Establishing a closer link with basic behavioral science promises to provide important directions for the continued development of

health-related behavior interventions. One important example of a model that attempts to integrate individual psychological processes with contextual factors is Social-Action Theory. It views the person as influenced by environmental contexts or settings to which he or she brings a particular temperament and biological context. Thus, a person's capacity to practice healthy eating habits and to exercise is influenced by access to health-enhancing foods and safe places to exercise and by internal goal structures, self-efficacy beliefs, and problem-solving skills. In Social-Action Theory, biology and social environmental contexts determine the success of interventions to promote individual behavior change. Social-Action Theory specifies mediating mechanisms that link organizational structures to personal health. It provides a framework for multilevel approaches to health promotion and illness prevention. It offers a theoretical rationale for intervening in health policy and for creating environments that are conducive to self-protective choices. Social-Action Theory provides an approach for defining public health goals and modifiable social and personal influences that can be used to encourage individual health behavior change. It fosters interdisciplinary collaborations by incorporating and coordinating the perspectives of the biological, epidemiologic, social, and behavioral sciences. Like other models Social-Action Theory underscores the long-term nature of the process of altering health behavior, and of the need to make a detailed behavioral diagnosis for each person and to tailor interventions to match his or her current stage of readiness to change.

Summary

The impact of behavior on health is enormous. In the early eighties of the past century the US Department of Health and Human Services compared the estimated contributions of various determinants of mortality and morbidity on the ten leading causes of death in the US, showing that individual lifestyle accounted for more than 50 per cent of the overall contribution (Badura 1994). The European Commission (EC 1998) has reported that approximately 80 per cent of death among European citizens aged 35 to 64 are due to cancer, cardiovascular diseases, accidents and suicides, thus underlining the significance of behavioral factors known to be contributing to these diseases and causes of death. Given this epidemiological situation, health psychology understandably has a major focus on behaviors that lead or contribute to health and illness. Healthcare professionals, community leaders, and policy try to understand interactions between health and behavior and to make that knowledge useful to improve the health status of individuals and populations. Health and behavior are related in various ways, yet those interactions are neither simple nor straight-forward. Given the wide acknowledgment that cigarette smoking is linked to a variety of deadly diseases, for example, it has to be questioned for which reason people smoke. And given equally convincing evidence connecting excess weight with cardiovascular disease and other health problems it has to be questioned for which reasons so many people are far above their optimal weight. It is not clear whether such unhealthy behavior indicates a simple lack of willpower. It is still being under investigation how social environment influences these behaviors. It is not understood how stress makes people sick. The present synopsis reviews available information about links between health and behavior, about the influence of social environment on these behaviors, and about interventions to improve health by means of modifying behavior or personal relationships.

Cross-References

- ► Behavioral Patterns
- ► Health Behavior, Theories

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Health Behavior, Theories

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Synonyms

Theories of health behavior; Models of behavior change

Definition

Models of behavior change have been developed to guide strategies to promote healthy behaviors and facilitate effective adaptation to and coping with illness. The corresponding theories focus on a range of factors influencing behavior determinants, including facts within an individual (such as thoughts, feelings and beliefs), factors in groups or relationships, and factors that exist in organizations and communities (such as structures, regulations, policies and laws). The concept of community itself has been defined repeatedly. Most of these definitions include two basic features: locality and quality, or structure and function. Structure refers to an area with geographic boundaries. Function describes shared values, norms, communication, and helping patterns. This function is also the major operating force in community psychology interventions.

Basic Characteristics

Many theories that have been developed in health psychology to explain health-related behaviors emphasize individual cognitions, thoughts or beliefs. These theories can be named social-cognition models (Conner and Normann 1998). Prominent examples are the ► health belief model (Rosenstock 1974), the theory of reasoned action (► reasoned action theory) (Ajzen and Fishbein 1980), the theory of planned behavior (► planned behavior theory), ► protection motivation theory (Conner and Normann 1996), ► health locus of control and self-efficacy theory (Sanders 1982). Other models include the model of health promotion behavior, the ► transtheoretical model of change, the model of conditioning (► conditioning model), the ► cognitive social learning theory, ► self-regulation, the theory of trying, the precaution adoption process model, the ► social action theory, and the health action process approach (Schwarzer 1996). Self-efficacy is a concept, which is most widely, acknowledged across these theories (O'Leary 1985). It has been applied to diverse areas such as school achievement, mental and physical health, career choice and socio-political change

(Wagner and Kirch 2006). Self-efficacy has become a key variable in clinical, educational, social, developmental, health and personality psychology. By means of the self-system, individuals exercise control over their thoughts, feelings and actions. Among the beliefs with which an individual evaluates the control over his/her actions and environment, self-efficacy beliefs are the most influential arbiter of activity. Self-efficacy is constructed on the basis of the four most influential sources: enactive attainment, vicarious experience, verbal persuasion and physiological as well as emotional factors. It plays a central role in the cognitive regulation of motivation, because people regulate the level and the distribution of effort they will expend in accordance with the effects they are expecting from their actions. While outcome expectancies refer to the perception of the possible consequences of one' s action, perceived self-efficacy pertains to personal action control (Bandura 1992). A person who believes in being able to cause an event can conduct a more active and self-determined life-course. Self-efficacy reflects the belief in being able to cope with challenges by means of adaptive action. It can also be regarded as an optimistic view of one's capacity to deal with stress. A low sense of self-efficacy is often associated with feelings of depression, anxiety and helplessness. People with low self-efficacy levels often have pessimistic thoughts about their accomplishments and personal development. In order to initiate and maintain health behaviors, it is necessary to believe that one has the capability to perform the required behavior. Therefore, the likelihood that people will adopt a valued health behavior (i. e. physical exercise) or quit a detrimental habit (i. e. smoking) depends on the level of self-efficacy.

Cross-References

- ► Cognitive Social Learning
- ► Conditioning Model
- ► Health Belief Model
- ► Health Locus of Control
- ► Planned Behavior Theory
- ► Protection Motivation Theory
- ► Reasoned Action Theory
- ► Self Regulation
- ► Social Action Theory
- ► Transtheoretical Model

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Health Belief

► Oral Health Behavior

Health Belief Model

Definition

The Health Belief Model was developed in the 1950s in the U.S. Public Health Service. It is still used as an assessment tool to understand why persons participate in programs for the prevention or detection of diseases (e. g. being immunized against the flu). The original model encompassed five concepts; self-efficacy was added for modern applications. Perceived susceptibility is defined as the subjective opinion about the chances of contracting a condition; perceived severity is the subjective opinion of how serious a condition and its consequences might be if untreated. Perceived benefits means the opinion of the effectiveness of various available actions in reducing the problem, and perceived barriers are the potentially negative aspects of a health action, e. g. side effects or costs. Cues to action might be an environmental event or a bodily trigger. Self-efficacy is defined as the person's confidence in performing a particular behavior successfully.

Health of Boys and Men

► Men's Health

Health Campaigns

Synonyms

Health promotion; Prevention

Definition

Health campaigns refer to various activities aimed at promotion of healthy lifestyle and prevention of health risk factors such as smoking, poor diet habits, sedentary lifestyle, etc. They include activities such as preparation and dissemination of culturally appropriate health materials in native languages, inclusion of indigenous health practitioners in health promotion activities, and also promotion of mutual learning, capacity building and sharing information through workshops.

Health Care

Synonyms

Health maintenance; Health protection; Medical management; Preventive medicine; Medical services

Definition

Health care refers to the prevention, treatment, and management of illness and the protection of mental and physical ► well-being through the services provided by the medical nursing, and allied health professions. The organized provision of such services may constitute a ► health care system.

There are many ways of providing health care in the modern world. The most common way is face-to-face delivery, where care provider and patient meet personally. This is practice in general medicine in most countries. However, with modern telecommunications technology, it is becoming more common that practitioner and patient communicate over the phone, video conferencing, the internet, email, text messages, or any other form of non-face-to-face communication. The characteristics of a health care system have significant effect on the way medical care is delivered.

Cross-References

► Health Care Services

Health Care Access

Synonyms

Health care availability

Definition

Health care access refers to availability and accessibility of ► health care services in terms of proximity of health care services, infrastructure of ► health care delivery, number of ► health care professionals providing medical services, medical insurance. There is a vast discrepancy between access to health care and ► public health initiatives between developed nations and developing nations. In the developing world, many ► public health infrastructures are still forming. There may not be enough trained health workers or monetary resources to provide even a basic level of medical care and disease prevention. As a result, a large majority of disease and ► mortality in the developing world results from and contributes to extreme poverty.

Cross-References

► Health Determinants, Economic

Health Care Availability

► Health Care Access

Health Care Costs

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Synonyms

Health care expenditures; Expenditures on health care

Definition

Health care costs are the sum of both public and private expenditures spent on health care services in a given country at a given time. The variation in health care costs between countries is substantial. The main drivers of health care costs are non-demographic factors such as national income, relative prices, and technology.

Basic Characteristics

Health Care Costs: International Comparisons

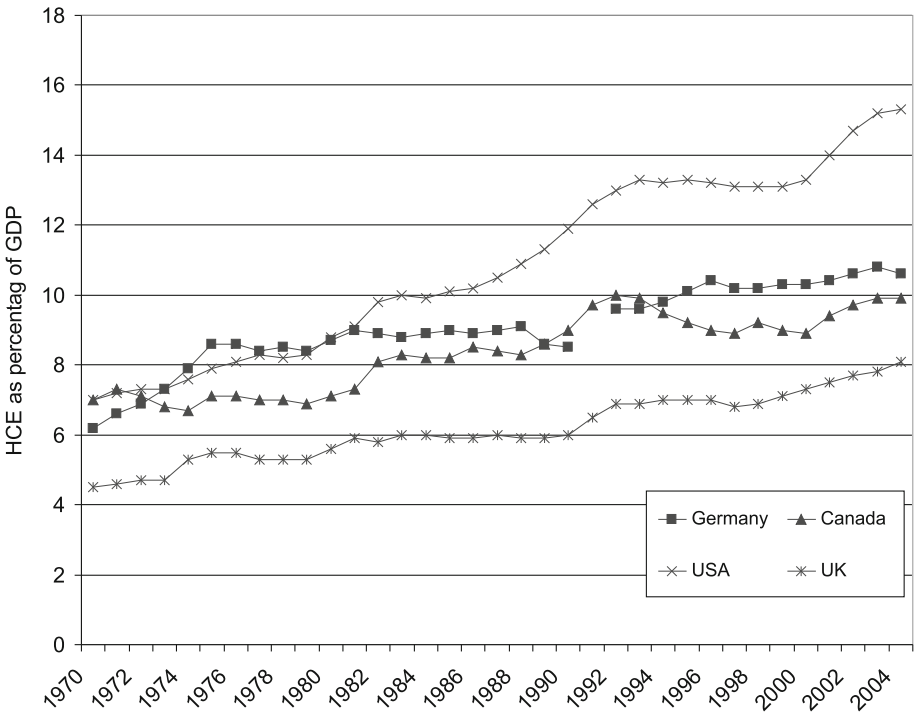
From a macroeconomic point of view, the sum of health care costs is the sum of both public (taxes, social insurance) and private (private insurance, out-of-pocket payments) expenditures spent on health care services in a given country at a given time. The Organizations for Economic Co-Operation and Development (OECD) has developed a methodology to standardize health care expenditures and to make them comparable across member countries (OECD 2005). Health care costs are either measured per capita in US$ PPP (► purchasing power parity) or as a share of ► gross domestic product. Figure 1 shows the development of health care expenditures as a share of GDP over time for four selected countries.

The variation in health care spending between countries is substantial and is mostly determined by the wealth of individual countries – measured in GDP per capita, the outliers being the United States (way below the regression line in the upper right hand quadrant), Luxemburg (way above the regression line in the upper right hand quadrant) (see Fig. 2). Moreover, differences in health care costs also originate from different approaches toward health care system design such as ► health financing and remuneration of health care providers (► regulatory mechanisms).

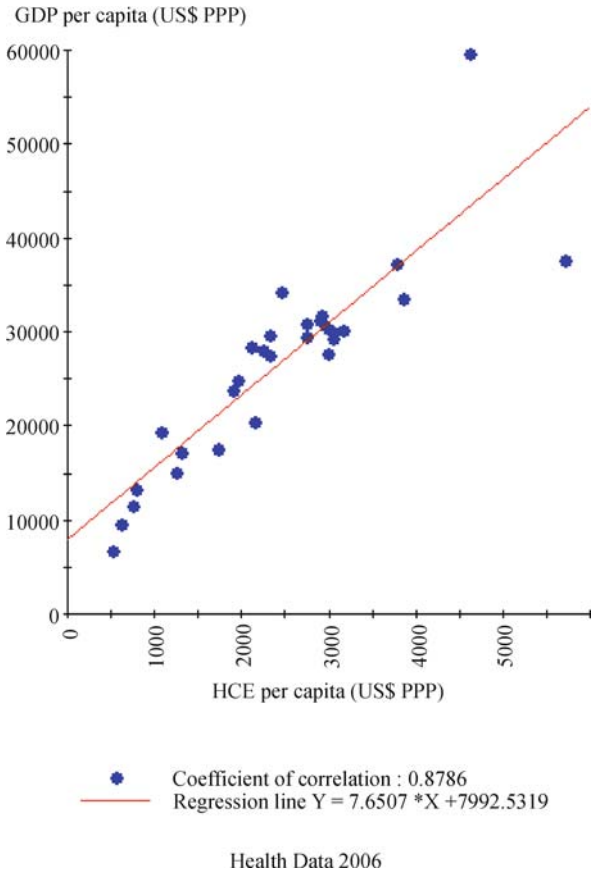
Drivers of Health Care Costs

Policy makers are concerned about the pressure that rising health care costs are putting on publicly financed health care systems. As a consequence, projections about the future trends of health care costs have been developed both nationally and internationally. In order to project future trends, the main drivers of health care costs need to be identified. These can be distinguished as demographic and non-demographic factors (OECD 2006).

Demographic factors originate from the tendency that population ageing – i. e. a rising share of older age groups in the population as a consequence of increased



Health Care Costs, Figure 1
Health care expenditures as a share of GDP in the United States, Canada, the United Kingdom and Germany 1970–2004. Source: OECD Health Data, October 2006



Health Care Costs, Figure 2 Health care expenditures per capita and gross domestic product per capita. Source: OECD Health Data, October 2006

life expectancy – will induce upward pressure on health care costs, since health care costs increase with age. This is true if an increase in longevity increases the number of years lived in bad health (► expansion of morbidity); however, there is at least one major factor that alleviates this tendency. Health care costs are concentrated at the end of life. If increased life expectancy means that more individuals live longer and die later, pressure on health care costs will be lower than expected (► compression of morbidity). In other words, if longevity gains translate into more years of► "healthy ageing", there is no reason to identify population ageing as a major driver of costs in health care (OECD 2006). As a consequence, projections which identify population ageing as a major driver of health care costs will overestimate the growth of health care costs (Stearns and Norton 2004). Empirical evidence on the question whether "healthy ageing" or "unhealthy ageing" is prevailing points to the hypothesis that non-demographic factors are the main drivers of health care costs. Several empirical studies have found that the impact of population ageing on health care costs is rather limited if proximity to death is controlled for – with the possible exception of long-term care, in which circumstance "unhealthy ageing" matters (Zweifel et al. 2004; Werblow et al. 2007).

Health Care Costs, Table 1 Decomposing growth of public health care spending, 1981–2002

	Health Spending	Age Effect	Income Effect	Residual
Canada	2.6	0.4	1.7	0.6
Germany	2.2	0.2	1.2	1.0
United Kingdom	3.4	0.2	2.3	1.0
United States	4.7	0.1	2.0	2.6

Source: (OECD 2006)

As a consequence of the rather weak link between population ageing and health care costs, other – non-demographic – factors need to be considered as the key drivers of health care costs. These factors include growth of national income, since health care costs tend to grow as national income goes up (see Fig. 2). However, even after controlling for demographic factors and growth of national income, a "residual" growth in health care costs remains. The residuum can mostly be explained by technology and a growth of relative prices (OECD 2006). Table 1 shows a decomposition of public spending growth per capita for selected OECD-countries.

Cross-References

► Compression of Morbidity
► Expansion of Morbidity
► Gross Domestic Product
► Health Financing
► Healthy Ageing
► Purchasing Power Parity
► Regulatory Mechanisms

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Health Care Delivery

Definition

Medical care delivery
Health care delivery is aimed at prevention and treatment of disease through health care system. It is classified into primary, secondary and tertiary care.
Primary care medical services are provided by physicians or other health professionals who have the first contact with patient seeking treatment or care. It is organized in medical office's, nursing homes, schools, home visits. It also includes preventive care and health education.
Secondary care medical services are provided by medical specialists in their offices at clinics or hospitals. Patients are referred to them by primary ► health care provider who first diagnosed or treated patient.
Tertiary care medical services are provided by specialist hospitals or regional centers equipped with diagnostic and treatment facilities not generally available in secondary care medical services.

Health Care Differences

► Health Care Disparities

Health Care Disparities

Synonyms

Health care differences

Definition

Health disparities are defined as population-specific differences in the presence of illness, health outcomes or access to health care. Health disparities refer to gaps in the quality of health and health care across racial and ethnic groups. There is evidence for higher incidence of chronic diseases (such as diabetes, cardiovascular diseases, etc.), higher ► mortality and poorer health outcomes among minority populations (or indigenous populations in nation-states).

Health Care Education

► Health Care Profession

Health Care Expenditures

► Health Care Costs

Health Care Facility

Synonyms

Medical building; Health facility

Definition

Health care facility is defined as a building with the necessary medical equipment and health care professionals aimed at practicing medicine.

Health Care Financing

► Health Financing

Health Care Funding

► Models of Finance

Health Care Industry

► Health Care Profession

Health Care Informatics

► Medical Informatics

Healthcare Information System

► Health Information System

Health Care Plan (US)

Synonyms

Health insurance

Definition

Health care plan in the United States means health insurance. Health care plans cover the risk of illness or injury of an individual through the insurance principle. They may be privately financed and administered through insurance premiums and private insurance companies or publicly administered by the state and financed through public funds such as ► medicare and ► medicaid.

Health Care Policy

► Family Health Policy

Health Care Profession

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Synonyms

Health care industry; Pharmaceutical industry; Health care education

Definition

The health care profession comprises all persons who provide services aiming at the preservation or improvement of the health of individuals or the treatment or care of individuals who are injured, sick or disabled. In a very broad definition, all individuals that participate in some way in the delivery of health care are part of the health care profession. The contemporary health care profession is more and more characterized by a group of highly trained professionals providing their services as an interdisciplinary team.

Basic Characteristics

Background

The health care industry is one of the world's largest industries with still significant growth rates. It consumes about 9% of the gross domestic product (GDP) of the OECD countries compared to nearly 7% in 1990 and 5% in 1970. Health care thus forms an enormous part of a country's economy. The United States has the highest share of health care costs related to GDP in the world with 15.3%. The USA is followed by Switzerland with 11.6%, France with 11.1% and Germany with 10.7% share of health care costs related to GDP. Per capita health spend in the OECD countries has in average increased by more than 80% in real terms between 1990 and 2005 compared to only 37% growth in GDP per capita.

Medical Profession

The medical profession holds the most important position within the health professions. The physician forms the central part of the medical profession. Whereas in the United States, the term physician is commonly used, other countries like the UK, Canada, Australia, Germany or Japan usually use the term doctor. In these countries, a physician often refers to specialists in ► internal medicine. In all developed countries, the studies of medicine are offered by a ► medical school belonging to a university. The entry-level medical education programs are tertiary-level courses that are often followed by a period of supervised practice before full registration is granted. Physicians need government permission to practice in most countries, which is known as licensing in the United States, approbation in Germany or registration in the UK.

The general practitioner (GP) or family physician (FP) is a physician who is mainly responsible for providing comprehensive health care to every individual seeking medical care which is summarized as primary care. The GP acts as a generalist and accepts every patient be it for the treatment of acute and chronic illnesses or the provision of preventive care and ► health education for all ages and both sexes. The medical specialists on the other hand limit access to their services based on age, sex and/or diagnosis. They specialize in a certain field of medicine and go through additional training. Usually general practitioners act as gatekeepers. They see the patient first and if necessary refer them to the respective specialist.

According to the OECD, the number of doctors in OECD countries has increased significantly by 35% between 1990 and 2005 to 2.8 million. This growth was predominantly driven by an up to nearly 50% growth of specialists compared to a 20% increase in general practitioners (GPs). In most OECD countries, there are now more specialists than general practitioners. With regard to income levels, the specialists earn more than the GPs in most OECD countries which is one reason for the greater increase of specialists in recent years. There are, furthermore, large variations when it comes to numbers of doctors per capita. As of 2005, in the OECD countries, this number ranges from around 4 doctors per 1000 population in Belgium, Italy, Spain and Switzerland to below 2 doctors in Mexico, Turkey and Korea. Overall, this ratio of practicing doctors per 1000 population has grown in almost all OECD countries between 1990 and 2005. However, this growth was lower than in the 15 years before, mainly driven by the introduction of cost-containment measures in many countries.

Nursing Profession

The nursing profession consists of people responsible for the treatment, safety, and recovery of acutely or chronically ill or injured people. Nurses also support the health maintenance of healthy individuals and the treatment of life-threatening emergencies. Nursing education and career structure differs widely throughout the world. In general, there are in most cases several different levels of nurses that are distinguished by increasing education, responsibility, skills and experience. Besides the clinical activities, nurses might also participate in medical and nursing research as well as the execution of non-clinical functions that are part of the health care delivery. The nursing profession forms the largest group of providers within the health care system and they are still predominantly female. The number of practicing nurses per 1000 population in the OECD countries again differs widely. The countries with the highest density of nurses are Ireland, the Netherlands and Norway with about 15 nurses per 1000 population compared to the countries like Mexico, Korean and Turkey with only about 2 nurses per 1000 population which is only slightly higher than the density of doctors in these countries.

Pharmaceutical Profession

The pharmaceutical industry in general has the two functions of research and development (R&D) and manufacturing. Most pharmaceutical companies are engaged in both functions, some specialize in either R&D or manufacturing. Most of the drug producers are large multinational companies that serve the three largest markets in the world, the United States, Europe, and Japan. Within the pharmaceutical industry, all different health care professions are found as the large drug manufacturers employ individuals with different educational backgrounds like medicine, pharmaceutics, chemistry, bio-chemistry, etc. Spending on pharmaceuticals and other medical non-durables accounts for a significant share of the total expenditure on health in most developed countries. For the OECD countries, this percentage ranges from around 9% in Norway, Denmark and Luxembourg to around 30% in the Slovak Republic, Poland and Hungary. In Germany, pharmaceutical expenditure accounts for 15% of total health expenditure compared to 12% in the United States.

The drugs prescribed by the physicians are distributed by pharmacists in pharmacies that might be either dedicated premises or part of a retail drugstore or chemist. The pharmacists furthermore provide advice on the selection, dosage, interactions and ► side effects of the medication. They also offer detailed information about ► over-the-counter drugs that do not require a prescription by a physician. Some pharmacist offer more and more public health related services: giving advice about diet and exercise, participating in health promotion campaigns, providing advice on complimentary medicine. As mentioned above, pharmacists increasingly pursue non-traditional pharmacy work. Some phar-

macists work as employees of pharmaceutical companies where they are engaged in research and development or marketing and sales or they work for health insurance companies where they develop pharmacy benefit packages and carry out cost-benefit analyses on certain drugs. Other pharmacists work for governmental institutions or pharmacy associations. Finally, pharmacists engage in academic work either as teachers or researchers.

Allied Health Professions

The term allied health profession is used to describe all those people who are not covered by the medical profession, the nursing profession and the pharmaceutical profession but still are part of the health care system and contribute to its function. Allied health professionals are characterized by a formal education and/or clinical training credited through an official certification, registration or licensure. They usually collaborate with physicians and/or other members of the health care system to support a high quality delivery of patient care, be it identification, prevention, or treatment of diseases, disabilities and disorders. There are numerous professions that are encapsulated in the allied health professions, e. g. electrocardiographic technicians, nutritionists and dieteticians, occupational therapists, kinesiotherapist, and speech therapists.

Conclusion

An increase in medical and health care expenditures can be observed on a global level. In many countries, this has resulted in shifting patients away from hospital treatment to outpatient treatment in physicians' private and group practices or ambulatory hospital settings. This is in line with an increasing demand for specifically trained specialist physicians as reflected in the significant growth rates of the last 15 years. Despite this trend, the general practitioner's role remains key to the health care system and some countries, like Germany, have even changed their legislation and increased incentives to prevent patients going directly to the more expensive specialists. This gate keeper role of the GP, already established in the Anglo-American countries, is expected to be further enforced in the future in other countries to mitigate against the growth of the direct use of specialists. The growing importance of public health related topics, especially prevention and care of the chronically ill, will further strengthen the role of the general practitioner as well as the demand for nursing and other services offered by the allied health professions.

Cross-References

- ▶ Health Education
- ▶ Internal Medicine
- ▶ Medical School
- ▶ Over-the-Counter Drugs
- ▶ Side Effect

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Health Care Professionals

Synonyms

Persons providing medical treatment and care; Medical staff

Definition

▶ Health care professionals are people working in health sector providing health care in terms of preventive and curative services in different types of medical and even non-medical institutions.

Health Care Provider

Synonyms

Health professional; Caregiver

Definition

► Health care provider is defined as a person who helps in identifying or preventing or treating illness or disability. Health care providers are physicians, nurses, pharmacists, etc.

Healthcare Providers

Definition

Healthcare providers are persons who provide health care as part of their job responsibilities. In the purest sense, healthcare providers work for emergency medical services, hospitals, medical clinics, etc., but a child-care worker or employee who is required to provide emergency care in any business may be deemed a healthcare provider in his or her employment setting. Normally, a healthcare provider is a doctor, a nurse, or another trained member of a healthcare team.

Health Care Provision Indicators

Definition

Indicators of resources and provision of health care include several dimensions. Some refer to health workers, their education, employment, and performance. Others concentrate on health care itself, its availability, access, provision of health care on all levels of prevention (primary, secondary, tertiary), health expenditures, and medical technology. The utilization of health care is determined by rates of hospitalization, hospital beds, employment-to-bed ratio, and length of stay in hospital. The most difficult factor to estimate is the quality of health care, since it relies on many other parameters – health care, health professionals, and consumers, etc.

Health Care Quality

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Definition

Health Care Quality has been defined by the American Institute of Medicine as "the degree to which health services for individuals and populations increase the likelihood of desired ► health outcomes and are consistent with current professional knowledge" (Lohr 1990). Donabedian proposed thirty years before to define quality in health care as three-fold: quality of health care structure, process-quality and quality of outcome (Donabedian 1966). The quality of the structure of health care relates to adequacy of the facilities, personnel, and policies to deliver medical care. Process quality is concerned about the appropriateness of diagnostic or therapeutic interventions. Outcome quality means the effectiveness and efficiency, i. e. the ► health status that people experience as well as the economic dimension of the health care provided.

Despite all efforts, the proposed definitions of health care quality remain rather vague and suggest that a definition of health care quality on an absolute level is impossible. Health care quality can only be defined with respect to a specific goal, for example with respect to standards, norms and criteria for process and outcome quality. In this case, the definition of health care quality depends on the dynamics of the environment caused for example by technical progress and has to be revised regularly. Another important factor is that the definition of quality relies on rather subjective than objective factors, because the health status of an individual depends mainly on its personal estimation.

Basic Characteristics

History of the Idea of Health Care Quality

The dimension of quality in health care has become increasingly popular in the industrialized world after the first important waves of ► cost containment in the health care sector during the 80s. Economic evaluation and ► rationing in health care have put enormous pressure on health care providers and a lowering of their quality of services has been observed. Although in former times, health care quality was taken for granted, today, more and more patients and health care authorities are concerned about the quality of health care.

As the idea of health care quality had entered the medical scene, health care professionals tried to make it more operational. Various measures of quality have been developed according to the general definitions.

Measures for health outcome were conclusively related to a process or a group of processes that can be modified to improve the outcome. Measures for the organizational quality were either connected to the processes or directly to the outcome in order to be reliable and valid quality measures.

The American Institute of Medicine described a few years later quality in health care as "patient-centered, timely, efficient, effective, safe and equitable, as well as coordinated, compassionate and innovative." Ultimately, health care quality does not mean under-utilizing care that could help people, using the wrong kind of care and overusing care that is not necessary.

Indicators of Quality

In order to assess and improve quality in health care, many countries have developed indicators of quality on a national level that may serve as a framework for all health care provider. Indicators of quality are criteria, standards, and other direct qualitative and quantitative measures used in determining the quality of health care.

In **Germany** for example, indicators of quality are defined along the three-fold definition of quality according to Donabedian.

Indicators for the organizational quality are:

- Education and training of doctors
- Continuing qualification and number of staff
- Equipment of the health care provider (doctors' offices, hospitals, laboratories)
- Access to doctors' offices and hospitals
- IT-infrastructure of the health care provider (doctors' offices, hospitals, laboratories)

Indicators for the process quality are:

- Diagnostic techniques
- Therapeutic measures and nursing
- Principal diagnosis of hospital admissions
- Co-operation between colleagues
- Communication with patients

Indicators for the quality of outcome are:

- Improvement of ► health status, healing of diseases
- ► Patient Satisfaction
- Level of blood pressure and blood sugar
- Change of behavior that influences health status
- Impact on ► morbidity

These indicators are interdependent as the existing organization and resources have an influence on the processes, and processes influence the quality of outcome.

In the **United States**, health care quality indicators have been developed by the Agency for Healthcare Research and Quality (► AHRQ) using a broader approach than the German classification above.

The quality indicators are a set of four modules each of which measures quality associated with processes of care that occurred in an outpatient or an inpatient setting.

1. Prevention Quality Indicators (PQIs) identify hospital admissions that could have been avoided, at least in part, through high-quality outpatient care.
2. Inpatient Quality Indicators (IQIs) reflect quality of care inside hospitals and include:
   - Inpatient ► mortality for medical conditions
   - Inpatient mortality for surgical procedures
   - Utilization of procedures for which there are questions of overuse, underuse, or misuse
   - Volume of procedures for which there is evidence that a higher volume of procedures may be associated with lower mortality
3. Patient Safety Indicators (PSIs) also reflect quality of care inside hospitals, but focus on potentially avoidable complications.
4. Paediatric Quality Indicators (PDIs) both reflect quality of care inside hospitals and identify potentially avoidable hospitalizations among children.

On an **international level**, the Organization for Economic Co-Operation and Development (OECD) has recently developed International Health Care Quality Indicators responding to the growing interest by health care policymakers and researchers in OECD countries in measuring and reporting the quality of medical care. These indicators serve to compare the quality of different countries with different health care systems.

According to the OECD, quality indicators means "indicators for the technical quality with which medical care is provided, i. e. measures of health outcome or health improvement attributable to medical care (changes in ► health status attributable to preventive or curative activity)" (Kelly, Hurst 2006).

The recommended indicators from the OECD Health Care Quality Indicators Project are:

- Breast cancer survival
- Mammography screening
- Cervical cancer survival
- Cervical cancer screening

- Colorectal cancer survival
- Incidence of vaccine preventable diseases
- Coverage for basic vaccination
- Asthma mortality rate
- AMI 30-day case fatality rate
- Stroke 30-day case fatality rate
- Waiting time for femur fracture surgery
- Influenza vaccination for adults over 65
- Smoking rates.

The comparison of OECD countries according to the health care quality indicators in this project has shown that no country is among the best countries on all indicators and no country is among the worst countries on all indicators. Most of the countries have one or more indicators on which they are high performers and some other indicators where they are low-performers. The differences across countries may depend on several factors, for example the country specific disease incidence or prevalence of risk factors (age, gender, etc.).

Quality Assurance and Quality Management

In the well developed health care systems throughout the world, ► stakeholders in health care are concerned with health care quality. Even if the notion of quality is subjective, health care professionals try to incorporate quality indicators in their daily work and the terms of quality assurance and quality management are part of the health care sector. On the provider level, quality of health care is maintained or improved by measures of quality assurance and by an overall quality management. Quality assurance (or quality assessment) in health care intends to assure or improve the quality of care in a defined medical setting or program. Quality assurance includes the evaluation of the quality of care (for example through quality indicators), the identification of deficiencies and the activities leading to assure or improve quality.

Quality management describes the whole spectrum of activities leading to the continuous improvement of quality. It encompasses the planning of quality measures including quality assurance, the implementation of these measures in the service delivery process, regular checking of the effectiveness of the measures and the follow-up actions to ensure continuous improvement of quality. The quality management approach also analyzes the different factors that influence the quality of the delivery of health care, such as the use of practice guidelines, ► clinical pathways or protocols, the motivation of health care personnel through recognition of professional accomplishment or payment policies.

Country Examples of Quality Assurance

In all countries with well developed health care systems, quality assurance has become increasingly important at least on the national health policy level. With respect to the structure, processes and outcome of health care provision various programs and measures have been developed by the governments. On a provider level, there is in some countries a lack of implementation and transparency of the quality assurance programs. The following country examples highlight the different approaches to implementing quality assurance in health care:

In the United States, there is a growing concern about health care quality since the publication of three reports detailing quality-of-care deficiencies in 1998. The Agency for Healthcare Research and Quality (AHRQ) provides an annual update on quality of health care using performance measures to monitor quality progress in the United States in the National Healthcare Quality Report since 2003. Many health care organizations have implemented their own quality management systems based on the national standards set by AHRQ.

In Denmark, a national strategy for continuous quality development was defined in 1993. According to this strategy, counties and municipalities had to include quality measures in their goals for ► health plans. In this context, compulsory practice guidelines were applied for the first time assuring certain standards of quality of care.

In the Netherlands, quality assurance is an important goal of the public health policy. However, the development and implementation of quality assurance is largely the responsibility of health care providers who regulate themselves. The government acts only as a controller of the quality systems by supporting certification activities of health care providers.

In other countries, specific measures of quality assurance are implemented with great success: In Finland for example, there are quality assurance programs for prevention in the sector of mother-child care. In Switzerland, prevention in the dentistry sector especially for children is excellent.

Cross-References

- ▶ AHRQ
- ▶ Clinical Pathways
- ▶ Cost Containment
- ▶ Health Outcomes
- ▶ Health Status
- ▶ Managed Health Care Plans (U.S.)
- ▶ Morbidity
- ▶ Mortality
- ▶ Patient Satisfaction
- ▶ Quality of Care
- ▶ Rationing
- ▶ Stakeholders

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Health Care and Rehabilitation

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Introduction

Health care is defined as the prevention, treatment, and management of illness and the preservation of mental and physical well-being through the various services offered by the medical profession (physicians/doctors) and other professionals such as nurses, pharmacists, and therapists. The provision of those services constitutes a health care system, which is the response to the health problems of a society. The nature and format of health care delivery is strongly influenced by the respective health care system. The financing approach has the greatest influence within a health care system as it determines the payment and compensation structures for the health care provided. Public health is an important part of a health care system, with the objective of improving health, prolonging life, and improving the quality of life among whole populations through health promotion, disease prevention, and other forms of health intervention. Rather than individual health care that focuses on individual's illnesses and risk factors, public health serves the whole population with a focus on disease causes, means of disease prevention, and on processes and outcome of care.

There has been a wide array of different health care practices since the beginning of recorded history, of which medicine is the mainstream scientific tradition. It was developed in the Western world in around 1450 and is also called biomedicine, allopathic medicine, or Hippocratic tradition. Throughout the world, there are still several other health care practices separate from Western medicine. Health care practice combines science and art, with science and technology being the evidence base for many clinical problems for the general population. The application of this scientific knowledge combined with intuition and judgement to derive the correct individual diagnosis and corresponding treatment approach is the art of health care practice.

The health care industry is one of the major and fastest-growing industries worldwide and constitutes a key part of national economies. It covers over 10% of the gross domestic product (GDP) of most developed nations. For example, health care costs in 2005 for hospitals, doctors, nursing homes, diagnostic laboratories, pharmacies, medical device manufacturers, and other components of the health care system accounted for 15.3% of the GDP of the United States (US), the largest proportional expenditure of any country in the world. The 2005 average for the Organisation for Economic Co-operation and Development (OECD) countries was 9.0%, with the US, Switzerland (11.6%), and France (11.1%) having the top three highest proportional expenditures.

Health care addresses acute diseases as well as chronic diseases. Typically, acute care is delivered in high technology, intensive, institutional type settings such as hospitals or physician's practices. Acute care uses primarily medical care to fix or cure acute diseases or injuries. Chronic care is an array of integrated medical and non-medical services which take place in a variety of settings. The objective is to assist people with chronic conditions to live independent, full lives. Chronic care is a continuum of care that is required over a period of time for people who either never acquired or have lost functional abilities. Rehabilitation services are applied to both acute diseases and chronic conditions (diseases and disabilities), with a clear focus on the latter. In case of acute diseases, rehabilitation services are only used for a certain period of time ("subacute care") whereas for chronic conditions they are in most cases applied longer term. There is no temporal dividing line between acute and ► chronic disease as the difference in addressing the respective diseases is more attitudinal than temporal. Management of acute illness tends to focus on cause and cure while management of chronic disease tends to focus on limitation of effects, dealing with these effects, and maximizing patients' potential quality of life.

Profession

Although the physician ('doctor') holds the most important position within the ► health care profession, other professionals like nurses, therapists (e. g. occupational therapists, physiotherapists, and speech and language therapists), and pharmacists are also fundamental in offering their respective services. This is especially true for ► long-term care and rehabilitation, where the important role of interdisciplinary teams has become increasingly recognized in recent times.

The term physician is traditional and commonly used, especially in the US, whereas the term doctor is more common in other countries like the United Kingdom (UK); physician then often refers to specialists in internal medicine. The entry-level medical education programs in developed countries are tertiary-level courses offered by medical schools that usually belong to universities. After completion of the entry-level program, the graduated doctors often have to undertake a period of supervised practice prior to receiving full registration. The permission to practice must often be granted by government and is known as licensing in the US, registration in the UK, and approbation in Germany.

The general practitioner (GP) or family physician plays a vital role in many health care systems as he or she provides ► primary care by treating acute and chronic illnesses, provides preventive care, and offers health education for all ages and both sexes. GP is a common term in the UK and some other Commonwealth countries. A medical specialist is a physician who is specialized in a particular field of medicine. Medical specialists have to undertake additional training and internship to become sufficiently knowledgeable about a specific part of the human body. GPs usually see the patients first and refer them to the respective medical specialist if they cannot cure the illness or cannot identify the cause of the illness.

A nurse is – along with other health professionals – responsible for the treatment, safety, and recovery of acutely or chronically ill or injured people, health maintenance of the healthy, and treatment of life-threatening emergencies in various health care settings. Nurses might also be involved in medical and nursing research programs and they often offer a wide range of non-clinical services that are necessary for the delivery of health care. Although the structure of the nursing profession differs throughout the world, there are usually different levels of nursing practitioners depending on education, responsibility, and skills.

Pharmacists are drug therapy experts who optimize medication management to produce positive health outcomes. In a traditional view, pharmacists have primarily compounded and dispensed medications on the orders of physicians. In the recent past, the pharmacists' services have evolved towards clinical practice, medication review, and drug information. In some country legislation, those new roles have become mandated by law.

Distinct from the medical, pharmaceutical, and nursing professions, there are many other clinical healthcare professions, often summarized as allied health professions. They act as allies in the healthcare team and ensure that the healthcare system functions well. Titles and roles vary from country to country. Depending on the country and the local healthcare system, the following professions may be included: bioengineers, dental hygienists, diagnostic medical sonographers, electrocardiographic technicians, hemodialysis technicians, laboratory technicians, medical assistants, nutritionists & dietitians, occupational therapists, phlebotomists,

physical therapists, physician's assistants, radiographers, respiratory therapists, and speech therapists. Due to consistently increasing costs for health care, there has been a trend towards shifting patients away from expensive hospital treatment towards physician's practices and ambulatory clinics, resulting in an increased requirement for skilled health care delivery personnel. The allied health professionals increasingly have to adhere to national training and education standards, which is often reflected in diplomas and certified credentials that have to be accomplished.

Health Care Delivery

Health care delivery is the process of providing health care, with face-to-face delivery being the most common form. However, technological progress also allows for health care offerings in absentia by, for example, communication by phone or internet, video conferencing, emailing, text messaging, or any other form of non-face-to-face communication.

Health care provision can be differentiated into primary care, secondary care, and tertiary care. Primary care can be defined as "the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients and practicing in the context of family and community" (Green et al. 2004). Primary care is provided by physicians specifically trained for and skilled in comprehensive first contact and continuing care for persons with any undiagnosed sign, symptom, or health condition not limited by origin of the problem, organ system involved, or diagnosis. Primary care includes diagnosis and treatment of acute and chronic illnesses in a variety of health care settings as well as health promotion, disease prevention, health maintenance, counseling, and patient education. A significant proportion of all medical visits can be treated by the primary care provider. The primary care physician – often a GP or family physician – usually collaborates with other health care professionals utilizing consultation or referral as appropriate. When it comes to ► medical specializations, the primary care physician usually covers family practice, internal medicine, pediatrics, and at times obstetrics and gynecology.

Secondary care services are medical services offered by specialized physicians in their offices, clinics, or hospitals. Patients are often referred by the primary care physician who treated the patient first and required the expertise or procedures offered by specialists. Tertiary care medical services are offered by specialist hospitals or regional centers that are equipped with diagnostic and treatment facilities that are not available at local hospitals, clinics, or practices. Patients are usually referred to tertiary care settings by primary or secondary care personnel. Examples of tertiary care services are specialist cancer care, neurosurgery, burns care, and plastic surgery.

There is differentiation between systems that are primary care led and those that are more hospital-based, also called pluralistic systems. To prevent excess utilization of expensive secondary care services, some primary care based countries like UK or The Netherlands have introduced a referral system with the GP in a gate-keeping role. Patients in those countries only have access to hospital inpatient and outpatient services by means of referral. In the US, also primary care led, however, there has been a trend toward self-referral by patients for these services, rather than referral by primary care providers. Countries such as Germany and France (mostly with a social security system) that maintain parallel access to GPs and medical specialists use other means to ration the use of health care services like co-payments and other financial disincentives.

Acute Illness

Acute care covers the treatment of an acute period of illness, the treatment of injuries related to an accident or other trauma, and recovery from surgery. It is provided in a physician's practice or in a hospital by specialized personnel utilizing complex and sophisticated technical equipment and materials. When considering acute care, it can be differentiated into ► outpatient care, ► inpatient care, and self medication/self care. Outpatient (or ambulatory) care includes all health care services that are provided to patients who do not require an institutional bed as inpatients during the time when services are offered. Inpatient care applies to a patient who is formally admitted to an institution for treatment and has to stay for at least one night in the hospital or other institution providing inpatient care.

Inpatient care primarily takes place in hospitals and is provided by physicians, nurses, and other health care

professionals. Some patients only attend the hospital for diagnosis and/or therapy without staying overnight (outpatients), while the majority is formally admitted and stays overnight or for several weeks or months (inpatients). Hospitals are differentiated from other health care facilities by their ability to admit and care for patients. The most common type of hospital is the general hospital, which offers a broad range of medical specializations including an emergency ward to treat patients with immediate threats to health. A general hospital is usually the primary regional health care facility offering a significant share of beds for intensive care and other specialized facilities. There are also specialized hospitals, which include trauma centers, children's hospitals, seniors' (geriatric) hospitals, and hospitals dealing with specific medical needs such as psychiatric problems or pulmonary diseases. Some hospitals are affiliated with universities for medical research and the training of medical personnel. Many hospitals are still non-profit, however there is an increasing trend towards for-profit institutions in many developed countries.

Following an acute illness or operation like e. g. a hip replacement, ► short term rehabilitation is often required, also called sub-acute care. Short-term rehabilitation is considered appropriate when there is reasonable medical expectation of a significant functional improvement within 60 days of initial treatment. The services are usually performed by interdisciplinary teams, often under the direction of a physician. According to the needs and wishes of the patient, the services are either provided in a residential setting, the physician's or therapist's practice, or the patients own home.

Besides consultation with physicians, individuals increasingly take actions to maintain good health or respond to illness on their own. Those actions are summarized as self care, which includes self medication in the form of individual initiation and management of treatment instead of prescription by a health care professional. The increasing pressure on worldwide health care budgets has encouraged more self care as a way of managing demand for health care services. Going forward, it is therefore likely that pharmacists become increasingly involved in managing minor illnesses. Examples of those symptoms and conditions for which the public already regularly treats itself are headache, dandruff, heartburn, migraine, colds, and acid stomach.

Chronic Diseases and Disabilities

Chronic conditions are health problems that require ongoing management over a period of years or decades. Considered from this perspective, ► chronic diseases like ischemic heart disease, cancer, stroke, arthritis, chronic obstructive pulmonary disease, dementia, and depression comprise an enormously broad range of what appear on the surface to be distinct health issues. There is furthermore considerable ► impairment and disability associated with trauma and infectious diseases like HIV/AIDS, tuberculosis, and malaria prevalent in less developed countries. Throughout the world, there are about six hundred million people who live with disabilities of various types, of which around 80% live in low-income countries. Most of these people are poor and have only limited or no access to basic health care and rehabilitation services and facilities. The number of people with disabilities is increasing due to war injuries, landmines, HIV/AIDS, malnutrition, chronic diseases, substance abuse, accidents, environmental damage, population growth, and medical advances that preserve and prolong life.

Chronic conditions and disabilities presently comprise the major health burden in developed countries, and trends for developing countries forecast a similar situation. Non-communicable conditions and mental disorders accounted for around 60% of total mortality in the world and almost 50% of the global burden of disease in 2000. This share will increase to 60% of the global disease burden by the year 2020, with heart disease, stroke, depression, and cancer as the largest contributors. In developing countries, chronic conditions including injuries and mental disorders are even expected to be responsible for almost 80% of disease. Low and middle-income countries are the biggest contributors to the increase in burden of disease from non-communicable conditions. In China or India alone for example, there are more deaths attributed to cardiovascular disease than in all other industrialized countries combined. This implies that health care costs become excessive when the national health care systems do not succeed at efficiently managing and addressing chronic diseases. The costs associated with chronic diseases greatly exceed expenses for medical treatment but affect society as a whole.

Most health care systems have not yet developed and adjusted towards better reflecting the increasing need

for chronic care. The health care is often fragmented and still focused on acute and emergent symptoms. Although the individual's health behavior and adherence to therapies is crucial to treat chronic conditions, the information and skills provided to the patients to optimize handling of these conditions is often not considered essential or comprehensive. This is reflected in the fact that many health care systems usually do not include a long-term, goal-oriented plan for patients with chronic conditions, and relevant and reliable medical information is not available across providers or over time. The organization of health care often lacks the use of existing community programs, which is a particular issue in low-resource settings that cannot be sufficiently served by the existing primary care setups. Although many chronic conditions are preventable, health care professionals still quite often fail to regard their interactions with patients as opportunities to inform, educate, and motivate them about health promotion and disease prevention strategies. This information would enable patients and their families to improve their health, to prevent or delay the onset of chronic conditions, and to prevent and reduce complications related to chronic conditions for patients that already suffer from a chronic disease. Prevention and health promotion should be part of every health care encounter but this is still far from clinical reality. ► Managed care – as exists in the US and is emerging in other countries like Switzerland – has the potential to provide a range of integrated services required by people with chronic conditions, although the managed care industry is just beginning to realize and respond to chronic care needs.

► Long-term care involves individuals with chronic diseases and disabled persons, often elderly members of society. Long-term care refers to a continuum of medical services, social services, and housing designed to support the needs of people living with chronic health problems or disabilities that affect their ability to perform everyday activities. The goals of long-term care are much more complicated and considerably more difficult to measure than the goals of acute medical care. While the primary goal of acute care is to return an individual to a previous functioning level, long-term care aims to prevent deterioration and promote social adjustment to stages of decline. Long-term care includes a broad range of services emphasizing medical as well as social services. While acute care is usually limited to specialty providers, the providers of long-term care are more wide-ranging. They include traditional medical providers such as physicians and hospitals, rehabilitation providers such as physiotherapists, formal community caregivers such as home care agencies, facility providers such as nursing homes and assisted living facilities, and informal caregivers such as friends or family members. It is common for long-term care to provide custodial and non-skilled care, like assisting with normal daily tasks like dressing, bathing, and using the bathroom. Long-term care can be differentiated into institutional care and non-institutional care like ► community care.

Institutional (or facility) care comprises nursing home care and several kinds of supportive housing. Nursing homes provide institutional care for people recovering from an acute illness or for those whose chronic needs require skilled nursing care and significant assistance with activities of daily living (ADL) such as bathing, toileting, or transferring. Supportive housing is designed to provide group living, assistance with daily personal care, and protective oversight for people with long-term care needs. The various types of supportive housing services differ from country to country.

Community care is especially prevalent in Anglo-American countries like the US or UK. It can be either formal care like home health care and hospices or informal care, meaning in-home care and support by friends and family. Home health care, also known as domiciliary care, is health care provided in the patient's home by health care professionals. Home health care differs from home care or custodial care. Home care is non-medical care provided by persons who are not nurses, doctors, or other licensed medical personnel. Home health care may involve a wide variety of medical and social services and providers, depending on the patient's needs.

Hospices provide supportive emotional and spiritual services to terminally ill patients and their families, in addition to medical services. These services usually involve an interdisciplinary team that includes a physician, a nurse or nurse's aide, a social worker, a member of the clergy, and volunteers. Team members provide medical services, social services, and respite care for the patient and their family. The modern hospice is a relatively recent concept that originated and gained momentum in the UK after the founding of St. Christopher's Hospice in 1967. Since its beginning, the hospice movement has grown dramatically. The first hos-

pice in the United States was established in 1974. Hospice care is one form of ► palliative care that still most often occurs in the dying person's home. Palliative care concentrates on reducing the severity of the symptoms of a disease or slows its progress rather than providing a cure. It aims at improving quality of life by reducing or eliminating pain and other physical symptoms, enabling the patient to ease or resolve psychological and spiritual problems, and supporting the partner and family. Palliative treatment methods may also be applied to patients that suffer from side effects of curative treatments like, for example, the nausea associated with chemotherapy. Although palliative care is by no means a new concept, only a few physicians have put much focus on it in the past. Traditionally, the predominant goal of the physician was to cure patients; putting more efforts into making the conditions for the patients more comfortable and increasing quality of life was often interpreted as giving up on them. The concept of accomplishing a good quality of life has gained importance in the recent past; however, there is still a way to go.

In all countries, informal care provided by the family has always been and still is the major source of provision of long-term care. This is true for care of older persons as well as for care of patients with chronic conditions. However, the heavy burden of care cannot be shouldered by families alone. Due to a wide range of social, economic, demographic, and epidemiological factors, family resources are dwindling. In addition, family caregivers need guidance, support, and skills to manage this often complex care. The growing demand for home care means that families that do not have sufficient know-how are often left to deal with the caregiving responsibility and effort on their own. Effective long-term policies are therefore a key challenge for many health care systems around the world. There is no single solution that covers all the national issues and countries are therefore evaluating several different approaches. Yet, they are still not shared appropriately and comprehensively to enable other countries to use the existing knowledge and establish long-term care as an integral part of their health and social systems.

Table 1 summarizes the characteristics of acute and chronic care.

Rehabilitation

With the increase in chronic diseases and disabilities, rehabilitation medicine has emerged and developed in the recent past. Rehabilitation services primarily address disabled and chronically ill persons; ► short-term rehabilitation also covers acute illnesses, as explained above. Rehabilitation is an active and dynamic process by which a disabled person is helped to acquire knowledge and skills in order to

Health Care and Rehabilitation, Table 1 Characteristics of acute care and chronic care

Characteristics	Acute care	Chronic care
Goals of care	Cure: Restore to previous level of functioning	Assistance and care: Maintain independent living Facilitate successful personal and social adjustment Minimize further deterioration of physical and mental health Prevent acute exacerbations of chronic conditions
Providers of care	Specially trained health care and human services professionals in institutions set up for acute care purposes	Multiple caregiver sources and settings, often includes network of relatives, friends, and community services along with hospital, home health care, and social service professionals
Scope of care	Primary care with specialist support if required	Broad scope of social, community, and personal services, as well as medical and rehabilitative care
Quality of care measures	Significant government investment in many developed countries in outcome measures and quality of care standards for most hospital-based acute conditions	Relatively few measures to assess quality of care
Care delivery setup	Typically occurs within one organization	Multiple organizations involved; collaboration required

maximize physical, psychological, and social function, thus promoting activity and participation. Rehabilitation approaches can aim at:

- reducing disability
- acquiring new skills and strategies that reduce the impact of the disability
- altering the physical and social environment to allow for easier functioning with the given disability.

The key benefits of rehabilitation are improved functional outcomes, reduced unnecessary complications, and better coordination and use of resources. One key element of rehabilitation is team work, which involves a wide array of different professionals. ► Rehabilitation teams can work in many different contexts like hospital based, mainly consisting of physicians, therapists, and nurses, or community based, involving local authority employees such as social workers and community occupational therapists. The rehabilitation team has to function as a coherent whole, allowing client-centered goals to be set and monitored. Thus, the team has to be outcome oriented instead of discipline oriented. The rehabilitation core team generally consists of a rehabilitation nurse, a clinical neuropsychologist, an occupational therapist, a psychotherapist, a speech and language therapist, and a rehabilitation physician.

As for health care, there are again different organizational models of ► rehabilitation delivery. There is no single way to develop a rehabilitation service and the physical base, team, structure, scope, and range of the services provided differs from community to community and from country to country. Inpatient rehabilitation takes place in the hospital in a dedicated rehabilitation unit that is usually able to deliver all standard post-acute inpatient rehabilitation. In the case of regional hospitals, the rehabilitation unit often consists of more specialized therapists, physicians, and nurses and will probably contain a more specialized range of equipment and assessment facilities. In many countries, those specialized services are also offered in specific inpatient rehabilitation clinics. Outpatient rehabilitation can be performed at the disabled person's home, in outpatient rehabilitation centers, or at the specialist therapist's office.

The delivery models described are primarily applicable to health systems in the Western World. A large part of the rest of the world, especially developing countries, has less than adequate rehabilitation resources and facilities. Thus, other models had to be developed to overcome those difficulties. The World Health Organization (WHO) initiated the concept of ► community based rehabilitation (CBR) as part of general community development efforts aiming at the rehabilitation, equalization of opportunities, and social inclusion of all people with disabilities. Its implementation is driven though the combined efforts of the people with disabilities, their families, organizations, communities, and the relevant governmental and non-governmental health, education, vocational, social, and other services. CBR has evolved in recent years towards putting more emphasis on human rights, ongoing actions to address inequalities and alleviate poverty, and expansion of the role and influence of Organizations of Persons with Disabilities (DPOs), which have been established and strengthened in many countries.

The objective of the WHO concept of an inclusive community is the adaptation of the structures and procedures of the community to facilitate the inclusion of people with disabilities. It focuses on all citizens and their entitlement to equal treatment, including those with disabilities, and thus benefits all people in the community, not just those with disabilities. A characteristic of CBR and similar programs is the involvement of the disabled people and their representatives. To enforce equal opportunities for people with disabilities, a common, multi-sectoral approach involving communities, DPOs, national policies, different government ministries, NGOs, and other stakeholders is necessary.

Summary

The development of health care in the last century has been characterized by increasing differentiation in the tasks of physicians, resulting in the development of a range of disciplines. On one hand, there are physicians with generalist tasks, mostly working outside the hospitals, who fulfill an important role in prevention and treatment of diseases in populations. On the other hand, there are specialists who are increasingly focused in narrow areas of health care, offering those services mostly in hospital settings and losing the connection to the community. The future society will be an aging one with the concurrent burden of degenerative diseases. The "Health for All" call made in 1978 at the WHO conference in Alma Ata which aimed at achieving this approach to health care has failed in many instances. This is partly driven by the fact that primary care still

needs to further improve and delineate its role in public health care to achieve health for all. The individualist, high-cost hospital-based care system will neither be affordable in the future, nor deal with the problems facing our society. An effective approach to address those newly emerging health problems requires changing the structure of the hospital-based health system towards a public health oriented, community-based structure, as has already been partly implemented in long-term care. Rehabilitation services have to be integrated within this approach given the increasing demand for those services by both disabled and chronically ill people, especially the elderly. This is especially true for developing and poorer countries where, for example, community based rehabilitation points towards the right direction. All of this implies that collaboration between public health and individual health care is required to bridge the gap between the two disciplines and achieve health for all people. The provision of a community-oriented health care system seems inevitable in many countries as the hospital-based health care system will not be able to solve the problems of health care in the future.

Cross-References

- ► Chronic Diseases
- ► Community Based Rehabilitation
- ► Community Care
- ► Health Care Profession
- ► Impairment and Disability
- ► Inpatient Care
- ► Long-Term Care
- ► Managed Care
- ► Medical Specializations
- ► Outpatient Care
- ► Palliative Care
- ► Primary Care
- ► Rehabilitation Delivery
- ► Rehabilitation Teams
- ► Short-Term Rehabilitation

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Health Care Services

Synonyms

Medical care services; Health care

Definition

► Health care services are defined as services aimed at prevention, treatment and rehabilitation of illness through the services provided by different health care professionals such as physicians, nurses, etc.

Health Care System Reforms

► Health Systems Reforms

Health Care Systems

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Synonyms

Health system

Definition

Health care systems are organizations where health services and health care are provided. They can be divided into three subgroups: state health services, social health security systems, and private health insurance systems. There is no overall accepted definition for health care systems. As an interdisciplinary field of research, health care systems aim at promoting and maintaining the population's health. Thus, they have contributed greatly to better health. How they act and are implemented depends on which services are provided and how the health care systems are organized.

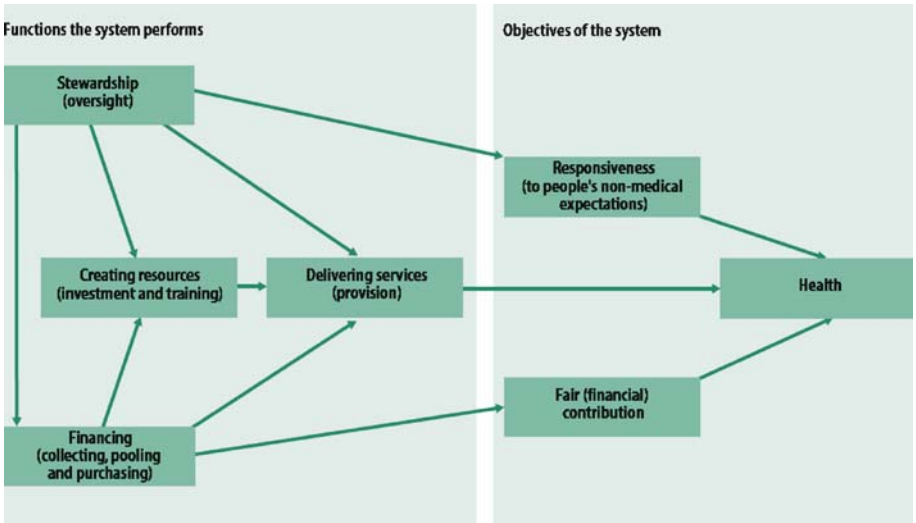
Basic Characteristics

Besides individual behavior and personal circumstances, an individual's health is also affected by health care systems, starting with care during pregnancy and delivery of a healthy baby and up to care of the elderly. As an interdisciplinary field of research, health care systems aim primarily to promote and maintain the population's health. Thus, the lives of most people are dependent on health systems. Intention and overall aims are to improve the well-being of the individual or population, minimize risk factors, and identify and treat diseases (Schwartz and Janus 2006). Health care systems are based in institutional structures, which differ from nation to nation. Financing of these systems is guaranteed by both public (e. g. taxes) and private funds (e. g. donations).

What are Health Systems?

As there are many influencing factors on health, such as nutrition, physical activity, social circumstances, workplaces, and so on, health care systems and the definition of a health care system often vary. This is not only the case on an international and national level but on a regional level too. There is no precise definition existing regarding what health care systems are – neither on a national nor on an international level. According to the definition from the World Health Organization (WHO), there is no specified frame regarding what a health care system stands for, where it starts, and where it ends. Finally, a health system is defined as "*... all the activities whose primary purpose is to promote, restore or maintain health.*" (WHO 2000). This statement includes both health activities that have a direct impact on the individual's health, as primary prevention and health promotion, and also covers activities with a secondary health-enhancing effect, like improving environmental safety. Although the definition of health care systems is not precisely given, these systems "*... today represent one of the largest sectors in the world economy*." (WHO 2000). Development started in 1883 when Germany enacted a law for the health of low-wage workers and thus started the first social insurance model. Many nations worldwide followed and adopted the law on a national level.

In general, health care systems are organizations from which health care is provided. These vary widely from one nation to another. If comparing the systems among different countries, the financing and management of the health care systems are appropriate aspects to compare. Funding can be public or private and control can be led by governmental or public bodies. Thus, health systems are mainly characterized by great dif-



Health Care Systems, Figure 1 Relations between functions and objectives of a health system (WHO 2000)

ferences in organization and funding. These differences often lead to diverse outcomes in health policies and, finally, health within the population itself. It follows that mistakes in investment in a health system have long-lasting consequences for all individuals and systems involved. Health system research therefore aims at developing tools for describing these differences and tries to improve circumstances for better health (WHO 2000).

Much preventable disease could have been prevented by a well-established health system that reaches the whole population and aims at promoting health and preventing diseases. Particularly deprived people are affected by unequal distribution. The intention is to compare health systems by looking at what they achieve and what they really do in terms of realizing their overall goals (Roemer 1991). Figure 1 gives an overview on how functions and objectives of health care systems are related to another.

Three fundamental objectives are recognized for health care systems – improving the health of the population they serve, responding to people's expectations, and providing financial protection against the costs of ill-health (WHO 2000). For implementing these on a national level, the impact of policy and its decisions is fundamental. Individual circumstances within each country lead to different implementation of these objectives. Resources differ and health problems within each country vary. Influences such as distribution of income and wealth or impact of climate constitute no real indicators.

Success in the overall frame of health systems covers the effective control of diseases (WHO 2000). The final aim is the protection and improvement of health of the population; inequalities have to be limited by fairness and without discrimination. Resources in health systems need to be raised appropriately.

Health systems in all nations have a great impact on the health of an individual. With their design, management, and financing they contribute to better health for all by affecting people's lives directly. After undergoing reforms in the past 100 years and concentrating on the extension of the social insurance system, health systems' focus is now on the promotion of primary health care.

A problem that still exists is the unequal distribution of resources within different international health care systems. Generally, they should integrate people's health needs and their expectations. Often, there exists an unbalance between these expectations and reality, particularly with regard to tariffs that people have to pay and the benefits they get in return. Misuse of the health system's power can lead to harm rather than to a well structured and organized system. Thus, the intention of health care systems is not implemented as it is supposed to be and preventable diseases occur that could have been avoided. These aspects lead to a high potential for improvement of health care systems and their funding, starting at the policy level.

An overall objective of health care systems is the health of the whole population from the beginning of their lives. Aiming at implementing this goal requires the

best management and financial distribution with respect to current improvements and political circumstances, influencing whether health care systems do their job effectively or not.

Finally, demographic changes and medical and technical improvements have to be taken into account. This aspect leads to increased expenditures in health care systems, and affects all nations (WHO 2000).

Policy's interest has to be to help health systems to use their own resources for achieving goals. Furthermore, policy-makers need to find out how health systems are structured and how they work. These findings are fundamental for understanding and, thus, for improvement of health care systems, giving support within their resources. On the other hand, it is not only the health care system that influences the individual's health. It is in the population's interest to pursue resolutely their rights and obligations, leading to them being better informed. People should be able to integrate their expectations in order to become an active part of the whole health care system. In addition, through comparisons of experiences from other nations, the individual health care systems can be adopted according to their specific cultural, historical, and social circumstances.

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Health Care Teams in Palliative Care

Synonyms

Interdisciplinary palliative care groups; Multimodality hospice approach

Definition

In palliative medicine and hospice care transdisciplinary work is fundamental. Groups of physicians, nurses, social workers, physiotherapists, occupational and complimentary therapists, hospice chaplains, family members, housekeepers and volunteers provide the best chance for successful health care in patients with incurable illnesses. They support the critically ill patient medically on the one hand, and psychologically on the other hand. The caregivers are by themselves under severe emotional stress.

Health Care Utilization

► Health Determinants, Economic

Health Change

Synonyms

Health outcome

Definition

Health outcomes describe the change in the ► health status of an individual due to a clinical intervention or therapy. To measure health outcomes, health professionals establish a list of the end results of a particular health intervention according to the experience of the patients. It includes for example the change of the ability to function in everyday life and the general perception of well-being. The research of health outcomes that links the care patients receive to the outcomes they experience has become an important factor to monitor and improve the quality of health care (► health care quality).

Health Communication

Definition

Health communication is the art and technique of informing, influencing, and motivating individual, institutional, and public audiences about important health issues. The scope of health communication includes

disease prevention, health promotion, health care policy, and the business of health care, as well as enhancement of the quality of life and health of individuals within the community.

Health Control

Synonyms

Health promotion; Healthy public policy; Disease prevention

Definition

Health control includes the policies and processes that enable people to increase control over and improve their health, as is stated in the Ottawa Charter for Health Promotion (1986). These address the needs of the population as a whole in the context of their daily lives, rather than focusing on people at risk for specific diseases, and are directed toward action based on public policies on the determinants or causes of health. The main goal is a progress towards a healthier world.

Health promotion must become an integral part of domestic and foreign policy and international relations, including in a situation of war and conflict. To achieve this, it is necessary to promote dialog and cooperation among nation states, civil society and the private sector. An example of such a successful treaty to improve health of the population is the World Health Organization Framework Convention on Tobacco Control.

Cross-References

- ► Disease Prevention
- ► Health Promotion
- ► Healthy Public Policy

Health Data

Synonyms

Confidentiality; Data protection

Definition

An individual's claim to limit access by others to aspects of one's personal life, notably including one's identifiable health data.

Health Data Management

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Definition

Health data management comprises all activities relating to managing health data as a valuable resource. It encompasses acquiring, entering, processing, coding, outputting, retrieving and storing of data gathered in the different areas of health care, for example at the level of health care providers (physicians, hospitals, pharmacies and other health care facilities) and at the level of health care payers (health insurances, social insurances). Health data management also embraces the validation and control of data according to legal or professional requirements.

Basic Characteristics

Evolution of Health Data Management

As a result of the great progress in information and communication technologies over the last years, the landscape of health care delivery and medical data management has significantly changed. In contrast to former health data management through paper records that stored physically data where it has been produced, there are today more and more health care areas in which data are managed electronically. In many health care provider organizations, information technology plays an important role not only for document management, but also for administrative activities and clinical processes. Electronic data management allows improved physician's access to clinical data, the use of bar coding, computerized prescriptions and numerous software applications supporting health care providers in the ► reimbursement process via ► diagnosis related groups as well as in their quality assessments (► health care quality). With rising cost-consciousness in the health care sector, the need for information automation as well as for transparency of resource utilization

is increasing. As a result, information technology and computer science continue to have a great potential in the health care and medical world. Health care payers, for example, turn increasingly to ► business intelligence tools and analytical data processing systems to evaluate cost, utilization and effectiveness of health care services. The growing efforts towards Integrated Health Care (► integrated health care) led to further developments of ► telemedicine (or ► e-health applications) as an important tool to improve access to services for patients in more remote areas and to offer distance learning for health care professionals. Another popular development, electronic health or patient records are increasingly applied to centralize patients' information of the different services provided in one health care unit or across several health care units. Further developments head towards so-called "patient smart cards" loaded with clinical and demographic information. These developments require organizational, functional and scientific knowledge as well as ethical and legal standards for data quality, information security, access control and privacy.

Challenges: Standardization and Norms

Ethical aspects concerning the secure distribution of sensitive medical information, the balance between groups of patients' needs, expectations of health professionals and the health care industry's requirements are major challenges to the recent development of health data management.

In all countries with well developed health care systems, efforts on national and international levels to set norms for electronic health data management can be observed. Recommendations are formulated to:

- harmonize standards for data exchange, e. g. harmonization of formats, syntax, headers, links, etc.
- protect database access and patient identification, e. g. digital signature for health professionals, unique identification process for patients, etc.
- define the role for health data management and the electronic health record including long term preservation and a set of minimal functions
- evaluate conformity to existing norms and standards on an international level

In most countries governments are setting legal standards for health data management. In Europe, the European Committee for Standardization delivers proposals and recommendations on standards for health informatics and ► e-health (European Committee for Standardization 2005).

Electronic Health Records (EHR)

In all developed health care systems, the introduction, or broader application of, ► electronic health records is a highly discussed topic.

Definition EHR capture and manage the whole history of patient health information. They function as the physician's primary information resource during the delivery of care.

Advantages and Risks EHR enable doctors, administrators and patients to benefit from a rich and sophisticated informational environment. As individual medical records can be electronically linked and aggregated, they promise a more comprehensive and coordinated health care approach for patients. On a community or national level, EHR provide a previously impossible insight into the health of population groups and therefore offer new opportunities for epidemiological studies.

EHR support the monitoring and evaluation of the quality of care provided, the effectiveness of the health care organization's infrastructure and the utilization of practice guidelines (► infrastructure and service delivery). Electronic patient data facilitates the accountability in health care as ► resource allocation, ► reimbursements, ► health outcomes and risks (co-morbidities and side-effects) become transparent. From the epidemiological perspective, EHR offers the possibility to realize new comprehensive studies of population health, risk factors and disease burdens thanks to the provision of appropriately masked long term information on a much broader basis than former survey data. Furthermore, the various scientific research institutes will be able to exploit electronically available patient data in order to improve the overall information about the health care system.

However, electronically available patient records make access and distribution of data easier and could therefore threaten privacy and lead health insurers to discriminate against patients with high-risk disease profiles. The electronic management of health data could be vulnerable to unauthorized access and exploitation.

Conclusion

Despite the advantages of EHR, ethical standards have to be imposed externally on every organization dealing with personal health data in order to ensure respect for the well-being and dignity of patients and to protect their interests. As physicians have the obligation of confidentiality and, generally, patients own their own health records, it is they who decide to authorize physicians to disclose health data or not.

The future of EHR is a question of balance between the protection of individual ► privacy rights and the realization of public benefits from electronic health information. The use of EHR depends ultimately on successful de-identification to make health records anonymous and patients' consent authorizing health data disclosure.

Cross-References

- ► Business Intelligence Tools
- ► Diagnosis Related Groups (DRGs)
- ► e-Health
- ► Electronic Health Record (EHR)
- ► Health Care Quality
- ► Health Outcomes
- ► Infrastructure and Service Delivery
- ► Integrated Health Care
- ► Privacy Rights
- ► Reimbursement
- ► Resource Allocation
- ► Telemedicine

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Health Data Protection

Synonyms

Confidentiality

Definition

A subset of ► privacy that focuses on health data protections arising from a relationship of trust between individuals (e. g., relationships between physicians and patients, researchers and human subjects, genetic counselors and clients).

Health Determinants

Synonyms

Factors that influence health

Definition

The events and environmental factors that give rise to the immediate causal factors are often termed "determinants". Health determinants include physical, biological, behavioral, social, and cultural factors.

Among physical factors the most important ones are climate and geographical characteristics of a particular region.

Biological determinants may be inherited or acquired.

Social determinants of health are very complex. Perhaps the broadest social determinant of health is a country's level of social and economic development.

Cultural factors influence behavioral patterns that in turn may promote or endanger health.

Health Determinants, Economic

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Synonyms

Health care access; Health care utilization; Medical outcomes; Economic evaluation; Health impact assessment; Demand of health care

Definition

Health status is influenced by a multitude of factors. The health status and the health-related quality of life of individuals, or a specific population, are fundamentally determined by the environment and the circumstances (health determinants) of a person, or a population. It can be further assumed that economic circumstances have a considerable influence on the environment. Ironically, not only has the economy an influence on health status but health status has an enormous influence on income and economic growth. Our health status and our ► health-related quality of life is dependent on where we live, the condition of our environment, our individual genetic make-up, our income and educational level and social status. It is obvious that health determinants have to be included in a health economic analysis. Besides genetic prerequisites (biology and genetic endowment), gender and culture it is clear that economic circumstances have an enormous influence on health and health-related quality of life.

- **Social and economic environment:** Health is dependent on income and social status. The bigger the differences between the rich and the poor, the larger the differences are in the health status of a society. Resources should be sufficiently available to guarantee the imbedding of the individual into social support networks and social environments.
- **Physical environment:** An environment which maintains health requires a corresponding infrastructure which maintains a healthy environment (water, air, traffic, and home) and healthy working conditions. Health services which provide prevention, diagnosis and therapy have to be available. Individuals and the society in which they live have to have sufficient financial resources to maintain the desired environment and provide the essential infrastructures.
- **Individual characteristics and behaviors:** People with a low standard of education and literacy tend to be less healthy. Inadequate working conditions, stress and little self-esteem have negative effects on health. People who have secure employment are healthier, particularly if they have control over their work environment and their job. Balanced nutritional habits, physical activity, personal health practices and coping skills have a positive effect too. The fundamentals of healthy living are formed in childhood. It is essential to support individuals and whole populations; sufficient personal financial resources have to be provided.

Basic Characteristics

Health and Economic Growth

The targets of a health care system are the maintenance, support and recovery of the population's health in its group-specific and regional sub-structures. Objectives for political action can be derived from the general and special factors which determine health status and the health-related quality of life. Health policy related decisions can be aligned to the scope of actions mentioned above. Health equals wealth: countries with a high level of health grow faster than countries with a low level of health. There is also a linkage between improved health and the escape from poverty. Health interventions are subject to political decision-making processes since financial and social resources have to be utilized. From the economic point of view, scarce resources need to be utilized optimally; thereby maximizing the benefit for the individual and/or the whole society, thus, the health sector makes an important contribution to the welfare of a society. Despite the constant regrets about increasing expenditures, a paradigm shift is presently taking place in the perception of the health and social sector.

Health can no longer be seen as a dependent variable of economic and social development but has to be recognized as a factor for ► economic growth. This was recognized by the WHO commission examining the interrelations among investments in health, economic growth and poverty reduction (WHO Commission on Macroeconomics and Health 2001). The report on "Macroeconomics and Health: investing in health for economic development" detects several key findings: A worldwide scaling up of health interventions for the low-income countries of $30 to $40 per person will require approximately $27 billion per year in donor grants by 2007 ($38 billion per year by 2015). Around $6 billion per year are currently provided. These investments would save up to eight millions lives and they would translate into hundreds of billions of dollars of increased income. So, besides the expense of maintaining health, which burdens the economic disbursements for social systems and the nation's competitiveness subject to financial plans, the contribution of health care

to economic growth and employment is documented. The health status of the population has a qualitative and quantitative influence on human resources of a society and therefore is an essential input factor for economic growth. The productivity of workers is improved by health (qualitative dimension) and by the reduction of illness the number of workers is increased (quantitative dimension). Also, the market for individual health services with its various products, services and facilities is itself an industry where enormous sales can be made and in which many people can find jobs. The demand for a higher quality of life and a best possible state of health is not just based on an ethical and moral sense of justice; health represents a productive resource and therefore is of social value and promotes the growth of a society as a whole.

International differences in life expectancy provide a cross-national challenge concerning the maintenance, re-establishment and promotion of health as well as the financing of health services. Health-related political targets, outlined above, are dependent on the economic power or the social wealth of a country. Based on extensive literature, there is an obvious link or interrelation between health and poverty. Moreover there is an interrelation between health expenditure, gross domestic product, education and life expectancy. Taking these indicators into account the various health determinants are important parameters in a country's economy.

Health Determinants and Evaluation

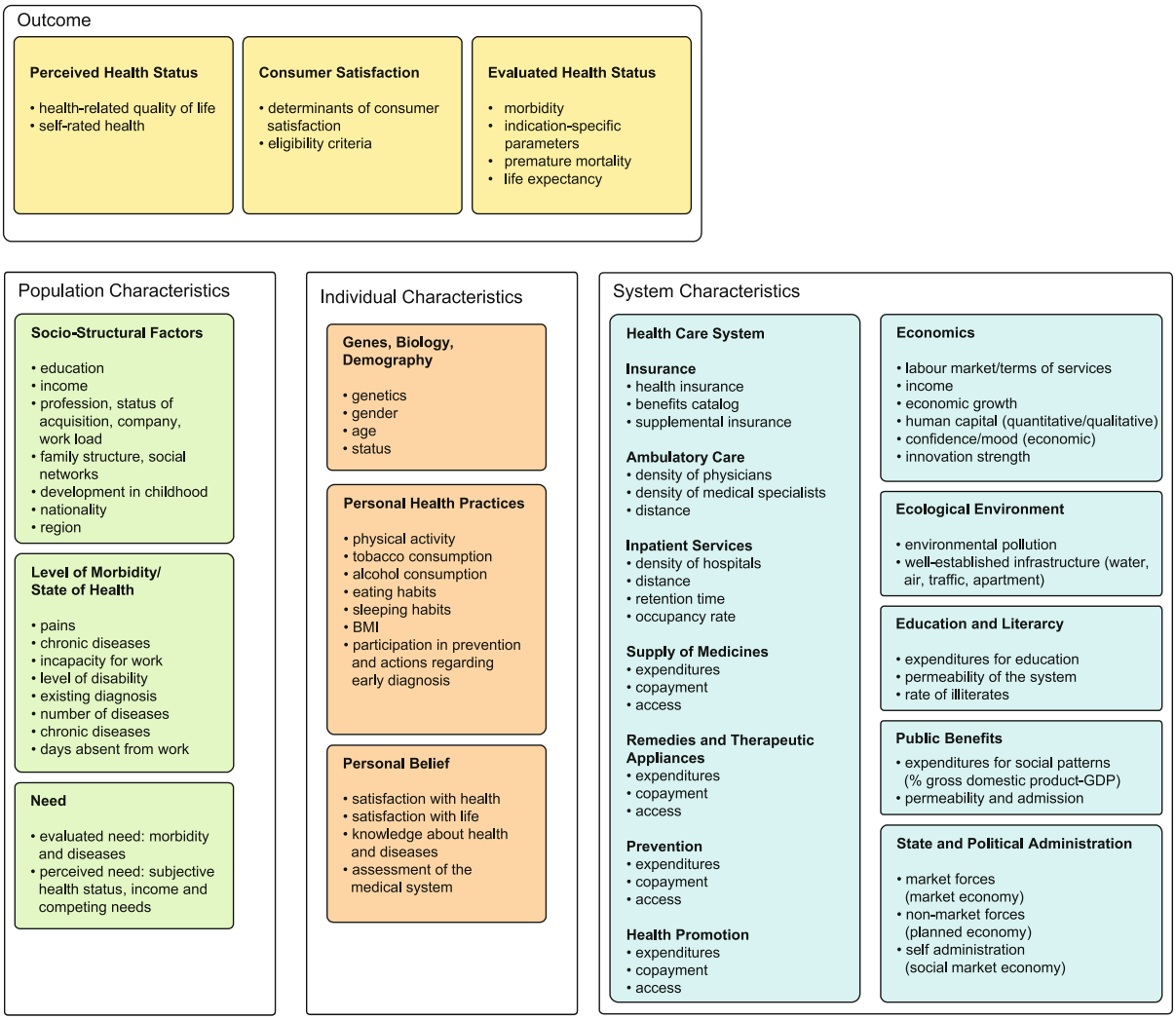
Measures of health promotion and health care interventions aim to affect health determinants. Intervention at both a governmental and a personal level are required. So, substantial environment, social environment and personnel resources need to be provided to promote changes in behavior – with the aim of increasing life expectancy and a health-related quality of life and reducing morbidity and early mortality. In terms of an optimal use of scarce health resources the achieved results (medical outcome and health-related quality of life) must be in relation to the used resources (input factors). Health economics play an important part in the evaluation of health and health care interventions and provide a set of techniques to assist decision making in the health care sector, to promote efficiency and ► equity. Making optimal decisions concerning the allocation of scarce resources can make a big difference in the degree to which health care systems continue to function; ultimately it can mean saving more lives and providing a better quality of life (social benefits). Health economics is about maximizing social benefits obtained from constrained health producing resources.

The ► health economic evaluation makes a comparison between alternative courses of action, therefore the existing options are evaluated in terms of both their costs and their benefits (Drummond 2005). On this basis a ► health impact assessment intends to identify the positive or negative impact, effectiveness, efficiency and eligibility of different populations. Due to complex causal pathways between interventions (projects, programs or political/social strategies) and a potential health impact at the individual or population-related level, a verification is often hardly possible. Numerous confounding factors do influence the outcome and impact (health status) so that the verification of an existing correlation between alternative action and changes of health status and a health-related quality of life is quite difficult (Andersen 1995; Sprangers and Schwartz 1999).

First the health determinants have to be registered and their influence or causal effect chain has to be described. Regarding the documentation of the results sources have to be made transparent and missing or incomplete information has to be pointed out. A comprehensive representation is based on qualitative and quantitative evidence. Therefore a model of demand and production of health-related products/services is required – including predisposing characteristics, enabling resource as well as need's influencing factors.

Demand and Health Care Utilization of Health Goods and Services

Due to the requirements mentioned above two theories out of economics and social sciences should be focused on in the following. Health economics deals with the claims and the production of medical care and health promotion. The supply and demand are described by models which explain the behavior of the interested people and contractors by economical decisions. Regarding the empirical revision of the assumption it has to be noted that the socio-scientific and health economic models are overlapping and develop into multivariate models. Socio-scientific and economic analysis



Health Determinants, Economic, Figure 1 Individual-, system- and production characteristics effecting health status

point out the behavior of individuals or whole populations by means of population-related and system-related characteristics. These can be completed by result-related characteristics of politics and production-related features.

One health economic model for estimating demands or claims on health goods and health services is the so-called Grossman Model (Grossman 1972). According to the basic models for the household productions Grossmann established a periodical model to present the demand for health. In 1986 Wagstaff developed a simplified presentation which is based on periodical presentations of Grossmann 1972 and also represents his three basic assumptions:

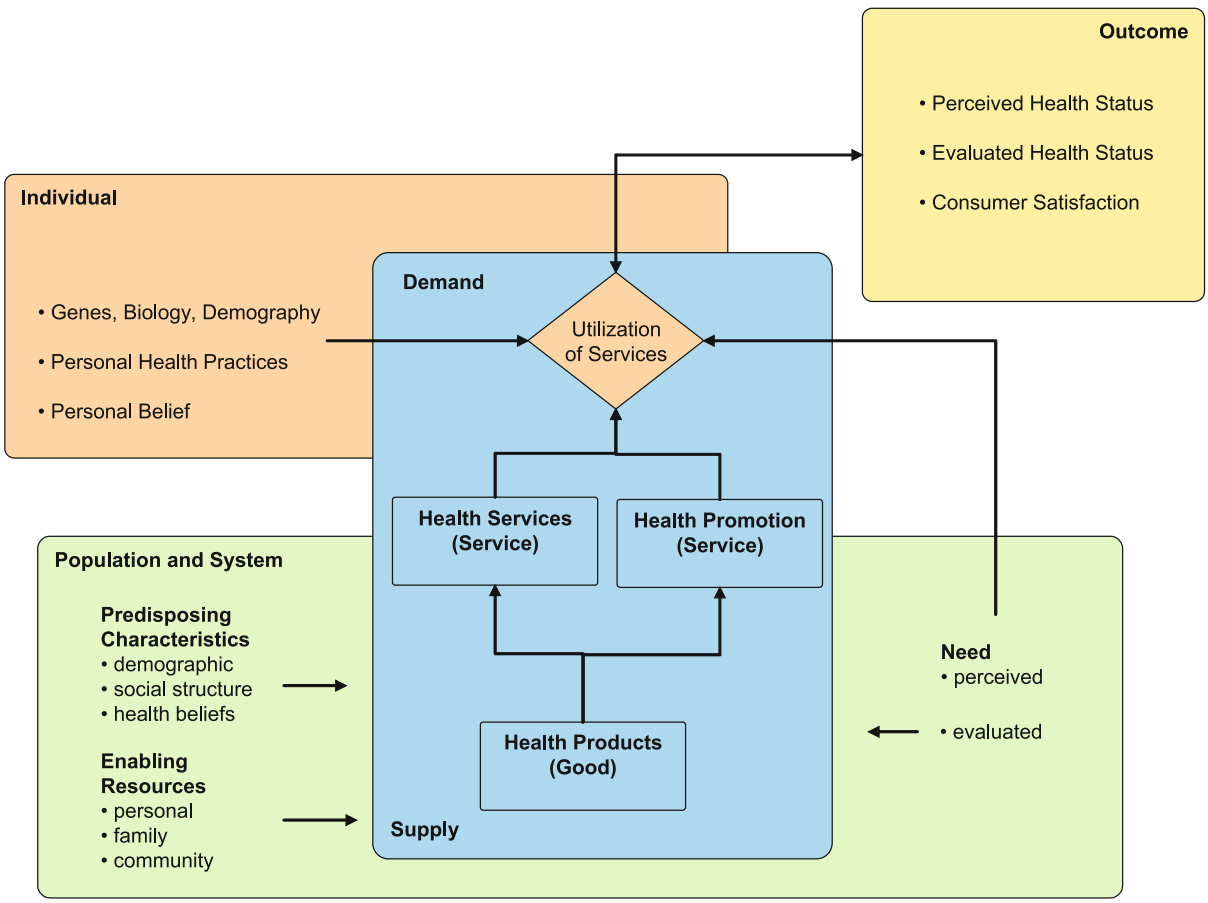
- Health is a human need besides other needs. With no doubt a good health status is the aim of every person; however, health is also competed with other needs. The satisfaction of these needs is competed with health: first by the consumption of scarce resources which could be used by health goods, on the other hand through the direct influence of health (smoking, alcohol etc.). The thesis, that health may be seen as the "uppermost commodity", can be questioned – often harmful behaviors are noticed. The capital stock of health depends on the claims of medical services and a deduction rate which is explicitly defined as a role of age (of capital stock of health) and the intensity of its use. With the help of the

deduction rate characteristics like health behavior or the education level can also be integrated into the model.

- The person's state of health is determined by the consumption of health goods or health services.
- In this model the demand for medical services is interpreted as a derived demand, i. e. the individual asks for health and not medical services. By the use of services (medical and custodial care or services of other professions in the field of cure) or the use of products (drugs, medical engineering, other means etc.) the health of the individual can be kept or restored completely or partly. The target regarding the consumption of health goods is the prolongation of life at simultaneous attention of the quality of life. The consumption of health goods or services takes place with exchange that is connected to costs. A connection between the earned income and the state of health can be established by ascribing an intensive and consumption use to a higher capital stock of health. There are only limited resources that are available for people interested in goods. Apart from an underlying health insurance, the basics of the model can be seen to be that the consumer of health services has to pay for it directly, i. e. he or she has to raise the amount for medical care, services or health products within the limited budget.

Some statements of the Grossman model have been disproved by the empirical evidence. According to the model the state of health and the demand for medical services have to be correlated positively, this has not been confirmed empirically.

Within the production of health services there is a distinction between the service level of the manufactoring of health products (level I: secondary sector) and the establishing of services (level II: tertiary sector).



Health Determinants, Economic, Figure 2 Synthesis of the determinants of the demands and the production of health

In economics, a service is the non-material equivalent of a commodity. The delivery of these services typically involves the following factors: service providers, equipment and physical facilities for service provision, the client and customer contact. During the provision of a health service a high degree of interaction between patient and service provider is required. The patient's cooperation is an additional component of the production (additional input factor). Therefore it is difficult to analyze behavior like utilization of health care services and the resulting outcomes.

A socio-scientific behavioral model was already published by Andersen at the beginning of 1970 (subsuming: Andersen 1995). This basic approach which was steadily developed over the years, contains a wide (potentially complete) spectrum of categories for subsuming of individual and social determinants which can influence the utilization of health services. The model is suitable for putting in an analytical order categories or determinants which can be consulted for the description, explanation and forecast of the utilization. The categories Predisposing Characteristics, Enabling Resources and Need are in the center of the model as magnitudes of influence on the demands of health services.

- **Predisposing Characteristics:** With this underlying item Andersen summarizes all features which indirectly affect the demands. These features include different areas like demography (age, gender), social structure (social status, education, etc.) and health beliefs (attitudes, values and knowledge related to health).
- **Enabling Resources:** These resources describe necessary conditions for the use of health services. It is distinguished between personal (income and the existence of health insurance and additional insurances) and community-related resources (the existence and the reachability of facilities at the habitation and working place).
- **Need:** Interestingly enough Andersen distinguishes between an affected person's need (according to the individual needs) and one by a professional sentence objectified need (subjective sentence of an expert).

Later the model was completed with the components *Outcomes* and *Environment*. Moreover Andersen and his co-workers completed the model with feedbacks of outcomes on ► population characteristics (population-related features) and on the health behavior. There are many international studies which base on the model of Andersen. The empirical explanatory power strength of Andersen's model is about 25% of the interindividual variance. The most important explanatory variable is the subjective assessment of own symptoms (Need) while other factors play a smaller role. Figure 2 gives a summary of the most important factors for the classification of the determinants related to health care utilization.

Cross-References

► Economic Growth
► Equity
► Health Economic Evaluation
► Health Impact Assessment (HIA)
► Health-Related Quality of Life (HRQOL)
► Population Characteristics (Demographics)

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Health Determinants, Environmental

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Synonyms

Environment-related determinants of health; Environmental health determinants; Social and physical factors influencing human health

Definition

The emphasis which research and public discussion are increasingly placing on environment and health is an expression of the growing importance which long-term assurance and improvement of both living conditions and the environment have as indicators and determinants of human health and welfare. The World Health Organization (WHO 1998) uses the term 'environmental health' to include all physical, chemical, biological and psychosocial factors which can have a potentially harmful effect on the health of both the currently living as well as the future generations.

Basic Characteristics

Statement of the Problem

During the 20th century, environmental determinants of human health (e. g., ► workplace hazards and living conditions, health services) and individual lifestyles (Naidoo and Wills 2003) underwent a change in quality mainly in the industrialized nations. Advances in curative medicine and environmental hygiene, improved living and working conditions, socio-economic and technological progress as well as availability of health care structures have contributed significantly to increase the life expectancy and quality of life (Kistemann et al. 2002). Although the environmental conditions have improved greatly thanks to technological progress and legal regulations (e. g., threshold values), the current high level of health is subject to interference from a number of factors which arise from new or recurring questions about the relationship between people and their environment (EEA 2003).

According to estimates, a fourth to a third of the world's ► burden of disease is due to environment-related ► risk factors. The WHO-commissioned Environmental Burden of Disease Study showed that about a third of all health problems in Europe affecting children and adolescents (i. e., from birth to the age of 19) can be traced back to environmental agents (Valent et al. 2004). In children aged 0–5, up to 40% of the total burden of disease is due to environmental risks (EEA and WHO 2002).

The Importance of Multifactorial Determinants of Public Health

While most deaths in developing countries are caused by communicable ► infectious diseases associated with poverty, scarcity of water, sewage disposal and poor hygiene – e. g., malaria, cholera and tuberculosis (WBGU 2005) – the so-called 'modern health risks' predominate in the industrialized nations. These stem from changes in lifestyle, a technological environment and global environmental processes such as climate change which increasingly endanger human beings and the environment beyond the local and the national level (Kevekordes and Mersch-Sundermann 1999). Typically, changes in the illness pattern show a shift towards ► chronic diseases (e. g., cardiovascular or nutrition-dependent diseases, allergies, asthma). On the one hand, these are caused by individual, lifestyle-associated risk factors (e. g., smoking, ► nutrition), on the other hand they are clearly connected to environmental factors. An explicit, causal relationship between exposure and effect can rarely be shown. Using a rough classification, the following must therefore be distinguished:

- multifactorial environment-related diseases (e. g., allergies) (Behrendt et al. 1999);
- diseases where environment involvement is discussed and where environmental factors can act as triggers or co-factors (e. g., some types of cancer) (Nguyen 2002);
- environment-related functional syndromes (e. g., multiple chemical sensitivity [MCS]) where environmental factors are discussed as possible contributory causes (Wiesmüller and Hornberg 2002); and
- ► somatoform disorders (Bullinger 2002).

In addition to their influence on health-related quality of life, these problems also have a significant economic aspect for the public health system (e. g., the burden of disease which is caused by environmental pollution due to road traffic and accidents). The causes of these health problems are likely to be found in various areas of life and in the everyday physical and social environment. Evaluation and assessment of the relevant environmental determinants must therefore base on an understanding of the environment that transcends a strict scientific and technological definition.

The Environment as Seen from the Public Health Perspective

Public Health in the context of ► ecological health promotion and ► environment-related health protection requires a concept of the environment which comprises not only environmental toxins, but living conditions in general. The one-sided biomedical definition with emphasis on pathogenetic factors must be expanded to include the central dimensions of the social, economic and cultural environment (Schmidt-Denter 2002) in the various areas of life (e. g., housing and health; Fehr et al. 2005) where physical, chemical, biological and social factors interact. A comprehensive understanding of the environment depends on a broader definition including psychosocial and ecological aspects and integrating the often neglected potential and resources found in the environment to promote and safeguard human health.

The Effect of the Environment on Human Health: Environmental Factors as Both a Resource and a Health Risk

Since human beings and their environment constantly interact with each other, the influence on human health by environmental factors must be seen as natural and hence unavoidable. Environmental resources like water, soil, air, plants, animals, microorganisms, electromagnetic and other ► radiation can act in two ways: On the one hand, they can promote human health. Contact with nature is able to help relax, alleviate ► stress and generally contribute to the individual well-being (RMNO 2004). Green spaces in residential districts improve the quality of recreation in public areas and have a positive influence on human activities. They encourage ► physical activity, thus indirectly promoting healthier ► behavioral patterns and hence improving the health status (Maller et al. 2005). On the other hand, an artificially altered environment can endanger human health. Potential environment-related threats can stem from a number of factors; e. g., harmful substances can be taken up through various routes, including the gut, the airways and the skin. The main factors are chemical (e. g., gases, particles, fibers, heavy metals, organic compounds, pesticides, estrogens in the environment), biological (e. g., microbial contamination of food, indoors contamination by bacteria and mold) and physical (e. g., ► noise, radiation) (Seidel 1998). Important social determinants (► health determinants, social) (Neuser et al. 2002) include isolation, poverty and discrimination. Human health is affected mainly by these factors acting in combination – also depending on the intensity, degree and duration of exposure – in different areas of everyday life such as home, food, leisure, work, traffic in ► urban environments etc. (Fehr et al. 2005).

The Home and the Living Space as an Important Environmental Determinant of Human Health

The home and the living space is where human beings spend most of their time. The importance of its resources and limitations as environment-related determinants of human health was rediscovered and made a topic of public ► health policy only a few years ago (Jackson 2003). Social ► epidemiology and hygiene research in the 19th century focused on hygiene standards and basic infrastructure. Nowadays, emphasis is on challenges posed by the increasing volume of individual travel, intensified land development (construction) to the detriment of green and recreation areas, as well as growing social problems (Stronegger and Freidl 2004). The home and the living space, who are related in a variety of ways (Schmidt-Denter 2002), are particularly well suited to illustrate the close correlation between the environmental burden, the availability of environment-related public health resources, as well as social status. Since a lower income is associated with a clear disadvantage regarding quality of home (e. g., construction) and living space (e. g., traffic, nearby industries), differences in exposure to physical and chemical factors show a definite correlation with education, income and professional status. Accordingly, the less affluent population shows a greater clustering of health risks and problems (Bolte and Mielck 2004). Unlike the ► environmental justice movement in the USA, in Germany these social inequalities started being addressed and were made a subject of public health research only a few years ago. Considering the potential effects of a high exposure, especially for socially disadvantaged groups and areas, there is a pressing need for action, including ► risk assessment, ► integrated environment-related public health reporting and ► health impact assessment (HIA). Population-related preventive ► environmental medicine – including the basic disciplines environmental hygiene, environmen-

tal toxicology and environmental epidemiology (Kistemann et al. 2002) – is a vital part of public health.

Strategies and Approaches for Promoting Environment-Related Public Health

In view of the scarcity of data regarding the actual risk potential of environmental factors endangering human health; cause-effect relationships; specific groups at particular risk from environmental factors (e. g., children, migrants, pregnant women, the elderly and sick people); ► gender differences in exposure and health effects of environmental burdens; social and regional distribution patterns of environmental burdens; as well as possible (eventually late) health effects of chronic, ► low-level exposure, etc. (Meyer and Sauter 2000), environment-related determinants of human health must be approached with prevention in mind by minimizing the risks and making the most of environment-related public health resources. Keeping an ecological perspective of human health and disease, this requires a holistic view of the environmental media, health-promoting resources as well as environmental toxins and their health effects while taking into consideration populations in their entirety and their interaction with the environment (Fehr et al. 2005).

While ► prevention starts with specific diseases or rather disorders and emphasizes lowering of risks, ► health promotion follows a resource-oriented approach. Despite different perspectives and strategies, prevention and health promotion can complement each other effectively in practice (Altgeld and Kolip 2004). The existing approaches for ► health behavior prevention – e. g., preventing exposure, promoting environmentally sound consumer behavior – aim at disseminating behavior prevention in the people's immediate environment. This would open up the possibility of not limiting environmental awareness in health promotion projects to just preventing danger and reducing risks, but implementing it from a health-promoting angle both in particular ► settings and at the community level. There is great potential for integrated programs which have become established both at the national and the international level in the last few years. They form the basis for an integrated cooperation of health, urban development and the ► urban environment. The most important programs are the 'Local Agenda 21', the German 'Healthy Cities Network' and the Federal-Länder Program 'Socially Integrative City' (Trojan and Legewie 2001). Their special characteristic is to focus on environmental *and* human health determinants and engage in transregional cooperation in different technical fields which shape environmental and living conditions (e. g., urban planning, environmental medicine, social work).

Cross-References

► Behavioral Patterns
► Burden of Disease
► Chronic Diseases
► Ecological Health Promotion
► Environmental Justice
► Environmental Medicine
► Environment-Related Health Protection
► Epidemiology
► Gender Differences and Health
► Health Behavior
► Health Campaigns
► Health Impact Assessment (HIA)
► Health Policy
► Health Promotion
► Infectious Diseases
► Integrated Environment-Related Public Health Reporting
► Low-Level Exposure
► Noise
► Nutrition
► Physical Activity
► Radiation
► Risk Assessment
► Risk Factor
► Setting
► Social Factors
► Somatoform Disorders
► Stress
► Urban Environments
► Workplace Hazards

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Health Determinants, Psychological

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Synonyms

Risk and protective factors of psychological health and well being

Definition

Health determinants follow a broad theoretical framework allowing the consideration of psychological, physical, biological, social and environmental protective and risk factors as well as the interplay of these factors affecting psychological health and general well

being. Psychological health is characterized by a continuum of health related conditions ranging from healthy states to ill conditions. Psychological health and its determinants represent a theoretical framework as well as an applied field for health psychology aiming at health promotion and prevention of illness as well as an approach to clinical treatment for established illness.

Basic Characteristics

Concept of Psychological Health

The definition of psychological or mental health has varied over time in terms of concept and complexity. A movement away from a definition of mental health as resistance to or absence of mental illness emphasizes the way a person felt about himself or herself, other people, and the world, particularly in reference to his or her own place in it, while special significance was attached to the person's feelings about earning a living and their responsibilities towards those who depend on them. This movement became known as positive mental health. In defining mental health, Ginsburg (1955) settled for simple criteria such as 'the ability to hold a job, have a family, keep out of trouble with the law, and enjoy the usual opportunities for pleasure'. A more complex definition is reflected by Jahoda (1958), who suggested six approaches to the concept. These approaches were based on:

1. self-concept and attitudes towards self, including accessibility of the self to consciousness for self-objectification, a correctness of self-report, self-acceptance, and a sense of personal identity;
2. self-actualization and positive growth motivation;
3. integration of personality, including the balancing of physic forces, a unifying outlook on life, and a capacity to withstand stress and tolerate anxiety;
4. autonomy, including a stable set of standards for one's actions and a capacity for relative independence from the social and physical environment;
5. perception of reality characterized by accuracy, freedom from need distortion and accurate empathy towards other people;
6. adaptation and environmental mastery, including the ability to love, to work, to play, to engage in interpersonal relationships, to meet situational requirements, to adjust, to solve problems.

Despite Jahoda's definition being criticized as an unreal expectation of universal bliss, it indicates the ideal of those who insist that mental health is more than absence of mental illness. In addition, this broad and complex definition is suitable for the concept of ▶ mental health promotion. Norman Sartorius, Director, Division of Mental Health, World Health Organization in Geneva states 'promotion of mental health means different things to different people. To some, it means the treatment of mental illness; to others, preventing the occurrence of mental disorders; and to still others, increasing the ability to overcome frustration, stress, and problems and enhancing resilience and resourcefulness' (Sartorius 1989).

Factors Influencing Psychological Well Being

Psychological well being is essentially a subjective construct, and people appear to derive an assessment of their own well being using both external (social and environmental) as well as internal (personal) indicators. Diener (1998) has contended that well being is related to inherited temperament in addition to factors such as person–environment fit, self-esteem, life tasks and goals and the sense of agency in the realization of these goals. This is consistent with the view that a strong sense of psychological well being may indicate an individual's perception of his mastery over life's challenges, especially in relation to that of others (Napholz 1994). A diminished sense of emotional well being may contribute to poorer health status by affecting health behavior and lifestyle as well as the level of risk awareness (Steptoe and Wardle 2001). This suggests that health and psychological well being are intimately related and also impact on socio-economic indicators such as employment since depression and the resultant low level of psychological well being has been shown to decrease the chances of obtaining and maintaining employment (Alexandre and French 2001).

Since life experience is an integral part of well being (Ryff and Heidrich 1997), the interpretation of these experiences in terms of the degree of satisfaction with life must also be important. Since subjective assessments are more influential in determining well being and life satisfaction than objective circumstances (Stedman 1996), it is clearly necessary to distinguish the internal determinants of well being from those that are predominantly social. In terms of public health and social policy, it is important to pay attention to people's perceptions of their own health, partly because of

the interactions between social relationships and physical and mental health. These interactions are even more significant when one considers how well being and satisfaction with life are inextricably linked to social and economic factors. In this larger context of social and economic development, Marsella et al. (1997) has suggested that success is meaningful only when it can be translated into personal well being and an acceptable degree of satisfaction with life. The other direction of this relationship also holds true; that sustainable social and economic development is most likely to occur when the members of a society have a sense of psychological well being and life satisfaction.

The Concept of Psychosomatic Medicine

The term *psychosomatic* emphasizes essential unity of the psyche and the soma, a combination rooted in ancient Greek medicine. Common disorders caused at least partly by psychological factors include childhood ► asthma (http://www.highbeam.com/doc/1E1-asthma.html), certain ► gastrointestinal problems, ► hypertension, ► endocrine disturbances, ► diabetes, and ► heart disease. In most psychosomatic conditions there is some interaction between psychological factors and physiological predisposition to the illness. Sigmund Freud, at the end of the 19th century, laid the scientific groundwork for psychosomatic study, with his theoretical formulations based on new methods of treating hysteria. His methods were reinforced by the psychobiology of the American psychiatrist Adolf Meyer and the research of the American physiologist W. B. Cannon on the physiological effects of acute emotion. The treatment of psychosomatic ailments may involve a medical regimen as well as some form of psychotherapy for the patient. In recent years, psychosomatic medicine has been subsumed under the broader field of behavioral medicine, which includes the study of a wider range of physical ailments. Understanding the psychological causes of various ailments is crucial: studies suggest that a large percentage of deaths are rooted in behavior. In the 1960s, concepts related to conditioning gained prominence, as researchers found that humans and animals could learn to control their autonomic nervous system responses, usually involved in psychosomatic complaints. Emerging from this research came the technique of biofeedback that provides individuals with information concerning their own physiological responses, which they may begin to alter through conscious techniques of control. The newest area of research related to psychosomatic medicine has been called ► psychoneuroimmunology, the study of the interactions of the endocrine system, central nervous system, and immune system. Researchers believe that studies of these biological systems can help to show how an individual becomes vulnerable to illness.

Definitions and Concepts of Prevention and Intervention

Two physicians, Hugh Leavell and E. Gurney Clark (1953) defined three levels of prevention that were applicable to all disorders and dysfunctions. The initial concept of prevention was rooted in a public health (community) perspective, and so pure prevention, specifically 'primary prevention', was aimed at groups and communities believed to be at increased risk for the development of a disorder or dysfunction. The standard epidemiological definitions of prevention appear in Table 1. Primary prevention reduces the prevalence of a disorder or dysfunction by reducing the number of new cases (incidence) that appear in a defined population. The goal of primary preventive interventions is to prevent the onset of a disease or disorder, thereby reducing its incidence (number of new cases occurring in a specific period of time). In essence, primary prevention may be dichotomized into two main endeavors: (1) actions designed to prevent the development of psychiatric disorders; (2) interventions designed to promote well being as an inoculant against dysfunction.

Secondary prevention reduces the prevalence of a disorder by reducing the duration of a disorder or dysfunction in individuals who have expressed signs and symptoms of that disorder. Secondary prevention is defined as early intervention and prompt treatment of the early signs and symptoms of an emerging illness or disorder, with the goal of reducing the prevalence (total num-

Health Determinants, Psychological, Table 1 Epidemiological definitions of prevention

Prevalence	= Incidence *x* duration
Incidence	= Prevalence/duration
Primary Prevention	Reduce prevalence by reducing incidence
Secondary Prevention	Reduce prevalence by reducing duration

H

ber of existing cases) of the condition by decreasing its duration. According to Cowen, there are two distinct pathways to secondary prevention:

1. identify prodromal signs of serious disorders early, so that prompt effective steps can be taken to divert dire psychological consequences;
2. identify signs of dysfunction as soon as possible in a person's life history and use the best available tools to short-circuit later, more serious problems.

Tertiary prevention is the reduction of the prevalence of residual defects or existing disability secondary to the presence of an illness or disorder (often of chronic nature and duration). Tertiary prevention refers to rehabilitative efforts to enable those with longstanding or chronic mental disorders or disabilities to function at their highest possible physiological and psychological level.

Any model for the prevention of psychiatric disorders must allow for many different types of interventions to co-exist in a comprehensive, coordinated, and collaborative program. The types of interventions that are currently being developed, implemented, and evaluated for the prevention of mental disorders and the promotion of mental health are quite broad (Tables 2 and 3), reflecting the multidimensional, multicausal, and multifactorial vies of psychiatric disorders and psychological health.

Cross-References

► Bronchial Asthma
► Diabetes mellitus
► Endocrine Disturbances

Health Determinants, Psychological, Table 2 Preventive interventions at different levels

Intervention Target	Level	Nature of Intervention
Individual and/or family	Case level	Intrapsychic, intrafamilial, interpersonal
Group of individuals or families	Class level	Familial/ subcultural
Local environment (i. e. institutions, agencies, neighborhoods)	Community level	Sociopolitical
Wider environment areas (i. e. national)	Central level	Sociopolitical

Health Determinants, Psychological, Table 3 Types of interventions

1.	Biological (drugs, nutrition, diet)
2.	Physiological (relaxation therapy, exercise)
3.	Cognitive/learning (problem solving techniques)
4.	Behavioral (stress reduction)
5.	Social skills training and competency building
6.	Environmental/ecological (family, workplace, community)
7.	Psychoeducational (coping, adaptation, appraisal and assessment)
8.	Media (TV, radio, magazines, newspapers)
9.	Social support/mutual help
10.	Job training

► Gastrointestinal Problems
► Heart Disease
► Hypertension, arterial
► Mental Health Promotion
► Psychoneuroimmunology

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Health Determinants, Social

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Synonyms

Socioeconomic influences; Social causation

Definition

The analysis of social determinants of health is concerned with how the health of populations is influenced by features of a society and its socioeconomic and sociocultural organization. To understand how the circumstances in which people live and work affect their health, descriptive and analytical knowledge is required, which is largely drawn from social epidemiology, sociology, and related public health disciplines. The largest variations in health between and within countries probably emerge from people's differential standing within in a societal hierarchy: the lower the individual's socioeconomic status, the poorer their health. Social determinants of health are explored both at the individual and aggregate level of data analysis.

Basic Characteristics

Levels and Trends

Throughout history, substantial differences in disease rates and mortality between and within countries existed, and continue to exist even in modern industrialized societies. In addition to a North-South gradient in health – with poorer health in less developed countries – an East-West gradient is observed, in particular between Central, Eastern, and Western Europe, where differences in life expectancy between e. g. men in Russia and Sweden are as high as 20 years.

The influence of ► social factors on health is not restricted to poverty and material deprivation despite their overwhelming impact in less developed countries. With the epidemiological transition from infectious to degenerative diseases as primary causes of mortality, ► health-adverse lifestyles have become major determinants. These lifestyles are shaped by specific cultural norms, economic incentives, and social pressures. A 'Western lifestyle', characterized by consumption of food rich in fat and calories, sedentary life, smoking, and alcohol consumption, among others, is being spread across the world, in particular across rapidly developing countries.

In recent decades, this 'wealthier' lifestyle has become more prevalent among lower socioeconomic groups. Hence, substantial social inequalities in health are observed, resulting in a social gradient: the lower a person's status (in terms of educational attainment, income, and occupational standing), the higher his or her risk of poor health. These differentials are substantial even in most advanced current societies, where mean life expectancy is shortened by five to six years among members of the lowest compared with the highest socioeconomic status groups (Mackenbach and Bakker 2002; Marmot and Wilkinson 2006).

Macrosocial and Microsocial Factors

Every human society is characterized by a set of social values, norms, and institutions that are instrumental for the survival and growth of its members. If these values and norms lose their validity and meaning or if patterns of social exchange become unpredictable and unstable, individuals tend to suffer from states of social anomie (lack of rules and orientations). A number of epidemiological investigations have explored adverse effects on health produced by sociocultural instability, by rapid social change, or by a high level of social anomie.

The majority of these studies found evidence of elevated risks of subsequent physical and mental illness (Berkman and Kawachi 2000). Thus, a stable social network and a particular quality of social exchange, termed social support, may act as protective resources in coping with stressful circumstances. Social support is defined as the experience of, or access to, social relationships that offer mutual understanding, trust, and solidarity, and that recurrently elicit positive emotions. Negative health effects result from social separation, social isolation, or exclusion. These microsocial conditions are reinforced by macrostructural patterns of

social disintegration and a shrinking social capital. Social capital describes reciprocal social exchange in neighborhood and community life, including solidarity and trust. As these conditions are more prevalent among lower socioeconomic groups, they aggravate the burden of disease in less privileged populations (Kawachi and Berkman 2003).

The Role of Work and Employment

Among the macrosocial and microsocial determinants of health, work and employment are of outstanding significance for several reasons. Having a job is a principal prerequisite for continuous income and, thus, for independence from traditional support systems (family, community welfare, etc.). Increasingly, the level of income determines a wide range of life chances. Furthermore, training for a job and achievement of occupational status are important goals of socialization. It is through education, job training, and status acquisition that personal growth and development are realized, that a core social identity outside the family is acquired, and that goal-directed activity in human life is shaped. At the same time, occupational settings produce the most pervasive continuous demands during one's lifetime, and exposure to harmful job conditions is an important determinant of disability and premature death in midlife.

People threatened by job loss, job instability, or downsizing, and people undergoing forced or downward mobility were shown to suffer from increased morbidity and mortality. With the advent of economic globalization and automatization, these conditions are likely to continue to impact on a substantial proportion of working populations. However, even within a stable work force, exposure to stressful work environments contributes to the burden of disease. These social determinants of health are not confined to physical adversity, but concern an adverse ► psychosocial work environment. A large body of evidence indicates that jobs characterized by high demands in combination with low control and employment conditions, defined by an imbalance between high efforts and low rewards in terms of money, esteem, or promotion prospects, adversely affect the health of working populations (Siegrist and Marmot 2006).

Life Course

Much of the social inequality in adult health is due to socially patterned environmental exposure in early life. Poor growth in utero, insecure attachment in early life, and early adversity (e. g. lone mothers, poverty) are more prevalent in deprived social groups and have long-term effects on health (Kuh and Ben Shlomo 2004).

Different developmental trajectories may aggravate the burden of disease later in life through increased vulnerability or accumulation of adversity. Adolescence is one such stage within the developmental trajectories with far reaching health effects, due to the fact that health adverse behaviors are acquired and reinforced during this period, particularly among socioeconomically and socioemotionally vulnerable groups. Exposure to adverse environments continues to affect health beyond working life as recent studies document a continuation of the social gradient of morbidity and mortality into early old age (McMunn et al. 2006).

Policy Implications

Despite the fact that a convincing body of scientific evidence on social determinants of health originates from observational studies rather than from randomized controlled trials, this evidence has direct policy implications at several levels. While it is difficult to target macrosocial levels of societal structures and processes, population health can clearly be improved by changing lifestyle-related behaviors and by modifying microsocial environments. Creating a nurturing environment for children, improving education and social skills, implementing health-promoting working conditions, and strengthening infrastructure and social capital in deprived neighborhoods and communities are examples of public health measures that aim to reduce social inequalities in health.

Conclusion

The world's population is experiencing substantial progress in life expectancy. Yet, adverse social conditions continue to affect health and to result in premature mortality. These conditions include poverty and social disintegration, unhealthy lifestyles, noxious and stressful working conditions, social exclusion from work and participation, and critical conditions during infancy, childhood, and adolescence. It seems unlikely that

these trends will be diminished in the near future. Moreover, pressures originating from population growth and poverty in developing parts of the world, new socioenvironmental risks, and man-made disasters may aggravate rather than moderate this burden. At the same time, with increasing awareness of public health evidence and increasing policy efforts, a sustainable and healthier future is still a realistic goal.

Cross-References

- ► Health-Adverse Life Styles
- ► Psychosocial Work Environment
- ► Social Factors

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Health Disparities

Synonyms

Disparity; Inequality

Definition

A broad term used to describe differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups – in particular those that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation.

Health Economic Evaluation

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Synonyms

Economic evaluation of health care technologies

Definition

The term health economic evaluation describes the comparative assessment of costs and outcomes of alternative health care technologies or health strategies. The result of health economic evaluation studies is the incremental cost-outcome ratio (► incremental cost-effectiveness ratio), the relation of the estimated additional costs and the estimated additional outcome saved or lost by using an alternative health care technology.

Basic Characteristics

There are two main features of health economic evaluation. First, this kind of economic analysis evaluates the input and the output; the costs and the ► outcomes of health care technologies, respectively. The outcomes are sometimes also called benefits or consequences. The costs per one unit of a definite measure of outcome are defined as the cost-outcome ratio or cost-outcome relation, which expresses the value for money of a defined health care technology. Second, in health economic evaluations, the choice between two or more possible alternatives to improve a defined health problem has to be made. Therefore, health economic evaluations are by definition comparative. They compare at least two different alternatives and attempt to define an explicit set of criteria that may be useful for the decision that must be made in situations with scarce resources. If there is only one existing alternative or the costs or the outcomes of only one alternative are assessed, the study should not be described as a full economic evaluation, but only as a cost-, outcome-, or cost-outcome description (Berger et al. 2003; Drummond et al. 2005). Most economic evaluation studies compare two alternatives to solve a health problem in one defined medical indication. If generic outcome measures are used, it is also possible to compare health technologies used for

different indications and in different settings of health care from a theoretical and methodological point of view. Although in practice it is not yet fully implemented, in theory it is possible to evaluate a large number of possible diagnostic and therapeutic interventions – e. g. the whole catalog of reimbursed items of a sickness fund – and to list them according to their cost-outcome ratio in a league table. The most prominent representative is the QALY (► quality-adjusted life year) ► league table.

One key element of economic evaluations comparing alternative health care programs is the economic concept of "incremental change", which means that only the additional cost of an alternative is compared to the additional outcome gain. Consequently, in contrast to cost of illness studies, only the differences from one alternative to another (= increment) are considered and not the full range of all possible costs and outcomes. The main result of a health economic evaluation study is the incremental cost-outcome ratio (► incremental cost-effectiveness ratio), which expresses the additional costs per additional standardized outcome measure.

The results of economic evaluation studies are demonstrated graphically, in so-called cost-effectiveness planes, which show the incremental costs on the y-axis and the incremental outcome gain on the x-axis (Drummond et al. 2005; Drummond and McGuire 2001). The four quadrants of a cost-effectiveness plane illustrate the four possible relations of costs and outcomes comparing two alternative strategies e. g. a new technology and a standard treatment:

1. The new technology shows higher costs and a lower outcome (north-west quadrant)
2. The new technology shows lower costs and a better outcome (south-east quadrant)
3. The new technology shows lower costs and a lower outcome (south-west quadrant)
4. The new technology shows higher costs and a better outcome (north-east quadrant)

If the incremental cost-effectiveness is located in the north-west or the south-east quadrant, the decision for the less costly and more effective alternative can easily be made. One alternative shows a better outcome for lower costs and is the so-called ► dominant strategy. The decision for or against a new technology is more difficult if their incremental cost-effectiveness is located in the north-east quadrant. This is often the case for innovations because they tend to have an additional medical benefit combined with higher costs. In this case, the crucial question is what is the relation of the additional costs and the additional outcome? In other words, is it adequate value for money to use the new technology?

Establishment of an implicit or explicit ► threshold depends on the ability of the decision makers and the preferences of the society. So far, no official threshold has been established by decision makers, but implicit thresholds derived from reimbursement decisions of 50,000 EUR, 50,000 USD, or 30,000 BPS per life-year gained or per quality-adjusted life-year are discussed in the literature (Rawlins and Culyer 2004).

According to the type of outcome measure, four forms of full health economic evaluations can be differentiated (abbreviations in brackets) (Gold et al. 1996; Drummond et al. 2005; Kobelt 2002; CADTH 2006):

- Cost-minimization analysis (CMA)
- Cost-effectiveness analysis (CEA)
- Cost-utility analysis (CUA)
- Cost-benefit analysis (CBA)

For the description of cost-effectiveness analysis and cost-utility analysis, refer to the corresponding chapters: "► cost effectiveness" and "► value, human life – utilities". Some authors also use the term cost-consequence analysis for a type of study in which the costs and various outcomes are estimated without indicating the relative importance of the components listed; this approach leaves the reader or the decision maker to form their own view (► cost-consequence analysis) (Berger et al. 2003).

Cost-Minimization Analysis

In cost-minimization analyzes, it is assumed that all consequences of the compared alternatives are identical and that there is no additional benefit of the use of one or another of the alternative strategies. An example would be two drugs that lower the blood pressure with exactly the same side effects, quality of life, patient satisfaction, and interactions with other drugs. Consequently, making the assumption of identical outcomes, only the costs of the alternatives are compared.

This kind of health economic analysis is not usually recommended because, in most cases, it cannot be assumed that different alternatives show an identical outcome (Berger et al. 2003; Gold et al. 1996; Drummond et al. 2005; CADTH 2006). There is another sce-

nario in which cost-minimization analyzes can be chosen: if the aim is to demonstrate the dominance of one strategy. If a clear superiority of one alternative compared to another has been demonstrated in clinical studies and, in an additional cost-minimization analysis, the alternative with the better outcome also shows lower costs, there is a situation of dominance in which the decision is definitely made for the alternative with lower costs and better outcome.

Cost-Benefit Analysis

In cost-benefit analyzes, all costs and all outcomes are expressed in monetary units (e. g. EUR or $). The result is given as a net calculation of gain and loss (in contrast to CEA and CUA in which the results are expressed in cost-outcome ratios).

The costs of the intervention are measured. The outcomes and benefits for the patients are also expressed in monetary items using methods of valuation of the patients' observed or stated preferences. The most common approach is to determine the ► willingness-to-pay, meaning that individuals are asked to define the amount of money they would be willing to pay to avoid a certain health state or illness. Willingness-to-pay can be determined either directly by trained interviewers (► contingent valuation) or indirectly by drawing conclusions from the behavior of individuals (► revealed preferences).

The main advantage of cost-benefit analyzes is the generic approach. Due to the fact that no specific outcome measure has to be chosen, very heterogeneous technologies, with any kind of benefit that patients consider beneficial enough to attribute a certain amount of money to, can be compared. Cost-benefit studies are widespread outside the health care sector but, due to the ongoing methodological dispute over measuring and quantifying the medical benefit of health care in monetary terms, they are currently less common and less important for decision makers in health care resource allocation.

For the costing process, refer to the chapters about ► economic measures and ► cost of illness – costing.

Time Horizon

For economic evaluation studies, a time period that covers all relevant consequences of the intervention should be considered (Gold et al. 1996). This so-called ► time horizon is often longer than the follow-up period of clinical or epidemiological studies. This has two consequences: (1) it has to be acknowledged that, for economic evaluation studies, the standards of evidence-based medicine cannot be used in the same strict manner as is common with clinical trials. (2) the time exceeding the follow-up period of randomized clinical trials or epidemiological studies can only be estimated by ► modeling (Buxton et al. 1998).

Data Sources

In health economic analyzes, it is not usually possible to base the complete calculation on primary data individually collected from the included study population. Usually, the primary data of randomized controlled trials or epidemiological analyzes are combined with a number of different additional data sources such as administrative data from sickness funds, routine data sets from official statistics, and reimbursement catalogs or predefined package definitions e. g. from DRG catalogs or treatment guidelines (CADTH 2006). Also in contrast to clinical studies, data collection in health economic analyzes can not only follow the described bottom-up approach but can also use routinely collected large data sets, e. g. of sickness funds or health care organizations (► claims data analysis), as the basis of the analysis in a top-down approach. Following the framework of evidence-based medicine, these retrospective analyzes of routine data, which are quite commonly performed in the US, have less scientific evidence compared with randomized controlled studies (Sackett et al. 1996). However, to gain knowledge about real-life routine care, such studies offer clear advantages by avoiding strict patient selection and an artificial study-determined treatment setting.

Cross-References

► Claims Data Analysis
► Contingent Valuation
► Cost-Consequence Analysis
► Cost-Effectiveness
► Cost of Illness – Costing
► Dominant Strategy
► Economic Measures
► Incremental Cost-Effectiveness Ratio
► League Table
► Modelling

- ► Outcome (Health Economics)
- ► Quality-Adjusted Life Years (QALY)
- ► Revealed Preferences
- ► Threshold
- ► Time Horizon
- ► Value, Human Life – Utilities
- ► Willingness to Pay

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Health Economics (Burden of Disease)

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Introduction

Health economics is the application of economic theory and economic methods to phenomena and problems associated with health (Culyer 2005). A comprehensive taxonomizing framework that systematically includes the various topics of health economics was developed by Alan Williams from the University of York. The "Williams' Schematic of Health Economics" (Culyer and Newhouse 2000) conceptualizes this definition (► health economics, concepts). Topics of health economics include – among others – the meaning and measurement of health status, the production of health and health services, the demand for health and health services, ► cost-effectiveness analysis, economic evaluation, health insurance, health care financing, equity problems, the organization of health care markets, methods of remuneration of physicians, performance management of health care organizations, and economics of comparative health systems (Culyer 2005; Jones 2006).

This synopsis of the field of health economics is divided into two main parts. The first part covers research topics of health economics which are summarized under the heading health care system design. This part includes topics such as methods of health care financing, problems of health insurance markets, regulatory mechanisms, and systems of provider remuneration. The second part of the synopsis covers topics that are related to the economic evaluation of health care technologies and interventions. These topics include costs of illness, and cost-effectiveness and cost-utility analyses, as well as the question whether the value of human life (► value, human life) can be reflected by these concepts. The bridge between the two parts is built by a summary of the ► burden of disease concept of the World Health Organization (WHO). This generic and mainly epidemiological approach should not be seen as an integral part of health economics, although there are clear implications for health economic topics such as health care financing and cost of illness.

Health Care System Design

Economic theory – more specifically neoclassical microeconomic theory – generally assumes that a competitive process of adjusting demand and supply of goods and services will lead to an optimal allocation of scarce resources. This process should be left alone by policy makers and public interventions. If it is not, economic incentives for the modification of supply and

demand will be disturbed and market forces will not be able to reach the allocative optimum.

However, health care systems around the world are heavily regulated – which is even the case for rather libertarian countries such as the US. The reasons for this rather extensive regulation are a number of severe market failures in health care markets. Health economics provides some important tools to analyze the origin of market failures and to develop solutions to deal with them. In this section, the most important market failures on the demand side as well as on the supply side of health care markets are summarized. Moreover, policy tools that have been designed to address them are discussed.

According to microeconomic theory, demand is the mechanism which drives a competitive economy (Rice 2002; Folland et al. 2007). Demand is the key: the amount of goods and services that is produced and consumed is determined by the preferences of consumers. In the long run, supply adjusts to demand. However, demand theory is based on a number of important assumptions. Specifically, the following assumptions need to be fulfilled (Rice 2002) (► consumer choice):

- Individuals are the best judges of their own welfare.
- Consumers have sufficient information to make good choices.
- Consumers need to know the results of their decisions.
- Individuals are rational.

Most of the time, these assumptions are not fulfilled in health care markets. Individual consumers usually lack the medical education needed to execute informed choices on treatment options. The outcome of medical interventions (or non-interventions) is not always clear for consumers of health care services. The rationality of consumers is disturbed by the often very personal consequences of consumption decisions. If the demand for health care services were unregulated and were left to the competitive process only, severe market failures would occur. The economic and medical results of these market failures – most importantly unequal access to health care services – are generally not acceptable to societal preferences. As a consequence, designers of health care systems usually restrict individual choice – e. g. by requiring mandatory coverage of health insurance.

In most microeconomic applications, supply plays a subsidiary role to demand. It is generally assumed that supply adjusts if consumers' preferences change. Again, supply theory is based on a number of crucial assumptions, most importantly that supply and demand are determined independently. Once more, this essential assumption is not fulfilled in most health care markets. Supply and demand of health care services are closely interlinked, which is clearly contradictory to the traditional microeconomic model. Health economics closely studies the question of whether health care providers – particularly physicians – act as perfect agents for their patients or whether physicians are able to induce demand for their services among patients (Rice 2002). Health economists generally agree that physicians – the suppliers – are able to induce demand for their services, at least to some degree. As a consequence, designers of health care systems have come up with a variety of policy measures to reduce incentives to induce demand.

Table 1 summarizes the dimensions of health care system design (► health systems). Policy makers around the world heavily regulate health care financing, demand, and supply as a consequence of market failures in health care markets which are not socially acceptable. The role of health economics in this process is twofold. It analyzes market failures themselves and develops possible instruments for solutions – e. g. justifying universality of access as a consequence of non-rational consumers. Moreover, health economics also analyzes problems that occur due to the introduction of solutions to the original problems – e. g. non-optimal consumption of medical services because of universal coverage. In the remainder of this section, the dimensions of health care system design and the role of health economics are discussed in more detail (► regulatory mechanisms).

Health Economics (Burden of Disease), Table 1 Dimensions of health care system design

Health care financing	Universality of access Tax-financing vs. financing by health insurance premiums Role of private health insurance Single payer vs. multiple payers
Regulation of demand	User charges Basket of health care services
Regulation of supply	Remuneration of physicians and hospitals

Source: Based on (Rice 2002)

The first dimension of health care system design is health care financing (► health financing). With the exception of the US, Organisation for Economic Co-operation and Development (OECD) countries strive for universality of access to health care services. Universality of access can be justified for allocative as well as for distributive reasons. On the one hand, consumers may be willing to buy health insurance but they are unable to buy it if premiums are risk-rated – which will lead to distributive consequences that are socially unacceptable in all OECD-countries outside the US. On the other hand, adverse selection may also result in non-optimal market outcomes. Adverse selection can occur if health insurers set their premiums in relation to the average health risk of a population and consumers have different probabilities of illness. In that case, consumers with low probabilities may refrain from taking out health insurance. They may even consume health care services without paying for them – e. g. if these services are paid for by welfare or social assistance (free-rider behavior). At the same time, consumers with high probabilities of illness will most probably seize the opportunity to take out health insurance eagerly. If this is the case, insurers need to cover clients who incur higher health care expenditures than expected and therefore insurers need to raise premiums, which in turn further decreases incentives for low-risk individuals to take out health insurance. Universality of access is achieved by tax-financing of health care in countries such as the United Kingdom, Canada, or Scandinavian countries. In these countries, residents are eligible to consume health care services that are financed out of general tax revenue. Another possibility to achieve universality of access is mandatory universal coverage by social health insurance. In countries such as the Netherlands, Switzerland, and – for part of the population – Germany, consumers are obliged to take out social health insurance. Premium rate restrictions apply to make sure that individuals with high health risks are able to afford health insurance premiums. The US stands out because consumers in the US are not required to take out health insurance.

Universality of access can be achieved in tax-financed health care systems as well as in health care financing systems that rely primarily on social health insurance premiums. However, there are other policy objectives that may determine the choice between tax-financing and financing by health insurance premiums – notably implications for the redistribution of income and implications for employment. Implications for the redistribution of income in social health insurance systems very much depend on the mode of premium calculation. In tax-financed national health systems, implications for the redistribution of income depend on the design of the tax system (Wagstaff and van Doorslaer 2000).

If health care financing systems contain a direct link between health care expenditures and labor costs, rising health care expenditures lead directly to rising labor costs. Moreover, if there is a direct link, rising health care expenditures increasingly drive a wedge between labor costs of the employer and net wages of the employee. As a consequence, microeconomic labor market theory generally assumes that incentives for the employee to work diminish. What is more, incentives for the employer to substitute capital for labor – or to substitute cheaper labor abroad for domestic labor – increase. Therefore, all other things being equal, employment goes down. The growth of health insurance premiums may consequently result in a drain on employment in employment-based health insurance schemes, such as in group-based private health insurance in the US or social health insurance in Germany (► labor market).

With the notable exception of the US, OECD countries do not rely on private health insurance as a predominant mode of health care financing (► health insurance markets). Private health insurance serves three distinct functions. The first is as an *alternative* to other social health insurance or public arrangements. The second function is to *supplement* basic health insurance or tax-financed health care, providing coverage for services not covered by the public arrangement or to cover the financial risks of co-payments and coinsurance. A third function of private insurance is to provide what can be termed *complementary or double-cover* coverage, in which consumers purchase additional private health insurance even though they have to participate in existing public schemes (Colombo and Tapay 2004).

Tax-financed systems, such as those in the United Kingdom, Canada, and Scandinavian countries, are non-competitive single payer systems. The term single payer system means that in any given region, only one payer organization – such as primary care trusts in the UK – is purchasing care on behalf of patients. In the 1990s, the UK government strived to introduce internal markets (► health systems reforms). The competitive

nature of the market was supposed to provide the necessary incentives for health care providers to improve efficiency and responsiveness of the system. Internal markets were replaced by primary care trusts which emphasize cooperation rather than competition (Oliver 2005). Social health insurance systems may also be non-competitive systems – as is the case in France. However, as a result of a number of health insurance reforms in the 1990s (► health systems reforms), several countries, such as Germany, the Netherlands, and Switzerland, introduced competitive multi-payer systems based on a regulative framework of regulated competition (► competition, health care). A key element of regulated competition is an effective method of risk adjustment in order to neutralize incentives for risk selection by competing health insurers (van de Ven et al. 2003). Consumer choice (► consumer choice) is another key element in increasing competitive pressure for health insurers. Consumer choice is less pronounced in the competitive multi-payer private health insurance market of group contracts for the non-elderly in the US. In most cases, employers purchase a number of options for employees and the employees' choice is limited to these options (Dowd and Feldman 2006).

As noted above, microeconomic theory strongly emphasizes demand as a driving force of competitive markets. This logic is also inherent in most theoretical models of health economics. However, in order to avoid market failures, demand for health insurance and health care services by individual consumers is heavily regulated in most OECD-countries. From an economic point of view, however, universal access to health insurance leads to over-consumption. The rationale behind this argument is quite straightforward: because the marginal price of health care services is lower than marginal utility – the price is zero if there is full coverage without user charges – consumption of health care increases. This effect is called ex-post moral hazard and is generally considered to result in a welfare loss to society. Ex-ante moral hazard refers to the effect that being insured has on behavior – notably, less effort for preventive activities. This theoretical argument has been confirmed empirically. In a unique natural experiment (RAND health insurance experiment), it has been shown that demand for health care services increases as coverage by health insurance goes up (Newhouse and Insurance Experiment Group 1993). Health economists usually suggest introducing user charges at least for health care services that are elastic in price – specifically non-urgent, elective health care services. As a consequence, patients will refrain from using health care services that provide a low marginal utility (Cutler and Zeckhauser 2000). However, the share of non-urgent elective health care services as a share of total health care expenditure is rather small (► health care costs). Moreover, due to severe information asymmetries, user charges may also deter consumers from using health care services that provide high marginal utility. The RAND health insurance experiment has also shown that consumers reduce consumption across all health care services if user charges are introduced, they do not differentiate between services which were considered to be highly or rarely effective (Lohr et al. 1986).

The problems of adverse selection and moral hazard are also important for the definition of the basket of health care services that are provided by health insurance. If the basket of health care services is not standardized – as is the case in most private health insurance schemes in the US and elsewhere – low risk individuals may find it attractive to choose a basket of health care services which provides only very basic coverage. At the same time, high-risk individuals will most probably choose maximum coverage – which results in adverse selection. If regulation mandates an extensive standardized basket for health care services in order to fight adverse selection, problems of over-consumption (moral hazard) will develop. As noted before, user charges will only solve this problem if consumers are able to identify health care services with low marginal utility – which is rather doubtful. Regulation usually attempts to solve this dilemma between adverse selection and moral hazard by the centralized assessment of marginal benefits of health care services. In fact, the economic evaluation of health care interventions, which is performed by the National Institute of Clinical Excellence in England and by other institutions in other countries, seeks to substitute the individual assessment of marginal costs and marginal utility with a collective assessment of marginal costs and marginal utility.

As noted before, traditional microeconomic theory does not put much emphasis on the supply of goods and services. Supply is supposed to adjust to changing preferences of consumers. However, it can also be argued that demand is not determined independently of supply. The suppliers of health care services – primarily physicians and hospitals – do not act as perfect agents of

their principal – the patient. As a consequence, health economics is concerned with the regulation of supply of health care services as well – more so than traditional microeconomic theory is concerned with producers. Health economics aims primarily to develop remuneration systems with the goal of making it advantageous for the physician to behave in a way that is in the patient's and the payer's best interest (► regulatory mechanisms). Traditionally, research was focused on fee-for-services payment systems – which contain incentives for over-utilization of health care services – and on capitation payment systems, which developed primarily in managed care organizations and contain incentives for under-utilization of health care services. Recently, research has been focused on "pay-for-performance" schemes. In these schemes, the remuneration of physicians and hospitals is linked to defined quality performance thresholds (Rice 2006).

Burden of Disease

The term ► burden of disease generally describes the total, cumulative consequences of a defined disease or a range of harmful diseases and their respective disabilities on a community. This approach combines measurement of mortality and morbidity with non-fatal outcomes, such as quality of life aspects. The gap between an ideal situation, where everyone lives free of disease and disability, and the cumulated current health status is defined as the burden of disease.

In the 1990s, the WHO, in co-operation with Harvard University and the Worldbank, developed a methodological concept to quantify the global burden of disease based on statistical measurement of the disability-adjusted life year (DALY). The DALY aggregates the time lost because of premature mortality and the time spent in a limited health state (Homedes 1996). Consequently, the DALYs for a defined disease or health condition are calculated as the sum of the years lost due to specific premature mortality and the years lost due to disability for incident cases of the health condition. Further time discounting and non-uniform age weights give less weight to years lived at a younger age.

The cumulated disease-specific DALYs aggregated according to the country-specific prevalence of the diseases and disabilities considered reflect the burden of disease of a specific society or a country. The Global Burden of Disease concept of the WHO compares a large number of low-, middle-, and high-income countries with regard to their country-specific burden of disease, and offers mortality figures, which refer to the number of people who die and the causes of death. Thus a comprehensive and consistent set of estimates of mortality and morbidity is given, expressed by the single indicator DALY and differentiating by age, sex, and region.

Economic Analyses of Defined Health Care Technologies and Interventions

This field of health economics is characterized by the intention to describe or investigate economic aspects of defined health conditions or the use of defined health care technologies. Health care technology in this case stands for all diagnostic, therapeutic, rehabilitative, or palliative procedures that influence the health of an individual. With relevant influence from medical sciences, the concepts can be subdivided into: (1) mainly descriptive studies with epidemiological elements and the intention to describe real-life health care settings, and (2) study designs derived from the methodological concepts of clinical studies, which focus on clearly defined medical interventions in often highly selected patient groups, typically not only giving an average measure for the costs and the medical outcome of patients but further aggregating the results to a more abstract ratio of the costs per a predefined outcome such as life-year gained. Examples of the first group of study designs are cost of illness studies, decision analytic health policy models, and budget impact analyses. Classic economic evaluation studies such as ► cost-effectiveness or cost-utility studies are examples of the second group (Gold et al. 1996; Drummond et al. 1997). Inclusion of costs distinguishes health economic analyses of defined health technologies from epidemiological or clinical studies. Costs refer not only the costs of the intervention but also the costs of all direct or indirect consequences of the use of the technology. There are some general aspects of the costing process (the measurement of costs) such as the perspective, approaches, sources of data, and the types of costs, which will be described before the different study designs are mentioned (Canadian Coordinating Office for Health Technology Assessment (CCOHTA) 1996; Canadian Agency for Drugs and Technologies in Health (CADTH) 2006).

Time Horizon and Modeling

For many diseases, the medical and economic consequences of a more successful therapy compared to a less successful alternative are relevant for a long period of time, often a patient's lifetime. In many cases, e. g. screening tests or other measures for primary or secondary prevention, the medical and economic benefits often occur a long time after the intervention. For economic evaluation studies, therefore, a time period that covers all relevant consequences of the intervention should be considered (Gold et al. 1996). This so-called time horizon for comparing health economic analyses is often longer than the limited follow-up period of clinical or epidemiological studies. This has two consequences: (1) it has to be acknowledged that the standards of evidence-based medicine cannot be used for economic evaluation studies in the same strict manner as is common with clinical trials; (2) the time exceeding the follow-up period of randomized clinical trials or epidemiological studies can often only be estimated by ► modeling. Widespread modeling techniques such as medical decision tree analysis, Markov models, or discrete event simulation are seen as standard methods for estimating the medical and economic consequences of many health technologies in the patient's lifetime, but it has to be assured that the studies are conducted and described transparently and with high methodological standards (Philips et al. 2004).

Perspective

The perspective of an economic analysis of a health care technology describes the point of view which is taken for the costing and, if relevant, for the outcome measurement. The choice of the perspective is a basic decision to be made for every analysis and can crucially affect the result of the calculation. It especially influences determination of the costs. From a societal perspective, all costs and benefits are taken into account, including productivity loss due to a health state, treatment, or diagnostic procedure. From the narrower perspective of a health insurance or sickness fund (often called the payer's perspective), only their own expenses, expressed as reimbursement rates in different sectors of the health care system, are relevant. From the perspective of an institution like a hospital, only the costs to the institution itself that are incurred during the inpatient stay are considered. The most important perspectives are the societal, the payer's, and the institutional perspective. According to most recommendations for economic evaluations in health care, a societal perspective should be considered at least in addition to other perspectives that have been chosen (Gold et al. 1996; Drummond et al. 1997; Canadian Agency for Drugs and Technologies in Health (CADTH) 2006).

Costing Process

In general, all costs related to the use of a technology should be identified and considered to be relevant. These costs are the monetary equivalent of resources such as goods or professionals' time. The resources are measured in quantifiable physical units e. g. inpatient days or GP contacts, as detailed as necessary for the analysis, and should be differentiated in categories that are appropriate to the decision makers. The measured resources are valued in a second step to express them in monetary units (Canadian Coordinating Office for Health Technology Assessment (CCOHTA) 1996; Gold et al. 1996). For valuing, mainly standard reimbursement or pricing catalogs are used. It has to be kept in mind that these charges are not necessarily identical to the costs according to the economic theory, which requires that the opportunity costs and the benefits that could have been derived from funding the next best alternative should be estimated. With rare exceptions in health economic analyses, the opportunity costs of health care resources can only be approximated using charges, assuming also that charges are the result of a societal process like the price of any other good in a functioning economy.

In health economic analyses, it is not usually possible to base the complete calculation on primary data collected individually from the study population included. Usually, the primary data of randomized controlled trials or epidemiological analyses are combined with a number of different additional data sources such as administrative data from sickness funds, routine data sets from official statistics, reimbursement catalogs, or predefined package definitions e. g. from DRG catalogs or treatment guidelines. Also, in contrast to clinical studies in health economic analyses, data can be collected by a top-down approach, using routinely collected large data sets e. g. of sickness funds or health care organizations as the basis of the analysis, as well as the described bottom-up approach. Following the

framework of evidence-based medicine, these retrospective analyses of routine data that are quite commonly performed in the US are considered a lower grade of scientific evidence compared with randomized controlled studies. However, to gain knowledge about real-life routine care, they offer clear advantages by avoiding strict patient selection and an artificial study-determined treatment setting.

Direct Costs

Direct medical costs are defined as the costs related to the provision of the health care intervention itself, including all side effects and all future consequences on health care diagnosis and treatment in different health care settings (e. g. inpatient hospital treatment, ambulatory care, drugs, rehabilitation). In some diseases, direct non-medical costs, e. g. for transportation or child care during a medical intervention of the parent, can also be incurred.

Indirect Costs

The so-called indirect costs incorporate the loss of productivity suffered by the national economy. Indirect costs can be due to decreased efficiency or total absence from work through illness – either for a limited number of days of absence or due to early retirement – or premature death.

There are two ways of calculating indirect costs: (1) the human capital approach and (2) the friction cost approach. Both approaches are based on the assumption that the lost productivity can be valued by the achievable gross income of the employed population, giving the labor a defined value (► labor market). Using the human capital approach, the entire period of absence from work due to illness is considered and valued by the achievable gross income. The human capital approach is based on economic theory and gives a maximum possible productivity loss (Sculpher 2001). The friction cost method more accurately estimates the actual loss of productivity in western industrialized countries. This method takes two main aspects of criticism against the human capital approach into consideration. First, some part of a short-term work absence, e. g. due to an influenza infection, is compensated for either by colleagues or by the employee when back at work. Second, in societies with a significant percentage of unemployed people, a large percentage of positions will be taken by a previously unemployed individual after a certain time, called the friction period (Koopmanschap et al. 1995). Using the friction cost method, only the shorter friction period is valued by the average achievable gross income.

The human capital approach is considered to be the simpler and more frequently used approach and is therefore recommended by a number of guidelines for economic evaluation studies, although it is also recommended that the friction cost approach in an additional scenario or at least a sensitivity analysis should also be calculated (Gold et al. 1996).

Cost of Illness Studies

The term ‘cost of illness’ has to be seen as separate from the ► burden of disease concept of the WHO. While the burden of disease concept is a generic approach, estimating the burden of all relevant diseases of a large number of populations, cost of illness studies are defined as analyses of the total costs due to one specific disease or health condition in one defined population.

In cost of illness studies, the total economic impact of a disease or health condition on society is estimated by identification, measurement, and valuation of all direct and indirect costs. This form of study does not focus on a particular intervention and does not address any questions regarding treatment efficacy or efficiency. Cost of illness studies usually adopt a societal perspective, measuring the financial burden incurred in different sectors of society such as the state or government, health insurers, and individuals.

The costs of illness can be estimated by taking into account the costs associated with all patients with a defined health state in a specific limited time period (prevalence method) or by calculating the long-time costs associated with those patients whose illness is newly diagnosed during a specific limited time period (incidence method).

Costs of illness calculations create information about the amount of resources spent on the treatment of a disease. This information can be helpful in generating hypotheses for health economic evaluation studies that compare different intervention strategies. Furthermore, the results can be used to set priorities for research activities regarding diseases with a larger potential of cost savings if more cost-effective alternatives would

be preferred. In situations where there are limited resources for health care, this information could be misunderstood as a signal to cut down resources primarily in the treatment of the most expensive diseases. A rational decision for more cost-effective alternatives should be prefered which not only considers the costs but also includes factors related to the medical benefit and therefore has the opportunity to produce more value for money in health care.

Economic Evaluation of Health Technologies

Economic evaluation studies are a systematic method of comparing two or more health technologies that can be used alternatively, by measuring the costs and the consequences (outcomes) of each alternative. As the outcome comparator, disease-specific measures such as time to relapse or events avoided, or generic measures such as life-years gained or utilities, can be chosen.

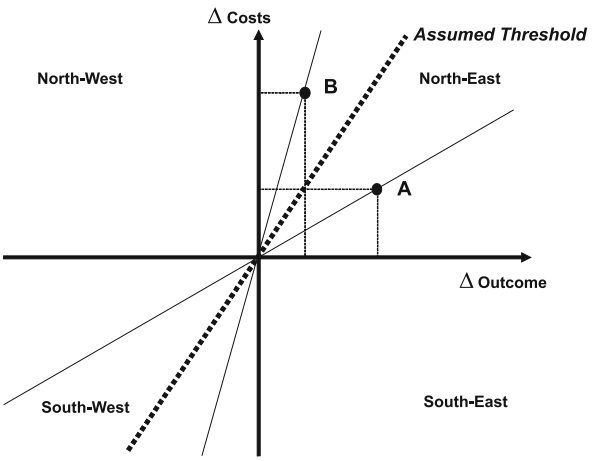
One key element of economic evaluations comparing alternative health care programs is the economic concept of "incremental change" which means that only the additional costs of an alternative are compared to the additional outcome gain. Consequently, in contrast to cost of illness studies, it is not necessary to calculate the full range of all possible costs and outcomes but only the difference (increment) between one program and an alternative.

The central result of a ► health economic evaluation study is the incremental cost-outcome ratio, expressing the additional costs per additional standardized outcome measure. Common examples are the costs per life-year gained or the costs per event avoided.

The results of economic evaluation studies are commonly demonstrated graphically in so-called ► cost-effectiveness planes showing the incremental costs on the y-axis and the incremental outcome gain on the x-axis (Black 1990; Drummond et al. 1997). The four quadrants of a cost-effectiveness plane illustrate the four possible relations of costs and outcome when comparing two alternative strategies e. g. a new technology and a standard treatment:

1. The new technology shows higher costs and a worse outcome (north-west quadrant)
2. The new technology shows lower costs and a better outcome (south-east quadrant)
3. The new technology shows lower costs and a worse outcome (south-west quadrant)
4. The new technology shows higher costs and a better outcome (north-east quadrant)

If the incremental cost-effectiveness is located in the north-west or the south-east quadrant, the dicision for identification of the less costly and more effective treatment is clear. One treatment shows a better outcome for lower costs and is dominant over the other. The decision for or against a new technology is more difficult if their incremental cost-effectiveness is located in the north-east quadrant. This is often the case for innovations because they tend to have an additional medical benefit connected with higher costs. In this case, the crucial question is: what is the relation of the additional costs and the additional outcome? In other words, is a new technology adequate value for money? Figure 1 shows a schematic cost-effectiveness plane. The use of the new technology B is responsible for higher additional costs and lower additional outcome compared with standard treatment than the new technology A. Technology A is more cost-effective than technology B. However, both new technologies are located in the north-east quadrant. Standard treatment is less effective but also less costly. The decision to use an implicit or explicit threshold depends on ability and the preferences of society. So far, no official threshold has been established by decision makers, but an implicit threshold of 50,000 EUR, 50,000 USD, or 30,000 BPS per life-year gained or per quality-adjusted life-year gained, derived from reimbursement decisions, is discussed in the literature (Rawlins and Culyer 2004).



Health Economics (Burden of Disease), Figure 1 Cost-effectiveness plane (adapted from Drummond et al. 1997)

Value of Human Life

Discussions about the interpretation of the results of economic evaluation studies and the legitimization of a threshold value up to which a new health care technology should be reimbursed by public payers also opens up the dispute about the value of a human life (► value, human life). Three main approaches should be considered. The human capital approach estimates the maximum expected future earnings of an individual based on the average achievable gross income. Heavy criticism was made of the use of this measure for valuing a human life and by doing so implying that the value of a human life is reduced to productivity from a national economic point of view. Furthermore, this approach discriminates major parts of the population who do not work for payment, such as children, housewives, the unemployed, old people, and people with chronic illnesses or disabilities. A second, so-called social decisions approach, uses decisions made in the public sector like reimbursement decisions or legal acts. The third approach is based on empirically created data on people's preferences. This can be done directly, by assessing the willingness to pay for a life year or a life-saving health care intervention, or indirectly, e. g. from surveys about the value placed by individuals on reduction of the risk of death due to a particular hazard. The third approach is currently regarded as the most appropriate as it reflects the individual preferences and uncertainty that is characteristic of such estimations.

Comparing the different approaches and also the results of different studies using the same approach, an extremely wide variation can be observed, from a few thousand € up to a few hundred thousand €. Currently, the methodological approaches are in an early stage of development and valid results will not be available for many years, if at all.

In the following chapters, the two main types of ► health economic evaluations, namely cost-effectiveness analysis and cost-utility analysis, are described. The third study type is the cost-benefit analysis (sometimes also misused as a generic term for economic evaluation). In cost-benefit studies, not only the costs but also the outcome is expressed in monetary units using valuations of the patients' observed or stated preferences. The most common approach is to determine the willingness-to-pay, meaning that individuals are asked to define the amount of money they would be willing to pay to avoid a certain health state or illness. Cost-benefit studies are widespread outside the health care sector but, due to the ongoing methodological dispute regarding the measurement and quantification of the medical benefit of health care in monetary terms, they are currently less common and less important for decision makers in health care resource allocation than other studies.

Cost-Effectiveness Analysis

The most common type of economic evaluation is the ► cost-effectiveness analysis. In this type of analysis, the outcome is expressed in adequate medical or epidemiological units e. g. life-years gained or number of events avoided, or specific measures like units of reduction of diastolic blood pressure (Gold et al. 1996; Drummond et al. 1997). The more specific the outcome measure is, the more difficult it is to use cost-effectiveness analyses to compare treatments for different diseases or whole health care programs. The advantage of cost-effectiveness studies is their ability to adopt the most relevant and clinically significant parameter and to compare treatment alternatives for a specific disease. The results are often more of a clinical nature. Therefore, they are often more easily accepted by the medical society than the more abstract results of cost-utility analyses. Cost-effectiveness studies can give useful information concerning the decision between a limited number of treatment alternatives for a clearly defined health problem. This is often the case for diseases where a standard treatment is already available, and the value for money of a new treatment alternative should be estimated based on the results of the first clinical efficacy studies. However, for use in the process of decision making for non-disease or non-indication specific allocation of health care resources, the results of cost-effectiveness studies are less useful. It is not possible to compare the costs per life-year gained of a life-saving intervention like heart surgery with the costs per case detected in a screening program, or the costs per exacerbation avoided in an educational program with COPD-patients.

Cost-Utility Analysis

Cost-utility analyses can be seen as a special form of cost-effectiveness analysis in which the outcome measures are the units of utility gained. In general, utili-

ties are numbers assigned to entities presumed to be the objects of patients' preferences, and thus the entities can be quantified and ranked. Utilities offer a patient-orientated generic measure which allows comparison of the effect of all possible interventions influencing the health state (Feeny et al. 1996).

By far the most widespread and prominent utility measure is the quality-adjusted life year (QALY). The QALY is a generic measure of utility that combines both the quality and the quantity of life generated by health care interventions. A year spent in perfect health is one QALY and a year spent in less than perfect health with a lower health-related quality of life is worth less than one QALY. Death or the poorest imaginable state of health is defined as "0". Aggregating the quality of life and the remaining lifetime, it has to be taken into account that the quality of life fluctuates over time. Quality of life must therefore be measured repeatedly over time (the course between the point measures has to be estimated) with generic instruments such as the EQ5D, the health utility index, or the SF-6D. Alternatively, the quality of life over the total health state path can also be estimated at one time using techniques such as standard gamble or time trade-off.

There is a certain amount of controversial debate about the theoretical foundation of the QALY, especially about its foundation in the welfare theory, as well as about the empirical robustness of the results and ethical implications of a possible use in resource allocation decisions.

League Table

One way of presenting the results of several cost-effectiveness or cost-utility analyses for decision makers is a league table. League tables rank health technologies and interventions according to their relative cost-outcome ratio, starting with the lowest cost per QALY gained (or the gain in another generic outcome measure) and ending with the most unfavorable cost per QALY ratio. In theory, league tables could be used by decision makers to allocate resources within a limited budget e. g. by only reimbursing technologies with costs per QALY gained below a defined threshold. There are major arguments for not making decisions about resource allocation in health care solely on the basis of league tables (Gerard and Mooney 1993; Bleichrodt et al. 2004), but in general the results of ► health economic evaluations can provide helpful additional pieces of information for the process of decision making. Decisions about allocation of health care resources have to be the result of a societal consensus and should never be made on the basis of economic analyses alone.

Summary

Health economics is defined as the application of economic theory and economic methods to phenomena and problems associated with health and health services. Topics of health economics include – among others – the meaning and measurement of health status, the production of health and health services, the demand for health and health services, ► cost-effectiveness analysis, economic evaluation, health insurance, health care financing, equity problems, the organization of health care markets, methods of remuneration of physicians, performance management of health care organizations, and economics of comparative health systems.

Health care systems cannot be regarded as a normally functioning market as this may lead to market failures such as inequity of access to health care services. As a consequence, competition in most health care systems is regulated in several directions. The main dimensions of health care system design are financing of health care and regulation of demand and supply. With regard to health care financing, three main principles, tax-financing, social health insurance, and private health insurance, can be distinguished. Key elements in regulating competition are risk adjustment and consumer choice. To decrease the moral hazard effects leading to increased demand in health care, regulative elements such as user charges can be implemented. An unnecessarily increased supply of health care should be regulated by remuneration systems that modify the incentives for hospitals and physicians.

In a situation of scarce resources available for health care, not all imaginable interventions can be reimbursed by third–party payers. As patients and health care professionals are mostly unable to assess the additional benefit of single health care technologies, collective assessments of the additional costs and the additional medical benefits or utilities are performed. In economic evaluation studies, the cost consequences, as well as the clinical efficacy of alternative interventions, are compared based on cost-outcome ratios. In cost-effec-

tiveness analyses, the chosen comparators are the costs per adequate clinical or epidemiological parameter such as the costs per life-year gained or the costs per event avoided. Utilities, the outcome measure of cost-utility analyses, aggregate the life-time gained by a defined intervention together with the patient's quality of life to a generic measure, which allows comparison of interventions for different indications and in different health care sectors. Key elements of economic evaluation studies of health care interventions are the choice of the perspective, the use of modeling techniques, and the choice of different cost components to consider for the costing process. More generic approaches to describe costs with respect to the effectiveness of health care systems as a whole are cost of illness studies and the burden of disease concept of the WHO.

Cross-References

- ▶ Burden of Disease
- ▶ Competition, Health Care
- ▶ Consumer Choice
- ▶ Cost-Effectiveness
- ▶ Health Care Costs
- ▶ Health Economic Evaluation
- ▶ Health Economics, Concepts
- ▶ Health Financing
- ▶ Health Insurance Markets
- ▶ Health Systems
- ▶ Health Systems Reforms
- ▶ Labor Market
- ▶ Modelling
- ▶ Regulatory Mechanisms
- ▶ Value, Human Life – Utilities

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Health Economics, Concepts

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Definition

The application of economic theory and economic methods to health poses some severe challenges. This is illustrated by a number of assumptions of economic theory and its application to phenomena and problems associated with health – such as externalities of consumption, the extension of traditional welfarist approaches, and agency problems.

Basic Characteristics

Health economics is the application of economic theory and economic methods to phenomena and problems associated with health (Culyer 2005). A comprehensive taxonomizing framework that systematically includes the various topics of health economics has been developed by Alan Williams from the University of York. The "Williams' Schematic of Health Economics" (Culyer and Newhouse 2000) conceptualizes this definition. However, the application of economic theory and economic methods to health poses some severe challenges. This is illustrated by a number of assumptions of economic theory and its application to phenomena and problems associated with health (Rice 2002).

Market Competition and Externalities

Market competition assumes that there are no negative externalities of consumption and no positive externalities of consumption. ► Externalities of consumption exist if one individual's consumption of a good or service has positive or negative consequences for the ► utility of another person. If externalities exist, a competitive market process will not lead to socially optimal outcomes. A positive externality increases the utility of another individual – although he or she does not pay for it. One classic example of a positive externality in health economics is immunization: the benefit of immunization is not restricted to those individuals who have been treated. However, in competitive markets, the direct beneficiary of the immunization will have to bear the full cost. As a consequence, individual consumers would buy too few immunizations. In order to overcome this market failure, governments may subsidize the purchase of immunizations, provide them for free, or make them mandatory. A negative externality decreases the utility of another individual. A classic example of a negative externality in health economics is smoking. Smoking by one individual decreases the utility of another individual. As a consequence, governments will either raise the price of smoking or restrict individual opportunities to smoke in the presence of non-smokers.

Demand Theory: Information Asymmetries and Extra-Welfarism

Economic demand theory assumes individuals are the best judges of their own welfare and consumers have sufficient information to make good choices. Moreover, demand theory also assumes consumers know the consequences of their decisions with reasonable certainty and that individuals are rational. Finally, demand theory assumes social welfare is based on the sum of individual utilities, which in turn are determined by the goods and services consumed (Rice 2002).

Most of the time, these assumptions are not fulfilled in health care markets. There are several examples that illustrate that regulation overrides the right of individuals to be the best judge of their own welfare – e. g. the obligation to wear a helmet while riding a motorcycle or the obligation to wear a safety belt while riding in a car. Moreover, individual consumers usually lack the medical education necessary to execute informed choices

on treatment options, which results in severe information asymmetries in the patient–physician relationship. The outcome of medical interventions (or non-interventions) is not always clear for consumers of health care services. The rationality of consumers is disturbed by the often very personal consequences of consumption decisions.

Finally, the "welfarist" approach of economic theory – social welfare is based on the sum of individual utilities, which in turn are determined by the goods and services consumed – is under close scrutiny in health economics (► welfarism). If the welfarist approach is applied to health, it means that health is a source of utility – both directly and indirectly – through the effects good health has on the individual's capacity to enjoy other goods and services. However, this approach is rather limited. Therefore, the concept of "► extra-welfarism" has been developed in health economics (Hurley 2000). Extra-welfarism acknowledges that a wider range of characteristics is relevant for individual welfare – not just the consumption of health care services and health in itself; it also refers to relative changes in consumption or work patterns as direct sources of utility or disutility. Extra-welfarism "*acknowledges the processes and transitions of life*" and "*makes no heroic assumptions about the ability of sick people to make rational utility-maximizing decisions on their own behalf*" (Culyer 2005: 127).

Supply Theory: Agency Problems

In most microeconomic applications, supply plays a subsidiary role to demand. Generally, it is assumed that supply adjusts if consumers' preferences change. Again, supply theory is based on a number of crucial assumptions, the most crucial being that supply and demand are determined independently. Once more, this essential assumption is not fulfilled in most health care markets. Supply and demand of health care services are closely interlinked, which is clearly contradictory to the traditional microeconomic model. Patients rely on health care professionals to reduce ► information asymmetries and to support them in order to make informed choices. This assumes that health care professionals act as perfect agents for their patients and refrain from pursuing self-interests that might be divergent from the interest of the patient. However, in practice, physicians are quadruple agents. They pursue the interest of the patient, their own self-interest, the interest of the third-party payer, and the interest of society as a whole (Rice 2006). Health economists generally agree that physicians – the suppliers – are able to induce demand for their services, at least to some degree. As a consequence, designers of health care systems have come up with a variety of policy measures to reduce incentives for ► supplier-induced demand (► regulatory mechanisms).

Cross-References

► Externality of Consumption
► Extra-Welfarism
► Information Asymmetry
► Regulatory Mechanisms
► Supplier-Induced Demand
► Utility
► Welfarism

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Health Economics in Dentistry

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Synonyms

Medical economics; Economic evaluation; Health services management

Definition

Health economics is an independent branch of economics that is concerned both empirically and theoretically with the economic aspects of healthcare and more particularly with the production and distribution

of scarce health goods. The justification for a specifically economic consideration of the non-economic good represented by health is that many healthcare problems (a) are connected with economic phenomena and conditions, (b) can be described and quantified in economic categories, and (c) either can be solved by economic means or, in view of the ► scarcity of the resources required, call for a strategy based on economic considerations. In addition, of course, other, non-economic, approaches (e. g. evidence-based medicine/evidence-based dentistry, social medicine or social law) can be applied, the results of which can contribute on an interdisciplinary basis to analyses in the field of health economics.

History

The genesis of health economics as an economic discipline in its own right is closely bound up with the trend of healthcare costs and the consequent realization that not everything desirable in the field of health is affordable. In view of this somewhat gloomy state of affairs, health economics for a long time enjoyed a reputation as a "dismal science". Yet health economics is not a mere policy instrument for containing costs, but in fact an indispensable aid to rational policy-making.

In the particular field of dentistry, the subdiscipline of "dental health economics" has now come into being, albeit hesitantly. In 1973 the American economist Paul J. Feldstein published the first systematic consideration of health-economic issues in the dental field, *Financing Dental Care: an Economic Analysis* (Feldstein 1973). Dental health economics is still relatively undeveloped in the German-speaking countries as compared with the United States, the United Kingdom, the Netherlands and Scandinavia.

Basic Characteristics

The specific methods used in health economics are characterized by systematic comparison of the costs and benefits of given actions and the balancing of alternatives against each other. According to the World Health Organization's standard definition, the function of health economics is "inter alia to quantify over time the resources used in health service delivery, their organization and their financing; the efficiency with which resources are allocated and used for health purposes; and the effect of preventive, curative, and rehabilitative health services on individual and national productivity" (World Health Organization 1975).

Research Issues

Health economics in the sphere of dental care is concerned in particular with the analysis of issues in and aspects of the following fields:

- **Allocation**: Is the allocation of resources to dental treatment inadequate or excessive compared with those provided for other areas of demand such as nutrition or education? Within the field of dentistry, should more or less be spent on prevention relative to expenditure on curative treatment (Räbiger 1989)?
- **Efficiency**: Are dental services rendered at the lowest possible cost for a given quality of care (in accordance with the "► minimum principle"), or are as many dental services as possible at the highest possible quality rendered for a given level of resources? And how can economic incentives contribute to increased efficiency, for instance with regard to the remuneration of dentists (Tiemann, Klingenberger, Weber 2003)?
- **Distribution of health goods and services**: How are the benefits of the dental healthcare system distributed to different sections of the population? Is good-quality care received only by those who can afford the services, or is there an entitlement to good healthcare irrespective of income, age, etc.?
- **Creation of value**: What is the significance of the dental care sector as a factor of growth and value in the economy and as a source of income for those working in the sector?

Levels of Analysis

Health-economic analysis can be applied at different levels. On the *micro-level* it concerns the actions of individual actors (e. g. aspects of dentist-patient communication, or effective practice management), the emphasis being placed on microeconomic elements. This level is sometimes referred to as "health services management". The *meso-level* examines the actions of the intermediate actors in the health system (e. g. associations of statutory health insurance funds, or regional associations of statutory health insurance dentists). Owing to the German tradition of strong corporatist structures, "intermediate-level control" is comparatively important in this country (Tiemann, Klingenberger,

Weber 2003). Finally, the *macro-level* is that of analysis of the characteristics of the system as a whole. The macro-level arises by the aggregation of individual actors into collectives such as "the dental profession", or "patients". "Health system analysis" is conducted from the macroeconomic point of view, and examines such issues as dental overprovision, underprovision and malprovision (SVRKAiG 2002).

Methods of Health-Economic Evaluation

For practical purposes, perhaps the most important aspect of health-economic evaluation in the dental field is assessment of the costs and effects of different therapies and/or preventive strategies. These are examined from various points of view, such as that of the individual patient, that of the health insurance sector, that of the dental industry or indeed that of society as a whole. The outcome parameters used are epidemiological data, such as the DMFT value for caries or the Community Periodontal Index (CPI) for periodontal status. To ensure that the results of health-economic evaluation studies can be validly interpreted, minimum requirements as to methodology and transparency must be observed (Drummond 2005). The most common types of studies are enumerated in Table 1.

A strikingly large number of evaluation studies in the dental field are devoted to comparison of the costs of preventive strategies with their effectiveness (CEA). Preventive care concepts have a relatively long tradition in dentistry. The principal landmarks in the prevention of dental pathology in Germany are the placing of group-prophylactic measures for children on a statutory basis in 1989 and the introduction of the system of individual prophylaxis in the statutory health insurance scheme in 1991. A comparison of the economics of various prophylactic measures (Saekel 2002) shows that all current measures of prophylaxis and tooth conservation are cost-effective and hence to be recommended in terms of health economics (Table 2). Apart from vaccination, no other field of healthcare has such high efficiency as dental prophylaxis, and in particular fluoridation for the prevention of caries (Räbiger 1989).

Similar studies have been carried out for a number of dental prosthetic treatments (Kerschbaum 1997; Walter et al. 1999). The usual method of calculating the cost of the alternatives is "decision tree analysis". This is a methodological approach to the systematization of decision-making processes that uses what are known as transitional probabilities to predict the occurrence of various health-related states (e. g. secondary caries or tooth loss), sometimes extending over relatively long periods. In the case of long-term predictions, the costs of medical measures must be not only added together but also discounted. In the dental field, a long-term perspective is appropriate mainly in connection with the survival rates of restorations, prostheses and implants, and with the biomedical compatibility of various dental materials.

With regard to the development of cost utility analysis (CUA) and cost benefit analysis (CBA), health-economic research is still in its infancy, as investigation of the benefits of dental measures is enormously more complex in terms of methodology than determination of their costs. Owing to the relative non-availability of empirical data in the field of dental health-

Health Economics in Dentistry, Table 1 Systematization of types of health-economic evaluation

Non-comparative studies	
Cost of illness study (CIS)	Determination of the direct and indirect costs of an illness without consideration of effects.
Comparative studies	
Cost minimization analysis (CMA)	Determination of the costs of two or more alternative courses of action assuming equality of effects.
Cost effectiveness analysis (CEA)	Comparison of two or more alternative courses of action in terms of cost and effectiveness. This calls for a uniform effect dimension defined clinically or epidemiologically.
Cost utility analysis (CUA)	This combines different effect dimensions within the single effect dimension of "quality-adjusted life years" (► QALY), so that the relative value of therapies can be determined even where indications differ.
Cost benefit analysis (CBA)	This considers effects in terms of monetary units, thus providing a common dimension for costs and effects. The inputs and outputs of different courses of action can then be compared and balanced against each other.

Health Economics in Dentistry, Table 2 Economics of selected measures of prophylaxis and tooth conservation

Measure	Benefit : Cost (B/C)
Home use of fluoridated iodine salt	> 70
Group prophylaxis (age range 4–12 years)	5.1
Fissure sealing of permanent molars	2.3
Risk-based intensive prophylaxis as group prophylaxis	2.9
Risk-based intensive prophylaxis at the dental practice	1.2
Root canal treatment	16.7

care, ► willingness-to-pay analyses bear great difficulties. Yet research on the quality-of-life aspects of dental care has made significant progress with the development of the Oral Health Impact Profile (OHIP) for the determination of the benefit, or utility, of alternative dental treatments from the patient's point of view. There is now a validated German-language short form of the OHIP questionnaire with 14 items (John et al. 2006), which allows problem-free assessment of patients' oral-health-related quality of life at the dental practice or in appropriate studies.

Conclusion

The significance of health economics as an instrument of rational policy-making is likely to increase further in the future, as health – including oral health – is in economic terms a ► superior good, which means that the demand for it increases disproportionately as incomes in society as a whole rise. The fact that medicine is a growth market is evident from the proportion both of the labor force (1970: 2.9%; 2004: 10.6%) and of GDP accounted for by the healthcare sector: in 2005 health-related spending averaged 9% of gross domestic product in the OECD countries, compared with only just over 5% in 1970.

Health economics, then, is fundamentally a science not of minimization but of optimization. Economic evaluations facilitate the choice of alternatives in dental practice in a situation of scarce resources. It would therefore be negligent to eschew health-economic approaches to issues in the field of dentistry.

Cross-References

► Minimum Principle
► Quality-Adjusted Life Years (QALY)
► Scarcity
► Superior Good
► Willingness-to-Pay Analyses

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Health Education

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Definition

Health education is defined in the context on health promotion as follows: Health education comprises consciously constructed opportunities for learning that involve some form of communication designed to improve health literacy, including improving knowledge and developing life skills that are conducive to individual and community health (WHO 1998).

Basic Characteristics

Health education deals with mediating health information that influences social, economic, or environmental related determinants of healthy lifestyles, health promoting behavior, and use of health services. Health education aims primarily at learning experiences and the voluntary actions people can take, individually or collectively, for their own health, the health of others, or the common good of the community. Defining health education as any combination of learning experiences designed to facilitate voluntary actions conducive to health emphasizes the importance of multiple determinants of behavior (Green and Kreuter 1999).

In addition, health education comprises the development and strengthening of ► life skills. Health education plays a significant role in health promotion and is needed for implementation of ► intervention strategies of primary, , and ► tertiary prevention.

The regional European office of the ► world health organization (WHO) describes health education as strengthening knowledge and experiences of individuals on health and illness and the organism and its functions, as well as disease prevention. It emphasizes the strengthening of knowledge and experiences of individuals regarding the utilization of health services and understanding of their functions. The objective of these efforts is to give individuals the responsibility for their health and the ability to use the offerings of health care systems. Health education is a systematically planned activity, and can thus be distinguished from incidental learning experiences. Further, this description of health education draws attention to voluntary behavioral actions taken by an individual, group, or community with the full understanding and acceptance of the purposes of the action – either to achieve an intended health effect or to build capacity for health.

Furthermore, the idea of health education is based on principal human rights to gather complete information in the field of health and illness. Health education contributes to fostering the motivation, skills, and confidence necessary to take action to improve health (BzgA 2003). Health education paves the way for ► health literacy, which is understood as the concept of well-informed humans, giving them autonomy in their health-related behavior.

Actions on health education might be carried out by individuals, groups, or communities; or policymakers, employers, teachers, or organizations whose actions or practices control or influence determinants of health. Health education can be described in the following contexts:

- Health education in traditional context
- Health education
- Health counseling
- ► Peer Education.

Health Education in Traditional Context

Health education developed from the educational work in hygienic issues at the end of 19th century and at the beginning of the 20th century. This kind of education aimed to educate humans in important aspects of health and diseases, which was the objective of historical education in ► hygiene. It was directed to the whole population or parts of it. At that time, health education was mainly disease-related. It was realized through mass media in order to educate the population in essential aspects of health and medical conditions. Subsequently, this approach of health education was replaced by the following principles that were outlined by the WHO:

- Strengthening of knowledge and experience on health, diseases, and about the physiology of the human organism
- Strengthening of knowledge and experience in regard to the structure of health services and their utilization
- Increasing awareness about social and environmental factors and health determinants.

Further Developments in Health Education

The development of health education was shaped by methods of social medicine, public health, and psychology that are based on concepts of risk factors and the ► health belief model. This model is still used as an assessment tool to understand why persons participate in programs for the prevention or detection of

diseases. Modern methods of psychology were considered after it was revealed that positive effects in health education were not achieved by education using the "wagging finger". Traditional health education aimed at increasing participation in interventions such as early recognition measures of diseases and vaccination campaigns, reduction of risk factors of diseases and addiction, and improvement of physical and mental health. The meaning of isolated health education campaigns decreases since the knowledge and cognitive abilities do not change sustainable health risk behavior to the extent that is desirable. Complex approaches promise more success.

Since the beginning of the 1970s, the main focus of educational measures has been directed towards risk factors of chronic diseases like smoking habits, obesity, lack of physical activity, and mental balance as well as high blood pressure and high blood sugar. For individuals in these risk groups who suffer from chronic illness, measures are intended to motivate them towards more healthy living. This development was supported by the possibility of medical monitoring of risk factors (BzgA 2003).

Currently, modern health education is shaped by the concept of designing and strengthening ► life skills. The WHO demands the promotion of communication offerings that contribute to the improvement of health literacy. Health education contains more than dissemination of information and knowledge transfer on health issues. Competences in health topics that are achieved by health education support the aim of a health promoting lifestyle for individuals and therefore support the strengthening of community actions in health promotion.

Actions on health education might be carried out by individuals, groups, or communities; or policymakers, employers, teachers, or organizations whose actions or practices control or influence determinants of health.

General health education measures like ► mass media campaigns using methods of mass communication may be also carried out in an organized form in adult education centers or at night schools. This kind of health education is characterized through voluntary participation and participation related, social and self-determined learning and integrated educational concepts on health topics. Measures of health education are also offered by health insurers and other different educational institutions. In this context, it is also termed health training or health counseling. Such facilities also offer information on health and depict a special form of health education but the information is only given to individuals or a small group of individuals. It is orientated on individual circumstances and differs from traditional health education.

In addition, a special kind of health education uses the concept of peer education. Peer education in the sense of health promotion means learning and mediating information, behavior patterns, and ethical qualities on health through the participants of the education group themselves, especially in population groups of youths and adolescents. The approach of peer education is used widely in the United States and is part of the academic curricula. Positive experiences exist for the following topics: Primary prevention of smoking and substance and alcohol abuse; counseling and information on eating disorders; HIV prevention and prevention of unintentional pregnancy; and coping with stress.

H

Cross-References

- ► Health Belief Model
- ► Health Literacy
- ► Hygiene
- ► Intervention Strategies in Prevention
- ► Life Skills
- ► Mass Media
- ► Peer Education
- ► Prevention, Secondary
- ► Prevention, Tertiary
- ► Primary Dentition
- ► WHO

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Health of the Elderly

► Aging and Health

Health Enhancement

► Health Promotion, Ethical Aspects

Health Facility

► Health Care Facility

Health of the Female Population

► Women's Health

Health Financing

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Synonyms

Health care financing

Definition

Designers of health care financing systems—at least in high-income countries and with the notable exception of the US—rely on either social health insurance premiums or taxes as the primary source of health financing. Both provide a high degree of risk solidarity and comprehensive coverage. In contrast, private health insurance premiums and out-of-pocket payments are usually considered to be secondary sources of health care financing.

Basic Characteristics

Sources of Health Care Financing

Health care systems are financed by a variety of sources. The most basic source of health care financing is ► out-of pocket payment. Usually, out-of-pocket payments are a secondary source of health care financing, since health care expenditures are highly skewed and out-of-pocket payments do not provide any risk-spreading (► health insurance markets). The second source of health care financing is premium income from ► private health insurance. Private health insurance is characterized by ► risk-related premiums. Due to ► adverse selection in unregulated private health insurance markets, private health insurance premiums in most countries—with the notable exception of the US—do not serve as a primary source of health care financing (Colombo and Tapay 2004; Reinhardt et al. 2004). In most industrialized countries, the primary source of health care financing is either ► social health insurance premiums or taxes (for empirical information on the share of different sources of health care financing see ► health systems). In the remainder of this section, we will discuss the implications of private health insurance, social health insurance, and tax financing for risk solidarity and income solidarity.

Implications for Risk Solidarity

Societies in most industrialized countries place a high priority on *fairness or solidarity* as a policy objective in health care financing (Wagstaff and van Doorslaer 1992; Wagstaff and van Doorslaer 2000). Two dimensions of solidarity need to be distinguished (van de Ven and Ellis 2000). The most basic dimension of solidarity is ex-post ► risk solidarity between the healthy and the sick. This means that there is a limited redistribution of resources from the unexpectedly healthy towards the unexpectedly sick. Risk solidarity is limited to health risks that become apparent after establishing the insurance contract. Risks that had been visible before the contract are accounted for by higher health insurance premiums. If the regulator does not intervene, private health insurance therefore provides ex-post risk solidarity between the healthy and the sick only.

However, with the notable exception of the US, most high-income countries do not rely on private health insurance as a predominant mode of health care financing (Gottret and Schieber 2006). Instead, designers of health care financing systems prefer to implement modes of financing which provide an enhanced degree of solidarity and redistribution (Mossialos et al. 2002; Wasem et al. 2004). Both social health insurance and

a ► national health service that is based on tax funding provide ex-ante risk solidarity as well as ex-post risk solidarity between the healthy and the sick. Ex-ante solidarity between the expectedly healthy and the expectedly sick implies that health risks are covered at any time. In social health insurance, premium rate restrictions apply—health insurers have to refrain from charging higher premiums for high health risks. In tax-financed systems, tax payments are not related to health risks.

Although both tax-financed schemes and social health insurance schemes provide comprehensive risk solidarity between the healthy and the sick, there are important differences between the two modes of financing. In tax-financed health systems—such as the English National Health Service or Canadian Medicare—solidarity is based on residence. There are few opportunities to opt out of the system. Thus, comprehensive coverage—and therefore comprehensive risk solidarity between the healthy and the sick—is easy to obtain. In contrast, social health insurance systems restrict solidarity to the members of the risk pool. Compared to private health insurance contracts, membership to social health insurance is easy to obtain. However, if it is not mandatory to take out social health insurance for the entire population, selection problems will follow: good risks may try to opt out of the social insurance system. They either will take out private health insurance—if it is available—or may rely on the provision of public services in the case of need. As a consequence, fewer good risks will be in the risk pool to subsidize bad risks. An effective instrument to neutralize incentives for opportunistic ► free rider behavior is the obligation for the entire population to take out social health insurance (Rice 2002).

Implications for Income Solidarity

Comprehensive risk solidarity between the healthy and the sick is an indispensable property of social health insurance. Moreover, ► income solidarity—solidarity between the rich and the poor—may be a fundamental feature of social health insurance as well, but not necessarily so. If social health insurance calculates ► community-rated premiums, these premiums are independent of income. As a consequence, social health insurance in this case does not redistribute resources from the rich to the poor. What is more, the consequences of community-rated premiums are regressive: the higher the income, the smaller the share that is spent on social health insurance premiums. In most OECD-countries that use social health insurance as the predominant mode of health care financing, these consequences are not socially acceptable. Therefore, designers of health care financing systems either implement a system of tax-financed and needs-tested premium subsidies as a complement to community-rated premiums or use income-dependent premiums as the primary mode of financing.

In tax-financed national health systems, the implications for the redistribution of income depend on the design of the tax system. The consequences on the distribution of income can be progressive, regressive, or proportional. Direct taxes on income may be equivalent to social health insurance premiums in terms of income solidarity. Thus, the consequences of direct taxes on income distribution are proportional if the tax rate is uniform across all income categories and across all income groups. The consequences are progressive if the tax rate is not uniform across all income groups but goes up as income goes up. However, direct taxes are only one important component of general tax revenue. Indirect taxes on consumption are another component. The consequences of consumption taxes on income distribution are usually regressive: the higher the income, the smaller the share that is spent on indirect taxes. This is a consequence of the fact that low-income groups have a lower savings rate than high-income groups. A popular instrument to attenuate this regressive effect of indirect taxes is to exempt basic consumer goods from indirect taxes or to apply lower tax rates to these goods.

Cross-References

► Adverse Selection
► Community-Rated Premiums
► Free-Rider Behavior
► Health Insurance Markets
► Health Systems
► Income Solidarity
► National Health Services
► Out-of-Pocket Payments
► Private Health Insurance
► Private Health Insurance, Alternative
► Private Health Insurance, Complementary
► Private Health Insurance, Supplementary

- ► Risk-Related Premiums
- ► Risk Solidarity
- ► Risk Solidarity, ex-ante
- ► Risk-Solidarity, ex-post
- ► Social Health Insurance

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Health Goals

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Definition

Health goals are general statements of intent and aspiration, intended to reflect the values of the community in general, and the health sector in particular, regarding a healthy society (WHO 1998).

Basic Characteristics

In General

Goal statements are clearly articulated, general statements that describe the future state of affairs and provide general direction, purpose or intent of what needs to be accomplished. In the context of health promotion, Nutbeam defines health goals as a summary of ► health outcomes which, in the light of existing knowledge and resources, a country or community might hope to achieve in a defined time period. On the basis of firm evidence, health goals are used for creating recommendations and a catalog of measures in special sectors and population groups. The involved participants commit to implement health goals in their field of authority. The implementation and sustainable development of health goals is applied in a long term process (WHO 1998).
Numerous countries have adopted an approach to setting health goals and ► health targets as a statement of direction and intent with regard to their investments for health. The World Health Organization (► WHO) has supported the development, and has promoted the use of health goals and targets at global and regional, national and local levels. One of the most known health goals is the general WHO statement "► health for all."
The prioritization of health risks and health problems formed the background for the development of health goals, related to citizens in general and patients in particular, in order to forward the political discussion about the advancement of health promotion, disease prevention and rehabilitation. Moreover, in order to achieve a high percentage of these health goals and energize both managers and suppliers of health promotion, available resources and funds should be used in a fast and efficient way.

Historical Development of Health Goals

In the 1970s health goals were developed from the reorientation of ► health policy with its new aims in health promotion and disease prevention. The World Health Assembly aimed at enabling the "Health for All" policy whereby every citizen would have the opportunity of leading a full productive and social life. This overall goal was adopted as the general strategy "Health for All" in 1979 and it has so continued (Declaration "Health for All in the 21st Century", adopted 1998). The global strategy "health for all" was followed by the European program with the title "Health for All 2000"

in 1984. It encompassed 38 health goals amongst other overall goals like "for a better health" or "for promoting healthy life styles." It was also agreed to measure the reaching of health goals regularly and to publish the results of this measurement. Therefore, 65 indicators were developed as standard measurements of achievement.

By 1991 health goals had undergone further development. After that the program was transferred to the health goal program, "Health for All in 21st Century – Health 21." An additional updating was carried out in 2005. The program does not provide explicit goals for any given region since the complex social economic and health conditions vary within the European Regions which make up the WHO. In this regard, it is necessary that each member state formulates its own concrete description of implementation and benefit of health goals at both national and regional levels. The priority goal of the WHO to reach health for all is supported by the following three fundamental aspects:

- Health as a one of the fundamental ► human rights.
- ► Equity in health and solidarity in action between countries, between groups of people within countries and between genders.
- ► Participation by and accountability of individuals, groups and communities and of institutions, organizations and sectors in health development.

The following four main strategies for action have been chosen to ensure health as fundamental human right:

- Multisectoral strategies to tackle the determinants of health, taking into account physical, economic, social, cultural, and gender perspectives and ensuring the use of ► health impact assessments.
- Health-outcome-driven programs and investments for health development and clinical care.
- Integrated family- and community-oriented primary health care, supported by a flexible and responsive hospital system.
- A participatory health development process that involves relevant partners for health, at all levels – home, school and worksite, local community and country – and that promotes joint decision-making, implementation and accountability.

On the basis of the mentioned principles of the WHO, the following 21 health goals depict the currently framework for health policy in the European region. These 21 health goals are regarded as standard for the assessment of progress in health situation improvements, preventive health care systems and the reduction of ► health risks and hazards (WHO 1999).

- Solidarity for health in the European region.
- Equity in health.
- A healthy start in life.
- Health of young people.
- ► Healthy Ageing
- Improving ► mental health.
- Reducing ► communicable diseases.
- Reducing noncommunicable diseases.
- Reducing injury from violence and accidents.
- A healthy and safe physical environment.
- Healthier living.
- Reducing harm from alcohol, drugs and tobacco abuse.
- ► Settings for health.
- Multisectoral responsibility for health.
- An integrated health sector.
- Managing for ► quality of care.
- Funding health services and allocating resources.
- Developing human resources for health.
- Research and knowledge for health.
- Mobilizing partners for health.
- Policies and strategies for health for all.

The 21 health goals of the program "Health for All" was taken into the health policies of almost all members of the European Union (WHO 1999). Numerous member states of the Organization for Economic Cooperation and Development (► OECD) adopted the idea of health targets and a large number of health goals were developed both at national and regional level. Since the beginning of the 1970s health goal programs have spread worldwide. For example, health goals were defined in Australia, Denmark, Finland, France, Great Britain, Ireland, Italy, Poland, New Zealand, United States and Sweden. Programs on the issues were also drafted at the regional level in many countries.

Cross-References

► Communicable Diseases
► Equity
► Health for All
► Health Impact Assessment (HIA)
► Health Outcomes
► Health Policy
► Health Risk
► Health Targets

- ► Healthy Ageing
- ► Human Rights
- ► OECD
- ► Participation
- ► Public Mental Health
- ► Setting
- ► WHO

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Health Impact Assessment (HIA)

Definition

Health impact assessment provides decision makers with information about how any policy, program or project may affect the health of people. HIA seeks to influence decision makers to improve the proposal. WHO supports the use of HIA because of its ability to influence policies, programs and/or projects. This provides a foundation for improved health and well being of people likely to be affected by such proposals (WHO Definition).

Health impact assessment (HIA) comprises detection and assessment of the impact a planned measure, project or program (e. g., expansion of an airport, street building) could have on the health of the population (e. g., ► noise, air pollution). In the context of ► prevention, HIA must aid the decision-making process by providing transparent and clear data on possible public health consequences for the various population groups as well as buildings and other structures involved. HIA can thus contribute to health being considered in other, not immediately health-related areas of politics such as municipal and residential planning.

In view of the different countries and bodies of law, implementation of HIA will be quite heterogeneous and not comparable between countries. Despite long-standing calls for implementing HIA alongside the legally mandated testing for potential environmental hazards. Currently, public health aspects are being incorporated in some countries only within the context of the legally mandated cooperation of the lower public health authorities in planning the course of environmental safety testing. One of the hurdles for implementing HIA is that environment-related aspects of health are not included in planning at the communal level, a lack of standards for implementing HIA, and no cooperation between the environmental and public health authorities.

Cross-References

- ► Health Determinants, Economic

Health Improvement

- ► Health Promotion, Ethical Aspects

Health Indexes

- ► Summary Measures of Population Health

Health Indicators

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Definition

Health indicators are quantitative or statistical measures or instruments used for the measurement of health status of an individual or defined group. They are variables that can be used to measure the changes in the level of health target achievement, or as indirect or partial measures of complex situations. ► Indicators can be numerical (rations, proportions, rates), or qualitative (existence or absence of an event). Health indicators

are divided into several main domains: demographic and socio-economic factors, indicators of health status, health determinants, indicators of health systems, and indicators of health policy, etc.

Basic Characteristics

Characteristics and Criteria for Design

Health indicators are constructed to measure health status (i. e. the occurrence of a disease or other health-related event) or a factor associated with health (i. e. health status or other risk factor) among a specified population. (Pan American Health Organization 2001) Furthermore, health indicators are markers of health-care system performance. They are used for ► health monitoring and ► health surveillance. Health indicators are selected and defined based on scientific principles and by their quality (► quality of health indicators). An ideal indicator must be: (PAHO 2001; European Commission 2001)

- Valid – effectively measures only what it attempts to measure, and it represents a true expression of the phenomena it is measuring;
- Reliable / objective – results of the measurement should be the same when the measurement is performed by other people or under similar circumstances;
- Sensitive – the indicator should have the capacity to measure changes of the phenomena of interest;
- Specific – it should reflect changes only of the situation/phenomenon it is related to, and not of similar or unrelated events;
- Measurable – data should be available or easy to obtain;
- Policy-relevant – the indicator should be capable of providing clear responses to key policy issues;
- Cost-effective – results of the use of an indicator should justify the investments in its implementation;
- Understandable – information users must be able to understand it and it should be easy to use and interpret by analysts.

Under the Health Monitoring Programme, the European Commission has proposed several strict criteria for the design of indicator sets:

1. Comprehensive and coherent – an indicator set should cover all domains of the public health field, but at the same time be consistent in structure, refer to the integrity of all data, and the values of all indicators within the set should be realistic and not contradictive.
2. Taking account of earlier work in the area of indicator selection and definition, an indicator set should follow rather than duplicate the previous efforts of international organizations, such as World Health Organization, in the establishment of good health indicators; furthermore, only standardized operational definitions, measurements, and calculation procedures should be used to guarantee the quality and comparability of the indicators.
3. Indicators should cover the priority areas that Member States of European Community currently pursue and meet the needs of Community Policies. Health indicators are expected to facilitate monitoring of health objectives and goals, strengthen the analytical capacities of health teams, and serve as a platform to promote the development of interconnected health information systems. (European Commission 2001)

Classification of Health Indicators

Various classifications of health indicators have been proposed. (OECD 2005; European Commission 2005; WHO 2005a; WHO 2006) Despite great advances in the development of indexes and complex health indicators, conventional health indicators, based on mortality and morbidity, are still being used as a base point of public health policies in practice (the so-called "pathologic" approach to health measurement). Introduction of methods oriented toward quantifying health rather than quantifying disease have led to the establishment of novel indicators, and turned the whole viewpoint toward a "generic" or positive approach to the measurement of health status. Based on various resources, health indicators can be summarized in the following groups.

Indicators of Health Status of the Population

1. Positive health indicators: low birth weight, low weight for age, low height for age, low weight for height, and low arm circumference for age;
2. Negative health indicators: perinatal mortality, infant mortality, maternal mortality, under 5 mortality, life expectancy, mortality rates by causes of death, incidence and prevalence rates (previously morbidity – HIV/AIDS incidence, cancer incidence,

prevalence of chronic illness, incidence of congenital anomalies, and incidence of communicable diseases), prevalence of long term disabilities, prevalence of injuries in road traffic accidents or at the workplace, average number of days lost due to illness per year for school, work, homemaking, and other social roles;
3. Perceived general health – satisfaction is measured as the proportion of the population aged 15 and over that report being dissatisfied with their social life; quality of life is measured as the proportion of the population that report perceiving themselves in fair or poor health (► health status indicators).

Demographic and Socioeconomic Indicators Related to Health

1. Indicators of population: rate of birth vs. death, internal migration rate (natural population growth per 1000 population), live births, crude birth rate, total deaths, crude death rate, abortion rate, total fertility rate, percentage annual increase or decrease in population, and median age of the population (► demographic indicators);
2. Indicators of socioeconomic development: national income per capita (in international dollars per capita), average annual growth of national income, gross national product, annual growth of gross national product; average income per working adult, and the allocation of income by geographical region or by profession group (► socioeconomic indicators; ► health determinants, social);
3. Employment and working conditions: total unemployment, total labor force, rate of unemployment of women, index of the dependence of the population, population by employment type, population by occupational class, and deaths due to work-related accidents;
4. Indicators of education: percentage of illiterate persons aged older than 10, percentage of primary, secondary or high school education, expenditures on education per student, average number of students per teacher, education attainment, and education enrolment;
5. Household conditions: total size of residence per person, rate of building, percentage of comfort apartments, and percentage of the population with a home connected to the water supply system;
6. Lifestyles and environmental indicators: average energy value of daily food intake, average content of macro nutrients, estimated consumption of fruits and vegetables (kg/capita/year), alcohol consumption (in liters of pure alcohol per capita), regular adult smokers aged 15 and over, first admissions to drug treatment centers, and average annual concentration of particulate matter $<10\mu$m (in $\mu g/m^3$). (► environmental health indicators; ► health determinants, environmental)

The indicators referring to the physical and social environment, genetics, and human behavior are also known as ► determinants of health.

Indicators of Health Policy

1. National health policy and strategy – the indicator is the adoption of national health policy and its implementation in the constitution and legislation of a state (► health policy indicators);
2. Allocation of resources in health – measured by the proportion of national income that is used for the funding of health protection of the population (total health expenditure as percentage of gross domestic product, or total expenditures on health in international dollars) (► health economics);
3. Health expenditure by sources of funds: social security, out-of-pocket payments, private insurance, or other private funds;
4. Community involvement – measured by its relation to decision making for health care and the presence of mechanisms to meet patients' health needs.
5. Presence of organizational setting and management process – measured by the existence of communication and cooperation between various departments and organizational units within the health service, as well as committees, expert groups, councils for health development, and non-governmental organizations.

Indicators of Health Care Provision

1. Provision of primary health care – can be estimated by provision of primary health care in a community (per total population), by immunization rate (percentage of the population immunized), provision of maternal, child and elderly health care (per total number of women, children and elderly, respectively), food and water supply, and health education

and promotion (► health care provision indicators; ► health care quality);
2. Availability of health care – number of people in the population divided by number of health workers or health institutions;
3. Accessibility of health care – percentage of people who will be using health services considering barriers – geographical, economical, and cultural, etc;
4. Utilization of health care: number of services per resident; rate of hospitalization; hospital beds per 100,000 population; number of nurses, physicians, or other health workers per 100,000 population; number of nurses and midwives per physician; in-patient care admissions per population; average length of stay in hospital (in days), discharge rated by diagnostic categories; and number of surgical procedures and transplantations, etc;
5. Health expenditures: total health expenditure (as percentage of gross national product or in international dollars per capita); expenditure on prevention and public health; expenditure on health administration and insurance; expenditure on medical services; expenditures on in-patient, out-patient and home care; and expenditure on pharmaceuticals, therapeutic appliances and medical goods;
6. Medical technology in health care: number of computed tomography scanners, magnetic resonance imaging units, and amount of radiation therapy equipment etc;
7. Education in health: number of health graduates, number of organizations and institutions to promote health, and implementation of health education in school activities;
8. Health workers' performance: availability (absence rates and waiting times), competence (prescribing practices, readmission rates, and rates of cross infection), responsiveness (patient satisfaction and assessment of responsiveness), and productivity (occupied beds, outpatient visits, and interventions delivered per worker or facility);
9. Quality of health care – can not easily be estimated; however, indicators include: accessibility of health care (physical access, availability, and affordability of health care), effectiveness of care, efficiency, acceptability, equity, continuity, qualifications of physicians, consumer satisfaction, and cost of care, etc. (Campbell 2000). (► health system indicators; ► health systems)

Summary Measures of Population Health

► Summary measures of population health combine information on mortality and non-fatal health outcomes to represent the health of a particular population in a single numerical index. Summary measures can be used for ► health reporting – comparing the health of different populations and monitoring changes in health status of the population over time. Such estimations are, in turn, used for the identification of priorities for health service delivery and planning, and research and development in the health sector. (Murray 2000; Mathers et al. 2004; WHO 2005b; Etches et al. 2006)

1. Disability-adjusted life years (DALY) is one of the indexes measuring the total economic burden of a disease. It refers to time lived with disability and time lost due to premature death and ill health in terms of the equivalent of the healthy years that did not happen, or the health debit. Simplified, it can be calculated as the sum of years of life lost due to premature death (YLL) and years of life with disability (YLD).
2. Healthy life expectancy (HALE) represents the number of healthy years people can expect to live under current conditions.
3. Potential years of life lost are estimated for every specific cause of death by adding estimated years of life up to 75 for every person who dies from birth until the age of 75. This indicator is important for the estimation of preterm mortality and is useful for assessing priorities in preventive activities in health.
4. Quality-adjusted life years (QALY) are an indicator of the quality of work of health service. This indicator summarizes the improvements in length and quality of life that occur as an outcome of health interventions or programs. Every year gained as a result of an intervention or program is standardized according to social value of the gain for that person. Good health is referred to as 1, whereas poor health causes a decrease in quality years of life of up to 0.5.
5. The physical quality of life index represents the combination of mortality rate of the newborn, lifetime expectancy for children aged one, and the rate of literacy in the population. (► health-related quality of life; ► health determinants, psychological)

Conclusions

The fact that environmental, socioeconomic, and early life conditions, together with individual actions and medical care, all interact to affect health has been known for a long time. Improvements in data collection, regular censuses, disease reporting, and statistical analysis have further helped to integrate information on the health status of the population. In turn, health professionals have been given a chance to act on several levels of prevention in order to improve conditions affecting health and health status itself.

Cross-References

- ▶ Child Health Indicators of Life and Development (CHILD)
- ▶ Demographic Indicators
- ▶ Determinants of Health
- ▶ Environmental Health Indicators
- ▶ European Community Health Indicators (ECHI)
- ▶ Health Care Provision Indicators
- ▶ Health Care Quality
- ▶ Health Determinants, Environmental
- ▶ Health Determinants, Psychological
- ▶ Health Determinants, Social
- ▶ Health Economics, Concepts
- ▶ Health Monitoring
- ▶ Health Policy Indicators
- ▶ Health-Related Quality of Life (HRQOL)
- ▶ Health Reporting
- ▶ Health Status Indicators
- ▶ Health Surveillance
- ▶ Health System Indicators
- ▶ Health Systems
- ▶ Indicator
- ▶ Leading Health Indicators (LHI)
- ▶ Quality of Health Indicators
- ▶ Socioeconomic Indicators
- ▶ Summary Measures of Population Health

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Health Informatics

- ▶ Medical Informatics

Health Information

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Introduction

This is an era of informatics where the quantity and quality of information is increasing exponentially – a phenomenon commonly referred to as "information explosion" or "information epidemic". As a consequence, users face the problem of managing the variety

of information they are covered by, known as the "information barrier", which in turn causes frustration named "informatics anxiety" (Greenes 1990).

Health information needs are universal. Health care professionals, health managers, statisticians, decision-makers within the health system, health insurance organizations, public health providers, and consumers – they all need health information. The ever-increasing amount of available information makes it even more important to manage the flow of knowledge. The multidisciplinary nature of public health disciplines makes it especially hard to capture useful updates without becoming overwhelmed by the diversity of information.

From Information to Informatics

Information is a result of the events taking place inside a material system; it is the output of a system of interest. The words information and data are used interchangeably in many contexts, which may lead to their confusion; however, they are not synonyms.

Data is the carrier of information, and is defined as given facts from which others may be inferred; it can also be described as a message that has not been developed with relation to its value in the specific situation. Data is further organized into meaningful unions, or accessed or interpreted to obtain specific information. **Information** is defined as data endowed with relevance, purpose, and meaning. It represents data that has been developed, and can therefore be valued by its capacity to increase our knowledge. Nevertheless, the process of creation does not stop there. **Knowledge** is developed from using or applying information. Knowledge is defined as the awareness or familiarity gained by experience, a person's range of information, a theoretical or practical understanding of a subject or language, etc., or the sum of what is known. **Wisdom** flows from the accumulated experience of applying and using knowledge, or as experience and knowledge together with the power of applying them. Obviously, the process of creation and transformation from data to wisdom is characterized by increasing interactions and complexity, supported by the human capability of understanding relations, patterns and principles on every level. This continuum is called the **Data, Information, Knowledge Ladder** (► data, information, knowledge) (The Knowledge College 2001). Today, many forms of human knowledge can be recorded and used in electronic information systems. Wisdom, however, remains essentially human at present.

Information, as well as energy and other natural reserves, has become one of the key resources available today. In order to fulfill this important role, information must be timely and correct, available at the moment of decision-making, acceptable, of adequate quality and quantity, at a fair price, easy to update, and of multiple uses.

Information can be observed from several **aspects** (Van Bemmel 1997):

- The syntactic aspect refers to the grammar or syntax used for the description, storage, or transmission of messages. The syntactic aspect of information is strongly related to the carrier of the information, that is, the specific language, type of image, or biosignal. The purely syntactic aspect of information is data.
- The semantic aspect of information refers to the meaning of the message, in terms of its significance for interpretation and decision-making. The meaning can often be derived only if we know the context of the message.
- The pragmatic aspect of the information refers to the value of the information, the media that carries it, the resolution and precision that it was written with, and the quantity in which it was produced, transferred, and received. From the perspective of human behavior, information was created with a certain purpose and a certain effect, such that a concrete action or state of mind occurs after we receive it.

Information can be created, transferred, stored, retrieved, accepted, copied, processed, and destroyed. But, in a digital world, written information must be coded before it can be transmitted over a digital system. The quantity of information transmitted by any message can be **measured**. The measurement of information is the measurement of the uncertainty of a situation. That measurement is called entropy. If entropy is large, then a large amount of information is required to clarify the situation. If entropy is small, then only a small amount of information is required for clarification. The unit of information is called a bit (binary digit), which represents the quantity of information needed to make a difference between two events with same probability. By reducing entropy per bit, coding can reduce transmission errors (uncertainties) due to the transmission medium.

Health care information is used for different **purposes**. The primary purposes are those directly linked to the work of professionals and patients; secondary purposes are in administration, management, education, research, etc. Information can be classified by the time of production, as periodical or non periodical; or by its material format, information can be in paper, electronic, or film format (signals, waves), etc.

Information is contextual by **nature**. This means that information can not be seen outside of the context of its production – without its context, information is often useless. For this reason, the use of primary medical information for secondary purposes without its context is associated with several problems such as misuse, inadequate coding and transfer, and waste or misinterpretation of valuable information. With its context, data can be used for advanced functions within health care, but not always. This has been translated into the First Law of Medical Informatics: "Data shall be used only for the purpose for which they were collected. If no purpose was defined prior to collection of the data, then the data should not be used." (Van der Lei 1991)

The scientific discipline that explores the structure and characteristics of information is called **informatics.** The name originates from the French phrase *information automatique*, defining the science of automatic processing of information. It is one of the youngest scientific disciplines but has the most dynamic and dramatic development, with important implications on the development of society and other sciences. Informatics encompasses analysis of the structure; properties and organization of information; information storage and retrieval; information system and database architecture and design; library science; project management; and organizational issues such as change management and business process reengineering.

Health care informatics is the science that addresses how best to use information to improve health care. Health informatics is an essential and pervasive element in all health care activity. It is the field where health, information and computer sciences, psychology, epidemiology, and engineering intersect, and proposes to improve the quality of patient care, increase productivity, and provide access to knowledge (Mullner 2006).

This field includes several areas: bioinformatics, medical informatics, public health informatics, and consumer health informatics, as well as clinical informatics, nursing informatics, imaging informatics, dental informatics, clinical research informatics, and pharmacy informatics. These specialties can be defined following a similar pattern: bioinformatics involves the use of informatics and computer science to solve biological problems; dental informatics investigates the application of informatics in dentistry; pharmacy informatics in pharmacy, nursing informatics in nursing, etc.

► Medical informatics is the scientific discipline that investigates the laws of creation, transfer, processing, and use of information, data and knowledge in order to solve medical problems, or more precisely it is a discipline related to cognitive tasks, tasks of processing of information and communication in medical practice, and education and research, including scientific methods and technology supporting these tasks (Hersh 2002).

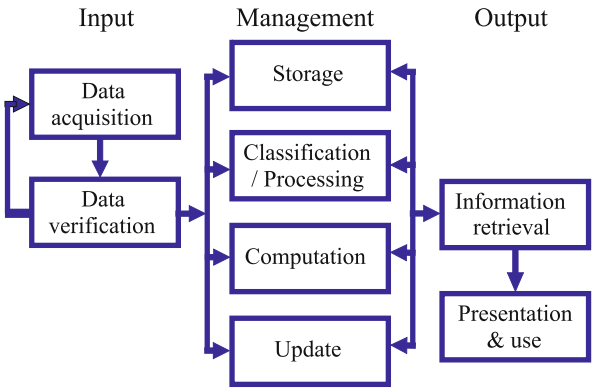
► Public health informatics is a scientific discipline that involves the systematic application of information, computer science, and technology to public health practice, research, and learning. Public health informatics is differentiated from other informatics specialties as its primary focus of concern is health prevention in populations or communities, rather than the health of specific individuals; thus, its health improvement strategy is oriented toward prevention rather than on treatment, and it has a wide range of interventions and operations within a governmental context (O'Carrol 2003).

► Consumer health informatics analyzes consumers' (i. e. patients') needs for information; studies and implements methods of making information accessible to consumers; and models and integrates consumers' preferences into medical information systems (Eysenbach 2000).

Evolution of Data into Information

All health care activities involve gathering, analyzing, and use of data. In the health information system, data usually, but not necessarily, follow a specific sequence (Fig. 1) (Dinca-Panaitescu 2003)

The main scope of **data acquisition** is to provide health professionals with information as a basis for further activities and a crucial tool in the process of decision-making. The physician can then apply his own knowledge on the specific condition or disease, and decide what intervention would be most suitable in that situation. Beside this obvious application, data are the basis of the whole process of decision-making in health care,



Health Information, Figure 1 Data in the Health Information System. Reproduced with the permission of Prof. Serban Dinca-Panaitescu

especially for health service planning and evaluation, and as indices of health service provision, usage, needs for health services, etc. Data acquisition includes data collection and data generation. The process of ► data collecting involves gathering data from various sources, whereas data generation refers to input of standard code formats.

Data can be divided into the following groups by the type of data collected and by the type of data source (Abdelhak 1996):

1. Administrative data – all data generated in an interaction between a patient and a provider in the health care delivery system: demographic, socioeconomic, legal, financial, and data from the provider.
2. Clinical data on a patient whether admitted to a health care facility or treated in a primary health care environment: main condition or principal diagnosis, medical history, physical examination and assessment, diagnostic tests, medications, operative procedures, and disposition.
3. Non-inpatient data – data collected for an emergency patient, outpatient, clinic, or aid post medical/health record: patient identification, history of presenting illness and physical findings, clinical observations, reports of tests and procedures performed, and the outcome of the visit.
4. Hospital census data – data on inpatients, emergency patients and ambulatory patient attendance that are collected daily by health care facilities and processed by the admission office staff: daily inpatient census, daily number of admissions, daily number of transfers in and out of wards, daily number of discharges, and deaths.
5. Secondary health care data collection – abstracted data from the daily inpatient census are used for: monthly and annual statistics such as the length of stay of inpatients and the inpatient occupancy rate; calculation of the gross and net death rates; autopsy rates; maternal, fetal, newborn and neonatal death rates; hospital infection rates; completion of morbidity statistics; vital statistics (births and deaths) for the production of national death and birth rates; and special registries related to patients with a specific diagnosis, condition or procedure (diabetes, HIV/AIDS, birth defects, infectious and contagious diseases, and organ transplants).

In collecting data, users are often faced with sometimes considerable anomalies in the data, such as incomplete or incorrect answers from the patient, noise on biosignals, or errors in biochemical analyzes. Information only exists to support decisions and actions; if it fails to do this, it is irrelevant noise. If the data are full of errors or incomplete, refer to past rather than present situations, or cannot be interpreted by the user then they are unlikely to help. More subtly, if useful data items are present but vital context is omitted (e. g. estrogen and progesterone levels present, but context, e. g. day of menstrual cycle, omitted), it is still hard to use the data.

The importance of ► data quality in the phase of data collection can not be underestimated. **Validation** of gathered data in the early phases of data processing reduces the cost of system data errors.

In order to reduce errors at the point of data entry, data should be entered as closely as possible to the information source, avoiding multiple independent points of unverified data entry, and the person doing the task should know the correct information. Furthermore, health professionals collecting and processing data should check for ► data errors, namely syntactic errors – are data presented in the right format and value; and semantic errors – are data possible and plausible.

It is often said that the quality of health care is measured by the quality of data in the medical record. In order to improve the quality of data, several steps can be taken (WHO 2003):

- An on-going quality assessment plan must be developed, supported both by managers and health staff;
- Staff responsible for quality control should be involved and deal with quality reports properly by

reading and acting upon recommendations in a timely manner;
- Performance indicators can be developed as a guide to monitor and evaluate the quality and appropriateness of care;
- Staff must be properly educated in order to clearly understand what quality means to the health institution, what is expected of them, and what benefit they get from high quality data;
- The data collection system needs to be simple and user-friendly;
- Quality activities need to focus on practice and not individual workers;
- Confidentiality needs to be maintained.

According to Fig. 1, once collected, data must be adequately managed. This management involves ► data processing and storage – classification, computation, coding, and eventual updates.

Most of the data collected in health care nowadays is **stored** as paper documentation. **Documentation/records** are defined as a group of techniques necessary for harmonized presentation, organization, and communication of the specific knowledge stored within (► record). The main purpose of documentation is to provide maximal accessibility and use of the information it contains (Van Bemmel 1997).

Medical documentation/medical records represent the notes of doctors and nurses about the patient's health status at the moment of contact with, and use of, the health service. It comprises anamnesis history, laboratory findings and results from other diagnostic procedures, and information on the applied therapies. The data within can be in various formats: textual format – natural language (medical history, consultation reports, and therapeutic protocols), numbers (measured variables, e. g., blood pressure, pH or temperature, and integer numbers e. g. heartbeats per minute, or number of hospital visits per month), images (radiography, CT scan, MNR scan, etc.), biosignals (ECG, EEG, etc.) and codes (diseases or drugs) (Van Bemmel 1997).

Stored data are usually organized chronologically as "time-oriented medical records". This structure of medical documentation means that users must go through all parts of the documentation in order to learn about a patient's current status or to find data they are interested in, which makes their use much more difficult. Computers can facilitate data collecting, storage and use, at least by enabling other types of data organization within a medical record, such as "sources-oriented medical records" and "problem-oriented medical records" (Van Bemmel 1997).

A collection of data is called a ► database. Data within a database are structured according to their similarity or affiliation with the same group. A file is a collection of records arranged in a database, which can be created, searched, updated, processed, reorganized, and destroyed. A special software system that enables manipulation of data is called a database management system. It is used for data storage, modification, retrieval, and control, as well as for data modeling on demand by the users. Using this system a user can access data easily and modify them for various purposes.

Paper records are physically stored in archives; in the computer, data are organized in files and directories, and physically stored in internal computer memory, or on external memory storage devices (magnetic, optical, and magneto-optical storage).

The rapid development of **electronic medical documentation** has enabled simultaneous access to documentation from various places (ambulance, hospital unit, and even operation theater), access to data from different viewpoints (by chronology, by organ systems, by medication, or by decisions made), highly structured data input, easy access to data, support to data analysis, and rapid electronic data exchange. A great challenge for electronic documentation is data stored in the format of free text that can not be coded, such as physician's observations on patient status, and which are sometimes more informative than coded, standardized information. This is why traditional paper documentation still has some advantages: it can be easily transported; data input is not highly structured enabling great freedom in writing data; medical staff need only basic education; it is a source for supporting patient care, research, and educating clinicians; it forms a basis for healthcare management and services; and it represents a legal report of medical actions (Van Bemmel 1997).

Crude, unprocessed, direct data collected from patients are not always represented in a way that enables information production. In order to generate information from data, we need data **processing**. This process is usually referred to as **coding/classification**. Medical records are coded to enable reporting, compiling, and comparing of health care data. Coding is defined as classifying data and assigning a representation for that data; it is the assignment of a specific code to a nar-

rative statement of diagnoses and procedures (WHO 2003). Data **computation** means mathematical or statistical analysis of the data (e. g. computation of Body Mass Index from body weight and height). Finally, we must bear in mind that health data are dynamic, that old values are changing, and new data are generated. Therefore, the process of data **update** must be performed regularly.

The final step in the evolution of data into information (Fig. 1) is ► data dissemination and utilization. Information does not exist without its users. **Users** of information are (WHO 2003):

- Physicians, nurses, and other health care professionals, who use information in the process of decision-making on the health status of patients and the population;
- Citizens – patients themselves, whose information forms the main part of their medical records;
- Health insurers, who require information to reimburse the health care facility for services rendered for every patient;
- Ministry of health, to review vital statistics and the incidence and prevalence of disease in a city, state, or country. The provision of accurate and reliable aggregate data is important for public policy development and funding of health care services;
- Legal representatives and courts, to protect the legal interests of the patient, physician and other health care professionals, the health care facility, and the public;
- Health educators and researchers, to analyze and interpret data to determine causes, prevention methods, and treatments for diseases, injuries, and disabilities;
- National governments who use the information to develop health care policy and provide and regulate funds;
- Media reporters, whose activities account for a considerable amount of the dissemination of information.

If useful information can not be retrieved then its acquisition can not be justified. ► Information retrieval systems are large, complex, heterogeneous, and loosely structured systems (such as journal articles, book sections, images, audio or video clips, and executable programs), in comparison to database systems that tend to be small and simple (birth dates, diagnostic codes, lab results, and drug prescriptions) (Gardner 1997).

Data and information can be **presented** in several forms: as tables, graphics, images, video, sounds, signals, etc. Creation of information from complete, correct and up-to-date data is not the last step in the evolution process described above. Once it evolves, information needs to be distributed, presented, and used. Furthermore, by synthesizing information from different sources to produce a concept or idea we create knowledge.

As mentioned above, we are living in an era in which the main world resource is knowledge, as expressed by Peter Drucker (2001): "In today's economy the most important resource is no longer labor, capital or land – it is knowledge" (The Knowledge College 2001).

The distribution of knowledge worldwide is enabled by the development of **communication technologies**. ► Communication represents the process of exchange of information, thus supporting contact between various users of information.

Although the most common type of communication in health care is mail, and in some countries the only type, this kind of communication is slow, and doesn't satisfy the need for accurate, up-to-date information. However, the flow of information is getting faster with the use of e-mail, electronic data interchange, and network technology. Advances in information and communication technologies make the global distribution of knowledge seem effortless. Technology, specifically the World Wide Web, enables information to be made available to multiple users the instant it is produced.

The process of delivery of health related services and information via telecommunication technologies is defined by the term ► telehealth (Wikipedia). In clinical medicine, telehealth technologies are used for the transmission of medical images for diagnosis (store or forward telehealth), transmission of medical data for diagnosis or disease management, exchange of live health services or education via videoconference (real-time telehealth), etc. Non-clinical uses of telehealth technologies include: distance education (continuing medical education, patient education, etc.), administrative uses such as meetings among telehealth networks, presentations, supervisions, and research.

The development of telehealth enables access to any knowledge, anytime and anywhere, speeds up the availability and spread of information, saves time, enables cooperation among colleagues and groups, and improves the quality of decisions.

► Telemedicine can be generally defined as "**medicine at a distance**" (Wootton 1996). Since telehealth is understood as the integration of telecommunication systems into the practice of protecting and promoting health, telemedicine is the incorporation of these systems into curative medicine.

The primary purpose of telemedicine is to enable access to specialized health services to people in distant and isolated places – teleconsulting (► teleconsultation). Teleconsulting has recently been used in surgery, for transmitting angiograms to vascular surgeons for consultation; and ophthalmology, for transmitting retinal images to the ophthalmologist using a retinal camera. Other examples of telemedicine include teleradiology – transmission of radiographic images to a radiologist for interpretation; telepathology – transmission of pathohistological samples for evaluation; teledermatology – transfer of images of pigmented skin lesions, including clinical and anamnestic data; and telepsychiatry – transmission of diagnostic and treatment information via audio-visual communication.

The terms ► e-Health and telemedicine are at times used interchangeably with telehealth. Like the terms "medicine" and "health care", telemedicine often refers only to the provision of clinical services, while the term telehealth can refer to both clinical and non-clinical services such as medical education, administration, and research. e-Health is used as a term that includes telehealth, electronic medical records, and other components of health information technologies.

e-Health is sometimes defined as "the use of the Internet or other electronic media by patients and the public to disseminate or provide access to health and lifestyle information or services" (Wyatt 2005). This differs from telemedicine, in which there is a health professional at one or both ends of the communication.

It appears that, in the United Kingdom, the development of e-Health has enabled better information to be available for patients and the public and better communication of patient information within the primary health care team, leading to fewer phone calls and appointments, and improved adherence to treatment (Wyatt 2005).

In the near future, e-Health implementation will be facing various challenges. Since e-Health provides simple, easy access to health information, support services, and goods, will it lead to the loss of the general practitioner's role as a mediator in health care? For example, a patient and specialist could email each other directly, or a patient could seek advice on the Internet rather than visit a physician; however, this risks possible exposure to false or incomplete information. Another issue might be the responsibility of the physicians to respond to patient emails promptly, raising questions concerning the moral or professional grounds of such responsibility and what sanctions would be enforced if this duty was neglected, as well as how the duty would be handled during holidays (Eng 2001).

Several societal issues will also need to be addressed: the quality of e-Health information and communication, privacy and confidentiality, clinical appropriateness, public policy, cost and financing, and resource distribution. Public services must clearly define the implications of these technologies for health care and public health systems in terms of quality, access, and cost, and must establish and adopt standards and guidelines for their appropriate use (Eng 2001).

There is a clear potential conflict of interest between patients, about whom information is collected, and health care providers, stakeholders, and society, who might benefit from access to information for commercial and purchasing reasons (Department of Health and Human Services 2000). ► Consumer protection measures will have to be undertaken in order to protect patient from commercial suppliers who can influence and even mislead them. The fact that patients have trouble accessing their medical information while that very information is being used for unregulated secondary uses has exacerbated worries about the confidentiality and proper use of medical records. Wyatt has proposed the term "e-Health nightmare" to describe a consumer's irrational fear of information technology and e-Health care. This fear, sometimes supported by the media, might even lead to the rejection of information technology advances in health care (Wyatt 2005).

Giving patients control over allowing permission to view their records – as well as over their creation, collection, annotation, modification, dissemination, use, and deletion – is key to ensuring patients' access to their own medical information while protecting their privacy. Patients have the right to understand and control their health information in several forms (Department of Health and Human Services 2000):

- Patient education on privacy protections. Health care providers are required to give patients a clear written

explanation of how they can use, keep, and disclose their health information.
- Ensuring patient access to their medical records. Patients must be able to see and get copies of their records, and request amendments. In addition, a history of most disclosures must be made accessible to patients.
- Receiving patient consent before information is released. Patient authorization to disclose information must meet specific requirements. Health care providers who see patients are required to obtain patient consent before sharing their information for treatment, payment, and health care operations purposes. In addition, specific patient consent must be sought and granted for non-routine uses and most non-health care purposes, such as releasing information to financial institutions and parties determining mortgages and other loans, or selling mailing lists to interested parties such as life insurers. Patients have the right to request restrictions on the use and disclosure of their information.
- Ensuring that consent is not coerced. Health care providers can not condition treatment on a patient's agreement to disclose health information for non-routine uses.
- Providing recourse if privacy protections are violated. People have the right to complain to a covered health care provider about violations of the provisions of this rule or the policies and procedures of the covered entity.

Health Information System

An information system is a technologically implemented medium for information recording, storing, and dissemination, as well as for drawing conclusions from such information. The ► health information system (HIS) is an information system for processing data, information, and knowledge in health care environments. The goal of a HIS is to use computers and communication equipment to collect, store, process, retrieve, and communicate patient care and administrative information for all hospital-affiliated activities, and to satisfy the functional requirements of all users. Therefore, a HIS has several functions (Van Bemmel 1997):
- support of day-to-day activities;
- support of the planning and organization of these day-to-day activities;
- support of the control and correction of planned activities and their costs, in view of agreements on medical and financial policies (management control);
- support of clinical research through use of the HIS database, which is particularly important for university hospitals.

Health information systems should address several domains (AbouZahr 2005):
- health determinants (socioeconomic, environmental, behavioral, and genetic factors), and the contextual and legal environments within which the health system operates;
- inputs to the health system and related processes, including policy and organization, health infrastructure, facilities and equipment, costs, and human and financial resources;
- the performance or outputs of the health system such as availability, quality, and use of health information and services;
- health outcomes (mortality, morbidity, disability, well-being, disease outbreaks, and health status);
- health inequities in determinants, coverage and use of services, and outcomes, including key stratifiers such as sex, socioeconomic status, ethnic group, and geographical location.

The classification of information systems is made by size, complexity level and fields of application (Van Bemmel 1997):
1. by size – systems can be local, institutional, regional, national, and international;
2. by structure – centralized or distributed;
3. by field of application: health information systems, medical research information systems, and medical education information systems.

Health information systems can be further divided into primary care information systems and hospital information systems, according to the levels of health care organization, and even further divided by subsystems into information systems of specific departments (radiology, laboratory, intensive care units, etc.)

A ► primary care information system has been developed in the Netherlands, Great Britain, and Scandinavian countries, where more than 80% of physicians use personal computers to communicate with colleagues and other levels of health care. Since primary health care is the point of first contact of the patient with the health care system, information systems on this lev-

el must fulfill the requirements for several tasks: electronic record keeping, organization of everyday administration, financial activities, reporting, statistics, and research.

The main purpose of the ► hospital information system is to support hospital activities on an operational, tactical, and strategic level. This system should enable more efficient use of limited resources in the health system, improvement in the quality of services offered by the health facility, support to research, and support to the undergraduate and postgraduate education of health professionals.

In order to satisfy these functions, hospital information systems must be equipped with electronic databases; applications for data access, retrieval, presentation and distribution; communication technologies; and terminals for data use. The future of these systems will be a detachment from isolated hospital information systems, moving toward "broad-spectrum" health information systems, created, accessed, and used by all providers of health services.

► Medical research information systems enable health professionals to stay up to date with current medical investigations. One of the well known databases of biomedical literature is Medline, updated by the National Medical Library of the USA. It indexes over 600 000 papers a year, published in medical journals. Intense flow and exchange of information in recent decades has resulted in the development of "evidence-based medicine". A new discipline, evidence-based medicine is based on systematic searches for evidence in medical investigations. As a consequence, the process of decision-making can not be based on intuition and the non-systematized clinical experience of a physician. Evidence-based medicine demands new skills from the physician who must be trained for efficient searching of medical literature and application of formal rules in the process of offering evidence based on critical evaluation of such literature.

► Medical education information systems provide easier learning and assimilation of knowledge from various fields of medicine and health care. They were enabled by the development and availability of multimedia (the Internet), and decrease in the price of computer technology (hardware and software) and printed publications (encyclopedias, dictionaries, handbooks, textbooks, and journals).

Advanced Applications of Health Information

Public health has been defined by the World Health Organization as "the art of applying science in the context of politics so as to reduce inequalities in health while ensuring the best health for the greatest number" (WHO 1998). Broadly speaking, the practice of public health may be defined as the organization and analysis of medical knowledge in such a way that it may be utilized by society for decision-making in health related questions.

► Public health departments play an important role in the collection and dissemination of national health statistics, which must be accurate, clear, concise, and understandable. The core activities of public health include (WHO 2003):

- collection, analysis, and dissemination of quality statistical information on the health status of the population, the availability of health services, and community-based immunization and health screening programs;
- development of public health policy at state, province and national level;
- development of quality assurance programs to monitor the collection of accurate and appropriate data and policy decisions;
- compilation and publication of statistics on the health of particular population groups, such as children (including infants and babies), women, indigenous people, and ethnic groups; and
- analysis of trends in mortality within the community and country.

Public health agencies are mandated to protect and improve the health of all people within their legal jurisdiction through surveillance of health trends, regulation, health promotion, and disease prevention. These highly information-dependent functions are generally performed in partnership with health care providers and organizations, which themselves depend on public health surveillance and guidance. Public health participation in health information exchange is likely to result in reduction of the costs and increase of the speed of health services.

Many countries have their own government agencies, usually Ministries of Health, which should respond to domestic health issues. In the United States, the frontline of public health initiatives is the Centers for Disease Control and Prevention in Atlanta.

The ten essential services developed by the National Public Health Performance Standards Program for the Centers for Disease Control and Prevention are (Centers for Disease Control and Prevention 2006):

1. Monitor health status to identify and solve community health problems,
2. Diagnose and investigate health problems and health hazards in the community,
3. Inform, educate, and empower people about health issues,
4. Mobilize community partnerships to identify and solve health problems,
5. Develop policies and plans that support individual and community health efforts,
6. Enforce laws and regulations that protect health and ensure safety,
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable,
8. Assure a competent public and personal health care workforce,
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services,
10. Research for new insights and innovative solutions to health problems.

Based on these essential services, this program identifies public health activities that should be undertaken in all communities.

Health protection is everything that a state or community, as well as social services, do in order to protect and improve the health of the population. The main task of the health system is to provide health services. The human, financial, information, and technical/material resources of a health system merge to provide health services. Ensuring equitable, universal access to health care – whether preventive, promotive or curative – is a key objective of health systems (WHO 2004).

► National Health Service delivery is usually divided into various levels of health protection. Generally, the classification of health protection is on three levels: the first level of health protection is primary prevention, referring to health promotion, protection, and prevention of disease; the second level is secondary prevention referring to early diagnostics and in-time treatment; and the third is tertiary prevention, related to rehabilitation after disease.

Activities and measures provided by the National Health Service according to the levels of health protection include:

1. On the level of health promotion and protection – general and personal hygiene, adequate food and water supply, physical activity, environmental protection, avoidance of risk behavior, and general and health education,
2. On the level of disease prevention – immunization, disinfection, pest eradication, occupational and environmental health prevention, and genetic counseling,
3. On the level of early diagnostics – screening and selective examinations,
4. On the level of disease treatment – pharmacological and surgical treatment, etc.,
5. On the level of rehabilitation – social integration, professional re-education, re-employment, and occupational therapy in hospitals.

The National Health System provides other important services specifically for vulnerable population subgroups:

1. For women during pregnancy and after childbirth – obligatory physical and ultrasound examinations during pregnancy, assisted childbirth in hospital units, medical examination after delivery, patronage visits, laboratory examinations, and genetic counseling;
2. For newborns and infants – systemic examinations in the 3rd, 6th, 9th and 12th month of life; screening for phenylketonuria and hip dislocation, and obligatory active immunization;
3. For young children – systemic examinations in the 2nd, 4th, and 6th year of life, and screening for hearing loss and eyesight impairment;
4. For school children – obligatory systemic examinations at the age of 7, 9, 11, 13, 15, and 17;
5. For students – systemic examination at enrollment, and reproductive health counseling;
6. For the elderly – patronage nurse visits, home care, and clubs for the elderly;
7. For disabled persons – prevention of injuries and accidents; prevention of stress and mental disorders; prevention of chronic degenerative disorders; early diagnosis and treatment of chronic diseases; rehabilitation, social integration, re-education, re-qualification, and employment; provision of orthopedic

facilities, physical therapy, psychological counseling, and social worker services; and special education of deaf, blind, and mentally retarded persons.

► Health indicators are instruments used for the measurement of health status. The World Health Organization has defined health indicators as "a construct of public health surveillance that defines a measure of health (i. e., the occurrence of a disease or other health-related event) or a factor associated with health (i. e., health status or other risk factor) among a specified population." (Pan American Health Organization 2001). In general terms, health indicators represent summary measures that capture relevant information on different health attributes and dimensions, and the performance of the health system. Taken together, these measures attempt to reflect and monitor the health status of a population. Most indicators are quantitative (represented by absolute or relative numbers), but there are also qualitative indicators (statements that something exists or not, or the gradations of an event – good, neutral, or bad, etc.). The Health Monitoring Programme under the European Commission has financed a project to establish a health indicator set with the primary purpose of measuring health status, its determinants, and the trends therein throughout the European Community (EC) in order to facilitate the planning, monitoring, and evaluation of EC programs and actions, and to provide member states with appropriate health information to make comparisons and support their national health policies (European Commission 2005).

Main categories for the ECHI (European Community Health Indicators) indicator set are (European Commission 2005):

1 **Demographic and socioeconomic factors:**
   - 1.1 Population: birth and death rates, net migration, total fertility rate, mother's age distribution, annual in(de-) crease of population in %, median age of population, etc.;
   - 1.2 Socioeconomic factors: national income per capita, total unemployment, total labor force, population by employment type, population by occupation, population by education, population in poverty, etc.

2 **Health status:**
   - 2.1 Mortality: life expectancy, infant mortality, perinatal mortality, mortality of children aged 1 to 5, specific mortality rates by causes of death;
   - 2.2 Morbidity: incidence and prevalence rates, disease-specific morbidity, prevalence of long term disability;
   - 2.3 Generic health status;
   - 2.4 Composite health status measures: Quality Adjusted Life Years (QALY); Disability Adjusted Life Years (DALY), Healthy Life Expectancy (HALE), Potential Years of Life Lost (YLL).

3 **Determinants of health:**
   - 3.1 Personal and biological factors: body mass index, blood pressure, breastfeeding;
   - 3.2 Health behaviors: regular smokers, total alcohol consumption, intake of fruit and vegetables, physical activity, use of illicit drugs;
   - 3.3 Living and working conditions: total size of residence per person, rate of building, percentage of comfort apartments, adequate food and water supply.

4 **Health systems:**
   - 4.1 Prevention, health protection and health promotion: immunization coverage, breast cancer screening, preventive activities, treatment of the most common diseases, provision of medicines;
   - 4.2 Health care resources: availability of health care – number in the population divided by number of health workers or health institutions;
   - 4.3 Health care utilization: number of services per resident; rate of hospitalization; hospital beds per 100000 population; physicians per 100000 population; number of nurses per 10000 population; number of health workers, nurses and midwives per physician; in-patient care admissions per 100 population; average length of stay in hospital;
   - 4.4 Health expenditures and financing: insurance coverage, expenditures on health;
   - 4.5 Health care quality/performance: end product of health service, consumer satisfaction.

The term ► international health service refers to all activities in the field of prevention, diagnosis, and treatment of diseases, requiring the combined discussion and actions of more than one country. The multifaceted nature of health and the multisectoral interactions that influence it have induced an increasing number of organizations to become active in the health field.

The need for international health cooperation has been recognized for years due to the fact that diseases are enhancing the borders of single countries, such as epi-

demic infective diseases and non-communicable diseases. Globally speaking, the health status of many populations has been significantly improved in the 20th century, following the improvement of socioeconomic standards, and technological and pharmacological developments in the field of health care. Still, the need for international cooperation exists due to occurrence of similar problems in some countries: poverty, malnutrition, infective diseases, and early death. Health services need international guidelines for diagnosis and treatment of diseases, standards for drug and medication registration and trade, and international regulations for quarantined diseases, etc.

International health services can be organized into several categories (Frenk 1997):

- Surveillance and control of diseases that represent a regional or global threat, including exchange of information about the incidence of epidemic diseases, provision of uniform regulations about quarantines, and uniform medical documentation;
- Promotion of research and technological developments related to problems of global importance, including establishment of mechanisms for exchange of information and experiences;
- Development of standards and norms for international certification and other global issues, such as standardization of vital statistics, trade with biological tissues, and hazardous drug registries, etc.;
- Assistance for health services in solving problems, including epidemics control, health service planning, and training of health staff;
- Advice to governments and health ministries related to international health issues such as malaria, AIDS, hemorrhagic fever; development of social medicine, improvement of living conditions, sanitation, nutrition, and water supply;
- Protection of international refugees.

Many international agencies, both governmental and nongovernmental organizations, are involved in international health services: the World Health Organization (WHO), the United Nations Children's Emergency Fund (UNICEF), the International Labor Organization (ILO), the United Nation's High Commissioner for Refugees (UNHCR), and the Council for the International Organizations of Medical Sciences (CIOMS), to name just a few.

The WHO is taking a proactive role in defining actions that will ensure tangible improvements in the health of populations. Since the first International Conference on Primary Health Care in Alma Ata in 1978, the WHO has been committed to the health movement "Health for All". The Regional Office for Europe adopted a long term European strategy "Health for All" in 1980, and expanded it in 1998 into a policy named "Health21 – health for all in the 21st century" (WHO 1998). The two main aims of this policy are to promote and protect people's health throughout their lives, and to reduce the incidence of the main diseases and injuries and alleviate the suffering they cause. Twenty-one targets for Health for All have been set, which spell out the needs of the European Region and suggest necessary actions to improve the situation. They are not meant as a prescriptive list, but together they make up the essence of the regional policy. They provide a framework for action for the region as a whole, and an inspiration for the construction of targets and development of health policies in the countries of the European Region.

From the outset, the WHO's closest collaboration has been with UNICEF. The role of UNICEF in health programs is to provide the required supplies and services in practically every field of interest to child health – e. g. the campaigns for BCG vaccination, the program for the supply of streptomycin and malaria projects, the projects on maternal and child health, nutrition, environmental sanitation, aid to hospitals, and milk hygiene, etc. The United Nations Educational, Scientific and Cultural Organization (UNESCO) is collaborating with the WHO on studies of education combined with community development, including studies of school health, health training for teachers, and teaching of social sciences (WHO 1998).

New partners on the health scene, both from the United Nations nongovernmental organizations, have brought new challenges to the WHO, which now has to maintain its role as the directing and coordinating authority in international health work. New challenges make it essential for the WHO to strengthen its leadership role in the new millennium.

Summary

Health informatics is a rapidly evolving discipline. The primary goal of health informatics is to solve scientific and practical problems. One of the greatest challenges is to simplify the process of data collection and creation, its transformation into useful information, and

finally the conversion of information into knowledge. A second task is to produce usable standards to represent data, information, and knowledge in such forms that enable their adequate application. Health informatics must provide good communication and interactions between users and the computer that would be free, informal, and safe at the same time. Since we do not fully understand the process of decision-making based on knowledge on one side and medical data on the other, the creation and modeling of knowledge represents both a scientific and a practical challenge. Implementation of hardware and software technology and the integration of existing systems is yet another challenge (Greenes 1998).

The main purpose of health informatics should be the improvement of health, addressing the needs of individuals, the population, health services and health professionals. This goal can be achieved in several ways: when applied in clinical practice, health informatics is used for the creation of electronic medical documentation, for monitoring devices that record vital signs, for image processing and analysis, for computer support to medical documents, and for hospital information systems.

Its application in health administration enables tracking of patients within the hospital, automated staff scheduling, cost analysis, managing materials and inventory, automatic billing for supplies, quality assurance, and outcome analysis.

Informatics supports the continuous education of health professionals, including web-based education, enables distance learning via teleconferencing, and supports the development of evidence-based medicine. Health informatics is also applied in research, analyzing the outcomes associated with treatments and procedures, performing quality assurance, and in the implementation of various treatment protocols, etc.

The use of valuable information improves health services, especially preventive services, and, furthermore, information provided to consumers guides their choice of health plans. With regards to clinical systems, informatics supports the process of decision-making for both healthcare providers and patients (O'Carroll 2003).

All in all, health informatics serves to improve health. The main cornerstone of this science is information, highly supported by computer technology that improves its flow, making it accessible, usable, and meaningful.

Cross-References

- ▶ Consumer Health Informatics
- ▶ Consumer Protection
- ▶ Database
- ▶ Data Collecting
- ▶ Data Dissemination and Utilization
- ▶ Data Errors
- ▶ Data, Information, Knowledge
- ▶ Data Processing and Storage
- ▶ Data Quality
- ▶ e-Health
- ▶ Health Indicators
- ▶ Health Information System
- ▶ Hospital Information System
- ▶ Information Retrieval (IR)
- ▶ Interchange
- ▶ International Health Services
- ▶ Medical Education Information System
- ▶ Medical Informatics
- ▶ Medical Research Information System
- ▶ National Health Services
- ▶ Primary Care Information System
- ▶ Public Health Departments
- ▶ Public Health Informatics
- ▶ Record
- ▶ Teleconsultation
- ▶ Telehealth
- ▶ Telemedicine

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Health Information and Education

► Public Health Law, Information and Communication

Health Information Management

Definition

Health information management is the job of handling the information requirements of a health care organization, including development, integration, evaluation and quality assurance of ► health information systems in health care.

Health Information System

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Synonyms

Healthcare information system; Patient-care information system; Medical information system

Definition

A health information system (HIS) is an ► information system for processing data, information, and knowledge in health care environments. It can be defined as an integrated effort to collect, process, report, and use health information and knowledge to influence policy-making, program action, and research.

Basic Characteristics

Development of Health Information System

Branches of health information systems are ► primary care information systems (information systems supporting primary health care), ► hospital informa-

tion systems (information systems supporting clinical work), public health information systems, geographic information systems, ► medical research information systems, ► medical education information systems, ► medical management information systems, etc. (► health information).

To initiate the development of new information systems, the World Health Organization proposes the following steps: first of all, the organization must identify the goals, desired outcomes, and the functional requirements of the system needed for healthcare. The information management team must set the technical program of information requirements, specify the criteria of the information technology architecture, and determine how the information technology will be implemented. Furthermore, all key stakeholders must be included in the project in order to ensure that the system will meet all their needs. And finally, the team must commit to a long term project with appropriate budget funding (WHO 1993). However, during the process of development, the information management team is faced with a dilemma—whether it is better to use a home-grown information system that will be sustainable in the long run, or to apply a system already available on the market without any changes. This issue might be solved by considering the main characteristics of the systems available on the market, including their costs or applicability to the present needs, and if these requirements are not met, development of a new information system must be considered (Berg 2004).

Healthcare and health services are constantly changing. Paper-based medical documentation is being abandoned while computers and new technologies are being included in healthcare; therefore the need for functionality in using patient data or medical knowledge for decision making has become predominant. Furthermore, since patients' rights have been recognized and are now respected, a new challenge for health information systems is that they must switch orientation from the healthcare system toward the health ► consumers (Haux 2006).

Implementation of a Health Information System

In the process of implementation of a system, the Public Health Information Institute recommends some guidelines to be followed (Public Health Information Institute 2004):

1. Engagement of all work process experts—everyone affected by a health information system must participate in the program of developing a HIS—public health program experts, information technology experts, healthcare providers, administrators, policymakers, and the business community, as well as the people in the community.
2. Analyzing the logical principles of information systems—understanding the processes and defining system requirements before physical implementation are the most important steps in developing or acquiring any information system.
3. Assuring interoperability—exchange of health information between all users of the system: public health departments, medical care providers, hospitals, laboratories, pharmacies, community agencies, etc.
4. Management for accountability—analyzing the capability of the system to meet the requirements of all users, accounting for the requirements in financial resources and time needed to complete the project.

Successful implementation of a system has many dimensions: effectiveness, efficiency, organizational attitudes and commitment, worker satisfaction, and patient satisfaction, and must be understood as a dynamic process. When implementing a health information system, health professionals must keep in mind that:

- Implementation is not only the technical realization of the system—the technology will inevitably affect the distribution and content of work tasks (change the recording practices), change information flows, and alter the relationships between healthcare professionals and other staff (raising the question of access to data). Physicians may feel oppressed by the need to be more structural and precise in their work.
- Implementation should not be managed by the information technology department—it is important for all users to understand the system, and to express their needs for the design, implementation, and improvement of the system.
- Implementation can not be fully planned and controlled. Health services might change, the mode of data collection might change, and the needs of health professionals might change, and so a system must have the capacity to be redesigned and reengineered in order to survive for years (Berg 2004).

Evaluation of Health Information Systems

The process of evaluation should follow several steps, and each step must be carefully planned and accomplished (Ammenwerth et al. 2003; Wyatt 2003; Berg 2004):

1. Goal of the evaluation—the goal of the evaluation is comparison of the situation before and after implementation of the HIS.
2. Time of the evaluation—recommendations are that the general intention of the evaluation and the starting point should be decided early in the life cycle of information technology.
3. Domains to evaluate—the areas of evaluation should be restricted to aspects which can be measured with the available resources. A complete evaluation of all aspects of a system is usually not feasible. Systems include many domains: the technical performance of the system—compatibility with other systems, upgradeability, maintenance, adaptability, etc; the professional domain—the impact of the system on professional work, user-friendly applications, supporting professionals' needs, and making work easier; the organizational domain—impact on the work process and organization as a whole, impacts on organizational strategy and health services provided, adjustments of the organization needed for implementation, and unexpected negative effects; the economic domain—the costs of buying the system, training personnel, and maintenance, and the expected benefits; the ethical point of view—effect of the system on the doctor-patient relationship and decision making, and the data security issue; and the legal features—legal status of patient data.
4. Study approach of the evaluation—when issues to be evaluated are determined, and when all stakeholders agree on the goals of evaluation, then the evaluators should define the most appropriate design of the study, relevant study questions, and outcome variables in detail.
5. Analysis and reporting—data interpretation depends on the material collected. It is recommended that different reports are produced for different stakeholders, reflecting their needs and perspectives.
6. Recommendations for further actions—both positive and negative results must be published in order to stimulate improvements and further development.

Failure of Implementation of Health Information Systems

Defining failure or success of the information system may be difficult because failure may look like success from one perspective, and vice versa from another. When an information system is implemented and major goals are met without the occurrence of any undesirable outcome for a long time, then implementation of the system must be considered successful (Littlejohns 2003; Heeks 2006). Failure may be attributed to several reasons:

- Failure to include healthcare professionals in the process of design and implementation, so that the system does not meet all of their needs.
- Failure to recognize the need for quick implementation in the healthcare sector, where management and responsibilities are changing.
- Failure to take into account the social and professional cultures of health organizations, or failure to provide adequate training and education of healthcare professionals.
- Failure to motivate healthcare professionals to adapt to the system in the atmosphere of anxiety and time pressure they are in, especially if the system is difficult to operate.
- Failure to learn from previous mistakes, usually as a consequence of failure to grasp an "overall view" of healthcare interventions in terms of cost, effectiveness, professional satisfaction, etc. When only selected professionals (e. g. information technologists, economists, etc.) are assigned to develop an information system they may not be able to take an objective view of other aspects of the system. They may be able to comprehend only the positive aspect of the system, rather than its disadvantages or negative aspects; this phenomenon is referred to as "my baby" syndrome (Littlejohns 2003).

Public Health Information Systems

Public health is a discipline that has made dramatic advances in recent years. Thanks to developments in public health, many health problems can be analyzed and understood from the perspective of the population. Public health is in great need of information systems that can be used for continuous monitoring of public health events, planning and surveillance of public health programs, financing and management in public

health, and health research (► public health information system) (AbouZahr 2005).

Geographic Information System

A ► geographic information system (GIS) is computer software developed for the input, analysis, and use of geographic data in public health. In the field of public health, GIS systems have provided a means to analyze data from a much more sophisticated perspective. In addition to being able to assess disease of the population by location, these systems have provided the means to analyze spatial and temporal relationships between variables, allowed users to identify spatial patterns in data, and have provided the means to integrate databases on the basis of geography (Richards et al. 1999). An example of the use of a geographical information system is for the assessment of exposure to environmental health hazards. A main advantage in using a GIS for exposure assessment is the possibility of modeling exposure geographically, so that individual exposure may be estimated without the need for time-consuming and expensive measurements (Jarup 2004).

Community Health Management Information System

The need for integrating all health systems into one information network has resulted in the development of the ► community health management information system (CHMIS), an electronic network linking all community stakeholders—healthcare providers, consumers, providers, purchasers, payers, and researchers—in a given community. Its main purpose is for the aggregation and exchange of information across the community in order to assure better performance in the health sector (O'Carroll et al. 2003).

Conclusions

Health information systems are rapidly increasing in variety, size, complexity, and sophistication. Health information systems are not limited to ► hospital information systems, but are expanding to worldwide networks, whose users can be patients, healthcare professionals, system operators, administrators, or researchers. With an increasing pressure on health services, public health, and health policy makers to improve population health with limited financial resources, health information systems can provide strong support to their activities in primary health care, clinical work, research, and education.

Cross-References

► Community Health Management Information System (CHMIS)
► Consumer
► Geographic Information System (GIS)
► Health Information
► Hospital Information System
► Information System (IS)
► Medical Education Information System
► Medical Management Information System
► Medical Research Information System
► Primary Care Information System
► Public Health Information System (PHIS)
► Risk Factor Information System

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Health Insurance

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Synonyms

Medical insurance; Medical cover

Definition

Health insurance is a system of protection which provides financing of health care (hospital, physician or medical expenses and treatment) in case of sickness or injury. Among other types of financing health care (for example taxation and ► direct payments), the insurance principle is employed in many countries through various forms. The organization of health insurances, their membership and funding mechanisms as well as their scope of financing varies from country to country. However, two types of health insurance models are predominant: the social health insurance characterized by the presence of sickness funds receiving a contribution of their member's wages and the private health insurance receiving premiums according to the risk profile of the insured.

Basic Characteristics

Health Insurance in the Context of Health Policy

In a majority of countries around the world, policymakers are concerned by an issue of paramount importance: how to ensure that all people in a country have access to health care when they need it? There are three main options for policymakers to design a system of health care:

1. tax-based health care system:
   In tax-based health care systems, individuals contribute to the provision of health services through taxes on income, purchases, property, capital gains and a variety of other items and activities. These taxes are typically pooled across the whole population. The government is in charge of the provision of health care services, usually from a mix of public and private providers and allocates the existing resources to the different areas of health care. Examples for health care systems mainly based on taxation are the United Kingdom, Ireland, Spain and Portugal, Denmark, Sweden and Finland.
2. social health insurance system:
   In social health insurance systems, contributions from workers, the self-employed, enterprises and the government are pooled into a single or multiple sickness funds on a compulsory basis. These so-called statutory sickness funds are either run by the government or by independent non-profit organizations. They typically contract with a mix of public and private providers for the provision of a well defined health care benefit package. Examples of countries with a social health insurance system are Germany, France, the Netherlands and Belgium.
3. private health insurance system:
   In private health insurance systems, premiums are paid directly by individuals, employers or associations to insurance companies, which pool risks across their membership base. Private health insurance can be a complete substitute for social insurance, typically found in market-based systems such as the US. They can also supplement an existing social insurance system as it is the case in France, Belgium and the Netherlands. Private health insurance is in general voluntary in contrast to social insurance that tends to be compulsory. However, in some countries private insurance may also be compulsory for certain segments of the population (for example the formal, employed sector).

To reach universal coverage, many countries opt for a mix of tax-based and private insurance health care systems or a mix of social and private insurance, mostly together with ► direct payments or so-called ► co-payments for services that are not covered by the insurance.

Comparison of Social and Private Health Insurance

Social health insurances and private health insurances are the two main types of health financing systems that

see the idea of insurance as superior to the idea of general taxation.

However the two types differ in many aspects:

(a) Contributions: The social insurance is organized along the ► principle of solidarity as contributions represent a percentage of the income that is generally paid partly by the employee and partly by the employer. Children or unemployed family members are typically free of contribution. The system aims to balance the different economic situations of their members. The private health insurance calculates its contributions with respect to the individual risk situation of the insured according to the ► principle of equivalence. Children and other family members contribute individually. The economic situation of the insured is not taken into account.

(b) Provision of health care: The social insurance works on a 'payment in kind' or third party payer principle, i. e. the insured do not have to pay the received health care services as long as they stay in the negotiated framework and social insurance contracts with providers of health care. Private insurance always reimburses the patient's expenses or co-payments. Some private insurance companies contract also with their providers and pay them directly. The scope of the health care provisions is typically higher with private health insurances because the choice of doctors and hospitals is free.

(c) Organization: Social insurance is mostly organized by the presence of several social sickness funds being either governmental agencies or independent non-profit organizations. Private health insurances are private for-profit organizations or companies often providing a wide range of other insurances.

(d) Financing model: The social insurance is typically based on a pay-as-you-go system, which means that all money that is paid into the health insurance system by its members and their employers, is being spent in the same year. The contributions have to cover the benefits in the same period. Private health insurances are typically fully-funded systems which means that the individual premium of the insured is calculated to cover the potential risk of illness for this individual over the whole contract period. Therefore private health insurances are less sensitive to the ratio of contributors to beneficiaries.

Health Insurance in the Context of Rising Medical Expenses and Limited Resources

Health care expenses are rising in almost every country with a health care system of universal coverage due to three main factors:

1. ► medical progress and improvements in technology
2. expansion of coverage by public health systems
3. aging populations in the industrial world with higher levels of ► chronic diseases and ► disability

The funding for the upward spiral of medical expenses is limited in all health care systems: In tax-based health care systems governments are unable to continuously raise the taxes. In social insurance based systems the compulsory contribution has to stay bearable for employees and employers. Private insurance models depend on the willingness of the individual to spend for health care especially if the private insurance comes as a supplement to compulsory social insurance (e. g. France).

In the context of rising medical expenses and limited resources, health insurances are obliged to define a number of measures on the demand and the supply side aiming to reduce medical expenses if a growth in the contribution rate becomes unbearable for the insured.

Demand side measures:

- The benefit package is restricted by the health insurance.
- Patients are asked for ► co-payments that may concern drugs, dentistry charges, spectacles and charges for visits to doctors.
- Health insurance improves the cost-awareness of their members by giving incentives not to consume health care (e. g. premium rewards).

Supply side measures:

- Health insurance sets budgets for hospitals and doctors operating under direct contract.

Global Examples

In some high-income countries general taxation replaced social insurance and in most countries the role of voluntary private health insurance increased moderately. Only a few countries offer private health insurance as a substitute for compulsory social insurance

or a taxed-based health system. In the USA, Germany, Switzerland and the Netherlands, private health insurance is the primary coverage for certain population groups. In these countries, private insurances offer also additional services for those who want to supplement their compulsory social insurance scheme. Countries like France and Belgium offer private health insurance only as a complement to the existing social insurance in order to insure the co-payments.

Most of the low- and middle-income countries have health care systems with very low or incomplete coverage of the population. Some of them are interested in extending their existing health insurance for specific groups to eventually cover the entire population. To reach a higher level of health insurance coverage, some factors are very important: the socioeconomic and political context, the level of income, the structure of the economy, distribution of the population and the possible role the government can play in facilitating the transition to universal coverage.

Cross-References

- ► Chronic Diseases
- ► Co-payments
- ► Disability
- ► Health Care Plan (US)
- ► Medical Progress
- ► Principle of Equivalence
- ► Principle of Solidarity

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Health Insurance Markets

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Synonyms

Health insurance programs; Health insurance schemes

Definition

Since the distribution of medical spending is highly skewed, health insurance is an important tool for spreading risks. This property of health insurance is considered to be of considerable value, both for individuals and for societies. This value is somewhat reduced by incentive problems of health insurance. Evidence on the health outcome of health insurance is surprisingly scarce. However, research from the US shows unambiguously that lack of health insurance leads to inferior health outcomes.

Basic Characteristics

The Value of Health Insurance

The value of health insurance is derived from the uncertainty and unpredictability of medical spending. Of any given population, only a very small fraction of individuals incurs a very large fraction of medical spending. The distribution of medical spending at any given time (and over time as well) is highly skewed. Although individuals have some information about their health status and their needs for medical spending, the exact amount is highly uncertain. As a consequence, health insurance is an important tool for spreading risks. This property of health insurance is highly valuable for individuals. Moreover, it is highly valuable from a societal perspective as well. In most developed industrial countries – with the notable exception of the US – comprehensive coverage against the financial risk of medical spending is highly valued by society. Moreover, comprehensive mandatory coverage avoids market failures such as ► adverse selection (► consumer choice).

However, the value of health insurance that is created by the spreading of medical risks is somewhat dimin-

ished by incentive problems caused by health insurance. There is a substantial body of literature in health economics which presumes that the existence of health insurance leads to overspending (Pauly 1968). Individuals with health insurance will use more medical services than they would if they were paying for these medical services themselves (► moral hazard). The term 'moral hazard' does not refer to some moral failure of individuals. It simply implies that individuals adapt their behavior to incentives set by health insurance: "the response of seeking more medical care with insurance than in its absence is a result not of moral perfidy, but of rational economic behavior" (Pauly 1968: 535). Economic analysis of the welfare implications of moral hazard actually led to the conclusion that moral hazard substantially reduces the value of health insurance and consumers might even incur a negative value from health insurance if the ► co-insurance rate is very low (Manning and Marquis 1996). This welfare loss occurs because, under health insurance, patients consume additional services that provide little benefit to them (Rice 2002).

A rather famous natural experiment has found that (higher) coverage of health insurance indeed leads to higher utilization rates of medical services. The RAND Insurance Experiment randomized about 6,000 individuals in six areas in the US into different insurance programs. The insurance programs differed by co-insurance rates – between 0 and 95 percent. Without co-insurance, total medical spending per capita was considerably higher than with some degree of co-insurance (Manning et al. 1987; Newhouse and Insurance Experiment Group 1993). However, the RAND Insurance Experiment also found that individuals are unable to distinguish between highly effective and less effective treatments (Lohr et al. 1986).

The design of health insurance involves a trade-off between spreading risk and appropriate incentives. More generous health insurance spreads risk more broadly but also leads to more overspending due to moral hazard. Several studies simulate optimal co-insurance rates, which range between 25 percent and 58 percent (Cutler and Zeckhauser 2000). From a societal point of view, these co-insurance rates are – at least outside the US – not acceptable. Therefore, most countries accept some degree of moral hazard in order to gain the benefits that are due to risk spreading: "Perhaps the most persuasive empirical evidence regarding the values of health insurance is purchased voluntarily, or provided to the citizens of democratic states. This evidence, represented by the high proportion of US consumers who are insured and the high proportion of developed democracies that have some form of national health insurance, suggests that the value of health insurance is overwhelmingly positive" (Nyman 2006: 102).

Health Insurance and Health Outcomes

It is quite evident that the health consequences of not having insurance at all can be quite dramatic. Research about the consequences of being uninsured in the US has shown consistently that individuals without health insurance receive fewer preventive and diagnostic services, tend to be more severely ill, and receive less therapeutic care. More importantly, having health insurance would decrease the mortality of the uninsured in the US significantly (Hadley 2003).

Evidence on the health consequences of different health insurance programs is scarce and rather ambiguous (Cutler and Zeckhauser 2000). The RAND Health Insurance Experiment has found some relationship between the level of co-insurance and health outcomes – although the findings were less dramatic and less conclusive than the relationship between the level of co-insurance and medical spending. Health outcomes did not differ across plans for most individuals. However, "health among the sick poor – approximately the most disadvantaged 6 percent of the population – was adversely affected … In particular, the poor who began the experiment with elevated blood pressure had their blood pressure lowered more on the free care plan than on the cost-sharing plans. The effect on predicted mortality rates – a fall of about 10 percent – was substantial for this group. In addition, free care marginally improved both near and far corrected vision … and increased the likelihood that a decayed tooth would be filled" (Newhouse and Insurance Experiment Group 1993: 339).

Evidence regarding the health outcomes of managed care insurance is also ambiguous. A review of the empirical literature comparing health outcomes of ► managed care health insurance and ► fee-for-service indemnity insurance did not find clear differences. About half of the studies found that managed care improves health outcome (quality of care) while the other half found that managed care has a negative impact on health outcomes (Miller and Luft 2002).

Cross-References

- ► Adverse Selection
- ► Co-insurance Rate
- ► Consumer Choice
- ► Fee-for-Service Indemnity Health Insurance
- ► Managed Care Health Insurance
- ► Moral Hazard
- ► Moral Hazard, ex ante
- ► Moral Hazard, ex post

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Health Insurance Plan

► Indemnity Insurance Plan

Health Insurance Programs

► Health Insurance Markets

Health Insurance Schemes

► Health Insurance Markets

Health Knowledge, Traditional

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Synonyms

Indigenous health knowledge; Traditional medicine

Definition

Traditional health knowledge is a dynamic system of distinctive knowledge of health maintenance in indigenous communities developed over centuries through empirical observation, spiritual insight, and traditional teaching. It is used by the majority of the world indigenous population for its affordability, accessibility, cultural beliefs, and efficacy of treatment. Indigenous people have a holistic (► holistic medicine) view of health that takes into account physical, mental, spiritual, social, and ecological dimensions. The value and importance of ► traditional knowledge for public health needs are recognized and evaluated. Traditional knowledge should be protected from disappearance and misuse.

Basic Characteristics

General Description

Traditional health knowledge in general refers to the unique health care experience and practices of indigenous communities. These practices uphold the specific concept of health and disease in a certain community. Local wisdom has accumulated and developed over centuries through naturalistic trial-and-error or investigation, application, modification, and innovation by indigenous and local communities to meet the health needs of their people. Importantly, unlike many Western models of health (► Western medicine), indigenous people's notion of health is often not individu-

al but one that encompasses the health of the whole community and the health of the ecosystem in which they live (Stephens et al. 2005). The indigenous communities tend to accentuate the spiritual, cosmological, and ancestral connection to their knowledge. While this knowledge may be acquired from a teacher and improved through experience, it eventually may be derived through direct communication with the spirit world through dreams, intuition, and visions. Aboriginal knowledge is often conveyed in narrative or metaphorical language.

Traditional health knowledge is highly influenced by the culture and historical conditions within which it first evolved, and as such eludes a precise definition, often containing diverse characteristics and viewpoints. The World Health Organization has adopted a very general definition which describes ► traditional medicine as knowledge based on the theories, beliefs, and experiences indigenous to different cultures, either codified in writing or transmitted orally and used in the maintenance of health as well as the prevention, diagnosis, improvement, or treatment of physical and mental illness. Traditional medicine includes diverse health practices, approaches, knowledge, and beliefs incorporating plants, animals, and/or mineral based medicine, spiritual therapies, manual techniques, and exercises applied singularly or in combination (WHO 2002).

Because of the holistic view of health, indigenous peoples have pluralistic solutions to their health problems that take into account physical, mental, spiritual, social and ecological dimensions of health. Treatment is based in the belief that each individual has his own constitution and social circumstances; therefore, it is designed not only to address the symptoms but also to restore the state of equilibrium within oneself and the environment.

The vast majority of the world's indigenous peoples (about 70%) live in Asia. Two kinds of system in traditional medicine are described in this area. One is the highly developed academic system with rich experience in disease therapy and prevention with theoretical basis, research institutes and established literature. The examples are Chinese medicine or Ayurveda, Unani or Siddha medicine in India, which are already institutionalized. On the other hand, there is a large pool of simple systems practiced by traditional healers in small ethnic groups. However, they are often marginalized, and they lack the respect and recognition from authorities.

Use

The majority of the indigenous population use traditional medicine to meet their primary health care needs. The main reasons for this are *affordability, accessibility, and cultural beliefs*, which are determined by a range of social, economic, geographical, and cultural factors as well as by efficacy of treatment. In some rural areas of Africa the ratio of traditional healers to population is 1:200 in contrast to the availability of allopathic (► allopathic medicine) practitioners, for which the ratio is 1:20 000 or less (WHO 2002). Traditional healers play an important role in the community. Payment for treatment differs, but most healers consider their ability to heal as something given by God, and they cannot accept any money.

In the poor countries, traditional knowledge becomes the only source of health care for the indigenous population. For instance, in Peru, where over 40% of the total population is indigenous, modern health care in many rural areas is completely unavailable. However, the indigenous population still has intimate knowledge of their traditional medicine, which has a history going back at least two thousand years. Elder healers from high altitude villages of the Peruvian Andes and elder shamans and native healers from the Amazon jungle are often sought by poor families for health care and help in need. The role of traditional birth attendants is also extremely important as more than half of all births in rural areas take place in the mothers' own homes. Recently, traditional treatment of infectious diseases is sought even in cases with possible access to pharmaceutical drugs due to a rise in antibiotic resistant bacteria and increasing resistance of the malaria parasite to ► conventional treatment. A successful treatment of drug addictions was achieved by a combination of Western health knowledge and indigenous spiritual healing in the Takiwasi Rehabilitation Centre where the rate of full recovery is around 60%, which is much higher than the recovery rate in the West.

In the wealthy countries, where access to modern health care is available, cultural beliefs play the most important role in the use of traditional knowledge. For example, in Canada at the Withehorse General Hospital, the First Nations innovative program integrates traditional knowledge to ensure quality and culturally sensitive care. The Elders, highly respected for their knowledge and recognized by their communities, are involved in

all aspects of the program, and patients can choose to receive a traditional treatment in a special healing room. With the imposition of ► Western medicine came the criminalization of the practice of traditional Inuit midwifery, and expectant mothers are still evacuated thousands of miles to give birth in the hospital. However, this is linked to a decrease in birth weight or an increase of birthing complications, and currently there is an interest in the reintroduction of traditional midwifery and "bringing birth back to the community" (NAHO 2005).

In traditional Chinese medicine, as in aboriginal culture, there is no clear distinction between food and medicine. Indigenous peoples have extensive knowledge about the benefits of ► traditional food. A recent study suggests that when aboriginal people return to their traditional ► diet and lifestyle, they can actually begin to reverse the effects of Western problems such as diabetes, hypertension, and poor cardiovascular health (Milburn 2004).

WHO Initiatives

The first international symposium entitled "Traditional Medicine – Its Contribution to Human Health in the New Century" was convened in 1999 and since then many international institutions, universities, research institutes, and regional NGOs have organized workshops, seminars, and conducted research on traditional medicine. In 2002 the WHO elaborated "TM Strategy 2002–2005" concentrated on four main objectives: policy; safety, efficacy and quality; access and rational use of traditional medicine. By 2006 the WHO published over 25 reports on traditional medicine, among them a National Policy on Traditional Medicine and Regulation on Herbal Medicines and a Global Atlas of Traditional, ► complementary medicine and ► alternative medicine. The WHO established a network of the WHO collaborating centers for traditional medicine, of which there are currently nineteen.

Protection

Traditional health knowledge has to be protected for two main reasons:

- possibility of disappearing;
- threat of ► biopiracy.

Despite its importance, traditional health knowledge is rapidly being lost due to a reduced capacity of indigenous communities to conserve their knowledge for future generations. Among the reasons are, for instance, that the younger generation does not want to retain knowledge from the older generation (especially in areas where modern medicine is available) or indigenous knowledge is regarded as a secretive art, and it is not passed between herbalists and traditional healers.

Since the mid 1990s the interest in the potential of traditional knowledge especially for pharmaceutical product development has dramatically increased. The medicinal value of plants is very significant, and indigenous people have traditionally been the ultimate resource for retrieving this extensive range of knowledge for the purpose of application to modern medicine. So far, 25% of drugs used by modern medicine are derived from rainforests; nonetheless, fewer than 5% of tropical forest plant species have been examined (Butler 2005). This leaves great potential for discovery but also the potential for biopiracy – unauthorized patenting of genetic resources.

The protection of traditional knowledge, including traditional medical knowledge, arises under Article 8(j) of the Convention on Biological Diversity (1992) – an international treaty signed by 188 member states of the United Nations by 2006. The World Trade Organization (WTO) and the World Intellectual Property Organization (WIPO) play important roles in protection of traditional knowledge. One problem is that this knowledge, being community-owned and handed down through generations, clashes with international property rights, which view knowledge as owned by an individual or a company.

Both the disappearance and misuse of traditional knowledge could be protected through its systematic collection and documentation organized on a national or a community level.

Here are a few examples:

- In India the Traditional Knowledge Digital Library was developed and 36 000 ancient medicine formulations were translated from Sanskrit to many languages.
- The American Association of the Advancement of Science (AAAS) is working to create an international database of traditional plant knowledge.
- TRAMIL (Traditional Medicine in the Islanders) collected information on the Caribbean ethnomedicines through direct contact with individuals who rely largely on home remedies.

However, very few traditional systems have a fair level of documentation in place and some forms of traditional medicines have largely become extinct.

Conclusion

Considering the growing awareness of the value of traditional health knowledge, and of its importance for public health needs, there is need for significant investment of human and economic resources in the further enhancement of traditional medicine to ensure its efficacy and reliability and to improve delivery. Promoting awareness of the reality behind traditional health knowledge, its importance, the challenges for its promotion, and the need for protection of the populace against malpractice is a task that is being addressed by a number of international organizations.

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Health Knowledge, Western

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Synonyms

Medical knowledge, modern

Definition

Western health knowledge is scientific medical information thoughtfully applied in the health care delivery system in a community. This is achieved through knowledge translation and knowledge transfer. Health knowledge translation is the adjustment of health information into a language accessible to a targeting population group. Knowledge transfer is accomplished after identifying data dissemination strategies that enable information to be shared effectively to meet the needs of different groups.

Basic Characteristics

Western Health Knowledge and Indigenous Health

Knowledge is "information combined with experience, context, interpretation, and reflection. It is a high-value form of information that is ready to apply to decision and actions" (Davenport et al. 1999). Health knowledge transferred into action serves as a tool for health promotion and improvement of people's lives.

Western health knowledge is based on solid evidence, efficacy, safety and rational use. It is developed through scientific research: identifying problem, making diagnosis, articulating treatment and raising effective responses. It means that clinical strategy in western medical care is based on the best available scientific evidence (► evidence based medicine). Medicine based on biomedical principles and practiced by holders of a medical degree (M.D.) or doctors of osteopathy degree (D.O.) and by their allied health professionals, such as physical therapists, dentists, psychologists and nurses is called conventional medicine (► conventional treatment), ► allopathic medicine, ► western medicine, mainstream medicine, orthodox medicine,

regular medicine or biomedicine (PAHO 2006). At all levels, modern medicine is an evolving medicine that is open to knowledge and advancement through conventional research.

In the 20th century science has led to dramatic improvements in health worldwide; for example, among public health successes is the global eradication of smallpox or the Framingham Heart Study delineating risk factors for cardiovascular diseases. In spite of these advances, health statuses within most indigenous groups remain poor.

Persistent existence of poor health knowledge, poor quality health service, shortage of professional health care staff and medication shortage are common in many of the remote locations in which indigenous peoples live.

The major health indicators show the significant inequities and the widening health gaps between countries and between the richer and poorer groups within countries. Most vulnerable population groups such as indigenous peoples have less access to health resources, get sicker and die earlier than people in more privileged social positions. Despite the diversity of indigenous people, it may be noted that they share common problems regarding health status and suffer from high child and maternal mortality, infectious diseases and malnutrition. In recent years, the incidence of chronic diseases (cancer, diabetes, obesity and cardiovascular disease), drug and alcohol addictions, sexually transmitted diseases and suicides have notably increased. Health is particularly poor for communities whose original ways of life were destroyed and replaced with a western lifestyle, inadequate housing, unemployment, and high rates of addictions.

Even in the wealthy nations, most studies show alarming health disadvantages for indigenous peoples. In Canada, tuberculosis is affecting Aboriginal Peoples at a rate six times that of the national average, and diabetes rates are as much as four times that of the mainstream population. The life expectancy for Inuit is on average 10 years less than the Canadian average (UN 2005). Pan American Health Organization experts noted that 40 percent of indigenous people in the Americas still lack access to conventional health care services (PAHO 2006).

Most illnesses, especially infectious diseases, are either preventable or to some extent treatable with a relatively small number of medicine. Combined with appropriate public health interventions, appropriately prescribed essential medicines and vaccines could, in principle, massively reduce the impact of disease of communities (UN 2005).

Biomedical discoveries (developing new interventions, drugs, vaccines, devices and other applications) cannot improve people's lives without research on how to apply these to diverse population groups. At present, there is overwhelming dominance of biomedical and clinical research compared to research into social determinants of health and health system research. The main contribution of research to health system is the translation of knowledge into action – using research to shape policies, health practices and public opinion (UN 2004).

Knowledge Translation, Transfer and its Use in the Indigenous Population

Health knowledge translation can be described as alteration or adjusting of health information into a language accessible to a targeting population group. Knowledge transfer can be accomplished after identifying data dissemination strategies that enable information to be shared effectively to meet the needs of different groups. Effective use/application of health knowledge enables to improve health service delivery.

Health knowledge translation and transfer to a variety of indigenous peoples (370 millions, in 70 countries, 5000 languages) are challenging because of their vast diversity including different levels of health literacy. Indigenous communities preserve at least in part their cultural, linguistic and social uniqueness that explains their sensitivity to accept different knowledge. Importantly, unlike many western models of health, indigenous people's notion of health is often not individual, but one that encompasses the health of the whole community and the health of the ecosystem in which they live. Because of this holistic view of health, indigenous peoples have pluralistic and holistic solutions to their health problems, with mix of traditional and allopathic medicine (Stephens et al. 2005). Western health knowledge translation activities have to account for this significant cultural differences including contrasting philosophy of what knowledge is. Biomedical health measures may not be compatible with local understanding of health and local ways of sharing knowledge. Therefore, indigenous communities often reject the imposed

modern health services only because they are misunderstood.

Barriers to uptake and use modern health knowledge are either specific to particular indigenous groups, or are commonly experienced by many such groups. They may exist in the:

- *cultural environment*: cultural belief about appropriate care; traditional beliefs and practices
- *social environment*: low literacy level, health behavior, influence of social trends, inappropriate influence of the media, distrust of western influence (may be related to previous adverse experience of innovation and exploitation), continual marginalization and discrimination, persistent poverty
- *political environment*: political corruption, different priorities
- *health care system:* lack of financial resources, inadequate human resources, lack of access to health care, failure to provide practitioners with access to appropriate information;
- *practitioners*: obsolete knowledge, poor practice organization, beliefs and attitudes
- *patients*: perceptions or cultural beliefs about appropriate care, health literacy

Regarding indigenous groups, any attempt to implement western health knowledge without community support may fail. After developing an appropriate message based on research knowledge it is essential to use credible messengers and proven approaches to transfer message. The message has to identify community beliefs and concerns. The effective way of conveying this knowledge to indigenous communities and establishing mutual understanding is facilitated for instance by:

- special events that bring together researchers, traditional healers and village elders (facilitate communication and bring mutual understanding)
- cultural brokers or indigenous health workers (they have trust of the community and serve as guides of incorporating culturally and linguistically competent health principles, values and practices).

In areas with Internet access e-learning technology assists to improve health knowledge.

Various international organizations, institutions, universities, or NGO's demonstrate the concern for improved health care access, health promotion and endorsement of health literacy of indigenous peoples.

WHO's regional offices play an important role for developing a comprehensive action plan to meet the goal of the Millennium Development Goals (MDG) and organizing activities for western health knowledge dissemination and its implementation in their respective regions.

A few examples:

PAHO (Pan American Health Organization) carried out several events, among them: "Health of indigenous peoples of Americas: Achievements and future directives" (December 2005 Nicaragua) or "The evaluation of the Health of the Indigenous Peoples Initiative within the framework of the International Decade of the Indigenous Peoples of the World", where only 5 of the 19 participating countries reported having scholarships specifically for indigenous students to pursue tertiary education. Most countries described the existence of local networks on malaria, children's health, maternal mortality, HIV/AIDS, and water and sanitation; however, coordination among different indigenous health networks and programs is limited (PAHO 2006).

The UNFPA (United Nations Population Fund) organized a project in Equator, Otavalo through local Jambi Huasi health clinic. Its services were upgraded to provide reproductive health education and information to women, men and adolescents and introduce a referral system for obstetric complications. The education is carried out in a culturally sensitive fashion, taking into account the special needs and concerns of Quechua-speaking natives. This way they are more receptive to the messages and services and, as a result, the contraceptive prevalence rate has climbed from 10 to 40 per cent. Both the infant and maternal mortality rates have fallen (UNFPA 2006).

"Health Unlimited", established in 1984, is the British charity that supports indigenous communities, and today they work in 15 countries across Africa, Asia and Latin America. 95% of their staff are indigenous people. The results of their work clearly illustrate that people can benefit from developing their skills as indigenous health workers and their ability to organize and take action to improve their health.

E-learning technology: "Health Academy", launched by the WHO, provides the general public with health information to create basic health knowledge; it promotes equality based on gender, nation, culture and education.

Conclusion

In conclusion, the appropriate and sensitive application of western health knowledge in indigenous population can undoubtedly advance the health of indigenous people. However, an intercultural approach and close cooperation with communities to develop mutual understanding is essential. The beneficial co-existence of traditional and modern medical system was already established in many cases.

Cross-References

- ► Conventional Treatment
- ► Evidence Based Medicine
- ► Health Knowledge, Traditional
- ► Western Medicine

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Health Literacy

Synonyms

Understanding of good health

Definition

According to a definition of the American Medical Association, health literacy is the ability to obtain, process, and understand basic ► health information and services needed to make appropriate health decisions and follow instructions for treatment. Health literacy incorporates a range of skills: to read, comprehend, and analyze information; decode instructions, symbols, charts, and diagrams; weigh risks and benefits; and, ultimately, make decisions and take action.

Health literacy includes the capacity to understand instructions on prescription drug bottles, to interpret test results, to understand medical education brochures, to give patient history, to articulate health concerns and describe symptoms accurately, to analyze relative risks and benefits, to understand informed consent forms, and to negotiate complex health care systems. With the development of the world wide web as a source of health information, health literacy may also include the ability to search the Internet and assess the quality of websites.

Studies show that people from all ages, races, income and education levels are challenged by this problem. Limited health literacy has negative implications for ► health outcomes, ► health care quality, and ► health care costs. For example, low literacy adversely impacts cancer incidence, mortality, and quality of life. It also affects glycemic control in diabetes, or blood pressure control in patients with hypertension, etc. Poor health literacy proves to be a stronger predictor of a person's health than, for example, age, income, or education level.

Improving the health literacy is a core aim of ► health promotion. Health literacy activities include creating easy-to-read, culturally appropriate health information materials, advocating for readers with limited skills, or enhancing access to health services.

Health Lobbying

► Advocacy

Health Locus of Control

Definition

The locus of control construct emphasizes the importance of perceptions of control, including mastery, self-efficacy and personal competence. It overlaps with concepts that focus on the causes of events. Although locus of control beliefs to some extent are based on causal attributions, there is a clear conceptual distinction between locus of control beliefs and causal beliefs. Causal beliefs focus on the causes of past events, whereas locus of control beliefs focus on expectancies for future events. While causal attributions in response to serious illness such as cancer has been investigated in sufficient detail, there has been little work applying attributional theories to health behavior among healthy populations.

Health Maintenance

► Health Care

Health Maintenance Organizations (HMOs) (U.S.)

Definition

Health Maintenance Organizations (HMOs) are a type of managed care organizations providing ► health insurance coverage and health care services through a number of contracted hospitals, physicians and other health professionals. They have been introduced in the United States during the 1970s. Patients being insured by a HMO receive all necessary health care services including disease prevention from one specific provider group within defined contracts. Patients generally receive a primary care physician who coordinates all medical care and acts as a gatekeeper for specialty services. HMO-providers receive fixed amounts per person (capitation payment) and therefore have no incentives to deliver unnecessary care, focus on prevention rather than costly hospitalization.

Health Management

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Introduction

While health policy focuses on defining health goals and creating the surroundings of a desired health system, health management focuses on achieving those goals. Since there is a broad variety of health goals which are partly competing against each other, such as reducing cost while improving the quality of health, health management deals primarily with the allocation of limited resources towards health oriented goals.

In any health care system, there are numerous ► stakeholders focusing on different health care related goals. The main stakeholders in health care are:

- Patients
- Inpatient health care providers: ► hospitals
- Outpatient health care providers: e. g. doctors, laboratories, etc.
- Health insurance companies
- Pharmaceutical industry
- Government

The variety of actors and goals in health care systems leads to a variety of health management practices being applied. Health management can further be defined as a systematic approach to optimize organization and processes in order to achieve predefined health related goals.

Patients

One of the primary targets of health management is to improve public health for individuals (patients) within a health system. This target includes, amongst various other targets, the improvement of a health-induced quality of life and a growing life expectancy. While life expectancy is easy to measure, it is much more difficult to measure the improvement in the quality of life. Various approaches have been made to find a method of measuring the quality of life. However, no comprehen-

sive system has been established on a global basis that has been consistently used by countries to manage the outcome of health care on a comparable basis (► health care quality).

Besides setting goals for health care and ► health insurance providers, and besides being a major source of funding for most health systems, patients also have significant control over health-related factors themselves. These areas can be categorized into preventative actions and compliance, which can have a strong impact on a patient's health status. In the preventative actions area, various measures of caution and 'healthy' life-style can be maintained (i. e. not smoking, exercising regularly, health-oriented diets) in order to manage one's personal health risk better. Compliance refers to how closely a patient follows instructions during and after a treatment or surgery. Various studies have shown that a lack of compliance, especially in the area of medication, can have a high impact on the recovery rate of a patient. In this sense, patients play a role in their own health management which is not neglectable.

But at present, only few health care systems educate their patients and apply incentives accordingly. Besides informing people about their ability to influence their health directly, a number of incentives could be institutionalized, such as health insurance tariffs that are linked to a person's manageable risks (as opposed to non manageable, chronic disease risks, such as allergies).

Instead, there are multi-layered conflicts that exist between patients and health insurance companies. On the one hand, health insurance companies need patients as customers to raise money for the insurance claims. In that regard, insurance companies need to appeal to the interest of the patients. On the other hand, those patients, i. e. customers, expect reimbursement for their insurance claims. They expect the payers to offer a wide variety of options for health coverage according to their individual needs. The payers, however, need to keep payments low, or they will face an increase in overall expenses, which leads to higher tariffs and, therefore, most likely fewer customers in the future. Ideally, payers want the patients to seek only needed care, follow providers' instructions, and recover quickly. If restrictions become too tight though, a patient may choose to change insurance providers.

The mentioned conflicts between patients and insurance companies are only an example of possible conflicts between patients and other stakeholders in a health care system. This demonstrates that health management has to deal constantly with opposing stakeholder goals and patient goals, although the overall goal remains the achievement of the best ► health outcome for the individual patient within the financial and organizational restrictions of the health care system.

Inpatient Health Care Providers: Hospitals

Hospitals are providers of inpatient health care on a public or private basis. They constitute an important part in every health care system with regard to the financial resources they need as well as to the medical impact they have. Hospitals are either providing necessary health care for all kinds of diseases or for specialized medical areas. As the hospital sector is vital to health management in any health care system, it is strongly regulated by government laws in most countries. The organization and structure of the hospital sector is therefore shaped by health policy guidelines. In order to constantly improve the health outcome of the delivered hospital services within restricted financial resources, health management measures constantly change.

A few examples of the main changes in hospital health management are:

Change of Payment Systems in Hospitals Towards Diagnosis Related Groups (DRGs) Traditionally hospitals have been financed by public or private financial resources on a basis of retrospective funding which means that the hospital owner allocates the financial resources according to the costs the hospital incurred the year before. Due to technical and medical improvements during the past decades, the hospital sector has particularly increased its need for financial resources leading hospital owners to shift from open-ended retrospective funding towards prospective budgets or per-case payments. Per-case payments are particularly popular in well developed health care systems. They are either based on contractual agreements between purchaser and provider or on ► diagnosis related groups (DRGs). Within the DRG system, patients are grouped together "according to principal diagnosis, presence of a surgical procedure, age, presence or absence of significant co-morbidities or complications, and other relevant criteria" (US Congress 1983). As all patients with-

in the same DRG are expected to have similar hospital resource use, DRGs are used to reimburse the cost of inpatient hospital care. Hospitals are paid a specific pre-determined amount for each patient treated according to its DRG regardless of the actual cost of care provided. This trend in the change of the financing method follows the overall need to reduce the continuously rising costs in the hospital sector (Mossialos 1999). The Organization for Economic Cooperation and Development (OECD) recently noted that 19 of its members had introduced DRG-based payments to control hospital reimbursement costs (Forgione et al. 2004). Most countries have adapted the original US model to fulfill their specific needs.

Besides using DRGs as a basis for reimbursement, some countries have designed DRG-based systems for planning, budget allocation and management of the hospital care provided. In France for example, DRGs are used to allocate budgets to hospitals: As DRGs demonstrate a similar use of hospital resources, hospitals can be compared with each other and an estimate for future hospital payments can be made. In Belgium and Ireland, DRGs are a means of reducing the length of stay and in the UK they are used as a system of management of hospital provision. DRGS may also be used to evaluate the quality of care: Since all cases in a DRG are clinically similar, treatment protocols and other factors, such as related conditions or demographic distribution, can be analyzed. In addition, quality reviews can be established, critical pathways can be designed and benchmarking between hospitals can take place.

Change of Disease Treatment With the change of disease patterns, such as the increasing advent of chronic diseases, the treatment methods are changing accordingly. There is a shift from distinctive operating hospital units towards multidisciplinary treatment, including the idea of a health care chain. These changes in disease management require not only a redesign of the processes of the health care delivery, such as the introduction of so-called disease management programs (► disease management programs), but also a redesign of organizational structures in hospitals.

Disease management programs became very popular in the United States during the 1990s as chronic diseases continued to be the major financial burden in the health care system. Enhancing health conditions of chronically ill people while reducing costs is the main concern of disease management programs. The key to success is to offer coordinated health intervention while avoiding complications and unnecessary health care services.

With regard to hospital management, many large hospitals of the early 20th century were divided into medical disciplines which delivered health services according to their own independent procedure. These rigid and very hierarchically organized hospital disciplines are slowly changing to integrate the idea of interdisciplinary cooperation and to participate in disease management programs.

Progress in Health Technology Health technology advancements in the hospital sector, such as diagnostic imaging, intravascular ultrasound and minimal invasive surgery, have led to a considerable reduction in the average length of stay of a patient. As a consequence hospitals have experienced an overall reduction in the number of their beds and a higher turnover in patients. Because administrative structures and procedures in hospitals needed to adapt, management techniques have become increasingly important. During the last decades there has been a boom in 'hospital management', attributing more importance to hospital administration than before.

Efforts to Improve Quality of Care Hospitals need to improve their quality of services in many areas (► health care quality). There is a lack of coordination between services, often an inappropriate use of resources with respect to the quality delivered and scarce maintenance of building and equipment as well as a lack of information among hospital staff on costs and outcome. Improvement in the quality programs necessitates changes in the organization and management of hospitals. The current trend is to consider hospitals as industrial companies which must be organized, managed and evaluated. In this sense, management functions and clinical activities have to be provided with a shared common goal of health care quality. Many initiatives aiming at the continuous improvement in health care quality have started: for example, the introduction of clinical guidelines, continuing medical education, disease management programs and standards for health technology assessment.

The continuous development of medical knowledge and improved treatment practices, together with the financial pressure of cost-containment and the rising expec-

tations in terms of quality of care, will inevitably lead to further changes in the organization and management of hospitals. The future challenges are two-fold:

1. to change the functional interaction between the levels of care incorporating the idea of a health care chain to provide effective and integrated health care to the patients, and
2. to change the reporting measures in order to make the effectiveness of health services transparent with regard to the patient's health quality.

Outpatient Health Care

Outpatient or ambulatory health care comprises health care services delivered outside the hospital in offices of physicians, dentists and other health care practitioners such as mental health specialists, physiotherapists, etc. Providers of outpatient health care operate in a national legal framework consisting of medical guidelines on the one hand and reimbursement methods on the other. The specific health infrastructure (► infrastructure and service delivery) of a country determines the health management measures applied in outpatient health care delivery. In the past decades health care delivered in the ambulatory or outpatient sector has become increasingly important as the inpatient sector faces more and more financial constraints. However, similar financial constraints, as already mentioned with regard to the hospital sector, are found within the outpatient health care sector and have led to numerous measures of cost-containment, initiated by the purchasers of health care services, i. e. health insurers or the government. Increasingly, controlling mechanisms and rationing measures have been developed.

With regard to doctors, many countries control entry to medical education and limit the number of independent doctors' offices that can be established. Their payment or reimbursement methods have also changed over the years. The payment per item of service method has, in some countries, been replaced by the so-called capitation payment whereby doctors receive a given amount per patient regardless of the individual medical situation of the patient. Other countries maintained the payment per item system but changed the relative value-scale in order to cut costs. Another important measure concerns prescribing behavior which is influenced, in many countries, by government guidelines promoting, for example, the use of generics.

With regard to the organization and processes of outpatient health care services, the development towards integrated health care (► integrated health care) leads to continuous changes in health management practices. In the field of prevention, long-term care and rehabilitation, which increasingly concern ambulatory services, integration is the key factor in the delivery of quality of care within financial constraints. To develop a more integrated approach to health care delivery some organizational changes are suggested as necessary:

- Ambulatory care has to be more flexible in order to link different levels of care, to improve access to adequate care and to improve the coordination between outpatient and inpatient health care.
- Telemedicine or ► e-Health applications have to be increasingly developed as a tool to improve access to services for patients in remote areas or with specific chronic diseases.
- The development of home health care on an ambulatory community level might be a cost-efficient and quality enhancing measure for the treatment of patients with diseases that are better suited to care at home than to long–term care in a facility.

Health Insurance

Health insurance companies are important stakeholders in the health management context as they are responsible for the payment of health services for individuals in case of sickness or injury. In countries with well developed health care systems there are three forms of health care financing:

1. Tax-based health care system, in which individuals contribute to the provision of health services through taxes that are typically pooled across the whole population. The government is in charge of the provision of health care services, usually from a mix of public and private providers and allocates the existing resources to the different areas of health care. Examples of health care systems mainly based on taxation are the United Kingdom, Ireland, Spain and Portugal, Denmark, Sweden and Finland.
2. Social health insurance system, in which contributions from workers, the self-employed, enterprises and the government are pooled into a single or multiple sickness fund on a compulsory basis. These so-called statutory sickness funds are either directed by the government or independent non-profit organiza-

tions. They typically contract with a mix of public and private providers for the provision of a well defined health care benefit package. Examples of countries with a social health insurance system are Germany, France, the Netherlands and Belgium.

3. Private health insurance system, in which premiums are paid directly by individuals, employers or associations to insurance companies pooling risks across their membership base. Private health insurance can be a complete substitute for social insurance; typicall of a market-based system such as the US. It can also supplement an existing social insurance system as is the case in France, Belgium and the Netherlands. Private health insurance systems are, in general, voluntary in contrast to social insurance systems that tend to be compulsory. However, in some countries, private insurance may also be compulsory for certain segments of the population.

Regardless of the specific form of health insurance, all face financial constraints due to medical progress and improvements in technology, expansion of coverage by public health systems and aging populations in the industrial world with higher levels of chronic diseases and disability. However, the funding for the upward spiral of medical expenses is in all health care systems limited: In tax-based health care systems governments are unable to continuously raise taxes. In social insurance based systems the compulsory contribution has to remain bearable for employees and employers. Private insurance models depend on individual willingness to spend money on health care, especially if the private insurance comes as a supplement to compulsory social insurance (e. g. France).

In this context health insurers are obliged to take measures affecting the balance of demand and supply aiming to reduce medical expenses if a growth in the contribution rate should become unbearable for the insured.

Demand side measures:

- The benefit package is restricted by the health insurance.
- Patients are asked for co-payments that may concern drugs, dentistry charges, spectacles and charges for visits to doctors.
- Health insurance improves the cost-awareness of their members by giving incentives not to consume health care (e. g. premium rewards).

Supply side measures:

- Health insurance sets budgets for hospitals and doctors under direct contract.
- Implementation of Disease Management Programs (► disease management programs) to improve care for chronically ill people while reducing costs through an automatic and streamlined care process.

Even if a growing insurance premium is not only in the interest of the health insurer but also in the interest of the patients, who are mostly contributors as well, there are still conflicts between patients and payers of health care that influence health management practices. On the one hand, patients expect payers to offer a wide variety of options for health coverage that can be customized to their specific needs. On the other hand, payers want to maintain or lower their cost contribution. They want the patient to seek only needed care, follow providers' instructions, and recover quickly. Patients should also seek to reduce their health risk behaviors through, for example, diet, exercise and smoking cessation.

Pharmaceutical Industry

As one of the completely private stakeholders in a health care system, the pharmaceutical industry comprises numerous private pharmaceutical companies who invest in research and development in order to meet the need for new pharmaceuticals or medical devices while working as for-profit organizations. Drugs are either delivered to the patient through pharmacies or directly through hospitals. Similar to the situation of ambulatory doctor's offices or hospitals, the pharmaceutical industry sector is highly regulated in all developed health care systems by government laws. These regulations mainly concern the process of research and development, the approval of drugs before commercialization is authorized, quality assurance in the production process and also the market price and reimbursements. In the context of medical cost containment, a number of measures have become very popular: the direct and indirect control of prices and profits by the government, the necessary price approval for reimbursement before a pharmaceutical product may be launched and the control of the use of expensive equipment in the inpatient sector. As a consequence the pharmaceutical industry tries to influence health policy decisions by lobbying through often nationwide associations. Representing an important part of the industry in the well developed countries, the power of these indus-

trial pharmaceutical associations is often considered as high.

Government

The government plays an important role in health management as it mainly acts as a decision maker to set the rules for the functioning of a health care system that fulfills the values and health policy ideals of the country. Within the regulatory framework the government may regulate volume and quality of the health care services, is responsible for legislation on health care financing, corporate negotiations, major professional regulations and public health measures such as prevention and health promotion. The government administration of health (e. g. Ministry of Health) formulates and administers the government policy in health, sets standards for the regulation and licensing of health care providers as well as for medical personnel in hospitals. Other governmental agencies that set public health standards are the Food and Drug Regulation Agencies and agencies regulating occupational health and safety in the workplace.

In most countries with well developed health care systems the government is in charge of a number of public health services (► public health services) which are focused on the health status of the whole population. Public health programs are typically provided by the ministry of health or other government agencies in order to promote, protect and improve public health. Programs encompass disease prevention measures, health education, immunization programs, control of communicable diseases, sanitary measures, and protection against environmental hazards.

In countries like the UK with a national health service (NHS), the government acts not only as a decision maker and provider of public health services but also as a payer and provider of individual health care services.

Health Management Worldwide

In 1998, many countries took a greater interest in improvement of health management, considering better management of their national health systems to be among their major needs and priorities. During this year, WHO Representatives' Offices in 16 countries managed WHO technical cooperation at country level and provided policy support to ministries of health on various aspects of health. Desk officers at the Regional Office continued to provide support for countries without WHO Representatives' Offices. In addition to serving as an interlocutor and focal point for contacts between WHO and its countries, the WHO Representatives play an important role in the implementation of the global health policy strategy 'Health for all', liaising with other UN agencies as well as bilateral donors and non-governmental organizations. The increasing reliance in recent years on extra-budgetary sources of income due to a combination of higher demands on WHO and lower regular budget resources in real terms underline the importance of the WHO Representatives' role in resource mobilization. Every effort is being made to make use of recent technological advances to establish communication links between WHO headquarters, its regional offices and country offices as well as countries to permit an efficient flow of information between all parties.

In most developing countries, health services are weak due to a lack of responsibility in the government, a lack of investment in health infrastructure to deliver health services as well as poor training and career structures for medical professionals. In order to respond adequately to national and regional expectations, needs and priorities, great efforts are being made by the Regional Office to provide necessary support to countries in the development and improvement of health management in the regions. This has been done through a variety of approaches including contractual services agreements, fellowships, national training activities, consultancy services and regional consultations, particularly on developing and expanding the use of the district team problem-solving (DTPS) technique.

Regional Office experts are regularly developing guidelines for restructuring the national health system, proposing possible reasons for restructuring, as well as mechanisms of restructuring, and the resources required to be made available for this process. The Regional Office collaborates with the Ministries of Health and develops a Quality Management Training Center for the countries they are in charge of. The center, which enjoys full support from policy-makers, is an innovative strategy to improve the quality of health care and health status through quality orientation, health system development and managerial capacity-building. The center focuses on the core health processes, problem solving and team work. The 12-month modular training program is action-oriented and product-oriented and fol-

lows a learning-by-doing approach designed to build on the knowledge and experience of the trainees.

The Regional Office continued its support to a number of countries in strengthening their planning capabilities at central and district levels. Efforts were made to promote strategic planning in ministries of health and to disseminate WHO literature on health futures. Support was provided through WHO collaborative programs to the national institutes of health management.

Summary

The overview of the different stakeholder activities within the well developed health care system has shown the wide spectrum of health management. In order to realize health policy goals, health management includes organizational strategies for the stakeholders, priority setting and cost-effectiveness analysis with regard to existing financial constraints and the implementation of a sound quality management.

Great effort has been made during the past decades in improving overall health management, new management techniques have been developed and promise to help bridge the gap between health care quality and existing financial constraints in the health sector. However, there are two main challenges for the success of health management in the future:

1. to manage the conflict of interest between the stakeholders in order to effectively apply health management practices, and
2. to deal with changing environment patterns of the health care systems, such as epidemiological and demographic changes.

As far as health management in developing countries is concerned, the organization, scope and quality of health standards and health services are still far behind the services provided in well developed industrial nations despite the WHO efforts over many years.

Cross-References

- ▶ Diagnosis Related Groups (DRGs)
- ▶ Disease Management Programs
- ▶ e-Health
- ▶ Health Care Quality
- ▶ Health Insurance
- ▶ Health Outcomes
- ▶ Hospitals
- ▶ Infrastructure and Service Delivery
- ▶ Integrated Health Care
- ▶ Public Health Services
- ▶ Stakeholders

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Health Monitoring

Definition

Health monitoring refers to regular checking of ongoing health activities or programs in order to determine if they are achieving the health goals of the population.

Cross-References

► Public Health Surveillance

Health of Muscles and Skeletal System

► Musculoskeletal Health

Health Outcomes

Synonyms

Health change

Definition

Health outcomes are defined as follows in the WHO Health promotion glossary:

A change in the health status of an individual, group or population which is attributable to a planned program or series of programs, regardless of whether such a program was intended to change health status. Such a definition emphasizes the outcome of planned interventions (as opposed, for example, to incidental exposure to risk), and that outcomes may be for individuals, groups or whole populations. Interventions may include government policies and consequent programs, laws and regulations, or health services and programs, including health promotion programs. It may also include the intended or unintended health outcomes of government policies in sectors other than health. Health outcomes will normally be assessed using health indicators. Health outcomes include morbidity and mortality; physical, social, and mental functioning; nutritional status; and quality of life.

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Health Phobia

► Anxiety Disorders
► Hypochondria

Health Plans (U.S.)

► Managed Health Care Plans (U.S.)

Health Policy

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Introduction

Health Policy combines the elements of formulating health related goals, choosing the approach, instruments and financing via a political ► decision making process, and evaluating the outcome. In 2006, there is no consistent process or standardized approach in place as to how those steps are applied in different countries and different health care systems. Instead, national health policy is based on several factors, such as the political system, history of health policy throughout past decades, and the power of the different ► stakeholders in the health care system. Those systems and their respective health policy processes can therefore differ widely.

Global Health Policy

When defining ► global health policy, it is necessary to define targets and goals of such a policy. Health targets are such instruments, which can facilitate the achievement of health policy. Health targets therefore represent a commitment of a system or legislative body to achieve specific pre-defined outcomes over a pre-defined period of time. Furthermore, they enable the monitoring and evaluation of progress towards those goals.

Health targets are based on outcomes and processes. They can be quantitative, such as immunization rates, or qualitative, such as the introduction of national health care programs and initiatives. To faciliate monitoring and management towards the achievement of health targets, they should ideally be specific, measurable, accurate, realistic and time–bound (SMART).

Targets set priorities and can be used to create high levels of commitment. They are the basis for follow-up and evaluation. Health targets can be applied nationally, internationally, or within systems on sub-national levels, such as public health care systems.

Numerous governments in the member states of the WHO European Region and in OECD countries utilize health targets as an instrument and guidance for policy formulation and implementation. Countries across the world have shown a persistent interest in health targets, with some countries having a long track record in formulating such targets. Those targets have been optimized and fine-tuned over the past decades, thus representing a second- or third-generation iteration of country- or system-specific health targets.

WHO states that "undoubtedly, health targets have stimulated the debate and contributed in various ways to the development of national and sub-national health policies. However, when it comes to implementation the track record of health targets is less clear and less perfect."

Global Health Targets

A "Health for All by the Year 2000" strategy was launched by WHO in 1977 to set global targets and to form a global vision amongst the member states. In May 1998, WHO adopted a resolution to continue global efforts under the "New Global Health for All" policy. Coinciding with the 50th anniversary of WHO and the appointments of a new director general, this is commonly viewed as an opportunity for the organization to unify global goals once again, focus on the ten most relevant goals, and to re-establish its role in achieving those goals. The 10 global ► health targets can be divided into three subgroups: four health outcome targets, two targets on determinants of health, and four targets on health policies and sustainable health systems. This framework is supposed to be implemented throughout all member states, which will have the opportunity to finetune and adjust their own targets within that framework. The 10 Global Health Targets are (van Herten and van de Water 1999):

Health Outcome **1)** Health equity: childhood stunting. By 2005, health equity indices will be used within and between countries as a basis for promoting and monitoring equity in health. Initially, equity will be assessed on the basis of a measure of child growth.

2) Survival: maternal mortality rates, child mortality rates, life expectancy. By 2020, the targets agreed at world conferences for maternal mortality rates (<100/100 000 live births), under 5 years or child mortality rates (<45/1000 live births), and life expectancy (>70 years) will be met.

3) Reverse global trends of five major pandemics: By 2020, the worldwide burden of disease will be reduced substantially. This will be achieved by implementing sound disease control programs aimed at reversing the current trends of increasing incidence and disability caused by tuberculosis, HIV/AIDS, malaria, diseases related to tobacco, and violence or trauma.

4) Eradicate and eliminate certain diseases: Measles will be eradicated by 2020. Lymphatic filariasis will be eliminated by the year 2020. The transmission of Chagas' disease will be interrupted by 2010. Leprosy will be eliminated by 2010, and trachoma will be eliminated by 2020. In addition, vitamin A and iodine deficiencies will be eliminated before 2020.

Determinants of Health **5)** Improve access to water, sanitation, food, and shelter: By 2020, all countries, through intersectoral action, will have made major progress in making available safe drinking water, adequate sanitation, and food and shelter in sufficient quantity and quality, and in managing risks to health from major environmental determinants, including chemical, biological, and physical agents.

6) Measures to promote help: By 2020, all countries will have introduced, and be actively managing and

monitoring, strategies that strengthen health enhancing lifestyles and weaken health damaging ones through a combination of regulatory, economic, educational, organizational, and community based programs.

Health Policies and Sustainable Health Systems

7) Develop, implement, and monitor national Health for All policies: By 2005, all member states will have operational mechanisms for developing, implementing, and monitoring policies that are consistent with the Health for All policy.

8) Improve access to comprehensive essential health care: By 2010, all people will have access throughout their lives to comprehensive, essential, quality health care, supported by essential public health functions.

9) Implement global and national health information and surveillance systems: By 2010, appropriate global and national health information, surveillance, and alert systems will be established.

10) Support research for health: By 2010, research policies and institutional mechanisms will be operational at global, regional, and country levels.

When reviewing those goals, it becomes apparent that individual goals have a different relevance for different countries. The development status of a country – developing country or developed country – plays a major role in the relevance of the different goals as stated by WHO. Van Herten and van de Water have analyzed those targets in 1999 (see Table 1).

Health Policy Analysis

Health policy analysis is the process of determining how to spend money or invest resources based on different alternatives that affect the health care system, public health system, or the health of the general public. Health policy analysis involves multiple steps:

a) identifying and defining a problem
b) identifying the ► stakeholders, i. e. who is affected by the problem (private healthcare providers , industry groups, medical device manufacturers, professional associations, industry and trade associations, advocacy groups, the government, and consumers)
c) identifying and comparing the potential impact of different alternatives on how to solve the problem
d) deciding between the alternatives
e) implementing the alternative of choice and evaluating the impact

Decision Making Process

The ► decision making process is largely dependent on national and regional specifics, such as type of government, historical processes and different levels of power of parties involved. The process aims to find a consensus on how – using which resources or instruments – a certain goal can be reached best, given restrictions such as financing, development levels, technical expertise, etc. The stakeholders involved include patients, governments, agencies, ► health insurance companies, medical doctors, health service providers, pharmaceutical companies, hospitals, private and public companies and different organizations representing various interest groups.

Those groups have historically been easy to differentiate. In recent years, however, there has been a trend towards integration of various tasks, which leads to an ► integrated health care approach. Such integrated concepts can help to bundle resources and thus can make healthcare more efficient by eliminating unhelpful boundaries. Moreover, the growing efforts towards integrated health care leads to further developments in the area of ► health data management. Thanks to the development of information technology in the medical area, transparency of resource utilization as well as the automation of information flows has increased. However, these developments also require decision making bodies and health policy makers to adjust their decision making process respectively.

Financing Health Care

According to WHO, there are five broad ways of revenue collection for health care financing:

1. general revenue (taxation)
2. social health insurance
3. voluntary or private health insurance
4. out-of-pocket payments
5. internal donations.

Within WHO, countries have selected different ways of collecting revenue. Globally, in 1998, the estimated health expenditure (after adjusting purchasing power) amounted to US$ 3.1 trillion or 7.9% of the global income. The average expenditure per capita was determined as US$ 503, ranging from US$ 82 in Africa to over US$ 2.000 in OECD countries. Nearly 30% of this global expenditure came from taxation, around 20–25% from out-of-pocket payments (OOP), and anoth-

Health Policy, Table 1 Analysis of target characteristics, appropriateness of indicators, attainability, and relevance for the 10 global Health for All targets (Van Herten / van de Water 1999)

		Target characteristics			Indicator characteristics					Relevance	
	Target	Clear	Quantitative	Time limits (years)	Clear	Quantitative	Total set	Better ones needed?	Attainability	Global	Member state
1	Equity in health	Yes	No	–	Not given				Unclear	Yes	Yes
	Equity indices	Yes	No	5	Not given				Yes	Yes	Yes
	Childhood stunting	Yes	Yes	20	Yes	Yes	?	Yes	?	?	?
2	Maternal and child mortality, life expectancy	Yes	Yes	20	Yes	Yes	Yes	No	?	Yes	?
3	Five major pandemics	?	No	20	Not well described				Unclear	Yes	?
4	Elimination of diseases	Yes	Yes	10;20	Yes	Yes	?	Yes	?	Yes	Yes
5	Water, sanitation, food, and shelter	?	No	20	?	No	?	Yes	Unclear	Yes	?
6	Health promotion	?	No	20	Not well described				Unclear	Yes	?
7	Health for all policies	?	No	5	Not well described				Unclear	?	?
8	Essential health care	No	No	10	Not given				Unclear	Yes	?
9	Alert systems	Yes	No	10	Not given				Yes	Yes	Yes
	Surveillance systems	?	No	10	Not given				?	Yes	Yes
	Health information systems	?	No	10	Not given				Unclear	Yes	Yes
10	Research	No	No	10	Not given				Unclear	Yes	?

? = questionable

er 20–25% from social ► health insurance contributions. The remaining 15% was accounted for by private insurance. Variation in the distribution between different sources of financing is wide; Asian and African countries have spent more from out-of-pocket financing than from government general revenue or social health insurance.

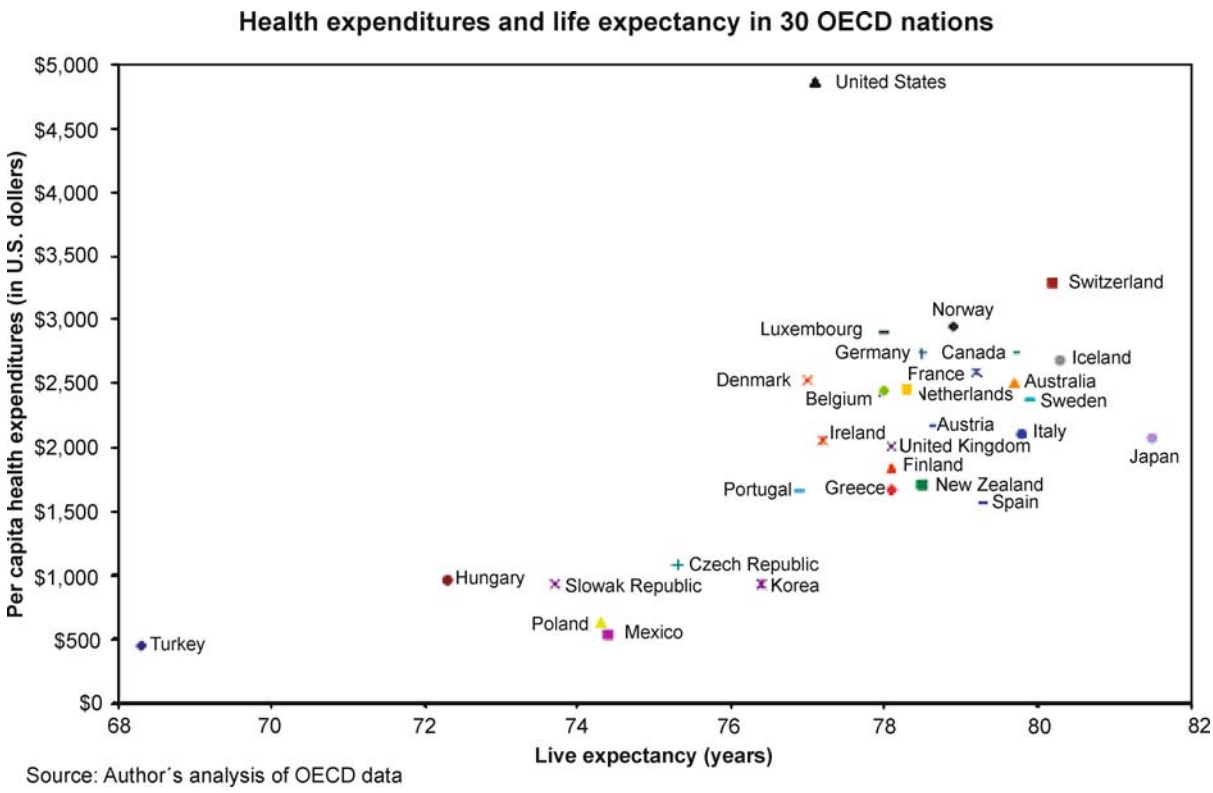
The Report of the WHO Commission on Macroeconomics and Health (WHO-CMH) recommended that countries should adopt an essential set of interventions with an average cost of US$ 30–40 per person. There is evidence to show that health systems which spend less than approximately US$ 60 per capita find it difficult to deliver a reasonable, minimum range of services.

The main source of financing across WHO – independent of the development state of a country – is from public general revenue, which is collected via taxes, health insurance contributions, and other methods. The levels vary, partly depend on the development state of a country. Moreover, the question remains what the optimum level of spending should be, how it should be collected, and what outcome should be achieved. An OECD study has demonstrated this challenge by comparing health expenditures and health expectancy in 30 OECD countries:

In 1981, a new indicator was proposed for the purpose of monitoring and evaluating of the global strategy for health for all by the year 2000: "the number of countries with at least 5% of GNP spent on health" (WHO 1999). While this indicator has never been formally adopted, the numerical level "5% of GNP spent on health" is commonly viewed as the WHO-recommended target.

According to WHO, "an appropriate percentage benchmark or target for health spending, like the fictitious target above, is extremely difficult to set. Research is under way to better define the minimum amounts of finance that countries should invest in order to optimally develop their health systems" (WHO 2005).

In a 2001 Report, WHO recommended that the low-income countries should increase their domestic spend-



Health Policy, Figure 1 Health expenditures and life expectancy in 30 OECD nations (Gould 2004)

ing on health by an additional 1% of GNP by 2007, and by an additional 2% by , linked to future trends of economic growth.

While many countries rely on general revenue for financing health care, others create or expand compulsory health insurance contributions, generally referred to as "social health insurance". These are usually based on pay-roll deductions, with additional contribution from the government in the form of general tax revenue. The World Bank in 1997 estimated that when a country's taxation is low (10% of GDP or lower), it would take 30% of government revenues to meet 3% of the GDP health expenditure target, through formal collective health financing channels. According to WHO "usually, poorer countries have widespread tax evasion among the rich and the middle class in informal sectors, thereby leading to low tax collections. They also rely heavily on taxation on international trade (exports and imports) and have the added limitation of broad-based taxes such as income tax or value-added tax."

A few countries have tried to add extra resources for health through earmarking a certain proportion of revenue collected from indirect taxation for health promotion and disease prevention. Some countries run state lottery services or other special revenue collection schemes, and earmark a certain proportion of collected funds for social services including health and education. Thailand recently enacted a legislation for a "Health Fund", which has specified a certain percentage of general revenue generated from taxes received from sale proceeds of tobacco and alcohol, being set aside for health promotion activities. With the adoption of the WHO Framework Convention on Tobacco Control (FCTC), an increasing number of countries are expected to use part of the revenue collected through a similar "sin-tax".

For inter-country comparisons, the level of health spending (like total health expenditure or per capita health expenditure as a percentage of GDP) may be useful. However, experience in some high- and middle-income countries has shown that more is not always better or always possible. Some developing countries with low investment in health could show outcomes comparable with those with high investment. What needs to be

seen is how efficiently and effectively countries spend their health resources according to their health needs. The output of effective spending according to health needs is reflected in the level of inequities in health outcome (WHO 2005).

Recent Trends and Developments

A WHO initiative was launched called "Health for All: the policy framework for the WHO European Region 2005 Update". According to WHO, "it answers the question of "Does tradition match the modern realities of policy-making?" In Europe, Health for All has proven to be visionary and inspirational. Is it also useful? Countries constantly face the need to make difficult choices and decisions that affect the functioning of their health systems. Can Health for All help them do so in a manner that ensures respect for human rights and for the values that lie at the heart of the European social consensus? The 2005 Health for All update proposes answers to some of these questions. Twenty-five years since the Health for All policy framework was first adopted in WHO's European Region, it is still seen by countries as valid, interesting and relevant. For some countries, Health for All served as a direct blueprint, in others it triggered the development of original, national Health for All policies, and many saw it as a basis for national target-setting, a source of ideas, a reference point or a general guideline in the area of values, health and human right and ethics. In the context of this broad usage of Health for All, the 2005 update should be seen exactly as what it is – an update, not a new policy. It reaffirms the European Region's 1998 HEALTH21 policy and is in the spirit of the global Health for All movement" (WHO 2005).

Since the update proposed an open-ended Health for All process, it provides a policy framework that can be developed further by the Health for All activities that countries decide to implement themselves. According to WHO, "It is hoped that the process will encourage the exchange of information, experiences and ideas inspired by the update and generated at the national and sub-national levels. Thus, the update will serve as a tool for promoting the ethical development of health policies and will be only one step in the continuing evolution and improvement of the regional Health for All policy" (WHO 2005).

Summary

Health policy does rarely exist on a global scale, but mostly depends on national specifics. Nevertheless, there are elements of health policy which can be applied globally. Therefore, WHO has formulated health goals, which naturally have different relevance for individual countries. Overall, within health policy, each decision making process is aimed at finding the most effective or efficient solution of specific health related goals, given different interests and levels of power of the stakeholders affected by the policy, and the ability to finance a potential outcome within a health care system.

Cross-References

- ▶ Decision Making
- ▶ Global Health Policy
- ▶ Health Data Management
- ▶ Health Insurance
- ▶ Health Targets
- ▶ Integrated Health Care
- ▶ Stakeholders

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Health Policy Indicators

Definition

Indicators of health policy are a subset of characteristics referring to the presence and implementation of national health policies and strategies, universal financial coverage, equitable distribution of resources, low cost sharing, comprehensive services, and family-oriented services. Some include indicators of social protection: social expenditure and community involvement.

Health Professional

► Health Care Provider

Health Promoting Hospitals

Definition

A health promoting hospital, as defined by WHO, does not only provide high quality comprehensive medical and nursing services, but also develops a corporate identity that embraces the aims of health promotion, develops a health promoting organizational structure and culture, including active, participatory roles for patients and all members of staff, develops itself into a health promoting physical environment and actively cooperates with its community.

Health Promoting Schools

Definition

A health promoting school can be characterized as a school constantly strengthening its capacity as a healthy setting for living, learning and working. It is defined by WHO as a place that takes all measures to foster health and learning, secures the health and education of officials, teachers, teachers' unions, students, parents, health providers and community leaders. Additionally, health promoting schools strive to provide a healthy environment and implement policies and practices that respect an individuals well being and dignity.

Health Promoting Workplace

Definition

A health promoting workplace (HPW) is a priority setting for health promotion. The concept of the HPW, as defined by WHO, is becoming increasingly relevant as more private and public organizations recognize that future success in a global marketplace can only be achieved with a healthy, qualified and motivated workforce. A HPW can ensure a flexible and dynamic balance between customer expectations and organizational targets on the one hand and employees' skills and health needs on the other, which can assist companies and work organizations to compete in the marketplace. For nations, the development of HPW will be a prerequisite for sustainable social and economic development.

Health Promotion

Synonyms

Healthy public policy; Health control; Disease prevention

Definition

Process of enabling individuals and communities to increase control over the determinants of health and thereby improve their health. Health promotion not only encompasses actions directed at strengthening the basic life skills and capacities of individuals, but also at influencing underlying social and economic conditions and physical environments which impact upon health.
The ► Ottawa Charter for Health Promotion (WHO 1986) identifies 3 basic strategies: ► advocacy, Enabling (► enablement) and Mediating (► mediation). Five areas of action support these strategies: building healthy/public policy, creating supportive environments for health, strengthening community action for health, developing personal skills for health and re-orienting health services ► prevention and health promotion

Cross-References

► Disease Prevention
► Health Campaigns
► Health Control
► Healthy Public Policy
► Public Health Law, Information and Communication

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Health Promotion Actors

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Synonyms

Actors in health promotion

Basic Characteristics

Background

The conception and implementation of the complex aim "health promotion" demands the collaborative work of many actors not only in the medical field but also many other fields and involves state or governmental and non governmental levels. Appropriate health promoting structures need to be in place to enable active intersectoral cooperation (► intersectoral cooperation) between different levels and all population groups.
Providing appropriate health promotion depends upon the cooperation of political decision makers at both national and international levels. Not only are regulations and laws required but also sustainable funding for continuous and long-term support is necessary along with flexible mediating and advising structures in health promotion. Those who devise and implement health promotion (the actors), at governmental as well as non governmental levels, come from the fields of education, welfare, health care and work.
For instance, at the European level, the European Union in 1986 passed a law assuring preventative health care and in 1993 the treaty of Maastricht contained health promotion as a central field of action of the European Community. The ► DG SANCO as part of the European Commission is responsible for the actions related to health promotion in the European Public Health Programme and it is the basis for the health policy in Europe.
The treaty of Maastricht anchored health promotion as a central field of action of the European Union. The DG SANCO of the European Commission runs the public health program which contains the following eight main topics amongst others:

- Health promotion.
- ► Health Information.
- ► AIDS and other ► transferable diseases.
- ► Cancer.
- ► Orphan Diseases
- Prevention of diseases.
- Environmental health.
- Prevention of addiction.

(Schwartz et al. 2002)

Principle Structure and Institutions Involved in Health Promotion and Disease Prevention

The national implementation of health promotion is strongly influenced by the structure and instruments of health policy devised by the politicians. Political activity can be subdivided in the following terms:

- ► Politics.

- ► Policy as well as ► policy networks.
- ► Polity.

Furthermore, political activity depends on the particular organization of the political authorities within any given state (e. g. central state or federal political system). In order to understand the structure and instruments of a country's health policy, one has to take into account the political organization of that country, remembering that health promotion actors are located on governmental as well as non-governmental levels. The principle structure depends also on the funding of health promotion and the legal framework. The financial funding for health promotion is significantly influenced by the implementation of one priority fields of action in health promotion: investment for health (Altgeld 2003).

Table 1 depicts an overview of several institutions that are possibly involved in health promotion and disease prevention activities.

Therefore, health promotion is strongly shaped by building up networks between the mentioned actors from different levels and representation bodies. These networks are often referred to an intersectoral cooperation, alliances, and partnerships or inter-organizational networks (► network) for health promotion. An ► alliance for health promotion is a partnership (► public private partnership) between two or more parties that pursue a set of agreed upon goals in health promotion. Building of alliances will often involve mediation between different partners and their aims such as the definition of common goals and ethical ground rules, joint action areas, and agreement on the form of cooperation. A partnership for health promotion is a voluntary agreement between two or more partners to work cooperatively towards a set of shared health outcomes. Such partnerships may form a part of intersectoral collaboration for health, or be based on alliances for health promotion. Such partnerships may be limited by the pursuit of a clearly defined goal – such as the successful development and introduction of legislation – or may be on-going, covering a broad range of issues and initiatives. Increasingly, health promotion involves a partnership between the public sector, civil society and the private sector.

Since the beginning of the 1990s, health promotion has been closely related to the development of networks. Important pioneering work on creating, developing and managing networks in the field of health promotion was published by the World Health Organization (► WHO). The WHO regional office in Europe encouraged the development of networks between local, regional, national, and international institutions as well as organizations. Many of these representative bodies in the field sought information from the key documents of the WHO on health promotion (WHO 1986).

The WHO provides these networks with a health policy framework for health promotion in the key documents "Health for All" and the "► Ottawa Charter on Health Promotion." The concept of interinstitutional and intersectoral collaboration and cooperation through network building was significantly promoted by the WHO. Currently, discussions concern not only a system of networks in health promotion but also the appropriate

Health Promotion Actors, Table 1 Actors and organization involved in health promotion activities at different levels

Level	Governmental institutions and other public bodies	Non governmental organizationsand private institutions/agencies
International	International policy institutions e. g. European Commission, DG Sanco	Representation bodies like ► INHPF, ► IUHPE, ► EUPHA
National	State or Federal Ministries of Health, Education, Welfare. Federal Centre for Health Education	National public health organizations, Federal association of consumer advice center, National contact center for self help groups, National societies of nutrition
Regional	Regional public health services	Regional federations on health promotion, Coordinating centers of self-help groups
Local	Local public health departments	Local activities of self-help groups Local health center Sport club Private trust and foundations

► setting of health promotion networks. It is considered that fostering networks enables the establishment of the necessary long term prerequisites of health promotion (Brößkamp-Stone 2002).

Successful health promotion and disease prevention requires a wide base of several institutions and state facilities, and ministries of health and state agencies for public health have to be involved. For instance, the American ► center of diseases control and prevention is one well known state public health institution in this field. Other issues of public health and prevention are also carried out by state ministries of consumer protection. The work of such state ministries is supported by subordinate departments in the following areas of work:

- Institutions for hygiene and transmissible diseases that aim at recognizing, preventing and fighting transmissible diseases.
- Public and state institutions for the protection of health and safety standards at work that aim at securing occupational safety and the prevention of work related health threats.
- Federal agencies for health education and health promotion.

Furthermore, various associations, foundations and scientific societies aim to strengthen and implement the goals of health promotion and disease prevention in order to improve knowledge about factors influencing the health of the population. These numerous organizations are derived, for example, from the following fields:

- Associations on nutrition.
- Associations on physical activity.
- Medical associations.
- Cancer associations, etc.

Cross-References

► AIDS
► Alliance
► Cancer
► Centers for Disease Control and Prevention (CDC)
► DG SANCO
► EUPHA
► Health Information
► Health Policy
► INHPF
► Intersectoral Cooperation
► IUHPE
► Network
► Orphan Diseases
► Orphan Drug
► Ottawa Charter
► Policy
► Policy Networks
► Politics
► Polity
► Setting
► Transmissible Diseases
► WHO

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Health Promotion Engagement

Synonyms

Commitment; Involvment; Engagement in health promotion

Definition

Involvement of affected or concerned persons in the process of identifying problems and needs as well as in the process of planning, implementing and evaluating actions. People have to be at the center of ► health promotion action and decision-making processes for them to be effective.

Participation can assume different degrees of involvement and commitment. There is a distinction between

active and equal collective participation and more passive collective acceptance of expert-oriented measures. Participative engagement in the sense of ► empowerment positively affects health through fostering the awareness of being able to exert control over one's living conditions and through revealing and furthering new skills and abilities.

Health Promotion, Ethical Aspects

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Synonyms

Health improvement; Health enhancement

Definition

Health promotion, as one of the main goals of public health practice, is the process of enabling people to increase control over, and to improve, their health. In order to reach this goal, public health initiatives at times come into conflict with other ethical principles (e. g. individual ► autonomy, ► social justice), therefore public health promoters have to deal with ethical dilemmas at various levels.

Basic Characteristics

Health promotion is significantly playing a more important role in health care in general, and public health practice in particular. Health promotion, as one of the main aims of modern public health practice, initially only focused on the lifestyle changes that might impact on the prevention of such things as cancer, chronic degenerative diseases and metabolic disorders; then it evolved and broadened its viewpoint to improving the physical and mental health and well being of people in local communities, including influencing living habits and living conditions that affect behavior, and also promoting individual self-esteem, dignity and respect.

To reach a state of complete physical, mental and social well being, an individual or group must be able to identify and realize aspirations, satisfy needs, and change or cope with the environment. Health is a positive concept emphasizing the possession of social and personal resources, as well as physical capacities. From this perspective, health promotion is a strategy to promote health by strengthening personal resources. To achieve this different methods are utilized at different levels. At a personal level, through positive socialization in families and peer groups, health consciousness is heighten and a sense of coherence is created; at a behavioral level, through health information, health education, health counseling, health training and social support, resources are strengthened; at a structural level, through a healthy public policy, resources are further strengthened. Health promotion is, therefore, not just the responsibility of the health sector, but involves the adoption of personal healthy life-styles that lead to personal well being.

Debating health promotion at times evokes different perspectives. On the one hand, the idea of individual responsibility has been submerged by the concept that individual rights or demands should be guaranteed by the government and delivered by public and private institutions, and that, in order to improve public health, government bodies should take responsibility. On the another hand, governmental institutions stress the responsibility of individuals to keep themselves healthy; this approach, however, may be seen as an ideological strategy for relieving a government of the obligation to provide healthy conditions and health care services.

Nevertheless, there is an increasing agreement, among both the general population and health professionals, that a good deal of disease is self-inflicted, and is a product of imprudent behavior, as proven by the evidence that various personal habits and lifestyle choices (such as poor nutrition, smoking, alcohol and drug abuse, failure to wear seat belts, unsafe sexual practices) are major causes of morbidity and mortality.

Traditionally, the "► harm principle" has been used by governments to impose restrictions on individual autonomy and freedom; ► paternalism, which imposed restrictions on those who represented a risk to others, was considered universally acceptable when the harm being caused was obvious. Divergences arose when the harm being posed to others was unclear, or when health promotion activities interfered with individual privacy and freedom in the name of the common good. What is still open, then, is the ethical question of how far a government should go in regulating, restricting or prohibiting behaviors that bring about morbidity and mortality;

or even in protecting citizens from commercial influences that may encourage or sustain patterns of behavior that are dangerous to health. How do we reconcile personal freedom and good health? Personal choice and common good?

According to Mr Mills, "He (the individual) cannot rightfully be compelled to do or forbear because it will be better for him to do so, because it will make him happier, because in the opinion of others to do so would be wise or even right." What role, then, should government play in urging citizens to give up their pleasurable but damaging habits? Many people believe that government should rarely exercise coercive powers either because they are ineffective or because they overrule individual autonomy, ► privacy, or liberty. The evidence of the negative consequences of some private habits and lifestyles, both on the public and on the individual's health, has added to the idea that there is an obligation to preserve one's health. How should society determine whether to intervene to protect the public's health and safety when doing so will diminish a personal or economic interest and will undermine individual freedom and personal responsibility? And how can the state be prevented from taking power to remove more and more choice in the name of better public health? Anyhow, some paternalistic health promotion interventions are based on the position that the costs of risky behavior are a national and not an individual responsibility; moreover, public health officials may feel justified and morally bound to prevent avoidable suffering and death regardless of social costs.

A very important role in this dilemma is played by health education. Health communication campaigns are the most common form of intervention designed to promote healthy behavior. Though they discourage certain activities linked to morbidity and mortality and encourage the adoption of others, they provide information to the individual, thus enhancing his personal autonomy. They have been credited with helping raise awareness regarding risks from chronic illness or new infectious diseases. They have been a tremendous factor in helping to promote the adoption of recommended treatment regimens and helping de-stigmatize populations that suffer from new and old medical conditions.

The debate, in these cases, is whether health education, which preserves individual autonomy and avoids coercion, is enough, and whether health promotion campaigns and advertising, using a wide range communication strategies in order to produce messages to promote public health, are appropriate.

Messages about how to improve health may not appear as ethically problematic and they can be viewed as rather benign, compared to more coercive methods in public health that involve regulations and sanctions. Yet, they may create subtle but real ethical dilemmas which permeate all facets of the public health communication process, including the initial focus on a particular health issue, choice of target populations, design of message appeals and assessment of effectiveness. Just to give but few tips:

- Tailoring messages corresponds to the communication ethical stipulation of comprehensibility, which requires the provision of complete and culturally-appropriate messages to diverse populations. A drawback associated with disseminating messages tailored to particular populations is that groups that are not provided with culturally-specific messages may feel excluded or short-changed.
- Tailoring messages may present competing demands to provide complete and accurate information whilst presenting this information in a format that is appropriate for low-literacy audiences. Yet, for some, low literacy may be a source of embarrassment and they may want to distance themselves from materials that have an appearance of being designed for low-literacy populations. This poses the challenge of developing materials that are respectful and not condescending but effective in their format.
- When the intended populations for communication interventions are the young, additional ethical issues may emerge: parents may object to the dissemination of information or the implementation of activities on certain topics. Yet, their children would like to obtain this information and public health practitioners strongly believe it is essential to promote their health. Should the children be provided with the information, despite the objections of their parents? Can this be justified on the basis of the rights of children and the young? Can this be justified on the basis of preventing vulnerable populations from harm?
- Appeals to personal responsibility are common in public health messages. Linking responsibility messages to health outcomes raises several ethical issues: the first concerns conceptions of culpability. Implied in messages that make a causal link between

a person's behavior and their health, is an assumption that people's behavior can significantly affect their health and therefore they can be held responsible for detrimental health outcomes. Whereas such messages resonate with the notion of human agency, they may be ethically problematic because they do not take into consideration that individuals may have limited impact on social factors that affect their behavior. Linking health with personal responsibility may, by implication, characterize those who do not adopt recommended health related practices as weak of character and at fault. This can lead to the conclusion that people should be held morally, and perhaps legally, accountable for their behavior, thus exempting society from paying certain health care costs, or requiring certain individuals to pay higher premiums.

- Messages that scare people regarding the hazards of a potential disease, on the one hand raise their motivation to avoid contracting it, but on the other hand may present a negative image of those who have the disease, thus stigmatizing them. Once stereotypes and stigmas are established, they can result in individuals being feared, avoided, regarded as deviant, and even blamed for engaging in the immoral behaviors that must have elicited the 'punishment' of their affliction. In general, this type of social climate can be devastating to members of vulnerable populations who suffer from stigmatized medical conditions since it can result in the internalization of self-blame and the destruction of self-esteem.
- With a continuous barrage of health messages aimed to promote the health of the public, the public is inundated with messages on the importance of health. As good health increasingly signifies virtue, those who are unhealthy may be made to feel that they are unworthy, forgetting that pain and suffering are part of human life and give a precious contribution to human growth and development at the psychological and spiritual level.

The task of developing ethically-derived public health communication also needs to include consideration of issues of diversity and pluralism amidst mounting social and economic disparities within and across nations. Scrutinizing public health communication strategies for ethical concerns should become a routine, not only because any benevolent attempt to contribute to people's well-being needs to be ethical, but also because communication interventions that are sensitive to ethical concerns are more likely to be better executed and to be trusted by intended populations.

One of the ethical aspects of health promotion concerns ► nutrition. We talk about nutrition when addressing lifestyle changes in relation to increasing foods with protective factors and reducing those with disease-promoting properties. If we look at a restricted population or at a specific Western country, it could be relatively easy to give guidelines which could also include the concepts of "► sustainable development" and "justice". The perspective changes if, instead, we look at the worldwide population. Just to give an example. The most recent general dietary guidelines for a healthy diet from the American Heart Association recommend: 'Eat at least two servings of fish per week.' This recommendation is based on scientific evidence. In the USA, there are 280 million potential fish consumers. Adherence to this recommendation would require the preparation of 29 billion fish portions per year for this market. Extended to the whole world, this would require 642 billion annual servings. Even if one were to restrict the recommendation to adults, this would only reduce the projected consumption by approximately half. Global compliance with the USA American Heart Association recommendation for regular fish consumption would risk the fish supplies of the world, and the ecological balance of aquatic and marine habitats. This recommendation is pro-people, but strongly anti-environment.

A very important step forward in the concept of health promotion has been "The ► Ottawa Charter for Health Promotion", released at the First International Conference on Health Promotion held in Ottawa in 1986.

The charter broadens the approach to health by proclaiming that good health is a major resource for social, economic and personal development and an important dimension of quality of life, and that its fundamental conditions and resources are: peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice, and equity (known as "► social determinants of health").

In this approach, health promotion includes various areas of action:

- Build healthy public policy .
- Create supportive environments.
- Strengthen community action.
- Develop personal skills.
- Reorient health services.

As a consequence, improvement in health requires a secure foundation in these basic prerequisites and demands coordinated action by all concerned: by governments, by health and other social and economic sectors, by nongovernmental and voluntary organization, by local authorities, by industry and by the media. Health promotion strategies and programs should be adapted to the local needs and possibilities of individual countries and regions to take into account differing social, cultural and economic systems.

The Ottawa Charter has definitely opened up new paths for the future development of health promotion and public health in general.

Looking at social justice has been indeed a major step in the recent evolution of public health practice, which has focused, more than in the past, on reducing differences in current health status and ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. One of the ethical issues is that the increased costs of health care have brought along disparities in distribution and accessibility within a specific population; moreover, if we look at the global level, it cannot be ignored that the developing world is still devastated by preventable infectious diseases, malnutrition and poverty.

There is still a long way to go, but health promotion aims and activities have already, as we have seen, taken up the challenge.

Cross-References

- ► Autonomy
- ► Harm Principle
- ► Health Determinants, Social
- ► Nutrition
- ► Ottawa Charter
- ► Paternalism
- ► Privacy
- ► Social Justice
- ► Sustainable Development

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Health Promotion, Fields of Action

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Synonyms

Action area

Definition

Action areas in health promotion were outlined in the ► Ottawa-Charta and support the implementation of the three basic strategies (► advocacy, ► enablement, and ► mediation) of health promotion mentioned in the Charta. The action areas are:

- Build healthy public policy
- Create supportive environments for health
- Strengthen community action for health
- Develop personal skills (life skills) and
- Re-orient health services.

The term "health promotion" was defined as an overall goal in the declaration "Health for all" that was made at the beginning of the 1980s in the last century. Aims, principles, and necessary terms of health promotion were summarized in the Ottawa-Charta on health promotion. According to the understanding of

the ► World Health Organization (WHO), health promotion describes the concepts of analyzing and increasing the resources and potential of health on all policy and social levels. This description led to the above-mentioned five important fields of action in health promotion that concretize the aims of it.

Health Promotion Action means to be active in the five fields described above, and is defined as follows by the WHO (WHO 1986):

Basic Characteristics

Healthy Public Policy (► Health Policy)

The development of healthy public policy was described by the WHO as a formal statement or procedure that is not limited to medical and social care. Moreover, health care has to be considered on all levels of political and social activities. A policy of health promotion is distinguished by mutually adding approaches in legislative rule-making that define regulations and incentives to enable the provision of health services and programs, and access to those services and programs. Further developments in healthy public policy initiatives will depend on them arising from a systematic process of building support for public health action that draws upon available evidence integrated with community preferences, political realities, and resource availability.

Supportive Environments for Health

The second field of action in health promotion is defined as creating supportive environments. The basis of action in this field is the close relation between human kind and the environment since a healthy environment has to be recognized as having a significant role producing health promoting living conditions. Protection of nature and the environment as well as sustainable development (► sustainability) dealing with resources is a prerequisite for implementing the strategies of health promotion. Creating supportive environments requires development of a stimulating and satisfying working and living condition (► living conditions). Direct political action is needed to develop and implement policies and regulations that help to create supportive environments. Economic action is also required, particularly in relation to fostering sustainable economic development and social action.

Community Action for Health

Strengthening community action is also a central matter in health promotion. It aims at establishing the development of community action of the population and supporting the capabilities of ► self-help groups and their activities in the sense of self-determination. Community action is also addressed through the ► participation of society in health issues and the health promotion-related work of each individual.

Develop Personal Skills

Developing personal skills is the process of supporting personality development and social competence through information and health-related education as well as the improvement of social competence. It aims at empowering (► empowerment) persons to increase their influence in health related behaviors and their everyday living conditions. In this context, it is aimed that individuals should get the possibility of a lifelong process of learning in order to attain the ► life skills that could be needed to deal with chronic disease or handicaps.

Re-orient Health Services

The term "re-orient ► health services" is understood as the development of a health care service by public health bodies that does not only concentrate on the process of recovery and rehabilitative issues but also on the improvement of health. It should also be considered that health is the result of a large number of health influencing determinants. This perspective leads to the identification of resources and their potential and specific strengths, which have to be supported by re-orientated health services.

The above-mentioned fields of action were confirmed as important and added to at the successor conferences of health promotion. In particular, all action areas were expressly established as effective measures for health promotion at the fourth conference of health promotion in Jakarta in 1997.

Further development of the concept of health promotion as defined by the WHO was significantly influenced by the conferences on health promotion held in Ottawa in 1986 and in Jakarta in 1997. The declaration of the conference of Jakarta focused on the following newer priorities (WHO 1997):

Promote Social Responsibility for Health

Social responsibility for health is reflected by the actions of decision makers in both the public and private sector to pursue policies and practices that promote and protect health (WHO 1997).

Increase Investments for Health Development

Investment for health refers to resources that are dedicated explicitly to the production of health and health gain. They may be invested by public and private agencies as well as by people as individuals and groups. Investment-for-health strategies are based on knowledge about the determinants of health and seek to gain political commitment to healthy public policies (WHO 1998).

Secure an Infrastructure for Health Promotion

Infrastructures for health promotion are understood as human and material resources, and organizational and administrative structures, policies, regulations, and incentives that facilitate an organized health promotion response to public health issues and challenges. Such infrastructures may be found in a diverse range of organizational structures, including primary health care; government, private sector, and nongovernmental organizations; and self-help organizations, as well as dedicated health promotion agencies and foundations (WHO 1998).

- Expand partnerships for health promotion
- Increase community capacity and empower the individual.

In summary, all of the above-mentioned fields of actions in health promotion are accepted as important for successful implementation of the strategies of health promotion. Mutual consent exists in the scientific community that health promotion activities are effective if the basic strategies are carried out in combination in order to achieve a high rate of participation of the target groups (► target group), to empower all actors, and to stimulate the building of networks and community action for health (Noack 2002).

Cross-References

- ► Advocacy
- ► Empowerment
- ► Enablement/Enabling
- ► Health Policy
- ► Health Service
- ► Life Skills
- ► Living Conditions
- ► Mediation
- ► Ottawa Charter
- ► Participation
- ► Self Help
- ► Sustainability
- ► Target Group
- ► WHO

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Health Promotion Models

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Synonyms

Health promotion theories

Definition

Models or theories in health promotion are systematically built and validated constructs with clearly defined and interconnected concepts covering a wide range of

phenomena related to health behaviors or health conditions. For this essay, the terms "model" and "theory" are used interchangeably, since their application does not follow a stringent logic.

Basic Characteristics

Empirical Basis for Practical Theories

Models or theories in health promotion are – in contrast to those of disciplines like physics – not approximations to an accepted hypothesized "truth" but guiding schemes for the explanation or planned change of health-related human behaviors or conditions. What makes them models according to generally accepted concepts is the fact that they have been empirically tested and proven to be of generalizable, practical usefulness: their "truth" is the compilation of effectiveness by experiences from many studies (sometimes far more than 1000) in vastly different types of populations.

Historical Developments and Types of Models

The best-known and most often applied health promoting models have four different orientations: the first, from the 1930–1950s examine ► health behaviors and behavior changes by focusing solely on the individual and her/his characteristics. While these theories substantially contributed to the understanding of human health practices, the attention to and inclusion of the broader environmental and socio-economic context led to a second generation of theories that additionally focus on the influence and competence of a community or "setting" in which individuals live, work, play, or learn. These theories might include the individual as one focus of intervention, but they also address issues beyond the control of the individual, such as the increased availability of supporting devices (e. g. condoms free of charge or the implementation of a health center in the neighborhood).

A third group of theories clusters around *awareness raising* and *knowledge transmission through communication and action-motivation*. Here, the targets might be individuals, (risk) groups, communities, or even whole nations, addressed by mass communication campaigns (► mass media) or social marketing strategies (e. g. BZgA's HIV-prevention campaign "Mach's mit").

A fourth group of theories focuses on the *analysis of organizational structures* and structural change mechanisms and their health impact by means of general policy or "► healthy public policy" development (Nutbeam and Harris 2004).

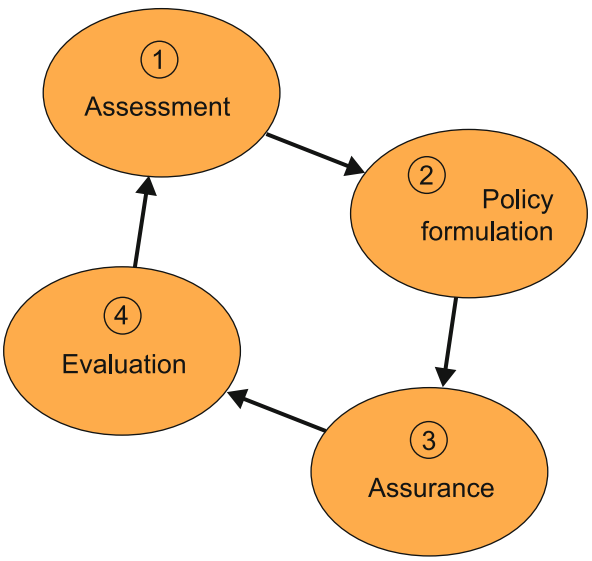
Many projects have successfully been conducted without theory – solely based on experience or intuition. However, the likelihood of success and ► effectiveness has been proven to be higher when the conceptualization is theory-led.

Usefulness of Models for Health Promotion

The use of models in health promotion can serve the purpose of helping to systematically plan, conduct, and evaluate health promotion interventions or programs. In modern public health practice, a mix of concepts from different models is usually employed and all major theories are checked for their applicability to a given project. One intervention model – the Pantheoretical Model – is a synergistic composition of concepts from theories of different disciplines like *education and training*, *persuasion*, *motivation,* and *facilitation* (McAlister et al. 1991; Seibt 2003a).

Models such as the Public Health Action Cycle (Fig. 1) remind practitioners to follow a systematic approach – from *assessment* to *policy and strategy formulation*, and from *implementation* to *evaluation* (Institute of Medicine 2003).

The ► precede–proceed health promotion planning model (Seibt 2003b; Green and Kreuter 2004) propos-



Health Promotion Models, Figure 1 The Public Health Action Cycle

es a clear understanding of the *social*, *epidemiological, behavioral, environmental, educational, organizational, administrative,* and *policy aspects* of a problem area during the needs assessment or planning stage; for evaluation, there is a distinction between ► process evaluation, ► impact evaluation, and ► outcome evaluation.

Selected Psycho-Social-Ecological Models

► Health education and prevention have developed towards health promotion along the following path: they started in the 1950s of the last century with context-free models, such as the ► health belief model where the individual is the sole target, and progressed to more recent theories such as the Social-Learning Theory or the Stages-of Change-Theory, which focus on the individual but also consider the individual's life style and their ecological and socioeconomic environment.

A short introduction to the three models mentioned is outlined here:

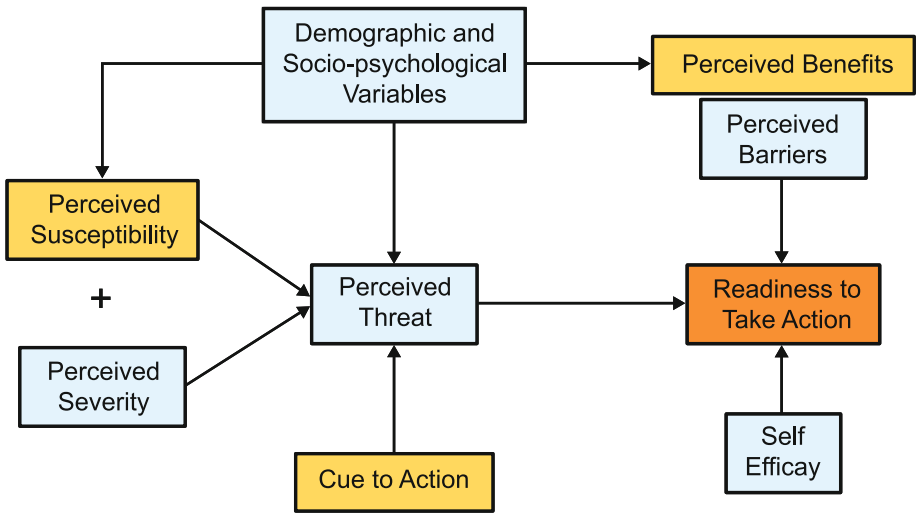
The Health Belief Model was developed in the 1950s by the U.S. Public Health Service. It is still used as an assessment tool to understand why persons participate in programs for the prevention or detection of diseases (e. g. being immunized against the flu). The original model encompassed five concepts; self-efficacy was added for modern applications (Fig. 2). Perceived *susceptibility* is defined as the subjective opinion about the chances of contracting a condition; perceived *severity* is the subjective opinion of how serious a condition and its consequences might be if untreated. Perceived *benefits* means the opinion of the effectiveness of various available actions in reducing the problem, and perceived *barriers* are the potentially negative aspects of a health action, e. g. side effects or costs. *Cues to action* might be an environmental event or a bodily trigger. *Self-efficacy* is defined as the person's confidence in performing a particular behavior successfully (Bandura 1986).

The model's empirically highest validated concepts are susceptibility and barriers, mostly used in combination with concepts of other models (Seibt 2003c).

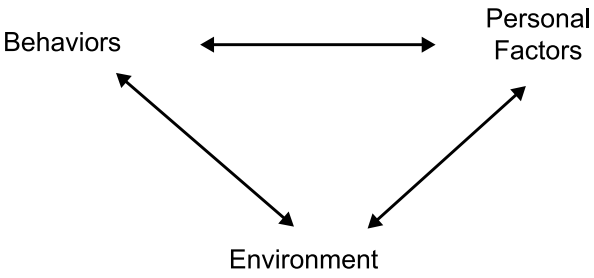
The ► social learning theory, also called Social Cognitive Theory, not only explains how people "learn" and maintain certain behavioral patterns, but also explicates factors influencing health behaviors and thereby provides the basis for intervention strategies for the promotion of behavioral change. Human behavior is explained in terms of a triadic, dynamic, and reciprocal model, in which behavior, personal factors (including cognitions), and environmental influences all interact (Fig. 3).

According to the theory, humans are not only able to learn from direct experience, but also by observing others and anticipatorily drawing conclusions for their own behavioral outcome; this type of vicarious learning enables them to build outcome expectations through cognitive processes, to acquire tactile and social skills through (imitative) training, and, amongst others, to develop self-efficacy expectations.

Social Learning Theory is widely used since its concepts are easy to operationalize for health promoting interventions: role models can be used to model pos-



Health Promotion Models, Figure 2 The Concepts of the Health Belief Model



Health Promotion Models, Figure 3 Scheme of the triadic, reciprocal interaction between the three determinants for human behavior according to the Social Learning Theory: Environment, Person, and Behavior (according to Bandura 1986)

itive outcomes, to correct misconceptions, to demonstrate self-reward, to reflect mastery, to point out opportunities, to signal social support, etc. (Seibt 2003d).

The Stages-of-Change-Theory, also called the ► transtheoretical model (TTM), differentiates phases through which people, groups, or organizations go when changing – both for eliminating an old and for adopting a new behavior or condition. This theory provides a time dimension for the change process.

The original Stages-of-Change-Theory distinguishes five phases:

In the first stage – *Precontemplation* – people have no awareness of the problem and no intention to take action; this stage is the most stable one. The second stage – *contemplation* – is defined as an intention to take action some time in the future, conceptualized as within the next 6 months for most individual problem behaviors. In this phase, there is recognition of a problem, and causes, effects, and solutions are reflected. However, there is no readiness yet to engage in any changes. In the third stage – *preparation* – the focus lies on the solution rather than the problem. There is an intention and a plan to test the new condition. It is an ambivalent stage with high awareness, anxiety, impatience, etc. Often, small changes have already taken place (e. g. a reduction in cigarette consumption per day). *Action* is the (fourth) stage in which individuals overtly modify their behavior or environment in order to overcome their problems. This phase requires considerable commitment of time and energy. *Maintenance* is the (fifth) stage in which people work to prevent relapse and consolidate the gains. For addictive behaviors, this stage often extends to an indeterminate period (e. g. former alcoholism).

A second dimension of the Stage-Theory is the specification of processes, by which people (or groups or organizations) move onto the next stages. In short, the progression through stages one to three involves cognitive, affective, and self-evaluative processes, while for stages three to five, social support, contracts, rewards, and environmental control mechanisms are important. In each stage, people can rush through, stay for long periods of time, or remain forever.

This theory allows differentiation between target populations and intervention methods in a stage-sensible way (Seibt 2003e). There is almost no public health problem behavior for which the theory has not yet been tested and used.

H

Other Models

There are other models or theories used in health promotion: the ► theory of reasoned action, also called ► theory of planned behavior (Seibt 2003f); the Diffusion of Innovation theory (Seibt 2003g); the Communication-Behavior Change Theory (Seibt 2003h); the Attribution Theory (Seibt 2003i); ► social marketing (Seibt and Lehmann 2003k), etc. Another group of theories includes those of changes in organizations for the creation of health-supportive organizational practice and those for the development of healthy public policy and community development (for a short description of those, see Nutbeam and Harris 2004 or Glanz et al. 2002).

Cross-References

- ► Effectiveness
- ► Formative Evaluation
- ► Health Behavior
- ► Health Belief Model
- ► Health Education
- ► Healthy Public Policy
- ► Impact Evaluation
- ► Mass Media
- ► Precede–Proceed Model
- ► Reasoned Action Theory
- ► Social Learning Theory
- ► Social Marketing
- ► Summative Evaluation
- ► Transtheoretical Model

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Seibt AC (2003) a) Pantheoretisches Modell, p 167; b) Precede/Proceed-Modell, p 180; c) Modell der Gesundheitsüberzeugungen/Health Belief Model, p 150; d) Soziale Lerntheorie/Sozial-kognitive Theorie, p 206; e) Transtheoretisches Modell der Phasen der Verhaltensänderung, p 233; f) Theorie des rationalen Handelns und Theorie des geplanten Verhaltens, p 229; g) Verbreitung von Innovationen – Diffusionstheorie, p 235; h) Modell der überzeugenden Kommunikation, p 152; i) Attributionstheorie, p 16; k) Soziales Marketing, p 210 (with author Lehmann M). In: BZgA (ed) Leitbegriffe der Gesundheitsförderung – Glossar zu Konzepten, Strategien und Methoden der Gesundheitsförderung, 4. erweiterte und überarbeitete Auflage. Fachverlag Peter Sabo, Schwabenheim

Health Promotion Outcomes

Definition

Health promotion outcomes, as personal characteristics and skills, as well as social norms and actions, organizational practices and public policies which are attributable to a health promotion activity, are defined by WHO. They represent the most immediate results of health promotion activities and are generally directed towards changing modifiable determinants of health. Health literacy, public health policy, and community action for health are included as health promotion outcomes. Health promotion outcomes often produce a broader range of changes and effects than initially intended by the program.

Health Promotion – Setting

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Definition

Setting is the place or social context in which people engage in daily activities in which environmental, organizational and personal factors interact to affect health and well being (WHO 1998).

Basic Characteristics

Settings are places or social conditions in which humans spend a huge part of their daily lives and which have a great influence on their health. Typical settings are work situations, areas of leisure time and schools. When carrying out interventions it is recognized that it is necessary to consider the living conditions of individuals and their settings. With regard to health promoting activities, need to be described and analyzed before implementing health promotion interventions. As individuals belong to and are influenced by a variety of settings, the formulation of the setting approach was an important step in the development of health promotion activities. Settings can be categorized in various ways: personal and individual (e. g. health risk related lifestyles), regional aspects (cities, regions, islands and countries), social as well as institutional (family, kindergartens, schools, associations or communities of interest).

The setting approach was first put forward as a health promotion concept in the ► Ottawa Charter in 1986 and it is the basis of the ► WHO ► healthy cities project; a long-term development project to place health on the agenda of cities around the world, and to build a constituency of support for public health at the local level (WHO 1998).

Numerous and widespread programs and interventions, mainly initiated by WHO, give credence to the fundamental importance of the concept of settings. Examples of settings include ► social networks, ► healthy islands, ► health promoting schools, ► health promoting workplaces (HPW), healthy cities and healthy vil-

lages, health promoting prisons, neighborhoods and ► health promoting hospitals.

The WHO initiative "Health 21" confirmed the setting approach as an important strategy in health promotion and was continued at the 4th Conference on Health Promotion in Jakarta, held in 1997. Settings were classified as central concept for strategies and interventions in social systems and organizations. Their focus was on organizational networks, not on the health risk behavior of individuals and their circumstances.

Therefore, the intention of WHO was to support the idea of settings in ► networks. The WHO/EURO initiative "Networking the networks" and other global networking activities are examples of these initiatives. They aim at creating a global alliance for health promotion. The whole concept of inter institutional and ► inter sectoral-collaboration and cooperation through network building was seriously promoted by WHO (WHO 1998).

Currently, discussions center not only on the concept of systems of networks in health promotion but also on the setting of health promotion networks; the fostering of networks is regarded as a necessity and long term prerequisites for health promotion will be established through network building (Broesskamp–Stone 2002).

Nevertheless, settings, as one part of health promotion interventions, need to be more specifically identified if implementations are to be successful. For example, community, city or workplace are not specific enough definitions; more particular information is required, such as which actors (e. g. ► target group, decision maker, professions, etc.) define the setting and careful consideration has to be given to the advantages and disadvantages their involvement incur. The success or failure of an intervention in health promotion activities in settings depends on the careful definition of these settings. This definition must not only describe the level of involved actors but also consider the addressed problems which are the target of the health promotion interventions (Grossmann, Scala 2003).

The advantage of defining settings is that the same intervention can be utilized to reach both actors and target groups at various levels; health promotion activities are combined, in a given setting, not only as individual measures but also as population related measures. Thus, all the participants of the setting define the potentials for health in a participative process and develop their own priorities and produce suggestions for improvement.

Cross-References

- ► Health Promoting Hospitals
- ► Health Promoting Schools
- ► Health Promoting Workplace
- ► Healthy Cities
- ► Healthy Island
- ► Intersectoral Cooperation
- ► Networks
- ► Ottawa Charter
- ► Social Networks
- ► Target Group
- ► WHO

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Health Promotion Theories

► Health Promotion Models

Health Protection

► Health Care

Health Record

Synonyms

Medical record; Patient record; Medical documentation

Definition

Health record refers to all patient records generated over an individual's lifetime by all health care providers

the patient was in contact with, and records every time that health services were used. It comprises the histories of all disabilities and illnesses, laboratory findings and results from other diagnostic procedures, and information on the therapies applied.

Health-Related Quality of Life (HRQOL)

Definition

In public health and in medicine, the concept of health-related quality of life refers to a person or group's perceived physical and mental health over time. Health-related quality of life is used to measure the effects of numerous disorders, short- and long-term disabilities, and diseases in different populations on their patients to better understand how an illness interferes with a person's day-to-day life. Health-related quality of life represents the functional effects of an illness and its consequent therapy upon a patient, as perceived by the patient.

Cross-References

► Indicator
► Quality of Life

Health Reporting

Definition

Health reporting is performed to follow the trends in health status of the population over time. Health reporting can be done using ► health indicators – changes of the indicator level in a specific period of time; by using indicator sets – a set of parameters used as a model to track progress of health goals over time; or by using health targets – formulated strategies adopted by several countries.

Health Research

Synonyms

Medical research; Clinical research

Definition

Health research is defined as investigative work undertaken on a systematic and rigorous basis using quantitative and qualitative methods to generate new knowledge aimed to impact on human physical, social and psychological well being.

Health Research and Indigenous Health

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Synonyms

Medical research; Clinical research; Medical anthropology

Definition

Medical research encompasses a broad range of activities within basic and clinical research, all aimed at improving or maintaining human health. Clinical research involves research on human participants, while basic research refers to underpinning research from areas such as animal studies, psychology, statistics, economics, physics, chemistry, etc. (http://www.mrc.ac.uk/index/current-research/current-clinical_research/current-clinical_research_definition.htm) (UK Medical Research Council).
Research and indigenous health focuses on two main areas:

- Research on traditional medical practices
- Research on indigenous populations

Basic Characteristics

Research Methods

Research on Traditional Medical Practices Ethnobotanical surveys and phytochemical analysis of possible active compounds should be done ideally simultaneously with a study of the socio-cultural beliefs and rituals underpining the use of plants in traditional medicine.
Research on traditional medicine has focused on clinical and experimental medicine. In order to maximize the contribution of traditional medicine to health

care globally, cultural, social, political and economical aspects of traditional medicine should be researched (Bodeker 2000).

Protocols for clinical trials should be designed according to the specificities of the tested substance and the cultural sensitivities of the peoples who have used the therapies for generations. Guidelines developed by the World Health Organization state that if a traditional medicine is in customary use with no reported side effects, a fast-track toxicology regime (testing on two species of animal for a six-week period) with documentation is an adequate basis for starting Phase III clinical trials.

Research on Indigenous Populations *Epidemiological research* has shown that native populations have a significantly lower health status than that of the dominant population and that barriers exist to receiving formal health care.

Safety

Roy Chaudhury has offered a model for the clinical evaluation of herbal medicines which includes toxicity testing of the plant in two species of animal for acute and sub-acute toxicity, a modified, shorter toxicity testing if the plant has already been used in man or is in such use now and the administration of the total extract or combination of plants, if used, in exactly the same way as it is prepared and used by the population (Roy Chaudhury 1992).

Claims of curing, especially, life-threatening diseases, and traditional practices related to pregnancy and birth have to be evaluated in order to avoid dangers. For instance,further research is needed to determine the side-effects of Isihlambezo (herbs taken in some regions of South Africa during pregnancy for cleansing) on the pregnant woman, the fetus, the labor process and the outcome of pregnancy.

Several research projects are focused on studying the safe side of herbal medicine as well as adverse drug reactions and adverse reaction of herbal medicine when used simultaneously with Western medicine.

Government Involvement

Traditional healers in some countries want their governments to fund testing of their remedies because they believe it is the only way these effective medicines would be recognized as such and become more widely used.

Some governments have urged traditional healers to collaborate with scientific researchers to prove the safety of traditional medical practices, in addition to the age-old practice in the respective communities.

Funding

Despite the importance, very limited amounts, mostly from private funds, are allocated for research on traditional medicines, as compared to research of the most advanced techniques and pharmaceuticals for diagnosis and treatment.

Resources should be channeled towards research into the efficacy and safety of traditional medicines.

Ethics

Most healthcare-related research that has been externally sponsored in developing countries has not taken account of traditional medicine. In some circumstances, the belief systems of traditional healers and biomedical researchers may be so incompatible that the two groups will be unwilling or unable to collaborate in research. Such collaboration is desirable, or even essential, for research to be successful (The ethics of research related to health care in developing countries, Nuffield council on Bioethics).

Many developed countries sponsor healthcare-related research involving populations and patients in developing countries. The Human Genome Diversity Project uses indigenous peoples as subjects for genetic research raising concerns that they are largely unaware of the potential impacts of this research on their communities. Informed consent is taken lightly and short-term health benefits are being promised to attract participation. Indigenous peoples have frequently expressed criticism of Western science for failing to consider their cultural world views and ethical principles when seeking to find breakthrough information for the advancement of biotechnology, which is least likely to benefit the populations from whom the knowledge derived (http://www.ipcb.org/publications/primers/htmls/ipgg.html).

Conclusion

Research on traditional medical practices from a culturally appropriate perspective and taking into con-

sideration social, political and economical aspects of indigenous health care as well is needed to validate diagnostic and therapeutic procedures on which the majority of peoples in the developing world rely. Indigenous health addresses mainly symptoms of illnesses as well as aspects of palliative care entailing rituals involving the entire community and thus the principles of testing used for Western medicine do not apply. The holistic nature of traditional medicine requires a new paradigm of research, different from the methods prevalent in biomedicine.

The results of unprejudiced research on indigenous medicine would promote the integration of the two approaches into a modern health care system.

The advances in biotechnology and genetics in recent years has alarmed indigenous peoples as to the effects on their culture and future and raised concerns about the ethical treatment of populations which are uneducated in respect to the methods and purpose of this research.

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Health Risk

Definition

Health risk from the environment comes about by the daily intake of toxic and carcinogenic chemical substances through the air, water and food which exceed recommended guideline values; these values should guarantee freedom from adverse effects to health over a life time of consumption.

Health Risk Assessment at Workplace

► Workplace Health Risk Assessment

Health and Safety Measures

Synonyms

Health and safety risk management

Definition

The law requires an employer to assess and manage health and safety risks. Risk management (► risk management and communication) involves the employer looking at the risks that arise in the ► workplace, and then putting sensible health and safety measures in place to control them.

There are three basic steps in managing the risk from workplace ► hazards:

1. eliminate hazards posed by equipment and work processes at their source (e. g. redesign the work process, substitute a safer chemical for a hazardous chemical, use new equipment);
2. if it is not practical to eliminate hazards, control the hazard to reduce the risk to workers (e. g. machine guards, noise enclosures, ventilation to dilute the concentration of a hazardous substance);
3. if it is not practical to control the hazard, protect workers from the hazard by using tools such as administrative controls, safe work procedures, effective safety training, proper supervision, or personal protective equipment.

Health Service

Definition

A health service is a permanent system of institutions aiming to meet the health needs of the population and to provide health protection for both individuals and the community.

Health Service Area

Definition

A health service area is a geographic area designated based on geography, political boundaries, population, and health resources, for the effective planning and development of ► health services.

Health Services Management

► Health Economics in Dentistry

Health Services Research

Synonyms

Routine health care research

Definition

Health services research is a multidisciplinary field of research that focuses on the study of the provision of individuals and populations with products and services related to health care. Goals are the evaluation of the effectiveness of health care measures under realistic conditions and the impact of influencing factors (e. g. insurance plans, costs, organization, structures, health technology, and quality of care). Health services research complements traditional clinical research. Its research domains are individuals, families, organizations, institutions, communities, and populations and ultimatly their health and well-beeing.

Health Services System

► Health Systems

Health Services System Reforms

► Health Systems Reforms

Health Setting

Synonyms

Living condition; Social system and organization

Definition

The place or social context in which people engage in daily activities in which environmental, organizational and personal factors interact to affect health and well-being. A setting is also where people actively use and shape the environment and thus create or solve problems relating to health. Settings can normally be identified as having physical boundaries, a range of people with defined roles, and an organizational structure. Examples of settings include kindergartens, schools, work sites, hospitals, villages or cities.

Action to promote health through different settings can take many different forms, often through some form of organizational development, including change to the physical environment, to the organizational structure, administration and management. Settings can also be used to promote health by reaching the people who work in them, or who use them to gain access to services, and through the interaction of different settings with the wider community.

Health Statistics

Definition

Health Statistics contain all relevant statistical information of the health status of populations or subgroups. In all developed health care systems, there are national health statistic centers identifying health problems, monitoring trends in health status and health service delivery of their population and identifying disparities in health status and the use of health care services by different subgroups. Health statistics are an important source of information for public health policies and programs and support medical research.

Health Status

Definition

The term health status describes the state of health of an individual, a group or a whole population that is measured at a particular time according to defined standards or indicators. The definition of these standards or indicators necessitates an evaluation of the degree of the individual's illness or wellness, basic physical and mental functionality and quality of life. The individual health status may be measured by a medical examination defining the presence or absence of life-threatening diseases, other diseases and their impact on the quality of life and risk factors of overall health. It may also be determined by asking the individual about his or her

health perceptions. As there is no single standard measurement for the health status of individuals or population groups, researches must define their own way of measuring.

Health Status Indicators

Definition

Indicators of health status are the essence of ► health indicators. They include mortality, morbidity (general rate and disease specific rates), generic health status, and composite health status measures. They are most widely used for comparisons between populations, for communication within the healthcare system, and for the coordination of future priorities in health of the community.

Health Strategy

Synonyms

Health action plan

Definition

Health strategy is defined as an elaborate and systematic plan of action in the organization of health care.

Health Subsidies

Synonyms

Subsidy; Voucher

Definition

A grant provided to individuals, organizations or institutions to purchase a restricted set of health-related goods and services. Consumer-side subsidies place purchasing choice in the hands of individual health care users, while producer-side subsidies support organizational or institutional provision of particular goods or services. These subsidies are primary granted by government or philanthropic foundations for the primary purpose of promoting a goal considered beneficial to the public welfare.

Health Surveillance

Synonyms

Medical surveillance

Definition

Health surveillance is the ongoing observation of the health status of the population and the factors that may affect it.
Health surveillance refers to the systematic collection, analysis, and interpretation of health data that has a significant impact on health, which is then used to drive decisions about health policy and health education. Health surveillance in occupational health refers to the application of medical tests and procedures to individual workers who may be at risk for occupational or work-related morbidity, to determine whether an occupational or work-related disorder may be present. A medical surveillance, also, applies tests and procedures on a group of workers with common exposures for the purpose of identifying individuals who may have occupational or work-related illnesses and for the purpose of detecting patterns of illness which may be produced by occupational exposures among the program participants. Medical surveillance represents the first step in ascertaining the presence of a work-related problem.
Occupational health surveillance entails the systematic monitoring of health events and exposures in working populations in order to prevent and control occupational hazards and their associated diseases and injuries. The purposes of occupational health surveillance is to identify the incidence and prevalence of known occupational and work-related diseases and injuries, and to find and evaluate other individuals from the same workplaces who may be at risk of similar disease and injury. Occupational health surveillance is an important means of discovering new associations between occupational agents and accompanying diseases.

Health System in Dentistry

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Synonyms

Oral health care system; Oral health care services; Dental care delivery system

Definition

The health system can be described on a fairly general level as the "totality of organized social action in response to the occurrence of disease and disability and for averting risks to health" (Schwartz and Busse 2003). Although this definition is broad and likely to meet with a wide measure of acceptance, it is not very useful for operational purposes. A narrower and therefore more practical definition subsumes within the concept of the health system "all institutions and activities directed towards the provision and funding of health benefits to the population" (Hajen et al. 2000). In this less wide-ranging sense, the term "health *care* system" is also used. The "oral health system" can be defined in functional terms as "the combination of organizations, flows of finance, workforce training and structure, laws, regulations and accepted practice which are aimed at improving the oral health of individuals and communities" (Anderson et al. 1998).

History

Health systems have existed ever since people first attempted to protect their health and to treat diseases. Organized health systems in the modern sense, however, are an institution of the last hundred or so years and universal cover is predominantly confined to industrialized countries. In Germany the process of development towards an organized health system began in the second half of the nineteenth century (Tiemann et al. 2003). Nowadays, owing to its quantitative significance the health system is already commonly described as an "industry". Total health spending in Germany in 2005 amounted to 239 billion euro, or 10.7% of gross domestic product. Oral health care is estimated to account for about 1% of GDP.

Basic Characteristics

A "system" is generally understood to mean the totality of interconnected elements that influence each other and are organized for a specific purpose. The system of oral health care thus involves the interaction between dentists and patients, health insurance funds, associations of statutory health insurance dentists, associations of health insurance funds, professional dental organizations, associations and societies, the dental technology industry, health ministries and other government institutions, as well as other bodies. The objectives of the system are enshrined, for example, in the German Dental Association's "Oral Health Goals", which are in turn based on the World Health Organization's "Global Goals for Oral Health 2020":

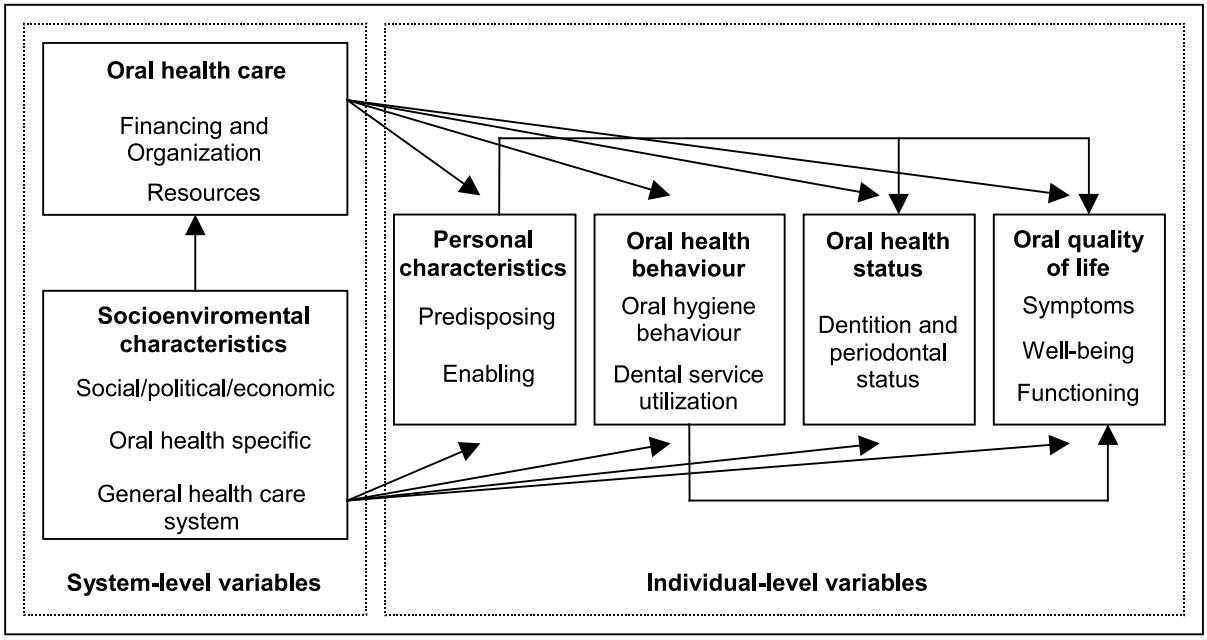
1. Promotion of oral health and reduction of the effects of dental, oral and maxillofacial pathology on general health and on psychosocial development, with particular reference to at-risk groups.
2. Reduction of the effects of dental, oral and maxillofacial pathology on general health at both individual and population level by early diagnosis, prevention and efficient treatment of oral disease.

Given appropriate operationalization of the specified aims, for instance on the basis of the ▶ DMFT value for caries or the Community Periodontal Index (▶ CPI) for periodontal status, attainment of the system objectives can be assessed empirically by ancillary evaluative research.

Analysis reveals that the oral health system can be broken down into three components, of which the third is assignable to the individual sector (see Fig. 1). They are:

1. The oral health care system proper (the medical system).
2. The social, political and economic background to the oral health care system (health policy).
3. Patients' individual capabilities and attitude patterns (which are subject to influence by the oral health care system and the socioeconomic background) (health behavior of the general population).

Compared with the health system as a whole, the oral health system exhibits certain particularities: "Most oral care is provided as an outpatient service, and hospital oral health care is very limited. Among the reasons suggested for this are: (a) the elective nature of most dental treatment; (b) the highly individualistic nature of solo dental practice; (c) the relatively restricted use of dental auxiliaries; (d) the chronic rather than life-threatening nature of most dental diseases; (e) the minimal interest in and development of hospital-centered treatment in general dentistry; and (f) the relatively slow advances in oral health sciences compared to medicine" (Holst et al. 2002).



Health System in Dentistry, Figure 1 Oral health system. Source: Chen et al. 1997

Comparative Oral Health Systems Research

The comparative analysis of health systems is concerned with the extent to which indications for the design of a health system can be derived from a comparison of differently structured health systems and from evaluation of experience gained in other countries. For the specific field of oral health care, the Manual of Dental Practice published by the Liaison Committee of the Dental Associations of the European Union (Kravitz and Treasure 2004) constitutes a good general survey of the various national oral health systems.

National differences in the design of oral health systems are largely attributable to the historical and cultural particularities of the countries concerned. Both the structure and organization of the system of oral health care and the level of benefits provided depend on a state's specific "► sociopolitical culture". The transferability of system elements between countries is consequently very limited. The outline of European health systems given in Table 1 reveals a number of common features that allow the systems to be assigned to just a few classes or "models" (Anderson et al. 1998; Holst et al. 2002; Klingenberger 2006).

As a rule, these models are not applied in pure form; that is to say, a given national health system may perfectly well include individual features of a different model and thereby assume a hybrid configuration. The Semashko model of the central and eastern European countries has developed in the direction of the Bismarck model since the "fall of the iron curtain" in 1989. Since all national health systems are faced with similar economic and demographic challenges and a concerted European health policy is proposed for the medium term (under the "Open Method of Coordination"), it is generally assumed that there will be a "► convergence of systems" – i. e. that the various models will develop in the direction of a "mixed system". The mixing of systems is already far advanced in some European states (the countries shown in parentheses in Table 1).

Measuring Health System Performance

An important aspect of comparative health systems research is international comparison of the performance of health systems – that is, the extent to which health goals (including oral health goals) are achieved and the resources required for this purpose. Anyone wishing to compare the performance of health systems faces two problems. First, generally accepted criteria for assessment must be identified (the assessment problem), and, second, the effect of the health system on the performance of other factors must be isolated (the problem

Health System in Dentistry, Table 1 Delivery models

Bismarck model (government-regulated social insurance system)	
• Oral health care is mainly financed through compulsory social insurance, with the option of voluntary private insurance • Contributions from employees and employers, usually as a fixed percentage of earned income; these contributions are pooled and disbursed by independent sickness funds • Provision relies mainly on private dental practitioners • Benefits cover most restorative dental care • There are also private insurance schemes in which patients pay their dentist directly and are reimbursed from the insurance company • Cost-sharing generally consists of the consumer's payment of a fixed percentage of expensive porcelain or gold restorations and fixed prostheses	*Countries*: Austria, Belgium, France, Germany, Luxembourg, Netherlands, (Switzerland)
Beveridge model (government-organized and tax-financed national health system)	
• Financing of oral health care used to be predominantly provided out of general and/or specific taxation, collected by central or regional government • Oral health care services are traditionally provided by publicly owned and managed institutions • Price and treatment profile regulation • Universal access to oral health care, but usually with defined levels of patient co-payments for treatment • Small but rising market share of voluntary insurance schemes	*Countries*: Denmark, Finland, Sweden, United Kingdom, (Norway), (Portugal), (Spain), (Italy), (Greece), (Ireland), (Iceland)
Semashko model (mixed system of Bismarck [financing] and Beveridge [provision])	
• Oral health care is mainly financed by compulsory social insurance • Comprehensive oral health care is provided free of charge to the whole population • Dentists are salaried public employees who operated from local or company-based polyclinics or hospital dental departments • Oral health facilities are publicly owned and the distribution of personnel, clinics, treatment and materials is planned • A small proportion of expensive services – mainly prosthetic services – is covered by patient-co-payment • Some private practice exists in several CEE countries, entirely paid for by patients on a fee-for-service basis	*Countries*: Central and eastern European countries (CEE)

of attribution) (Hajen et al. 2000). To permit the comparison of different health systems, the World Health Organization has developed an "overall health system performance" index, which takes account of the following five criteria of the performance of a health system (World Health Organization 2000):

- level of health (life expectancy)
- openness of the health system (accessibility)
- fairness of funding (distribution of burdens) and access to services (equity)
- status of medical care
- satisfaction of the population with the health system and individual satisfaction with one's state of health.

However, the World Health Organization's methodology has been criticized as unscientific. All multidimensional analyses are at risk of not comparing like with like – i. e. of failing to solve the assessment problem mentioned above. Statements about the performance of health systems should thus concentrate preferentially on detailed analysis of individual fields of care. A good example from the oral health care sector is the Euro-Z project, an empirical comparison of the prices of dental treatments in seven European countries (Kaufhold et al. 2001) ▶ (oral) health system performance.

Conclusion

The analysis of health systems is subject to a number of methodological problems, in consequence of which caution must be exercised in interpretation of the results. Yet health systems analysis can offer important early indications of feasible approaches to reform and of emerging trends. In the specific field of dentistry, a trend is becoming apparent, regardless of the particular system applied, for the proportion of expenditure accounted for by public funding to be reduced and for relatively more reliance to be placed on private ▶ models of finance. In the future, too, a greater role will be played by private service provision in the field of oral

health care. An early steering of health policy along lines based on the results of health systems analysis is desirable.

Cross-References

- ► Convergence of Systems
- ► CPI (Community Periodontal Index)
- ► DMFT-Index
- ► Models of Finance
- ► Oral Health Behavior
- ► (Oral) Health System Performance
- ► Sociopolitical Culture

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Health System Forms

Synonyms

Similar trends of health care systems reform

Definition

The basis of convergence theory is the hypothesis that industrial states with different forms of organization face comparable challenges and must accordingly develop similar solutions. The pressure of comparable problems, it is held, gives rise to similar requirements of adaptation and thereby results in an approximation of institutional, political and economic structures and strategies. A comparative study of health policies in the OECD member states concluded that "the most remarkable feature of the health care systems reform is the degree of emerging convergence". Transnational problems and trends in health care can be attributed to, for example, economic causes (mass unemployment or globalization), technical factors (innovative medical technology and consequent new treatment methods) and issues of population structure (demography and epidemiology).

Health System Indicators

Definition

Indicators of the performance of ► health systems are defined by effectiveness, appropriateness, efficiency, responsiveness, accessibility, safety, continuity, capability, and sustainability. Health system characteristics include the extent to which the system delivers good quality health actions to improve the health of the population. This is the most general term for health indicators, including indicators of health care provision, utilization, health care financing, and health policy.

Health Systems

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Synonyms

Health care systems; Health services system

Definition

Health systems are usually characterized according to the predominant source of health care finance. With the notable exception of the health care system United States (US) – which is a mixed system – one predominant source of financing can be identified in most Organisation for Economic Co-operation and Development (OECD) countries, which is either taxes or social health insurance premiums.

Basic Characteristics

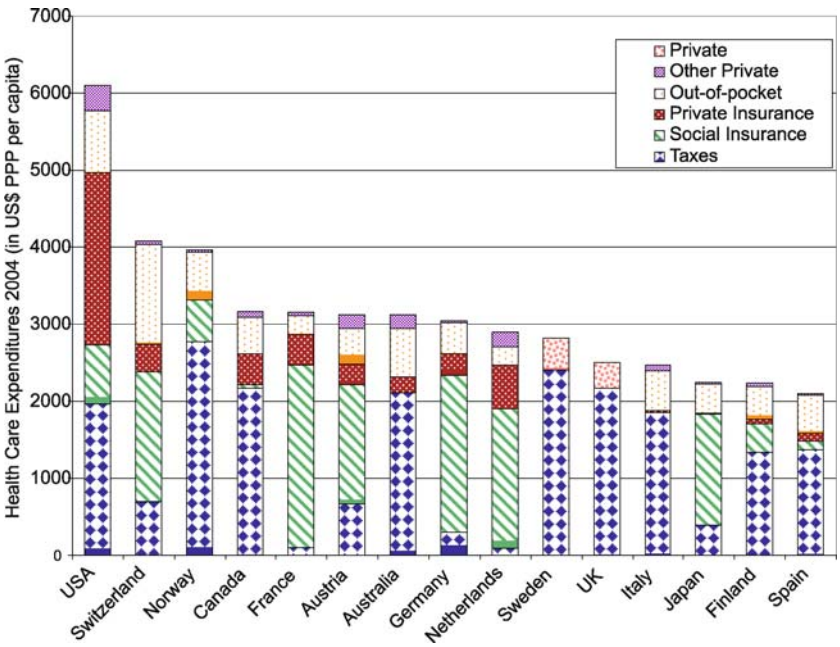
Typology of Health Care Systems

A typology of health care systems is necessarily rather crude, since divergent approaches towards the design of health care systems lead to diverging institutional arrangements. However, probably the most widespread approach for grouping health systems is by predominant mode of health care financing. Figure 1 illustrates the fact that no health care system is financed from one source only. However, with the notable exception of the US and maybe Switzerland, one predominant mode of financing can be identified. Countries such as Canada, Norway, Sweden, Finland, Australia, Italy, Spain, and the United Kingdom (UK) are predominantly financed out of taxes. Other health care systems such as those in France, Austria, Germany, the Netherlands, and Japan are financed primarily by social health insurance premiums.

Social Health Insurance Systems

The common feature of ► social health insurance systems is the fact that health care financing is administered by social health insurers at arm's length from government. In contrast to taxes, the premium income of social health insurers is earmarked for health care financing. As a consequence, social health insurance systems are less prone to under-funding than tax-funded health care systems – the Netherlands being an important exception (Brouwer et al. 2003). On the other hand, social health insurance financing may act as a drain on employment if premiums are linked directly or indirectly to labor costs (► labor market).

One important difference between social health insurance systems is whether health insurers are competing or not. In Austria and France, consumers are not able to choose between social health insurers; in contrast, there is considerable consumer choice in Germany, the Netherlands, and Switzerland (► health systems reforms, ► competition, health care). Moreover, social health insurance premiums are not the only source of



Health Systems, Figure 1 Health care expenditure and source of financing in selected OECD countries 2004, Source: OECD Health Data October 2006

health care financing in these countries. As a consequence, countries with social health insurance systems differ in the importance of secondary sources of financing. Except for Japan, private health insurance premiums are an important source of secondary health care financing in these countries. Only in Germany is private health insurance an alternative (► alternative private health insurance) to social health insurance – at least for part of the population (Wasem et al. 2004). This was also true for the Netherlands until 2005; however, social health insurance and alternative private health insurance were merged into one unified health insurance system in 2006 (Schut and van de Ven 2005).

Supplementary private health insurance is most important quantitatively in France (Turquet 2004; Wasem et al. 2004). Out-of-pocket payments are the biggest secondary source of health care financing in Switzerland. In fact, Switzerland is on the verge of becoming a mixed system, since tax-financing is also an important source of secondary health care financing.

Tax-Financed National Health Systems

In contrast to countries with social health insurance systems, health care financing in tax-financed countries is administered by governmental institutions. Health care is financed not by earmarked social health insurance premiums. Instead, it is usually financed out of general tax revenue. This means that health care has to compete with other items such as education and defense, which also have to be financed out of general tax revenue. As a consequence, rising health care expenditures may crowd out other public expenditures. Conversely, under-funding of health systems may occur if other spending items crowd out rising health care expenditures. Under-finding is therefore an important reason for long waiting times, which are a major problem in Canada and the UK (Hurst, Siciliani 2003; Oliver 2005). Table 1 shows that waiting times for specialist appointments and elective surgery are considerably higher in Canada and the UK than in the US and Germany. On the other hand, access problems due to cost are less prevalent in Canada and the UK than in the US and Germany.

Health Systems, Table 1 Waiting times among sicker adults in four countries in 2005

	CAN	UK	US	GER
Wait for specialist appointment (more than 4 weeks)	57%	60%	23%	22%
Wait for elective surgery (more than 4 months)	33%	41%	8%	6%

Source: Schoen et al. 2005

Mixed Systems

The US health system is often characterized as a system that is financed predominantly by private sources of finance. ► Private health insurance, co-payments, and charities indeed cover approximately 55 percent of health care expenditures in the US, which was equivalent to 3,375 US$ per capita in 2004. This amount exceeds *total* health care expenditures per capita in all other countries except Switzerland and Norway. However, another 2,727 US$ per capita are covered by public sources (taxes, social health insurance premiums) to finance public schemes for the poor and the elderly. This amount exceeds *public* spending on health care per capita in any other country except Norway (Woolhandler, Himmelstein 2002). As a consequence, the US health system is also characterized as a mixed system.

Although total health care expenditure per capita in the US is much higher than in any other country, only part of the population is covered by either private health insurance or public schemes. About 18 percent of the non-elderly population (over 46 million individuals) is uninsured (The Kaiser Commission on Medicaid and

Health Systems, Table 2 Access problems due to cost among sicker adults in four countries in 2005

	CAN	UK	US	GER
More than 1000 US$ out-of-pocket expenses for medical bills in the past year	14%	4%	34%	8%
More than 100 US$ out-of-pocket expenses for prescription drugs	16%	3%	30%	5%
Did not fill a prescription	20%	8%	40%	14%
Did not visit a doctor when sick	7%	4%	34%	15%
Did not get recommended test or follow-up	12%	5%	33%	14%
Reported any access problem due to cost	26%	13%	51%	28%

Source: Schoen et al. 2005

the Uninsured 2006). As a consequence, ► risk solidarity in the US is low and financial barriers to the access of health care services are high (see Table 2).

Cross-References

► Competition, Health Care
► Health Systems Reforms
► Labor Market
► Private Health Insurance
► Publicly-Financed Health Systems
► Risk Solidarity
► Social Health Insurance

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Health Systems Reforms

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Synonyms

Health care system reforms; Health services system reforms

Definition

A number of health system reforms have been exceptionally important during recent years. First, a comprehensive health insurance reform has led to the abolishment of alternative private health insurance in the Netherlands. As a consequence, Germany is the only remaining Organization for Economic Co-operation and Development (OECD) country where social health insurance and alternative private health insurance continue to co-exist. Second, the establishment of the National Institute for Clinical Excellence in the United Kingdom set a trend for assessing the cost-effectiveness of health care services, which has also been taken up by other countries. Finally, the health insurance reform in Massachusetts may lead to the introduction of universal health insurance in other states of the United States (US) as well.

Basic Characteristics

This essay follows the typology that has been applied in the essay on ► health systems. For each type of health system, one country where major health system reforms have taken place has been selected.

Reforms in Social Health Insurance Systems: The Netherlands

At the beginning of the year 2006, the Dutch government introduced a fundamental reform of the Dutch health system. The aim of this reform was to improve the quality and efficiency of the health system by introducing a uniform health insurance system and intensifying ► regulated competition between health insurers (Schut and van de Ven 2005; Greß et al. 2007). The rather arbitrary separation between social health insurance and private health insurance of the past has been abolished. This is a major achievement, since policy makers in the Netherlands have been trying to introduce an universal health insurance system since the early 1990s (Schut and van de Ven 2005).

Although the new health insurance scheme is executed by private carriers, regulation of the system is essentially social (Paolucci et al. 2006). All health insurers are

obliged to accept all applicants, premium rate restrictions do not allow ► risk-rated premiums, and insurers are compensated by a health-based ► risk adjustment system. The new health insurance scheme is compulsory for all inhabitants of the Netherlands.

As a result of the reform, the health insurance market in the Netherlands has changed dramatically. Price competition between health insurers has become very fierce and consumer mobility has increased dramatically. While consumer mobility was dormant before the reform, consumers started actively comparing prices and options after introduction of the reform. While the short-term effects of the reform seem to be in line with the intentions of policy makers, it remains to be seen whether the same is true for the long-term consequences of the reform. One key aim of reform was that the new system would lead to a more efficient provision of health care services. However, so far, competition between health insurers is based primarily on price. As a consequence, the quality of health care services is not yet an important means for health insurers to attract consumers (► competition, health care).

From a comparative perspective, the Dutch reform is a rather fascinating example of cross-country policy learning. Some key features of the Dutch reform, such as the introduction of a universal health insurance system, mandatory coverage for the entire population, tax-financed premium subsidies for low-income consumers, and voluntary ► deductibles, can also be found in the Swiss health insurance system. What is more, shortly after the introduction of the reform in the Netherlands, policy makers in Germany became very interested in the design of the new Dutch system. As a result, some key features of the health care reform of 2007 in Germany look strikingly similar to the Dutch system. However, one very important difference between the system in Germany and those in the Netherlands and Switzerland remains: the rather arbitrary separation between social health insurance and private health insurance in Germany.

Reforms in Tax-Financed National Health Systems: United Kingdom

Towards the end of the 1990s, "► postcode prescribing" had become a key issue for the tax-financed National Health Service. Examples where access to certain treatments and services differed between health authorities were frequent, and controversies had emerged over access to a wide range of treatments. As a consequence, the ► National Institute for Health and Clinical Excellence (NICE) was established in April 1999.

NICE is supposed to provide guidance on the use of health services to the National Health Service. The guidance is based on appraisals of pharmaceuticals, medical devices, diagnostic techniques, and surgical procedures, as well as preventive services (Department of Health 1998). Appraisals result in recommendations for the use of health care services within the NHS that are binding for regional health authorities. If providers intend to use a service recommended by NICE, regional health authorities have to finance this use. NICE is supposed to consider not only the clinical effectiveness of services, but – given scarce resources – also the relationship between effectiveness and associated costs (Devlin and Parkin 2004; Greß et al. 2005). In this respect, NICE has been the pioneer of a development which has become imperative in many other countries as well – no matter if these countries are predominantly financed by taxes or by social health insurance premiums (Greß et al. 2007).

Reforms in Mixed Systems: United States

Health insurance coverage in the mixed US health financing system is not mandatory. As a consequence, almost 20 percent of the non-elderly population in the US is uninsured (► health systems). So far, any effort to introduce universal coverage in the US on a national level or even on a state level has been unsuccessful. However, in April 2006, Massachusetts enacted legislation that is supposed to provide universal coverage to state residents (Haislmaier and Owcharenko 2006). The Massachusetts Health Care Reform Plan requires all adults in the state to purchase health insurance. Moreover, employers are required to provide health insurance coverage to their employees or a pay a fine. Individuals receive government-funded subsidies in order to be able to buy health insurance. By May 2007, more than 100,000 previously uninsured individuals had gained coverage because of the reform. As a consequence, the Massachusetts plan has generated a great deal of interest on the national and state level and has ignited a broader debate about the feasibility of the introduction of universal coverage (Kaiser Commission on Medicaid and the Uninsured 2007).

Cross-References

- ► Competition, Health Care
- ► Deductible
- ► Health Systems
- ► National Institute for Health and Clinical Excellence
- ► Postcode Prescribing
- ► Regulated Competition
- ► Risk Adjustment
- ► Risk-Related Premiums

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Health Targets

Synonyms

Health goals

Definition

Health targets are based on outcomes and processes. They can be quantitative, such as immunization rates, or qualitative, such as the introduction of national health care programs and initiatives. While not a requirement, health targets should ideally be specific, measurable, accurate, realistic and time-bound ("SMART"), to enable better monitoring and management towards achieving those targets. Health targets facilitate the achievement of health policy and therefore represent a commitment of a system or legislative body to achieve specific pre-defined outcomes over a pre-defined period of time (► health outcomes). As they set priorities, they can be used to create high levels of commitment and they are the basis for follow-up activities and evaluation. Health targets can be applied nationally, internationally, or within systems on sub-national levels, such as public health care systems.

Numerous governments in the Member States of the WHO European Region and in OECD countries utilize health targets as an instrument and guidance for policy formulation and implementation.

Health targets are defined as follows in the WHO Health promotion glossary:

> They define the concrete steps which may be taken towards the achievement of health goals and it means a change in the health status of a population that can be reasonably expected within a defined time period. Setting targets also provides one approach to the assessment of progress in relation to a defined health policy or program by defining a benchmark against which progress can be measured. The implementation of health targets requires the existence of a relevant health indicator and information on the distribution of that indicator within a population of interest. It also requires an estimate of current and likely future trends in relation to change in the distribution of the indicator, and an understanding of the potential to change the distribution of the indicator in the population of interest.
>
> (WHO 1998)

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Health Technology

Definition

Health technology includes a wide range of procedures, devices and equipment applied to the maintenance, restoration, and promotion of health. The technology comprises interventions at any stage of health

care, including primary prevention, early detection of disease and risk factors, diagnosis, treatment, rehabilitation, and palliative care.

Health Technology Assessment (HTA)

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Introduction

Health Systems have developed differently and with varying degrees of complexity throughout the twentieth century. They share a common reason for their existence; that is the improvement of health for the entire population. Unfortunately, they share another characteristic: available resources are limited, and delivering health services therefore involves making necessary decisions. As a result, decision-makers need information about the available options and their potential consequences. It is now apparent that many interventions once thought to be advantageous have, in the light of closer evaluation, turned out to be at best of no benefit, or at worst, harmful to the individual and counterproductive to the system. This recognition has led to the concept of "evidence based medicine" (EBM), which argues that the information used by policy-makers to make decisions should be based on rigorous research to the fullest extent possible (Ham et al. 1995). Sackett defined ► evidence based medicine as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients". However, Sackett recognized that "there is some fear that evidence-based medicine will be hijacked by purchasers and managers to cut the costs of health care" (Sackett et al. 1996). As a consequence, he changed his definition four years later to define evidence based medicine as the integration of the best research evidence with clinical expertise and patient values.

EBM primarily affects medical (and health care) practice and focuses mainly on the individual level, whereas Health Technology Assessment (HTA) aims to influence health policy and focuses on the population. In other words, HTA offers a way of evaluating actual or potential health interventions, and helps to ensure that the limited resources available are well spent. Health care systems worldwide are under increasing pressure, and such pressure does not seem likely to diminish in the near future. Critical health ► policy analysis and HTA are needed more than ever in order to assist policy-makers in making difficult decisions and choices.

Definition

HTA has been defined as "a form of policy research that systematically examines the short- and long-term consequences, in terms of health and resource use, of the application of a health technology, a set of related technologies or a technology related issue" (Henshall et al. 1997). Given the broad context of HTA, it is not defined by a set of methods, but by its intention.

The aim of a HTA report is to support decision-making in the health sector by systematically assessing medical, economic, social, and ethical aspects of health. HTA is also a form of policy analysis. By nature, HTA is a multidisciplinary activity, which systematically evaluates the effects of a technology on health, on the availability and distribution of resources, and on other aspects of health system performance such as equity and responsiveness (European Observatory on Health Systems and Policies). In order to achieve the goal of supporting decision making, two preconditions have to be fulfilled: the reports have to meet explicit qualitative standards and they need to have an actual impact on the decision-making process in its context.

History

The term "technology assessment" was first used by the Subcommittee on Science, Research and Development of the House Science and Astronautics Committee of the US Congress in 1965. After a long process, the Subcommittee defined technology assessment as "a comprehensive form of policy research that examines the short- and long-term social consequences (e. g. societal, economic, ethical, legal) of the application or use of technology". Later, beginning with reports from the Office of Technology Assessment (1976), this general definition was applied to the health field as well. HTA began to develop in Europe in the early 1970s, with studies of expensive medical devices in several European countries, notably Sweden. The Swedish Planning and Rationalization Institute (SPRI) began stud-

ies of the then-new computed tomography (CT) scanner in 1972, and then developed a series of studies of the implications of health technology. By the mid-1980s, other European countries had begun to carry out such studies and to use the term "health technology assessment" to describe their work.

Policy Analysis, Policy Orientation and Context of HTA

HTA has been compared to a bridge between the world of research and the world of decision-making (Battista 1996). This bridge is intended to allow the transfer of knowledge produced in scientific research to the decision-making process. In order to achieve this, HTA is dedicated to the work of collecting and analyzing evidence from research in a systematic and reproducible way, as well as making it accessible and usable for decision-making purposes, normally by assessment reports (► policy analysis). HTA shares these principles with EBM and clinical practice guidelines (CPG) and, together with them, enables a body of best practice initiatives to be built (Perleth et al. 2001).

Assessments can be conducted on, for example, investment decisions (purchasing new equipment), or shaping of the benefit catalog (reimbursement of new services), as well as decisions concerning the organization of service provision (inpatient vs. outpatient services). For the purposes of HTA, the decision-maker's need for information is termed the policy question. Intensive cooperation between policy-makers and researchers is needed in order to clarify the underlying policy question and tailor the assessment to the decision-maker's information needs. The quality of this interaction is one of the main determinants of the value of evidence for policy-making (Innvaer et al. 2002). Unfortunately, this cooperation is inadequately established in many countries. Therefore, HTA exists alongside policy decisions and is insufficiently recognized by politicians and health care managers. It is crucial to explain the context of a HTA clearly, so that readers can better assess whether the report is relevant to their own problems. The context-embedded approach of HTA is a key advantage of these assessments because EBM is mainly focused on randomized controlled clinical trials, and the transferability of such results into policy decisions is questionable. In order to give an evidence-based solution to the problems addressed in the policy question, the researchers have to define the policy question in terms of safety, efficacy, and effectiveness, and psychological, social, ethical, organizational, professional, and economic aspects. These questions determine how the rest of the assessment will be conducted, the aspects that will be evaluated, and those that will not, as well as the profundity of the research regarding each of the aspects mentioned.

In each country, the adoption and use of health technology is influenced by many factors, including the perception and experience of health and disease, the cultural responses to technology, the nature of the medical profession in the particular country, industrial information and promotion, and the financial and regulatory system (► HTA, context of).

Aspects of HTA

Technology assessment is carried out by a multidisciplinary group because it requires wider expertise than any individual or single disciplinary group could be expected to have. It identifies the groups that will be affected by the proposed technology (the "parties at interest") and evaluates the impact of the technology on each party.

A thorough assessment requires attention to different aspects of health technology and health technology assessment. Such aspects include dimensions (i. e. safety, efficacy, or effectiveness), functions (i. e. using, doing, and supporting HTA), focus (i. e. treatment or prevention), and type of technology (i. e. drug, medical procedure, or preventive program), as well as types of healthcare provider (i. e. inpatient and outpatient), and decision level (► HTA, aspects of). A scheme of all of these aspects can provide a method for evaluation and further development of the HTA; identifying gaps in coverage and suggesting improvements for the future.

A relatively new field where HTA is being used is to assess patient safety technologies (► patient safety HTA). Regardless of widespread investment in patient safety technologies, especially in the UK but also in the US and elsewhere, little HTA has been done to establish the effectiveness of these technologies. The HTA and patient safety literature suggests there are four categories of assessment of patient safety technologies: HTA for existing safety technologies, for underutilized safety technologies, for emerging safety technologies, and for safety aspects of technologies with a non-safety primary purpose.

HTA Methodology

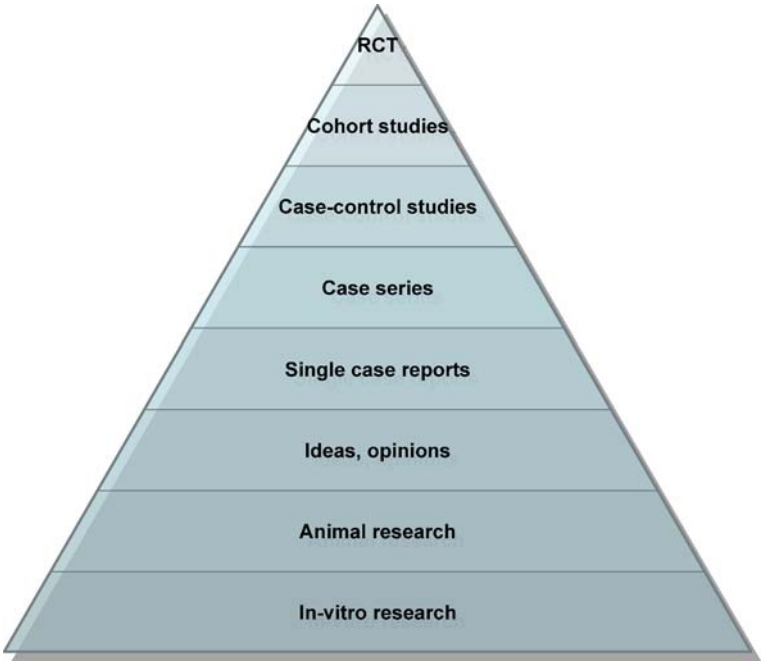
After consensus on the research questions has been reached, the task of the HTA is to retrieve, analyze, and synthesize the available evidence, and to prepare it in a way that is useful for decision-makers or politicians (► HTA, methodology). The researchers try to identify and collect the best available evidence that is suitable to give valid answers to the different aspects of the policy question. They then summarize this evidence. In some cases, it could be appropriate to provide recommendations for policy-making, or at least to outline resulting policy options.

A technical assessment of a pharmaceutical or medical device carried out by a program as a part of a regulatory decision can be called a HTA. Similarly, an ethical analysis concerning gene therapy, that is performed to clarify the implications of the therapy before deciding whether to provide it, can be considered a HTA. The most frequent activity in HTA is a synthesis or systematic review of available information, in particular on efficacy and cost-effectiveness, in order to assist different types of policy decisions. A prospective randomized clinical trial or prospective cost-effectiveness study done for policy reasons, as in the Netherlands or the UK, is also a technology assessment. On the other hand, clinical research or even clinical trials done solely for increasing scientific knowledge are not technology assessments.

Given the wide scope of HTA, it is not considered a discipline or a field; it is a systematic inter-disciplinary process based on scientific evidence and other types of information. It involves physicians, other clinicians, economists, social scientists, public health, and health service researchers, as well as ethicists. Additionally, the public and its representatives are more and more involved in HTA.

Role of Evidence

In the last decade, pressure to base decisions on evidence has been extended to other areas of health care, such as public health interventions and health care policy-making. In this context, evidence is understood as the product of systematic observation or experiment. The evidence-based approach relies mainly on research, that is, following a pre-established plan to systematically collect and rigorously analyze data. Evidence is the result of a search for practical, useful knowledge (Banta 2003). Additionally, the definition of ► evidence based medicine introduces the concept of best available evidence, which implies a "hierarchy of evidence". Since the evidence normally comes from research, it is important to consider the hierarchy of research designs as well as the quality of research execution. Some research studies are considered to be better than others; therefore, evidence from good research is generally considered better than evidence resulting from research of a lesser standard. HTA often assesses the potential effects of an intervention on health outcomes. In the evaluation of these effects, evidence from experiments is, in principle, superior to evidence from non-experimental observations. Furthermore, among experiments, some study designs are considered better than others, in consequence ranking higher in the hierarchy of research designs (Fig. 1: Hierarchy of research designs for evidence-based medicine). The rationale for a hierarchy of research designs is associated with the concept of EBM and involves considerations of validity, particularly internal validity. Internal validity is a form of experimental validity. An experiment is said to possess internal validity if it properly demonstrates a causal relation between two variables. Internal validity tells us how likely it is that an observed effect of an intervention is in fact attributable to that intervention. On the other hand, a study that readily allows its findings to be generalized to the population at large has high external validity, but not necessarily high internal validity. The extent to which the information provided by a study has clinical or policy relevance (the external validity) has also been defined as the "non-methodological quality" of the evidence (Lohr and Carey 1999). The more internal validity a research design has (the higher it is in the hierarchy of evidence), the more likely it is that the observed effect is truly attributable to the intervention. Further down in the hierarchy, the possibility increases that the findings from the study will be misleading. The design highest in the hierarchy is the randomized controlled (clinical) trial (RCT). However, a major problem of the gold standard study design for EBM, the RCT, is the poor external validity of the findings. Unfortunately, the external validity of RCTs is normally reduced as the participants and intervention delivery may not be truly representative of the population to whom the results should be applied later on. This can happen for a number of reasons; often only a very small proportion of the patients with a condition are considered eligi-



Health Technology Assessment (HTA), Figure 1
Levels of Evidence

ble for a trial. Additionally, important subgroups of the population are often systematically excluded, such as ethnic minorities, the elderly, and/or women. Furthermore, participants in research studies differ systematically from those eligible subjects who refuse to participate. Finally, yet importantly, research is often conducted in health care settings not representative of the usual health care setting.

The way in which an intervention has effects on health is referred to as its "directness". Evidence that a link is direct is thought to be better than evidence that a link is indirect. When there is only evidence on indirect links available, it is normally necessary to have evidence for each of the single indirect steps in the causal chain. A direct link can be established in a single study but several studies are needed for the establishment of a complete chain of indirect links. Directness is thus also related to the kind of parameters used to measure the effect of an intervention.

In contrast to the strict research hierarchy of the EBM concept, HTA reports try to judge and generalize their findings from different studies with different degrees of internal and external validity to make them suitable for decision makers who make decisions based not on the individual patient, but on the population.

The United States Task Force on Community Preventive Services has consistently developed a more elaborate hierarchy of research designs for the assessment of interventions. The authors introduced the concept of suitability for assessing the effectiveness of interventions (Briss et al. 2000), which goes beyond the internal validity of the research designs used. This approach is particularly interesting because it argues that the RCT is not always the most appropriate (or feasible) research design. It recognizes that other study designs—in particular, well-designed cohort studies—can produce data that are not obtainable from RCTs.

Assessing Research

The results from research are usually published in scientific journals. Consequently, searching for the best evidence is usually seen as synonymous with searching the literature for results of studies. Although it is desirable and sometimes necessary to search for evidence from sources other than the published literature, this is not always possible. Additionally, many systematic reviews and assessments focus mainly on published results and, as mentioned in the beginning, transparency and comprehensibility are necessary preconditions for a HTA report. Use of unpublished results always leads to problems in the verifiability of the report and should therefore be avoided. Sources for assessing studies to consider within a HTA report are mainly literature

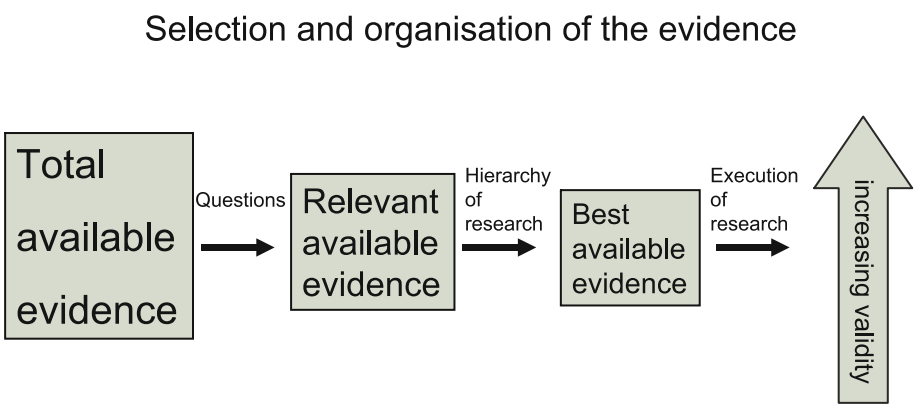
databases like Medline, EMBASE, Current Contents, etc. In addition, specialized ▶ HTA databases with complete HTA reports exist. The internationally recognized Cochrane Library is the best example of this type of database.

The concepts shown above allow for a broad classification of the available evidence on the effects of an intervention into different levels of quality. When evaluating an intervention, this approach can be used to limit the types of studies taken into consideration. Therefore, with the help of the hierarchy of research designs, it is possible to set a threshold concerning the types of research to be considered in the evaluation.

Several tools have been developed to assess and grade the quality of execution of single studies, following the same rationale as the hierarchy of research designs in Fig. 1. This rationale is higher quality = higher internal validity = higher level of evidence. A review identified 67 ways to assess and grade the quality of different study designs, most of which have been developed for assessment of the quality of RCTs (West et al. 2002). These grading algorithms allow ordering of a group of studies with the same design according to the quality of their execution, again generating a hierarchy. This approach makes it possible to organize the available evidence in a way that facilitates drawing conclusions and making recommendations. Figure 2 visualizes the process of organization and selection of evidence as it takes place when conducting systematic reviews as well as HTAs.

Summarizing the Identified Research

The group of studies selected as the best available to answer specified research questions is called the "body of evidence". A body of evidence is characterized by a combination of the hierarchy of research design, the directness of the evidence, and the quality of execution. Furthermore, factors such as the number of studies, the size of the effect, and the consistency of results across the group of studies are also relevant when judging the strength of the evidence. The challenge in HTA is to judge the evidence from different studies in order to give answers to the research questions and, based upon this, to the policy questions. In recent decades, several approaches have been developed to standardize the way researchers make judgments about the strength of the evidence that underlies their recommendations. To rate the strength of evidence, 40 different systems were developed (West et al. 2002). The concepts differ in the combination of factors required for the standard of evidence and the weight given to each when rating the strength of evidence derived from a group of studies. These systems also establish a link between the strength of the evidence and the strength of the recommendation. Strong evidence on the effects of an intervention allows for strong recommendations for or against the use of the intervention. Consequently, weak evidence only supports weak recommendations. There are several systems to standardize the process of grading the strength of recommendations, typically using letters (for instance A, B, C, etc.) to describe the grade of strength of a recommendation (West et al. 2002). If such a system is used in HTA reports, it is necessary that the authors provide information that allows the reader to interpret the grading of recommendations used. For each of the aspects of assessment in a HTA, the standard and relevance of available evidence needs to be assessed. The underlying rationale always consists of the same three key ques-



Health Technology Assessment (HTA), Figure 2
Selection and organization of the evidence

tions: are the research findings valid, are they relevant to the assessment questions, and how strong is the evidence?

Evidence Based Recommendations

The identification of strong evidence for the effectiveness of an intervention does not necessarily lead to the formulation of strong recommendations for or against its implementation in the health care system. Evidence of the effectiveness of health technology is only one part of the picture. Clinical recommendations consider (for the most part) only the benefits and disadvantages of one or more specific interventions.

The other parts of the picture, such as the impact on organization of the system, on resources available, on responsiveness, and on equity, also play a determinant role in the decision for or against the introduction or implementation of an intervention respective technology. Even with strong evidence of benefit for health from an intervention, the recommendations from a HTA may be against its implementation. When considering other factors, such as cost and cost-effectiveness issues, the burden of disease, needs and priorities, barriers to implementation, features of the health care system, cultural issues, etc., implementation can appear to be improper in a given context.

Normally, HTA explicitly considers such factors. However, for the assessment of these factors, RCTs do not occupy the highest place in the hierarchy of evidence since this study design is not appropriate to answer relevant questions besides clinical efficacy. In addition, the epidemiological approach is not always the appropriate method in these cases. Evidence obtained with empirical, social, or political science methods must therefore be considered in a HTA (► evidence based recommendations).

A consensus by the World Health Organization (WHO) Regional Office for Europe agreed a new definition of evidence in the context of HTA: "findings from research and other knowledge that may serve as a useful basis for decision-making in public health and health care" (WHO Regional Office for Europe 2004). This emphasizes the prospective relevance and validity of different study designs and research forms. It also goes further, acknowledging the value of evidence obtained with methods that—within the scope of some scientific discourses—are not considered scientific.

Impact of HTA

In addition to the dissemination and implementation of HTA recommendations, the evaluation of their effects is an important factor of HTA. Like other health technologies, HTA should be judged on the quality and size of its effects. In recent years, this aspect has received increased attention as HTA has begun to become an important part of health care policy-making in many countries (► HTA, impact of). However, the response of policy-makers shows that many of them do not see the importance of assessment. There is more interest in controlling costs then in steering health care. Consequently, even when good assessments are done, their impact on policy-making has been modest. The effects of HTA are linked with the assessing institution and the motivation of its commissioner (Gerhardus 2006). For best use of HTA, exact formulations of the impact aims are needed. As the first step in assessing a technology, the people concerned should be defined. These people have to formulate the aims and disseminate the recommendations of the HTA. Effects of HTA should then be evaluated, and if defined impact aims are not reached, a discussion should follow.

HTA Institutions

Many organizations throughout the world assess healthcare technology (► HTA, institutions). There is an evident need to cooperate and share information from different cultures. Since the beginning of HTA activities, efforts have been made to share experiences at an international level. The first meeting of the International Society for Technology Assessment in Health Care (ISTAHC, today called HTAi) in 1985 made evident the beginning of international networking in the field of HTA. HTAi represents mainly single researchers.

In contrast, the International Network of Health Agencies for Health Technology Assessment (INAHTA) represents agencies in different countries. It has now grown to 43 member agencies from 21 countries, and stretches from North and Latin America to Europe, Australia, and New Zealand.

All of the important HTA agencies in Europe recognize the need for improved coordination of HTA in Europe. There are several **European HTA Networks**. One of them is the HTA-Europe project, which aims to contribute to the effectiveness and cost-effectiveness of health care in Europe through improved HTA, and to

strengthen the coordination of HTA in Europe. A form of HTA exists in all of the old EU-15 member states, though with a high degree of diversity in institutionalization, impact and, financial equipment.

The Future of HTA

HTA is already an important force in Europe. Investments in HTA are growing, formal programs are being established at the national and regional level, and evidence is accumulating that HTA is making a difference in the cost-effectiveness and quality of health care. HTA is becoming a field of exceptional interest to policy-makers, because many health care interventions are not evaluated or inadequately evaluated. On the other hand, many beneficial and cost-effective technologies are not fully deployed for the benefit of the public. One key challenge is to base adoption and use of health technology on evidence such as that developed by HTA. Policies offer many possibilities for HTA; for example, coverage decisions, i. e. for pharmaceuticals, can be based on HTA. Determination of the number of services needed in an area can also be based on HTA. There are therefore many challenges for HTA at the national and regional levels of all countries.

Summary

HTA can provide a unique input into the decision-making processes of the health care system. In accordance with its broad concept, the principles and scope of HTA can be applied in order to assess the potential consequences not only of medical interventions, but also of organizational interventions, and even of health care reforms, since reforms can also be considered as interventions in the health system. HTA can offer several key features to decision-makers: a thorough assessment of the potential effects on health and the consequences of implementation of interventions for the health system, as well as for the economy and the society in which a technology is to be introduced or excluded.

To fulfill this task properly, evidence from different research traditions will have to be considered in one assessment, using a broad scope of evidence. The field of HTA has illustrated that it can identify technologies and produce meaningful assessments in a timely fashion. Technology assessment agencies have successfully involved leading physicians, administrators, and other professions in their work.

Nevertheless, some problems remain: despite the 20-year history of this field, many policy-makers do not see the importance of assessment. In fact, policy-makers sometimes have little interest in health care other than controlling costs. Even with coverage policy, which is being used increasingly to control costs, HTA is often not a part of policy-making. Much of the potential of technology assessment has not been realized. Even when good assessments are done, their impact on policy-making has been modest. However, there are great differences in adoption, implementation, and support of HTA between countries all over the world. Health technology itself is international and efforts to understand its benefits, risks, and costs must also become increasingly international. For this purpose, HTA is a promising way forward.

Cross-References

- ▶ Evidence Based Medicine, in HTA
- ▶ Evidence Based Recommendations
- ▶ HTA, Aspects of
- ▶ HTA, Context of
- ▶ HTA, Databases
- ▶ HTA, Impact of
- ▶ HTA, Institutions
- ▶ HTA, Methodology
- ▶ Patient Safety HTA
- ▶ Policy Analysis

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Health Telematics

Definition

Health telematics refers to health-related activities, services, and systems carried out over a distance by means of information and communication technologies, for the purpose of global health promotion, disease control, and health care; as well as education, management and research for health.

Health Transition

Definition

The health transition is the gradual change from a morbidity and mortality pattern driven by infectious, childhood and maternal diseases to a pattern of chronic, noncommunicable diseases occurring mainly in older age. The health transition is advanced not only in the industrialized countries, but also in high-income population segments of middle- (and even some lower-) income countries.

Health Warning Systems

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Synonyms

Monition about health hazard

Definition

System of forecasting and targeted dissemination of a warning message regarding a hazard to human health and recommended actions to be taken by the people concerned.

Basic Characteristics

Health warning systems, e. g. based on forecasting extreme weather and floods, help to protect life, health, and property and enhance national economies. Some such systems have been put in place in several countries, and others are being envisaged.

In the United States (US), excessive heat is considered to be the main weather-related killer, causing more fatalities in an average year than floods, strong winds (such as tornadoes and hurricanes), lightning, and winter events (storms and extreme cold spells). During an average summer, there are over a thousand excess deaths in the US that could be attributed to heat. If deaths due to heart attacks, strokes, or respiratory illness are above normal during a heat wave, they could be considered heat-related deaths, even if they may not be registered as such by a medical examiner.

People living in cities with strong summer weather variability have the strongest weather-mortality relationship. They are not adapted (► adaptation) to extremely hot weather, which is infrequent and occurs irregularly. The number of deaths reported during an intense heat spell is higher in such cities than in many tropical

cities, where hot weather is a normal state. Early season heat waves can cause higher mortality, because human organisms have not adapted. People acclimatize better to the heat as the hot season continues.

There has been considerable progress in the design and implementation of health warning systems in the US, established to reduce effects of weather extremes as well as for seasonal prediction of infectious diseases. Warning systems are being developed to permit urban health agencies and local meteorological offices to issue prior advice to the public if a dangerous heat wave is imminent. The National Weather Service (NWS) of the National Oceanic and Atmospheric Administration (NOAA) in the US provides advance notice (with a forecast capability of five days) of extreme heat events for the protection of life and health, based on a single heat index value derived from temperature and humidity. The excessive heat warning program started in Philadelphia and is currently functioning in more than a dozen cities. A custom-made system is developed for each city, based on the specific conditions of meteorology of each urban area, as well as urban structure and demography. The NWS is developing a plan to expand a heat/health warning system to each of over 70 large US municipalities with populations exceeding 500,000. The system initiated in Philadelphia is now becoming a worldwide model for heat forecasting and collaborative attempts to construct heat/health warning systems for vulnerable large cities around the world have been undertaken in three continents: North America, Europe, and Asia.

The French lesson of August 2003 showed that the death toll of the heat wave was not foreseen and detected only belatedly. Health authorities were overwhelmed by the influx of patients. Retirees' houses had no air conditioning. The number of deaths exceeded the working capacity of undertakers and crematoria. This lesson demonstrates the need for establishing health and environment surveillance, and heat wave forecasting and warning. Air conditioning in retirees' homes proved efficient (yet they are very energy consuming, hence contributing to enhancement of the ► greenhouse effect and ► global warming).

The World Meteorological Organization (WMO) develops a number of global products and services relevant to the natural disaster management. For example, the WMO Tropical Cyclone Programme monitors all tropical cyclones around the Globe from their early stages of formation and throughout their lifetime, providing information on their behavior, movement, and changes in intensity, and on associated onset and development of storm surges and floods. The WMO's Severe Weather Information Center project, carried out in collaboration with the Hong Kong Observatory, has the goal of developing a centralized source of official tropical cyclone warnings and information from around the Globe.

Since deadly extreme heat events occur in many regions of the world, the WMO is working with the World Health Organization (WHO) to develop guidelines that any country can use to set up and run heat/health warning systems. These systems will include monitoring and prediction of conditions leading to intense heat waves, to be carried out by the national meteorological and hydrological services, the WMO's constituency, and with communication between the meteorological and health sectors. They will increasingly include special measures for intervention (by the health and social service sectors) to inform and better protect the most vulnerable members of society.

Long-term forecasts and seasonal forecasts, e. g. based on El Niño-Southern Oscillations (ENSO), are being used in many regions, e. g. for drought warning, to improve preparedness and reduce disaster-caused human and material losses.

Cross-References

► Global Warming
► Greenhouse Effect

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Health of Women

► Women's Health

Healthy Ageing

Definition

A hypothesis that assumes an increase in longevity will increase the number of years lived in good health.

Healthy Cities

Definition

A healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential.

Healthy Island

Definition

A healthy island is one that is committed to and involved in a process of achieving better health and quality of life for its people, and healthier physical and social environments in the context of sustainable development.

Healthy Public Policy

Synonyms

Health control; Disease prevention; Health promotion

Definition

Health promotion is the process of enabling people to increase control over and improve their health. It involves the population as a whole in the context of their everyday lives rather than focusing on people at risk for specific diseases, and is directed toward action on the determinants or causes of health. The goal of a healthy public policy is health promotion. It is essential to create supportive environments, strengthen community action, develop personal skills and reorient health services.

Cross-References

► Disease Prevention
► Health Control
► Health Promotion

Healthy Subjects

Definition

Healthy subjects are people without any medical condition (including normal physiological and laboratory parameters) requiring treatment. The phrase is usually used for people participating in the early stages of clinical trials, where the kinetics and way of action of new pharmaceuticals is being established, or in studies to evaluate physiological or otherwise defined conditions. Because these individuals do not profit medically from such investigations, they are often financially compensated for their participation and any experimental risks are kept minimal and foreseeable.

Healthy Years Equivalent (HYE)

Definition

The concept of healthy years equivalent attempts to put the remaining lifetime spent in a limited health state relative to the time spent in perfect health. Individuals are asked to weigh the complete remaining lifetime directly. The concept of healthy years equivalent shows some relationship to the QALY concept but has not been fully implemented so far.

Hearing

Definition

A hearing is a procedural element of administrative proceedings and criminal proceedings as well as any type of lawsuits heard before courts. All individuals affected by administrative acts or court decisions have the right to receive a hearing where they are entitled to present their own facts and evidence and to challenge the administration's facts and opinions. Hearings are a crucial component of administrative and court procedure rules. Violation of the hearing right can result in unlawfulness of an administrative act or court order.

Hearing Impairment Caused by Noise

Synonyms

Occupational hearing loss

Definition

Hearing impairment is loss of normal hearing due to ► noise exposure. Occupational exposure to noise is quite frequent in metallurgy, construction, textile and many other industries. At the start of occupational noise exposure workers are faced with temporary hearing loss. This hearing loss is not only present during the exposure but also for a certain period after the exposure to noise. After several years of exposure, depending on ► individual susceptibility, this temporary hearing loss becomes permanent. A characteristic audiogram will show impairment in both bone and air conduction, with a maximum loss around 4.000 Hz which is symmetric and bilateral.

Heart Disease

Synonyms

Cardiac disease

Definition

A structural or functional abnormality of the heart, or of the blood vessels supplying the heart, that impairs its normal functioning. Heart disease is a general term that refers to any disease or condition of the heart, including coronary heart disease, hypertension, heart failure, congenital heart disease, disorders of the heart valves, heart infections, cardiomyopathy, conduction disorders, and heart arrythmias.

Heart Rate

Definition

Heart beats per minute.

Heat Cramps

Definition

Heat cramps is a medical condition occurring when the body is dehydrated and loses minerals due to excessive sweating. It is the least severe form of heat emergencies, which occur when human body is exposed to physical activity, in a hot environment, and without adequate water supply. The condition can occur in an occupational setting, in warm ► weather, in sportsmen, children, etc. The typical symptom is forceful and painful contractions of muscles exposed to intense activity: e. g. the muscles at the back of the calves (the gastrocnemius muscles) or the muscles of arms in sportsmen or workers. Heat cramps improve with rest, drinking water, and a cool environment.

Heat Exhaustion

Synonyms

Dehydration

Definition

Heat exhaustion refers to dehydration caused by prolonged physical activity without consuming adequate water, especially in a hot environment. This medical condition is characterized by impaired water homeostasis in the body. Symptoms of mild dehydration (loss of about 2% of body water) include headaches, visual impairment, decreased blood pressure, dizziness, thirst, discomfort, tiredness, and dry skin and mouth. In moderate dehydration (more than 5%) symptoms are lethargy, seizures, fainting, and sunken eyes. In severe cases

(with 10% to 15% fluid loss), muscles become spastic, paresthesia occur, skin is wrinkled, urination is greatly reduced, and the state may progress to delirium, unconsciousness, and death. Treatment includes re-hydration – replenishment of water and electrolytes orally or intravenously.

Heat Stroke

► Hyperthermia

Hebrew Bible

Definition

The Hebrew Bible begins with the sacred story about creation and salvation and contains the Jewish scripture. Christians accept the scriptures and their continued faith in a transcendent god.

Hedonic Pricing

► Willingness-to-Pay Analyses

Hegemonic Masculinity

Synonyms

Dominating masculinity

Definition

To speak of hegemony is to seek to come to terms with a particular idea of political leadership or influence. Much of what might have been positive aspects of the term have dropped out of use after Gramsci. Instead, the word typically implies a "demanding" and "commanding" form of dominance. Now, when used adjectivally, it typically imputes negative connotations to the word it modifies. The ability to use the word to refer to predominant influences towards "the good" through example and through reason are now almost wholly lost. When used of masculinity, it invariably indicates a "hard" version of what is considered to be acceptable male functioning. Therefore, no capacity is left for a Macduff both to publicly mourn the loss of loved ones to the treachery of a trusted peer and to publicly vow to right an injustice in the political domain. For Shakespeare, Macduff represents a masculine influence that stands with peers to face openly the tyrant Macbeth rather than retreat into an inner world as does Hamlet.

Heine-Medin Disease

► Polio
► Poliomyelitis

Hemagglutinin

Definition

Hemagglutinin is a spike-shaped glucoprotein of the virus surface. At the present time, 15 serotypes are known. Hemagglutinin not only causes agglutination (clumping) of erythrocytes but also controls viral attachment and uptake. The virus can only bind to specific receptors. Not all hosts have the same types of receptors. Thus, contagiousness of an influenza virus depends on the serotype of viral hemagglutinin as well as on the host's receptor pattern.

Hematopoietic Stem Cells

Synonyms

Haematopoietic stem cells; Hemopoietic stem cells; Haemopoietic stem cells

Definition

A hematopoietic stem cell (HSC) is the common precursor of any myeloid or lymphoid cell type, for example white and red blood cells, platelets and lymphocytes. Like the precursor of vessel cells, the HSC derive from the hemangioblast in embryogenesis.
HSC are clonogenic (► clonogenicity) as verified in animal models using lethally irradiated mice. Theoretically, mice can be rescued if one single HSC is successfully transferred to the animal bone marrow. In vitro, HSC can be induced to differentiate into various cell types, for instance cardiomyocytes. Due to their low proliferation rate it is rather complicated to expand them in vitro. Therefore, they may not provide an ideal cell type

for cell replacement therapy, where besides safety, feasibility is the most important property.

Hemolytic Uremic Syndrome (HUS)

Definition

Hemolytic uremic syndrome (HUS) is a severe complication of an EHEC-infection. It is caused by bacterial toxins. HUS is assumed to occur in 6–8% of all EHEC-cases. Primarily, young children, older people and immunocompromised people are concerned. HUS causes a destruction of small blood vessels, a breakdown of red blood cells (hemolysis) and a reduced platelet count (thrombocytopenia). The impairment of the kidneys leads to progressive renal failure. Without treatment HUS can be lethal, in 10–30% terminal renal insufficiency develops.

Hemophthisis

► Anemia

Hemopoietic Stem Cells

► Hematopoietic Stem Cells

Hemorrhagic Fever

► Tropical Diseases
► Tropical Diseases and Travel Medicine

Hemorrhagic Fever with Renal Syndrome (HFRS)

► Hanta Fever

Hepatitis

Synonyms

Inflammation of the liver

Definition

Hepatitis is inflammation of the liver that may be caused by several different viruses (A, B, C, D, E, F). Hepatitis A infection is acquired by ingesting contaminated food or water and is also called an illness of dirty hands implying poor hygiene habits as the cause of infection. Most common are hepatitis B and C infections that are acquired from contaminated blood or body fluids directly (e. g. needle) or during sexual contact. They may cause acute illness, as with hepatitis A infection, but also create many different long term consequences, including liver cancer.

Hepatitis A

► Food- and Fecal-Orally Transmitted Infectious Liver Diseases

Hepatitis A Immunization, Active

Synonyms

Hepatitis A vaccination, active

Cross-References

► Hepatitis A Vaccination, Active
► Immunization, Active

Hepatitis A Vaccination

Synonyms

Hepatitis A immunization

Definition

In hepatitis A vaccination, which was first permitted in 1996, whole inactivated viruses are administered. Two inoculations are given at an interval of 6–12 months, whereby the first vaccination already leads to a protective effect of almost 100% after 2 weeks. The second dose achieves long-term protection lasting at least 20 years. Although hepatitis A vaccination is one of the officially recommended vaccinations in some countries,

in other regions it is only administered for certain specified indications. There might be a higher risk of infection due to one's profession, due to residence in a community institution, in case of certain chronic diseases or when the subject is planning a journey to a region where endemic disease is present. Contraindications for the hepatitis A ► vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccine.

Hepatitis A Vaccination, Active

Synonyms

Hepatitis A immunization, active

Cross-References

► Immunization, Active

Hepatitis B

Synonyms

HBV-Infection

Definition

Hepatitis B is a viral infection, which is transmitted by contact with blood or other body fluids of an infected person. Following an incubation period of 2–6 months, inflammation of the liver develops. The symptoms are elevated liver enzymes, icterus, fever, malaise and stomach ache. In 0.5–1% the infection takes a dramatic course, which leads to liver failure and – without transplantation – has a lethal outcome. In adults a chronic hepatitis is found in 5–10%, in children the incidence is much higher, in newborn babies even up to 90%. In a number of countries, up to 30% of the population suffers from chronic hepatitis B. During the course of years, 50% of people with chronic hepatitis B develop liver failure or liver cancer. In general, no medicinal therapy is given in acute hepatitis B, chronic courses can be treated with interferon alfa and various virustatics. To prevent hepatitis B infection, active and passive vaccination is possible (► immunization, active; ► immunization, passive).

Cross-References

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Hepatitis B Immune Globulin

► Hepatitis B Vaccination, Passive

Hepatitis B Immune Prophylaxis

► Hepatitis B Vaccination, Passive

Hepatitis B Infection

► Sexually Transmitted Diseases

Hepatitis B Vaccination

Synonyms

Hepatitis B immunization

Definition

A ► vaccine against hepatitis B has been available since 1981. There is no age limit for its use. For newborn babies whose mothers are infected with active hepatitis B, the inoculation process should be started directly after birth. In such cases, the first dose of active vaccine is given simultaneously with a passive hepatitis B immunization. Otherwise, hepatitis B vaccination is generally implemented 3 times from the third month of age as part of the 6-fold vaccination, or twice when no pertussis component is involved, at intervals of at least 4 weeks, followed by a further vaccination after 4–12 months. The protection rate achieved is 95–99%. Booster vaccinations are recommended for persons at risk, in particular for those individuals who come into contact with blood frequently, such as medical staff, police officers or prison staff. Contraindications for the hepatitis B vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccine.

Hepatitis B Vaccination, Passive

Synonyms

Application of hepatitis B immune globulin; Hepatitis B immune prophylaxis

Definition

If a pregnant woman suffers from a chronic active hepatitis B, that means Hbs (surface)- antigen can be detected, the risk of the newborn baby developing hepatitis B is 10–20%. For this reason, infants of HBs-Ag-positive mothers should receive a passive hepatitis B-vaccination directly after birth. Simultaneously, the active hepatitis B-vaccination is started. Another indication for the administration of hepatitis B immune globulin is contact of a non immune person with the blood of someone infected with hepatits B. Due to their profession, some individuals come into contact with blood frequently and thus face an enhanced risk of infection, in particular medical staff, police officers and prison staff.

Herbalism

Synonyms

Herbal medicine; Phytotherapy

Definition

Herbalism refers to the use of herbs to prevent and cure illness. Whole plants or their parts are used for treatment instead of separating and purifying the active constituents of plants. Plant derivatives may be highly active and concentrated in various parts of the plant. The season of the year and the time of day may affect the best time for gathering. These preparations are difficult to standardize, since they are complicated mixtures which may have hundreds of constituents.

Herbalists

► Indigenous Health Care Services

Herbal Medicine

► Herbalism

Herd Immunity

Definition

Immunization involves both a direct benefit to the individual child as well as to those in the community who remain un-immunized and benefit from the immunization of the vast majority. The latter is called “herd immunity”.

Herpes Genitalis Infection

Synonyms

Infection with herpes simplex type 2

Definition

Following an incubation period of 2–12 days an infection with herpes-simplex virus can lead to lesions of the skin and the mucous membranes, cause general symptoms like fever, headache, painful swellings of the lymph nodes, or induce a severe systemic infection, which involves the whole organism. In local infections, firstly vesicles appear, which are arranged in groups, then the rupture of the vesicles leads to painful erosions, which develop into superficial ulcers. An effective therapeutic is aciclovir. Depending on the localization and the severity of the infection, aciclovir can be administered as an ointment, tablets or infusion. The viruses are not killed by the therapy, they can be reactivated at a later point of time.

Heterogeneity

Synonyms

Heterogeneousness

Definition

In the field of monogenic disorders, heterogeneity describes the phenomenon that the same phenotype can

be caused by different ► mutations. The different mutations can be located within a single gene (allelic heterogeneity) or may occur in different genes (locus heterogeneity). However, in contrast to polygenic disorders, a given individual harbors only one (autosomal-dominant) or two different mutations (autosomal-recessive) in one gene.

Heterogeneousness

► Heterogeneity

Heterotopic Pregnancy

► Ectopic Pregnancy

Heterozygosity/Homozygosity

Definition

Diploid organisms like humans carry two copies of each autosomal chromosome (paired homologous chromosomes) and thus, also two copies of each autosomal gene. One of the paired chromosomes (one of the two copies of a gene) is transmitted by the father, the other by the mother. If the sequence of the two copies (► alleles) of a gene is identical, the individual is homozygous, if the two copies of a gene contain different alleles, the individual is heterozygous. Autosomal-dominant disorders manifest when only one of the two copies of the underlying gene is mutated (heterozygosity). In contrast, autosomal-recessive disorders manifest when both copies of a gene carry either the same mutation (homozygosity) or two different mutations on each allele (compound-heterozygosity).

HETUS

Definition

Harmonized European time use surveys. Project initiated by the statistical office of the European Union to harmonize time use surveys in Europe and to provide for comparable time use data. Important source to analyze health related behavior(al) patterns.

HIB-Vaccination, Active

Synonyms

Active immunization against *Haemophilus influenzae* B (Hib)

Cross-References

► Immunization, Active

Hierarchical Linear Modeling

► Multilevel Statistical Analysis

High Blood Pressure

► Arterial Hypertension

Highly Dangerous Infectious Diseases

► Acute Life-Threatening Infections

High Risk (Prevention) Strategy

Definition

High risk prevention strategies represent preventive measures that focus on individuals who are judged most likely to develop a certain disease. They are valuable in addition to measures of prevention within the general population. One example for a high risk approach for stroke prevention is the treatment of hypertension in individuals that have previously suffered a transient ischemic attack (TIA). The high risk strategy falls mainly in the medical domain of secondary prevention (screening).

High Risk Workplaces

Definition

High-risk working places include all workplaces where in spite of completely or incompletely applied preventive measures and actions, health risks for workers still

exist that can endanger their safety and health. At high-risk places a higher risk of injuries, ► occupational diseases and damages exists, due to specific technological processes whereupon there is no possibility to apply the adequate occupational safety measures or due to specific demands related to specific health, physical, psycho-physical working ability of a person. Such high-risk workplaces include for example those in agriculture, logging, commercial fishing, etc.

With insight into risk and causal factors at workplaces, possible prevention strategies aimed at reducing risk, or interventions to interrupt the causal sequence of accidents should be considered. There is a wide range of protective technologies and strategies that has already been applied to workers' protection. The goal is the identification, development and implementation of effective preventive strategies to reduce the risk of injuries and occupational diseases to workers at the highest possible extent.

Hill People

► Indigenous Health Care Services

Hinduism

Definition

With some 900 million followers, Hinduism is the third most popular religion after Christianity and Islam. Its origins can be found in India. All believers take on the religion as a way of life, following the earlier Vedas scriptures.

Hippocratic Oath

Definition

The Hippocratic Oath concerns the doctor–patient relationship, focusing on the physician's code of conduct. It goes back to the forth century before Christ. The Oath stated: "I will use treatment to help the sick according to my ability and judgment, but I will never use it to injure or wrong them … And whatsoever I shall see or hear in the course of my profession … I will never divulge, holding such things to be holy secrets." Medical ethics consisted, therefore, initially, of these three, clear principles: ► beneficence, ► non-maleficence, ► confidentiality.

HIV/AIDS

Synonyms

HIV-infection; Acquired immunodeficiency syndrome

Cross-References

► AIDS
► HIV-Infection and AIDS

HIV (Human Immunodeficiency-Virus)-Infection

Synonyms

AIDS

Definition

Acquired immuno-deficiency syndrome (AIDS) results from the infection with the human immuno-deficiency virus (HIV). The virus is transmitted sexually or by inoculation with contaminated blood, but may be passed from mother to baby at birth. The highest risk is among homosexual or bisexual men, intravenous drug abusers, and people with multiple blood transfusions. AIDS infection is ► endemic in sub-Saharan Africa and India. Its origin is unknown. The virus damages the immune system and therefore the body's defense towards infections weakens. Carriers of HIV may be symptom-free for years, but after shorter or longer periods of time illness develops with various manifestations. AIDS is a fatal disease with new drugs helping relieve the symptoms, or prolong the survival period.

HIV-Infection

► HIV/AIDS
► HIV-Infection and AIDS

HIV-Infection and AIDS

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Synonyms

Infection with human immunodeficiency virus; Acquired immunodeficiency syndrome

Definition

AIDS is a chronical infectious diseases, which is caused by the HI (human immunodeficiency)-virus, and which is primarily transmitted by sexual intercourse or by reused contaminated needles of drug dependents. AIDS is characterized by a weakening of the immune system, which can neither be healed, nor prevented by a vaccination. Different drugs are available, which can impair the viral reproduction and delay the inevitably lethal course of the disease.

Basic Characteristics

History of AIDS and its Problems Nowadays

AIDS is a transmissible disease of recent times, which is caused by an infection with the HI (human immunodeficiency)-virus. Most probably, the HI-virus stems from the SI-virus (simian immunodeficiency virus), which can be present in chimpanzees. The SI-virus, however, developed from a combination of two different viral strains, which are found in guenons. As guenons are hunted and eaten by chimps, the chimpanzees were infected with the precursors of SI-virus. The first transmission to a human presumably took place in the middle of the 1950s by ingestion of chimp meat. In 1959, HIV-antibodies were detected in a man in Congo for the first time. The further spreading of the HI-virus among humans was caused by sexual intercourse or by contact with contaminated blood. As many years lie between the infection with the HI-virus and the onset of AIDS, the problems of this new infectious disease did not become relevant until the 1980s. Initially, AIDS seemed to concern only particular groups at risks. These groups were homosexual men, who faced a higher risk of infection due to frequent partner-swapping and the practice of anal intercourse, and drug dependents, who were infected by the virus through the reuse of contaminated needles. After an antibody test, which was developed by Robert Gallo in 1985, had become available, it quickly became clear that AIDS was much more dangerous than assumed initially. Within a short period of time, AIDS proved to be a global infection and a worldwide threat. In 1986, the virus was named "HIV", in the following year, AZT (Retrovir®), a ► nucleoside reverse transcriptase inhibitor (NRTI) was licensed as the first therapeutic substance. In 1988, the WHO declared December 1st as World AIDS Day. Two years later, a red ribbon became the sign of protest against the discrimination of HIV-infected people. In 1991, a loop of red silk ribbon established to be the international symbol of the fight against AIDS (Fig. 1). As a valuable parameter for therapy control, HIV-PCR (polymerase chain reaction) was introduced in 1994. During the following years, therapeutic possibilities were extended by the introduction of ► protease inhibitors (PI) (saquinavir in 1995), ► non-nucleoside reverse transcriptase inhibitors (NNRTI) (nevirapin in 1996), and a ► fusion inhibitor (enfuvirtide, 2003). With the awareness of the consequences of AIDS, the population of the industrial nations initially developed a kind of mass hysteria; during the course of 1990s the public interest slowly faded away, although the risk of AIDS remained unchanged. Unfortunately, knowledge about AIDS has decreased, especially among teenagers

HIV-Infection and AIDS, Figure 1 The Red Ribbon – the worldwide symbol for solidarity with HIV-positive people and those living with AIDS

and young adults. A lack of knowledge, promiscuity and careless sexual behavior with a high readiness to take risks make the fight against HIV more difficult. Furthermore, AIDS is frequently treated as a taboo subject. Many people do not know that they are infected, or they do not perform a test as they fear social discrimination. HIV-tests may not be available, especially in developing countries. Because individuals may be unknowingly infected and because the latency period is extended, transmission of the virus can easily be spread. Today, more than 40 million people are infected with HI-virus, 2.2 million are children under the age of 15 years. The most recent HIV-infections appear in Africa south of the Sahara; in these regions, the effects of AIDS are highly damaging. Meanwhile, 15 million children have become orphans due to AIDS, and by the year 2025 this number is expected to reach 25 million. Most of these orphans live in extreme poverty. Even if they are adopted by relatives, in most cases, the care they receive is not as good as that given to the biological children in the adoptive family. AIDS orphans are not only susceptible to exploitation and abuse but also their life expectancy is considerably shortened.
Further, a sufficient amount of therapeutics to treat AIDS is not available in developing countries.

The HI-Virus

The HI-virus is a RNA-virus belonging to the retrovirus group. One has to differentiate between the strains HIV-1 and HIV-2, both of which are divided into further subtypes. By the action of the enzyme reverse transcriptase, retroviruses integrate their genetic code into the genotype of the host's cells, that means, viral RNA is assimilated into the double-stranded structure of DNA. Other important viral enzymes involved in the process are integrase and a protease. HI-viruses bind to the so-called ► CD_4-receptors of T-lymphocytes (T4-cells, helper T-cells, CD_4-lymphocytes), which are responsible for cellular immunity. A complex of glycoproteins (Gp 120), which is found on the surface of HI-viruses, is responsible for the viral adhesion. The virus is highly adaptable and is able to develop different subtypes quickly. For this reason, it has an excellent survival capability because resistance to therapeutic measures can rapidly evolve. Due to the high mutation rate, the development of a vaccine has so far not been successful. HIV-infection is detected by the ► HIV-test. Virus load and CD_4 evaluation play an important role in determining the course of the disease.

Ways of Transmission

The HI-virus can be found in various body fluids. Blood, sperm, vaginal secretions, mother's milk and cerebrospinal liquor are contagious. On the other hand, no risks are associated with spittle, tears or sweat. Transmission of HIV by droplets or insect bites does not occur. The virus can be transmitted through microinjuries or larger lesions of the skin or the mucous membranes. Primarily, the virus is transmitted by sexual intercourse with an infected partner without the use of ► condoms. In the case of unprotected vaginal sex with an infected partner the woman's risk of infection is 0.05–0.15%, for the male partner 0.03–5.6%. These are average risks, but the individual risks have to be considered. Individual risks are markedly increased when there is a high virus load in the presence of other ► sexually transmitted diseases (STD), or if sexual intercourse is performed during menstruation. Another way of transmitting HI-virus is the re-use of contaminated needles in cases of intravenous drug consumption. Moreover, a pregnant HIV-positive woman can transmit the virus to her unborn child; the risk is about 25%. Babies can also be infected during the birth process or through breastfeeding. Blood transfusions are a further possible source of infection; thanks to the testing of blood donors, which was established in the middle of the 1980s, the actual risk of transmission by blood transfusion is minimal, at least in industrial countries. However, it has to be remembered that the HIV-test may remain negative for up to 3 months after an individual has become infected.

Course of HIV-Infection and AIDS

HIV-infection passes through three stages. Following an incubation period of 6 days to 6 weeks, the acute phase appears with flu-like symptoms (fever, headache, sore throat, exanthemas and swellings of the lymph nodes). It lasts 4–6 weeks. The following latency phase, in which there are no symptoms, can last for several years. After this phase, the so-called AIDS related complex (ARC) occurs. In this stage of the infection there are similar symptoms as in the first stage, but the symptoms do not disappear. The last stage of the disease, which in general takes a lethal course within two years,

demonstrates the complete AIDS clinical picture with ► AIDS-defining symptoms. There can be a considerable variability in the individual course of the disease. Fast progressors develop the clinical picture of AIDS within 5 years after the infection (5% of adults). Long-term non-progressors do not show any AIDS-defining symptoms even after a time interval of 15 years. In adults, the percentage of the latter group is 5%.

AIDS-Therapy

AIDS cannot be cured; it is only possible to delay the course of the disease and improve the quality of life. At the onset of therapy, the risk of developing AIDS and the long-term-toxicity have to be weighed up. Following the Centers of Disease Control and Prevention classification, there are 3 categories (A-C) according to clinical appearance.

- Category A is asymptomatic HIV-infection;
- Category B is defined by the presence of diseases, which do not belong to the AIDS-defining symptoms, but which can, most probably, be related to an immune deficiency.
- Category C consists of AIDS-defining symptoms.

Furthermore, the CD_4-status and the virus load are taken into consideration. Indications for an onset of therapy are a CD_4-value of 200–350 cells/pl, a CD_4-value of 350–500 cells/pl in combination with a high virus load, AIDS-defining symptoms and diseases, which indicate the presence of immunodeficiency. The primary aim of HIV-therapy is to reduce the virus load below the detection limit (< 50 copies/ml). Antiviral therapy (ART) is carried out as a combined treatment (HAART = highly active antiretroviral treatment). After an induction therapy with four of the available therapeutics, in most cases, maintenance therapy is carried out using three of the therapeutics; in general, 2 NRTI + 1 PI or 2 NRTI + 1 NNRTI. During the course of the disease, therapeutic drug monitoring is performed. Plasma levels of the drugs are determined in order to detect over- and/or underdosage. Moreover, CD_4-value and virus load are controlled regularly to evaluate therapeutic success. In the case of the development of resistances, changes in the medication will be necessary. Different databases supply information about current HIV resistance profiles (like http://hivdb.stanford.edu or http://www.hiv.lanl.gov/content/index). In HIV-treatment, so-called adherence plays an important role, meaning compliance with the therapeutic options. If > 5 % of drug applications are omitted, then an increase of virus load above the detection limit has to be expected. To achieve a good adherence, it is essential to inform the patient about the aims, necessity, complications and side effects of treatment.

HIV-Infection During Pregnancy and in Childhood

It has been found that in 90% of infected children, the HI-virus was transmitted vertically during pregnancy or breastfeeding. As infection with multiresistant viral strains is possible, a genotypic resistance test has to be performed. The administration of the antiviral drug nevirapin in pregnancy and birth by Cesarean section plays an important role in the "prevention of mother to child transmission" (PMTCT). In general, the course of HIV-infection is more severe in children and leads to death more quickly than in adults. In developing countries, 50% of the infected children die within the first two years of life, only a few survive beyond five years of age. In babyhood, there is an extremely high risk of developing AIDS-defining syndromes, like HIV-encephalopathy, pneumocystis-pneumonia or HIV-hepatopathy. For this reason, antiviral therapy should be given to all children below the age of one. In older children, the risk of AIDS and AIDS mortality correlate well with CD_4-values. Children should be given adequate therapy. Furthermore, consideration should be given to their whole social surroundings (caring persons, kindergarten, school, etc.).

Prevention of HIV-Infection and AIDS

The most important factors preventing HIV-infection are an informed population and the acceptance of safer sex (condom use).

Unfortunately, some years ago, in Africa, the Catholic Church claimed that condoms were not effective in the prevention of AIDS. The growth of such mistrust in the population makes information campaigns less effective. As promiscuous behavior amongst teenagers increases, sexual education, including information about sexually transmitted diseases, becomes a must for this age group.

In an effort to educate people in developing countries, companies of actors travel from one village to another performing show pieces about the AIDS problem.

In the case of a proved HIV-infection (positive HIV-test), a strengthening of the immune system should be striven for in order to delay the course of the disease. A healthy way of life with balanced diet, sufficient sleep and renunciation of smoking and drug consumption can help to achieve this aim.

To avoid the spread of HIV-infection, an easily available HIV-test which gives a quick result is necessary.

Postexposition prophylaxis (► postexposition prophylaxis (PEP) in HIV-infection) may be indicated in some situations. For example, inadvertent contact with contagious material (following a needle stick injury or some other kind of professional exposure) or the positive HIV-status of a partner does not becomes clear until after sexual intercourse has taken place.

Conclusion

HIV-infection, which is primarily transmitted by unprotected sexual intercourse, after a latency phase of several years leads to a deficiency of the immune system, which is called AIDS (acquired-immune-deficiency-syndrome). AIDS has become a disease with worldwide significance and far-reaching consequences for society. In developing countries, a great number of children suffer from the disease, either directly or indirectly by the loss of one or both parents. AIDS cannot be cured, a vaccination is not available, but the inevitable deadly course of the disease can be delayed by antiviral therapy. Information campaigns, the avoidance of unprotected sexual intercourse (without use of condoms) and the HIV-status of partners are of decisive significance in the fight against AIDS.

Cross-References

- ► AIDS-Defining Symptoms
- ► CD_4
- ► Condom
- ► Fusion Inhibitors
- ► HIV-Test
- ► Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)
- ► Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)
- ► Postexposition Prophylaxis (PEP) in HIV-Infection
- ► Protease-Inhibitors (PI)
- ► Sexually Transmitted Diseases
- ► Virus Load

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HIV-Test

Synonyms

Detection of HIV-Antibodies

Definition

HIV-test detects antibodies against the HI-virus. At first, a HIV search-test (HIV-ELISA-test) is carried out. In the case of a positive result, a second test follows for confirmation (Western blot method or immunoblot). According to the WHO, a person is assumed to be HIV-positive when antibodies against two different viral proteins can be detected. In further tests more detailed information of the virus' stems is revealed, and – after the onset of a therapy – testing of resistances is performed. Directly after the infection with the HI-virus, during the building antibodies phase, the test still shows a negative result. About 12 weeks after infection the detection of antibodies can assumed up be reliable. In newborns maternal IgG-antibodies are present, which leads to falsely positive test results. Due to this, in newborn children, a direct detection of the virus itself (e. g. PCR-test) is performed.

HMO

Definition

A Health Maintenance Organization (HMO) is a type of health care plan that provides a full range of healthcare services to its members. It offers prepaid, comprehensive health coverage for both hospital and physician

services. An HMO contracts with healthcare providers, e. g. physicians, hospitals, and other health professionals. Members are required to use participating providers for all health services. Members are enrolled for a specified period of time.

Hole

► Landfill

Holistic Medicine

Synonyms

Complementary medicine; Traditional medicine; Alternative medicine

Definition

Holistic medicine represents an approach to medical treatment based on the theory that living creatures and the non-living environment function together as a single integrated whole. The holistic approach to medicine insists on the study not only of individual disease but also of the response of people to their disease – physically, psychologically, and socially. A treatment plan must meet the unique needs of each individual, and all aspects of an illness are taken into account, such as the effects of the illness on personal relations, the family, work, and the patient's emotional well being. Holistic treatment prefers to encourage the patient's own capacity for self-healing, rather than having recourse to surgical or drug remedies, and emphasizes education and self-care, including proper diet and exercise.

Cross-References

► Alternative Medicine
► Complementary Medicine
► Traditional Medicine

Home Care

► Community Care

Home- and Community-Based Services

Definition

Home and community-based services are ► health services provided in a patient's place of residence or in a non-institutional setting located in the immediate community. They may include home health care, adult day care, consultative-specialist health care, medical equipment services, or other interventions.

Homogeneity Analyses: "Fixed Effect" Model

Definition

Homogeneity analyses: "Fixed effect" model is a method of meta-analysis (and general statistical modeling) which estimates an overall single effect for an intervention. Variation of study estimates is assumed to be due to random (sampling) error within studies. This model assume that the exposure effect is constant across studies and that variation from one study to the next is due solely to within-study random variation. Fixed-effects models may allow the outcome to depend on several fixed effects, corresponding to several variables that characterize the studies. This method of meta-analysis ignores between study variability, and may overestimate the precision of the treatment effect if there is significant unexplained heterogeneity between the studies.

Homogeneity Analyses: "Random Effect Models"

Definition

Homogeneity analyses: "Random effect models" is a method of meta-analysis (and general statistical modeling) which estimates the effect of an intervention, assuming that variation in the meta-analysis is a combination of random sampling error within studies and variation between studies. Random effect models are more conservative than fixed effect models, giving estimates with wider ► confidence intervals. This method takes into account the possibility that other factors may modify treatment effects, and assumes that the studies

included in the review are a random sample taken from the distribution of the possible treatment effects. If random-effect models are used, then the rationale for model selection should be given, and estimates of among-study variation should be reported.

Hookworm Infection

► Infection with Ancylostoma Duodenale

Hormone Replacement Therapy (HRT)

Definition

Hormone replacement therapy refers to the substitution with the female hormone estrogen alone (in a woman with no uterus) or estrogen and progesterone (in a woman with an intact uterus to prevent overgrowth of endometrial lining and consequently endometrial cancer) in the peri- and postmenopause to prevent signs and symptoms of the declining female hormone production in the ovaries. HRT is effective for menopausal symptoms as well as for the prevention of ► osteoporosis and hip fractures due to bone mass declines in the ► menopause. Because of the major adverse effects (increased risk of invasive breast cancer, cardiovascular diseases, stroke, phlebothrombosis) benefits and risk of HRT have to be weighed carefully and individually.

Hospice

► Palliative Medicine and Hospice Care
► "A Safe Place to Suffer"

Hospice Care

Synonyms

Palliation at home; Long term-care facility

Definition

Hospice and palliative care have a similar philosophy, namely the alleviation of symptoms (e. g. severe pain) for patients with end stage disease. But they represent differing aspects of the aim of 'a safe place to suffer.' Furthermore, their locations of treatment often vary. Hospice care is defined as 'a program that provides palliative care and attends to the emotional and spiritual needs of terminally ill patients at an inpatient facility or in the patient's home' (http://cancerweb.ncl.ac.uk/cgi-bin/omd?query=hospice&action=Search+OMD). Hospice care is most frequently provided in the patient's home, in long term care facilities or residential institutions.

Cross-References

► Palliative Care

Hospice Care in Children

► Paediatric Palliative Care

Hospice Chaplains

Synonyms

Geriatric chaplain

Definition

Hospice chaplains work in hospitals, seminaries or with volunteer organizations, which provide spiritual care for geriatric and terminally ill patients. They visit homes and retirement centers, often with the cooperation and assistance of voluntary helpers. The hospice chaplains, along with their team, provide a welcome relief from isolation and routine for most patients. Their visits mostly occur at weekly intervals on a one-on-one conversational basis which guarantees personal and intimate contacts that often lead to durable friendships.

Hospital-Acquired Infections

► Nosocomial Infections

Hospital Care

► Inpatient Care

Hospital Epidemiology

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Synonyms

Infection control

Definition

Hospital epidemiology and infection control have been synonyms for many years, and both refer to the discipline concerned with preventing the spread of infections within the healthcare setting. However, both of these terms have grown in terms of definition and function. *Infection control* refers to policies and procedures used to reduce or minimize the occurrence of hospital infections (► hand hygiene, cleaning/► disinfection/► sterilization, vaccination, ► surveillance, ► outbreak investigation, etc.). *Hospital epidemiology* is the use of scientific methodology to measure the necessity and effect of preventive strategies for hospital infection control.

Basic Characteristics

The fundamental roles of hospital epidemiology are to identify risks, understand risks, and eliminate or minimize the risks of hospital infections.

Hospital infection (HI), also called *hospital-acquired* or *nosocomial infection,* is an infection that originates or occurs in a hospital or other healthcare facility. The term "nosocomial" comes from two Greek words: "nosus" meaning "disease", and "komeion" meaning "to take care of".

The ► Centers for Disease Control and Prevention (CDC) has developed a set of definitions for surveillance of HI (Garner et al. 1988). The definitions combine specific clinical findings with results of laboratory and other tests. According to these definitions, a HI is an infection not present on admission, but acquired during a stay in hospital, that manifests itself either during hospitalization or in the period following a hospital stay. The majority of HIs become evident 48 hours or more following admission. HIs include occupational infections that healthcare workers acquire while performing their duties within a healthcare setting. All HIs can be classified as occurring in one of 13 sites. The most common types of HIs are ► surgical site infections, ► urinary infections, ► pneumonia, and ► bloodstream infections.

Epidemiology

Hospital infections occur worldwide and affect both developing and developed countries. Approximately 5%–10% of all hospitalized patients in developed countries acquire a clinically significant HI per year; the ► mortality rate attributable is about 10% (WHO 2002). The ► incidence rate for developing countries can be higher than 25%. HIs increase patients' morbidity and mortality, length of hospital stay, and treatment costs. HIs have occurred for as long as hospitals have existed. Reasons why nosocomial infections will be common in the future include the advancing age of patients admitted to healthcare settings; greater prevalence of chronic underlying diseases among admitted patients; increased use of aggressive medical and therapeutic interventions, including implanted foreign bodies and organ transplantations; growing numbers of immunocompromised patients; and transmission of ► antibiotic-resistant bacteria.

Etiology

Many different pathogens may cause HI. The infecting organisms vary among different patient populations, different healthcare settings and facilities, and different countries (Ducel et al. 2002). The most common nosocomial pathogens are bacteria, viruses, fungi, and parasites. These microorganisms may already be present in the patient's body or may come from the environment, contaminated hospital equipment, healthcare workers, or other patients.

Reservoirs

Reservoirs of HI may be animate (healthcare workers, patients' own endogenous flora, visitors) or inanimate in the environment, including equipment and medications.

Host

Exposure of a susceptible host to infecting agents is influenced by intrinsic factors (age at infection, birth

weight, sex, nutritional status, comorbid conditions and diseases, immunosuppression, immunization status, and psychological state of the host) and extrinsic factors (invasive medical or surgical procedures, medical devices, duration of antimicrobial therapy and hospitalization, and exposure to hospital personnel) (Mayhall 2004).

Environment

Environmental factors include a) physical factors such as building features, ventilation, water; b) biologic factors such as vectors; and c) social factors (socioeconomic status, sexual behavior, potable water, food preparation, and adequate waste disposal).

Mode of Transmission

Pathogens that cause HIs can be acquired in several ways.

a) *Endogenous infections*: bacteria present in the normal flora may cause infections due to transmission to sites outside their natural habitat.
b) *Exogenous infections*: bacteria can be transmitted through ► contact (direct or indirect); ► droplets or air; contaminated food, water or medications; or by arthropods or other insects. Contact transmission is the most important and the most common mode of transmission. Vector-borne transmission of infectious agents is of less significance in developed countries.

Risk Factors

All patients admitted to hospital are at some risk of acquiring a HI. The most vulnerable are neonates (especially premature babies), very old people, people with compromised nutritional or immune status, and those with comorbid conditions (such as diabetes). Other risk factors include a prolonged hospital stay, use of indwelling ► catheters, inadequate hand hygiene, and prevalence of antibiotic-resistant bacteria from the overuse of antibiotics.

Prevention

In the early 1970s, The CDC initiated the Study on the Efficacy of Nosocomial Infection Control Project (SENIC) to examine the ► effectiveness of HI surveillance and control programs. This project showed that approximately 32% of HIs are preventable if infection surveillance and control programs include four components: 1) appropriate emphases on surveillance activities and vigorous control efforts; 2) at least one full-time infection-control practitioner per 250 beds; 3) a trained hospital epidemiologist; and 4) feedback of wound infection rates to practicing surgeons (for surgical site infections) (Haley et al. 1980).

Although the components needed for prevention vary for the different types of HI, a variety of steps can be taken to prevent nosocomial infections, and include the following key components (Ducel et al. 2002):

- Adopting an infection control program which includes strict quality control of procedures known to lead to infection, and a surveillance program to track infection rates,
- Limiting transmission of pathogens through correct and frequent handwashing and glove use, aseptic practices, sterilization, disinfection, ► isolation strategies, and laundry,
- Limiting the risk of endogenous infections by minimizing invasive procedures and promoting cautious use of antibiotic medication,
- Protecting patients with appropriate antibioprophylaxis and vaccination,
- Prevention of infections in staff members,
- Continuing staff education.

Epidemiologic Methods Applied to Hospital Infections

Classic methods in epidemiology (► epidemiology, aims and scopes) are used to study HI. *Descriptive epidemiology* provides helpful tools to describe the distribution and frequency of HI, particularly in relation to persons (age, sex, race, marital status, personal habits, occupation, socioeconomic status, medical or surgical procedure or therapy, device use, underlying disease, or other exposure), time (duration of stay in hospital, pre- and post epidemic periods, seasonal variation, secular trends), and place (geographic occurrence of the HI or outbreak, medical or surgical ward of acquisition of infections). Information on each of these characteristics allows the formulation of a hypothesis about the source, reservoir, or the mode of transmission of a HI. In particular, descriptive data analysis may be performed in the early phase of the investigation of clusters of HI. ► Analytical studies are designed to test

hypotheses. Two types of analytical studies can be used: ► cohort studies and ► case-control studies. Examples of cohort studies include identification of risk factors for HI and risk factors for postoperative complications, and handwashing methods. A ► retrospective (historical) cohort study is widely used in the investigation of an outbreak of HI. Experimental epidemiology mainly consists of ► randomized clinical trials in hospital epidemiology. Examples are the following: prevention of catheter-related bloodstream infections, prevention of surgical site infections, prevention of ventilator-associated pneumonia, control of transmission of multiresistant microorganisms, etc.

Cross-References

► Antibiotic-Resistant Bacteria
► Bloodstream Infections
► Case Control Studies
► Catheter
► Centers for Disease Control and Prevention (CDC)
► Cohort Studies
► Contact
► Disinfection
► Droplet
► Effectiveness
► Epidemiology
► Hand Hygiene
► Incidence Rate
► Isolation in Public Health
► Mortality Rate
► Observational Studies
► Outbreak Investigation
► Pneumonia
► Public Health Surveillance
► Randomized Clinical Trials
► Sterilization
► Surgical Site Infections
► Urinary Infections

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Hospital Information System

Definition

A hospital information system is an ► information system for processing ► data, information and knowledge in hospital activities, i. e. on the secondary and tertiary health care levels. These electronic systems include electronic patient databases; applications for data access, retrieval, presentation, and distribution from several units (physicians' notes, nurses' notes, laboratory and other diagnostic tests, medications, etc); and communication technologies enabling simultaneous use by several users and transfer of information for several purposes: research, education, teleconsulting, etc.

Hospitals

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Definition

Hospitals are licensed establishments providing mainly inpatient healthcare, i. e. diagnosing, treating and housing the sick and injured, and managing childbirth. Outpatients, i. e. patients who do not stay in the hospital after treatment, can receive examination, ► emergency care or other services not provided by doctors outside the hospital. Hospital health care delivery may be on a public (government-owned) or private (non-profit or profit making) basis. Hospitals are either providing necessary health care for all types of diseases or specialized in some medical areas (e. g. children's hospitals, mental hospitals). The hospital sector is in most countries strongly regulated by government law. Scope and

quality of inpatient health care services depend on the resources spent in the hospital as well as on the qualifications of the hospital staff and therefore may vary significantly from one country to another.

Basic Characteristics

History

The term 'hospital' comes originally from 'hospitium' meaning a place for guests. During Roman times, its meaning has extended to 'needing shelter'. Throughout the middle ages, hospitals were charitable institutions for the needy, aged, infirm, or young and hospitals were mostly dependent on the church. In the 16th century hospitals took on their modern meaning as institutions where sick or injured people are given medical or surgical care. In Europe, in the late 17th century, large facilities for the sick and poor were created, and, especially in France, hospitals have since been well established. During the 18th century there was a rising need for hospitals due to the increase in the urban population in larger industrializing towns, and hospitals became more and more independent from the church. But there was little that could be done in a hospital that could not be as well done in a home. Only with the progress of medicine and surgery has the hospital flourished. Toward the end of the 19th century, hospital care was revolutionized by the discovery of anesthesia, improvements in sanitation, establishment of hospital nursing schools, and other advances. After the World Wars, hospitals broadened the scope of their activities, becoming important centers not only for health care services but also for medical education, nurse training, medical research, and the provision of patient convalescence and social support. The development of ambulance services, transporting sick and injured people, made the modern hospital also the focus of emergency care. In conclusion, hospitals have changed from places providing care solely for the sick and poor to being the center of the medical world, occupying an important place in society from birth until death.

Types and Organization of Modern Hospitals

Today, inpatient hospital health care is delivered either by general hospitals or by specialized hospitals, for example, mental health and substance abuse hospitals or other specialty hospitals such as specialized heart disease hospitals.

General hospitals are licensed establishments which provide surgical and non-surgical diagnostic and medical treatment for inpatients, using specialized facilities and equipment for all types of diseases. Hospitals also may provide outpatient care such as examination, laboratory services, diagnostic X-ray services or emergency services which are not provided by outpatient doctors' offices. In some countries, a minimum number of beds is a required condition for registration as a hospital. Hospitals can be run by the government on a national, regional or community level (e. g. general acute hospitals, army and police hospitals, prison hospitals), by private non-profit organizations (e. g. the Red Cross) and by universities (teaching hospitals). Teaching hospitals, in addition to providing care, train health care providers, perform research and provide high level services such as organ transplantation.

Specialized hospitals, such as mental health and substance abuse hospitals, provide the whole spectrum of inpatient services needed for mentally ill people or people suffering from substance abuse disorders requiring typically longer lengths of stay. Services comprise general psychological, psychiatric and nutritional care along with other social services.

Specialty hospitals are licensed establishments for the care of patients with specific types of diseases or medical conditions. For example, specialized emergency centers, hospitals for tropical diseases, orthopedic hospitals, sanatoriums for rehabilitation or disease prevention. These hospitals may also provide outpatient services, laboratory and operating room services.

Hospital staff in modern hospitals are required in significant numbers to provide the whole spectrum of hospital services. Large hospitals may employ between 2000 and 3000 people which makes the management of a hospital a very complex task. The main groups of employees in a hospital are as follows:

- Clinical staff: Physicians or doctors responsible for the diagnosis, treatment and prevention of diseases and surgeons, specializing in performing surgery.
- Nurses performing diagnostic skills (e. g. history taking), therapeutic management (e. g. coordinating

consultations and referrals), and promoting health activities in collaboration with the patient.
- Laboratory staff and pharmacists.
- Administrative staff dealing with finance and accounting, salaries, supply, storage, staff recruitment and training, building maintenance, catering, laundry, etc.

Funding and Payment Systems

According to the health care system and regulatory framework in place, hospitals may be run by the government or independent non-profit organizations with public funding through taxes or social insurances (e. g. in most European countries). Or, hospitals may be privately run with a clear for–profit motive (e. g. in the United States).

Regardless of who owns the hospitals, the methods of financing have changed significantly during the two past two decades all over the industrialized world. There has been a clear shift from open-ended retrospective funding of inpatient health care towards funding based on ► prospective budgets or ► per-case payments. The change in financing methods of hospitals is due to the persisting need for ► cost containment as endlessly rising hospital expenditures are confronted with limited public and private financial resources. Budgets in general are based on historical spending and do not typically incorporate incentives to spend less than the fixed budget. Even annually revised activity-related budgets make it difficult to realize cost containment. Therefore, more and more hospital owners changed the financing method of hospitals towards per-case payments based on purchasing packages, i. e. contractual agreements between purchaser and provider, or on ► diagnosis related groups (DRGs).

Organizational and Structural Changes, Future Challenges

There are four main factors that influence the organizational and structural changes in hospital health care provision:

1. Evolution of disease and treatment
   Many large hospitals reflect the scientific, economic and social situation of the time when they were built, i. e. the early 20th century. Distinctive operative units divided into medical disciplines deliver services according to their own independent procedures. Changes in the presentation of diseases, for example the increasing advent of chronic diseases, have led to a growth in multidisciplinary treatment based on the idea of a health care chain. These scientific and technological changes in disease management (► disease management programs) require a redesign of most hospital structures as rigid and hierarchically organized disciplines do not favor the cooperation of interdisciplinary care-teams.
2. Health policies and payment systems
   The regulatory framework resulting from health policy changes as well as from changes in payment systems influence the investment and delivery of care in hospitals. Payment systems may, for example, privilege investments in hospital equipment but not in the maintenance of hospital buildings. ► Per-case payments based on DRGs may lead to higher admission rates or extensive equipment use not directly related to the health gain but to the higher reimbursement rate.
3. Progress in medical technology
   Advances in health technology, such as diagnostic imaging, intravascular ultrasound and minimal invasive surgery, have led to a considerable reduction in the average length of stay of a patient. This has led to an overall reduction in the number of hospital beds and a higher turnover in patients.
4. Improving quality programs
   Hospitals need to improve their quality of services in many aspects (► health care quality). There is a lack of coordination between services, often an inappropriate use of resources with respect to the quality delivered and scarce maintenance of building and equipment as well as a lack of information among hospital staff on costs and outcome. Improvement in the quality programs necessitates changes in the organization and management of hospitals. The current trend is to consider hospitals as industrial companies which must be organized, managed and evaluated. In this sense, management functions and clinical activities have to be provided with the shared common goal of health care quality. Many initiatives aiming to improve health care quality have been started: for example the introduction of ► clinical guidelines, continuing medical education, disease management programs and standards for health technology assessment.

The continuous development of medical knowledge and treatment practices together with the financial pressure of cost-containment and the rising expectations in terms of quality of care will inevitably lead to further changes in the organization and management of hospitals. The future challenges are two-fold:

1. to change the functional interaction between the levels of care, incorporating the idea of a health care chain to provide effective and integrated health care to the patients, and
2. to change the reporting measures in order to make the effectiveness of health services transparent with regard to patients' health quality.

Cross-References

- ► Activity-Based Bugdets
- ► Clinical Guideline
- ► Cost Containment
- ► Diagnosis Related Groups (DRGs)
- ► Disease Management Programs
- ► Emergency Care
- ► Health Care Quality
- ► Per-case Payment
- ► Prospective Budgets

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Host

Definition

The host is the human or animal to which an agent acquires entry and in which it multiplies. The reaction of the host to infection is variable, resulting in an unapparent or clinical, mild or severe infection.

House Dust Mites

Synonyms

HDM; Dust mites; Domestic mites

Definition

House dust mites (HDM) are small arthropods approximately 0.3 mm in length. The biological family includes 47 species in 17 genera but those most frequently detected in human dwellings are *Dermatophagoides pteronyssinus*, *D. farina*, *Blomia tropicalis* and *Euroglyphus maynei*. The optimal air temperature for dust mite growth is between 18 and 27°C. Their major food source is skin scales and organic debris, but they are almost entirely dependent on ambient humidity for moisture. Feces, in the form of small airborne particles, have great allergenic potential due to protein residues, and inhalation of fecal particles is the main way of exposure. High levels of domestic mites and their allergens are usually observed inside homes in hot and wet climatic zones of the world but have now been found even in northern parts of Europe and North America, where cold and dry climates predominate. The highest mite densities are found in bedrooms and living rooms because these indoor spaces usually have large areas covered by textile materials. The most important adverse health effects due to biological indoor air contamination are asthma (primarily in children), atopic dermatitis, eczema, urticaria, allergic rhinitis, and conjunctivitis. Asthma is strongly associated with sensiti-

zation to indoor allergens, and among them HDM allergens are thought to be a major cause. Indoor relative humidity is the key factor that determines survival and development of house dust mites. For this reason, the most effective recommendations for reducing the HDM population and accumulation of allergens are maintaining relative air humidity below 50%, and encasing mattresses with a special mite-impermeable membranous material. Other recommended measures are improving ventilation, intense and frequent vacuum cleaning, reducing the total textile area in indoor spaces, and even removal of carpets and other floor coverings from the homes (especially from bedrooms) of those who suffer allergies to house dust mites.

Housing

► Urban Environments

HRQL

► Quality of Life

HTA, Aspects of

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Definition

Health Technology Assessment (HTA) is carried out by a multidisciplinary group because it requires wider expertise than any individual or single disciplinary group could be expected to have. While conducting a HTA, medical, methodological, ethical, social, legal, and economic aspects have to be considered, discussed and judged prior to formulation of the recommendations.

Basic Characteristics

Compared to assessing published medical evidence, the methods for assessing the ethical, legal, and social aspects of health technology by HTA are relatively undeveloped. One reason for this might be that integrating ethical inquiry into HTA is methodologically difficult. However, policy makers can only make well-founded decisions on the basis of HTA reports dealing with all of the aspects mentioned below.

Methodological Aspects

The core mission of HTA methodology is to promote the identification, development, and use of appropriate research methods so that health and social care can be built on the best possible evidence base. Consequently, the main purpose of HTA is to determine the available ► scientific evidence, including ► patient safety and risks, ► efficacy, and ► effectiveness.
Methodological aspects are discussed in detail under ► HTA methodology.

Economic Aspects

Because costs and efficiency have made technology prominent in health care policy-making, HTA has become much more focused on (and limited to) economic aspects of health technology, whereas general technology assessment lays greater emphasis on the societal context of technology, or the interactions between technology and society. Consequently, in HTA, different methods are seen as valid and viable. For example, HTA is much more dominated by quantitative (► quantitative research), comparative research than general ► technology assessment, where ► qualitative research is more often regarded as appropriate.

Ethical Aspects

Moral aspects have been on the HTA agenda since HTA itself was first used in Western societies in the early 1970s. The growing importance of biotechnology in medicine since then has added to an increasing awareness of ethical aspects. With relatively new issues like ► genetic testing, ethical questions have entered the agenda, going beyond the traditional clinical considerations. These ethical questions concern the possible impacts on society, and challenge our concept of health and disease as well as our understanding of human dignity, thus introducing a new quality into debates on health care and medicine. Regarding moral aspects, HTA has not matured as a comprehensive approach to evaluating health technology. Instead,

HTA has become much more focused on (and limited to) economic aspects of health technology, often with the consequence of insufficient consideration of ethical aspects of the new technology before a recommendation is made. Although there is no validated method for assessing values or ethics (in healthcare), at least three categories of ethical questions can be distinguished in HTA (Reuzel et al. 2004a):

- Issues related to essential concepts and definitions
- Issues related to the technology, which in health care focus on diagnosis, prevention, and therapy
- Issues related to resource allocation

Social Aspects

There is a need for ethical inquiry in HTA from the perspective that policy-making never appears to be based exclusively on economic (► cost effectiveness) data. Health technologies may have social and ethical consequences that influence policy-making and therefore need to be addressed in HTA. Typically, an ethical inquiry is carried out as an addition to conventional HTA, by including ► patient preferences or ► patient orientation of the procedure assessed in decision modeling, or by ► quality-of-life studies or discussions on equity and distributive justice (Reuzel et al. 2004a).

Legal Aspects

The structure of the legal systems in each particular country is determined by the basic structures of the medical and health care systems themselves. The difference between national health care systems, where the state determines the rules for accepted medical methods and products, and social insurance systems, which are more or less self-governing bodies, has to be observed within the framework of public legal regulations. Another important aspect relates to the local scope of decisions. In some countries, decisions based on HTA reports have effects at a national level, in other systems, only at a regional level. One problem is that the legal concepts for dealing with HTA recommendations, which leave considerable scope for interpretation, are relatively undetermined. Furthermore, the lack of consensus on the criteria and procedures of decision-making in HTA concerning health sciences as well as practice constitute unsatisfactory empirical facts, as well as a normative challenge.

A legal constitution of HTA has to guarantee the coherence of regulations in the different fields of law related to HTA (e. g. pharmaceutical law, law of medicinal products, statutory health insurance law) and the harmonization of their effects in the process of application (Francke 2006).

Cross-References

► Consumer Safety
► Cost-Effectiveness
► Effectiveness
► Efficacy
► Genetic Testing
► HTA, Methodology
► Patient Orientation
► Patient Preferences
► Qualitative Research
► Quality-of-Life Studies
► Quantitative Research
► Scientific Evidence
► Technology Assessment

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HTA, Context of

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Definition

Health Technology Assessment (HTA) has been compared to a bridge between the world of research and the world of decision-making. This bridge is intended to

allow the transfer of knowledge produced in scientific research to the decision-making process. A commonly accepted definition for the context of HTA does not exist because the context of HTA has to take a lot of different aspects into consideration. Besides the published evidence, for example, methodological, social, ethical, and legal circumstances have to be judged prior to giving a recommendation via a HTA report.

Basic Characteristics

Technology Assessment and Health Technology Assessment

► Technology assessment has been described as a comprehensive form of ► policy research that examines short- and long-term social consequences of the application of technology. Developing and/or using (health) technologies is based on value judgments, meaning that social, cultural, ethical, and legal factors are intertwined with the place of (health) technologies in society (Oortwijn et al. 2004). There is no sharp distinction between the terms technology assessment (TA) and health technology assessment with regard to the content because general TA tools can be and are applied to health technologies. Conducting HTAs does not begin and end with the HTA itself, but it is ideally embedded in a course of activities: first, the classification of pending problems; second, the prioritization of topics; third, conducting the research or assessment; fourth, appraisal of the recommendation; and last, its implementation.

Unfortunately, in many countries, the role of TA and HTA in the preparation of decision making and later implementation of these decisions is not well defined.

Perception of HTA

HTA exists alongside policy decisions and is often insufficiently recognized by politicians and health care managers. It is crucial to explain the context of a HTA report clearly, so that readers can better assess whether the report is relevant to their own problems. The context-embedded approach of HTA is a key advantage of these assessments, because ► evidence-based medicine is mainly focused on ► randomized controlled (clinical) trials, with questionable transferability of the results into policy decisions. In order to give an evidence-based solution to the problems addressed in the policy question, the researchers have to define the policy question in terms of safety, ► efficacy, ► effectiveness, and psychological, social, ethical, organizational, professional, and economic aspects of HTA (► HTA, aspects of). These questions determine how the rest of the assessment will be conducted, the aspects that will be evaluated and those that will not, as well as the profundity of the research regarding each of the aspects mentioned.

In each country, the adoption and use of health technology is influenced by many factors, including the perception and experience of health and disease, cultural responses to technology, the nature of the medical profession in the particular country, industrial information and promotion, and the financial and regulatory system.

Cross-References

► Decision-Making Process
► Effectiveness
► Efficacy
► Evidence Based Medicine
► HTA, Aspects of
► Policy Research
► Randomized Clinical Trials
► Technology Assessment

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HTA, Databases

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Definition

Sources for assessing studies to consider within a health technology assessment (HTA) report are mainly literature databases like Medline, EMBASE, Current Contents, etc. For assessing HTA reports themselves, specialized *HTA databases* exist. Normally, these databases are full-text databases (► databases, full text).

Basic Characteristics

Because many organizations throughout the world assess healthcare technology with different focuses, there is an evident need to cooperate and share information from different cultures. The most important medium for sharing such information are HTA databases. The most important of these databases are:

The Cochrane Library

The major product of the ► Cochrane collaboration is the Cochrane Database of Systematic Reviews. The Cochrane Library is published four times a year and is available on CD-ROM and the Internet. Each issue contains all existing reviews plus an increasingly wider range of new and updated reviews. It is published and distributed by Wiley InterScience and is also distributed by a number of other distribution partners. The Cochrane Library is a single source of reliable evidence about the effects of health care. Cochrane reviews are based on the best available information about healthcare interventions. They explore the evidence for and against the effectiveness and appropriateness of treatments (medications, surgery, education, etc.) in specific circumstances. The reviews are mostly prepared by health care professionals who volunteer to work in one of the many ► Cochrane review groups, with editorial teams overseeing the preparation and maintenance of the reviews, as well as applying the rigorous quality standards for which Cochrane Reviews have become known. The activities of the Collaboration are directed by an elected Steering Group and are supported by staff in Cochrane Entities (Centers, Review Groups, Methods Groups, Fields/Networks) around the world.
The following Databases are included in The Cochrane Library:

- The ► Cochrane Database of Systematic Reviews
- The ► Database of Abstracts of Reviewsof Effects (DARE)
- The ► Cochrane Central Register of Controlled Trials (CCTR or CENTRAL)
- The ► Cochrane Database of Methodology Reviews (CDMR)
- The ► NHS Economic Evaluation Database(NHS EED)
- The Health Technology Assessment Database
- The ► Cochrane Database of Methodology Reviews (CDMR)

Databases of the Centre for Dissemination and Reviews (CRD)

The ► centre for reviews and dissemination (CRD) of the National Health Service (NHS) in the United Kingdom was established in January 1994, and aims to provide research-based information about the effects of interventions used in health and social care. It offers three databases: DARE, NHS EED and the HTA database.

Database of Abstract of Reviews of Effects (DARE)

The CRD created this database for reviews and dissemination in 1994. Potential reviews are identified by hand searching key medical journals, regular searching of bibliographic databases, and by scanning gray literature and selected websites. The database includes reviews of health and social care topics. It contains summaries of systematic reviews, which provide a critical commentary on the quality of the review.
Different kinds of records (structured and provisional abstracts, Cochrane Reviews published in journals, Cochrane "flag" reviews) are added to DARE at the end of every month.

NHS Economic Evaluation Database (NHS EED)

Databases like MEDLINE and EMBASE as well as magazines (which are hand searched) and working papers of specialized working groups and ► HTA institutions are the sources of the NHS EED. The database contains bibliographical information and appraisals of economic evaluations in which costs, outcomes of treatment, and care alternatives in health care are compared. Experts in the NHS write appraisals that give information about different aspects of the original study, like study population or study design. Study types that are investigated include economic studies, cost-benefit analyzes, cost-utility analyzes, cost-effectiveness analyzes, cost-minimization analyzes, and cost-consequence analyzes, as well as ► systematic reviews of economic studies.

International Health Technology Assessment (IHTA) Database

The ► IHTA database contains information on HTAs and is produced in collaboration with the ► INAHTA Secretariat, based at SBU, Sweden.

The database contains records of ongoing projects being conducted by members of INAHTA, as well as publications reporting completed technology assessments carried out by INAHTA members and other HTA organizations. The abstracts in the database are descriptive rather than analytical and do not form critical appraisals of the reports (i. e. the reports have not been evaluated by reviewers from the Centre for Reviews and Dissemination).

Many different types of research are included in the HTA database. As well as systematic reviews, the database contains ongoing and completed research based on trials, questionnaires, and economic evaluations. Where possible, the research type is stated in the title or abstract. In some cases there is an overlap between the DARE database (systematic reviews) and the NHS EED database (economic evaluations).

Database of the International Network for Agencies for HTA (INAHTA)

This database was developed in cooperation with the international network of public HTA agencies (International Network of Agencies for Health Technology Assessment, INAHTA) and contains information on the current HTA projects and published HTA reports of INAHTA members. Information includes evaluation of medical procedures and technologies in health care, and is available as various kinds of documents, such as HTA reports, studies, survey results, economic appraisals, and systematic reviews.

DAHTA Databases

The ► DAHTA database contains HTA reports and projects provided by the German Agency for Health Technology Assessment ► DIMDI (DAHTA@DIMDI). In addition, other institutions like the Federal Physicians' Chamber (Bundesaerztekammer) and the National Association of SHI-Accredited Physicians (KBV) use the database to publish their HTA projects. Current international HTA reports are continuously included, with German abstracts of international HTA reports added by the DAHTA database staff. The database contains studies concerning medical evaluation and cost-efficiency of drugs, therapies, and surgical procedures, as well as studies supporting management and organization systems of health services.

Cross-References

- ► Centre for Reviews and Dissemination (CRD)
- ► Cochrane Central Register of Controlled Trials (CCTR or CENTRAL)
- ► Cochrane Collaboration
- ► Cochrane Database of Methodology Reviews (CDMR)
- ► Cochrane Database of Systematic Reviews
- ► Cochrane Review Groups
- ► DAHTA
- ► Database of Abstracts of Reviewsof Effects (DARE)
- ► Databases, Full-Text
- ► DIMDI
- ► HTA, Institutions
- ► IHTA
- ► INAHTA
- ► NHS Economic Evaluation Database(NHS EED)
- ► Systematic Reviews

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Database of Abstracts of Reviews of Effects (DARE): http://www.york.ac.uk/inst/crd/crddatabases.htm#DARE

Database of the International Network for Agencies for HTA (INAHTA): http://www.inahta.org/inahta_web/index.asp

Health Technology Assessment (HTA) Database: http://www.york.ac.uk/inst/crd/crddatabases.htm#HTA

NHS Economic Evaluation Database (NHS EED): http://www.york.ac.uk/inst/crd/crddatabases.htm#NHSEED

Ongoing Reviews Database: http://www.york.ac.uk/inst/crd/crddatabases.htm#ongoing

HTA-Europe Project

Definition

The HTA-Europe project was developed from a recommendation in the ► EUR-ASSESS project. In the HTA-Europe project, partners examined several preventive technologies in their respective countries, showing that prevention and screening procedures often seem to be prematurely adopted, without adequate assessment. The HTA-Europe project, as well as the EUR-ASSESS project, was aimed at improving coordination of HTA activities in the European Union. The main conclusion of this report was that it would be beneficial for the healthcare system of European Union countries for the European Commission to assist the establishment

of a coordinating mechanism for HTA at the European level.

HTA, Impact of

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Definition

The Impact of Health Technology Assessment (HTA) is the sum of the broad and diverse effects stemming from a ► HTA program's activities.

Basic Characteristics

Like other health technologies, HTA should be judged on the quality and size of its effects. In recent years, this aspect has received increased attention. HTA has begun to become an important part of health care policy-making in many countries.

The goal of HTA is change; it should help to demonstrate problems and potentials in disease control. Topics chosen for assessment must be important to society and information should be presented in a form that is useful to the intended audience. Technology assessment identifies the groups that will be affected by the proposed technology and evaluates the impact of the technology on each party.

Furthermore, together with the dissemination and implementation of HTA recommendations, the evaluation of their effects is an important factor of HTA.

However, the response of policy-makers shows that many of them do not see the importance of assessment. There is more interest in controlling costs then in steering health care. That means that even when good assessments are done, their impact on policy-making has been modest. Some factors cause some HTA to have little impact; a prerequisite for the assessment to be effective is that it must be comprehended and accepted by those who use it. Furthermore, content and preparation of the assessment must be properly formulated for it to be interesting.

The effects of HTAs are linked with the assessing institution and the motivation of its commissioner (Gerhardus et al. 2006).

For best use of HTAs, exact formulation of the impact aims is needed. As a first step in assessing a technology, the people concerned should be defined. These people have to formulate the aims and disseminate the recommendations of the HTA. Effects of HTA should then be evaluated, and if defined impact aims are not reached, a discussion should follow.

Impact Measures

Measuring the impact of HTA is very difficult due to the multiplicity of other influences on the policy-making process and the difficulty of measuring the longer-term impacts of HTA (Hailey 1990). Studies of HTA impact should include at least three types of evaluation: context, implementation, and outcome (Peterson 1998). Context evaluation identifies environmental enablers and barriers that influence the impact of HTA products; implementation evaluation identifies critical processes and activities in producing HTA products that influence impact; and outcome evaluation identifies the extent to which the HTA products influence healthcare policy and decision-makers. Normally, products that present evidence with clear conclusions tend to have a greater influence on decision making than those that do not.

A widely used measuring method in HTA impact analyses is direct ► client interviews. This could be "product specific", semi-structured interviews with requesters and purchasers. However, even if a HTA does not result in instrumental utilization, this is not "no impact".

In conclusion, the current impact of HTA on policy decisions has not been clearly and systematically examined, and programs on this topic are not implemented, even in the countries that have been using HTA intensively for decades.

Cross-References

► Client Interviews
► HTA Program

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HTA, Institutions

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Definition

Many organizations throughout the world assess healthcare technology. In the past twenty years, there has been a rapid expansion of the international Health Technology Assessment (HTA) community, which today includes 42 public organizations in 21 countries, and numerous private and nonprofit organizations (Mulcahy and Walley 2005). Many efforts have been made to share experiences at an international level, like establishing the International Society for Technology Assessment in Health Care. This network stretches from North and Latin America to Europe, Australia, and New Zealand.

Basic Characteristics

HTA in Europe

HTA is currently managed actively in 16 European countries, the old Member States of the European Union, plus Switzerland. These countries have established different national programs, tailored to their own healthcare environment. The leaders are Sweden and Denmark, who began to assess health technologies in the early 1970s. A number of the States of Europe are deeply involved in HTA, including Spain, The Netherlands, France, Sweden, and the United Kingdom (UK). Other countries have more recently begun to support and use HTA, including Austria, Belgium, and Germany. In the UK, a centralized National Health Service (NHS) program was established in 1993. The UK program is noted for its strong relationship with the UK appraisal organization, the National Institute for Health and Clinical Excellence (NICE), which uses HTA as the basis for its guidance for the NHS. Some of the national agencies are outlined below:

United Kingdom: National Coordinating Center for Health Technology Assessment (► NCCHTA)

France: National Agency for Accreditation and Evaluation in Health (► ANAES, formerly ANDEM)

Spain: National Spanish Agency for Health Technology Assessment

Netherlands: The Netherlands Organization for Applied Scientific Research (► TNO)

Sweden: Swedish Council on Health Technology Assessment in Health Care (► SBU)

ISTAHC and INAHTA

The foundation of the International Society for Technology Assessment in Health Care (ISTAHC) in 1985 in Copenhagen had the aim of beginning and promoting international communication and co-operation. The ISTAHC now has more than 1000 members all over the world and is today called HTAi (www.htai.org). In 1993, the International Network of Agencies for Health Technology Assessment (► INAHTA) was created. This Network presently has more than 20 members, mostly from European Countries (www.inahta.org), and provides access to a database of HTA reports and ongoing assessments. Networks across Europe are necessary to avoid the gaps and duplication in coverage of HTA that have become increasingly apparent. One project was inaugurated in 1994, and called the ► EUR-ASSESS project. Part of the aim of this project was to establish a network of those working in HTA in Europe. The need for improved co-ordination of HTA in Europe led to a subsequent project, the ► HTA-europe project, which was organized by the TNO Prevention and Health Institute in the Netherlands. A third project, the European Collaboration for Health Technology Assessment (► ECHTA), explored the possibilities of institutionalizing HTA at a European level. One of the most prominent outputs of this project was the formulation of best practice guidelines for undertaking and reporting HTAs (Busse et al. 2002). The most recent project, which was officially started in January 2006, is the European Network for Health Technology Assessment project (► EUnetHTA project).

HTA in North America and the United States

The first formal activity in HTA was the Health Program of the US Office of Technology Assessment, established in 1975. In the United States, the Agency for Healthcare Research and Quality (► AHRQ), Veteran's Administration Technology Assessment Program, and a multitude of private healthcare organizations and companies each conduct their own HTA. This

often leads to a fragmented, duplicative and highly variable quality of HTA in that country (Perry and Thamer 1999).

Cross-References

- ► AHRQ
- ► ANAES
- ► ECHTA
- ► Effectiveness
- ► EUnetHTA Project
- ► EUR-ASSESS
- ► HTA-Europe Project
- ► INAHTA
- ► NCCHTA
- ► SBU
- ► TNO

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HTA, Methodology

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Definition

Methods for assessing health technology assessment (HTA) reports have to use best scientific practices and procedures. Despite policy goals, HTA must always be firmly rooted in science and the scientific method. The process must be carried out with integrity and results must be valid.

Basic Characteristics

Research Question

For best use of HTAs, exact formulation of the impact aims is needed. In a first step of technology assessment, the people concerned should be defined. HTA promotes the decision-making of different kinds of associations, such as ► healthcare providers (e. g. ► HMOs), ► statutory health insurance providers, purchasers, patients, or policy-makers. These people have to formulate the aims and disseminate the recommendations of the HTA. A policy question, formulated by decision makers, is then transformed into the correct ► research question.

Realization of HTA

The core mission of HTA methodology is to promote the identification, development, and use of appropriate research methods so that health and social care can be built on the best possible evidence base.
Consequently, the main purpose of HTA is to determine the available ► scientific evidence, including ► patient safety and risks, efficacy, and effectiveness. HTA researchers retrieve, analyze and synthesize the available evidence. A ► systematic literature review is one important element in determining the efficacy and safety of a technology. Evaluations are based on different research categories: randomized clinical trials (► primary research), systematic reviews (► secondary research), and ► treatment guidelines or synthesis of evidence (► tertiary research). The group of studies that are considered to be the best available to answer the questions posed is called the "body of evidence". It is characterized by a combination of factors, such as the hierarchy of research design, the directness of the evidence, and the quality of execution. The strength of evidence is also influenced by other factors. In judgment of the evidence, the number of studies, size of effects, and homogeneity or consistency of results across all included studies should not be neglected. In the completed HTA report, literature is presented in tables or by ► meta-analysis. The literature used is also prepared in a useful manner for decision-makers. The challenge is to judge evidence from different studies. Research is contracted to academic researchers and investigation centers; multidisciplinary teams in scientific institutions are advantageous for the realization of HTA reports.

HTA Reports

The product of the HTA process is the assessment report or HTA report. The methodology must be exactly and transparently documented. The way researchers make their judgments about the strength of the evidence that will underlie their recommendations should be pub-

lished in a distinct manner. A review has identified 40 different systems used to rate the strength of evidence; it therefore seems intelligible to explain the used system in the report (West et al. 2002). Rating of the strength of evidence causes a grading of recommendation. There are also several systems to standardize the process of grading the strength of recommendation. Using letters is a typical way to describe the strength of recommendations (West et al. 2002).

The HTA program of each country normally publishes its generated HTA reports. In addition, they should be included in the ► cochrane library and other worldwide ► HTA databases.

Quality of HTA Reports

There are high claims for the quality of HTA reports and their recommendations. However, different problems may be present in these reports, especially the risk of unsystemic literature research and valuation. To prevent these risks, many countries have established HTA methodology programs. The most well-known of these programs is the ► UK HTA methodology programme, coordinated by the National Coordinating Centre for Research Methodology (NCCRM) in Birmingham.

Outcomes of HTA Reports

The outcome of a HTA report is normally a determination of the appropriateness of payments for services in health care systems.

Generally, HTA is intended to assist decision-makers in adopting rational decisions concerning three principal issues related to new health technologies (Pan American Health Organization 1998):

- approval for market access,
- approval for their inclusion in services financed with public funds, and, if appropriate,
- proper dissemination within the health system.

With regard to existing health technologies, HTA is intended to orient rational decision-making with respect to three principal issues:

- withdrawal of financing for technologies proven to be inefficient,
- generalization of new applications of technologies that already exist in the public health system, and
- withdrawal of technology (or suppression of one of its indications) from the market (e. g. a drug such as thalidomide, which was withdrawn because of its side effects).

Cross-References

► Cochrane Library
► Consumer Safety
► Healthcare Providers
► Health Maintenance Organizations (HMOs) (U.S.)
► HMO
► HTA, Databases
► Meta-Analysis
► Primary Research
► Research Question
► Scientific Evidence
► Secondary Research
► Statutory Health Insurance
► Systematic Literature Review
► Tertiary Guidelines
► Treatment Guidelines
► UK HTA Methodology Programme

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HTA Program

Definition

A HTA program is any governmental or private effort or structured program to promote HTA or several aspects of HTA in specific regions or worldwide. HTA programs include, for example, ► EUnetHTA and ► EUR-ASSESS.

Human Activity Integrating Risk Identification

► Risk Management

Human Capital Approach

Definition

The human capital approach is a method to estimate the ► indirect cost due to productivity loss. The value of the human capital is approximated by the value of an average individual's future earning. The entire period of absence from work due to illness is considered and valued by the achievable gross income. Over a long-time perspective, the human capital approach estimates higher indirect costs compared with the friction cost method.

Human Engineering

► Ergonomics

Human Factors

Definition

The terms ► ergonomics and human factors engineering are often used interchangeably. Initially ergonomics was more physiology and comfort oriented, while human factors engineering was more oriented to physical sciences. Ergonomics has traditionally focused on how work affects people, while the emphasis in human factors (engineering) is on the cognitive and perceptual factors leading to the design of systems that reduce the operation errors. "Human factors" is an umbrella term for several areas of research that include human performance, technology, design, and human-computer interaction.

Cross-References

► Ergonomics

Human Factors Engineering

► Ergonomics

Human Health Aspects of Disasters

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Synonyms

Disaster impacts on human health

Definition

Relations of disasters to human health

Basic Characteristics

Even if disasters (► hazards, natural; ► hazards, technological) are not commonly perceived as public health events, they clearly lead to deterioration of human health over vast disaster-affected areas.

Direct health-related impacts of disasters are: deaths, injuries, ► communicable diseases, and mental health problems. Health effects may result from unsafe or unhealthy conditions (lack of safe drinking water, spoiled food supplies) following the disastrous event. Indirect effects arise through social and economic disruption, infrastructure damage, and population displacement.

There are short-term health effects, such as injuries and stress associated with the disaster, and long-term health consequences, such as malnutrition, psychiatric disorders, depression, anxiety, alcohol or substance abuse, functional disabilities, and domestic (children and spouse) violence.

Life-threatening situations may arise, e. g. in elderly and lonely people with severe health problems who were trapped and abandoned in their homes.

Population displacement following disasters leads to increases in communicable diseases resulting from crowding, lack of clean water and shelter, and poor nutritional status. Due to the very large number of people that may be affected, malnutrition and famine triggered by disastrous events may be among the most important consequences of natural disasters, and the resultant deaths may outnumber the direct fatalities.

In areas hit by a disaster with no evacuation warning, the hardship can be even more intense. Families spend nights huddled together in places they believe to be relatively "safer", which may not necessarily be safer in reality.

Disasters test the integrity of water supply systems and increase the risk of outbreaks of water-borne diseases. The impacts of disasters are particularly severe in less developed areas featuring environmental degradation and in communities lacking basic public infrastructure. Populations with poor sanitation infrastructure and a high burden of infectious disease often experience increased rates of diarrheal diseases after disaster events. Post-disaster increases in cholera and typhoid have been reported. After some disasters in less developed countries, such as the 2004 tsunami, there was a higher risk of disease outbreaks caused by polluted drinking water and a higher risk of communicable diseases.

There is much evidence of the impact of disasters on mental health. There may be considerable prolonged impairment by common mental disorders (anxiety and depression). Depending on how much suffering, death, and destruction they witness during a catastrophe, some survivors suffer from ► post-traumatic stress disorder (PTSD), the same disorder that afflicts combat veterans. PTSD is psychological damage that develops after a traumatic experience and is almost always a delayed reaction to the trauma. Symptoms might appear soon after the event, but they might not surface until several months or even years have passed.

Among the symptoms of PTSD are a vanished sense of security, fear of another disaster, hypervigilance, fatigue, poor concentration, somatic problems (sleep disturbances, appetite difficulties, etc.), feeling nervous or tense, depression, and anxiety/stress. These are the expected reactions of a person who is suffering PTSD and facing the fact that their life circumstances have changed dramatically. Dealing with death or injury of family members, loss of a home, radically transformed neighborhoods, joblessness, the inconvenience of extensive repairs, etc., can cause a state of long-lasting shock and the rational thinking processes of those affected may not function normally.

Those who experience disasters are prone to severe stress. Children suffer ongoing nightmares. They often cling to their parents and refuse to go to school. Moreover, children who do attend school after a traumatic disaster – even those who have typically behaved well – may develop serious discipline problems.

Health impacts of disasters also fall under the categories of ► medically unexplained physical symptoms (MUPS) and ► functional somatic syndromes (FSS).

Many survivors of a disaster have two life-changing experiences. First, when they endure the trauma itself (e. g., seeing floodwaters sweep away their homes, watching gale-force winds destroy their neighborhoods, or witnessing the sudden death of their family members, friends, or neighbors), which might undermine (even permanently and irreparably) their sense of security and their ability to cope with life's problems. Second, they may face ongoing disorder in their day-to-day lives.

Cross-References

► Communicable Diseases
► Hazards, Natural
► Hazards, Technological

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Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS)

Synonyms

Human t-cell leukemia virus type III; Human t-cell lymphotrophic virus type III; Lymphadenopathy-associated virus

Definition

HIV is a retrovirus that is the cause of AIDS. The retrovirus gradually weakens the immune system by attacking Helper T cells. Two types of HIV exist: HIV-1 and HIV-2. HIV-1 is common worldwide, while HIV-2 is only common in West Africa. HIV is spread from person to person through blood, breast milk or other bodily fluids. This may occur through blood transfusions, hypodermic needles, or sexual contact. Mothers who have HIV while they are pregnant may spread the infection to their unborn child. An individual who has the retrovirus in their blood is called "HIV-positive". AIDS occurs when the HIV infection has severely damaged the immune system, a process that may take years. An HIV-positive person may or may not develop AIDS; however they can infect other people with the HIV virus.

Cross-References

► HIV-Infection and AIDS

Human Interaction

Synonyms

Interpersonal; Organizational interactions or relations

Definition

Human relations are defined as network of many different relations between humans either interpersonal or organizational relations.

Cross-References

► Human Relations

Humanitarian Agency

Synonyms

Aid agency; Aid organization; Relief organization

Definition

An aid agency is an organization dedicated to the support of people, animals, and nature in time of need. There are organizations within government as well as between governments as multilateral donors and as private voluntary organizations. Often humanitarian agencies are engaged in a special theme, such as the United Nations Children's Fund that supports children.

Humanitarian Aid

► Humanitarian Relief Operations

Humanitarian Relief Operations

Synonyms

Supporting measures; Humanitarian aid

Definition

Humanitarian relief operations assist victims of war, civil conflict, and natural disasters with material or logistical help. Particularly, it provides food and medicine. Aid is delivered by governmental agencies, non-governmental organizations, and humanitarian agencies to save lives, alleviate suffering, and maintain human dignity.

Humanity

Definition

It is based on humanitarian principles that ones duty is to strive to promote the welfare of mankind.

Human Relations

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Synonyms

Social relations; Human interaction

Definition

Most commonly, the term 'human relations' refers to any interaction between individuals or groups. Over the last century a number of disciplines, particularly in the social science and humanities areas, have contributed to understanding and analyzing the complexity and character of human relations and how they operate at the individual, group and societal levels.

Basic Characteristics

Describing 'Human Relations'

People take part in many forms of 'human relations' every day, whether it is in one-to-one situations, with family, at social gatherings, as part of a group or work organization, at a political level and through interaction with their ecological environment (McMichael 2001). Human relations are an important focus across a range of disciplines within the social science field including psychology, sociology, politics, anthropology and economics. Although concepts and interpretation may vary between disciplines, it is generally recognized that a defining feature of human relations is its focus on interaction and communication. The term 'human relations' is often used interchangeably with that of '► social relations' having connotations of association, co-operation, mutual dependence and belonging.

Individual and Group Human Relations

Social relations form the basis of concepts such as social organization and social structure and a central focus for human relations has been the examination and analysis of relationships between individuals and groups of people. At the individual level, areas such as interpersonal behavior focusing on socialization and personality development, attitude formation and perception of self are all seen as being important aspects of human relations (Cooper and Denner 1998). Equally, the culture of families, which may be viewed as a social system with their own particular group processes, or whole communities, which also have their own structures and organization, and may be influenced by, for example, changing patterns in employment opportunities or altered patterns of demography in urban and rural communities, reflect a group level focus in the broader context of human relations.

At the societal level, analysis of unequal positions such as by class, ethnicity, and sex/gender may have a substantial political impact and assist in understanding the structural cause of such inequalities, offer potential solutions for resolving the problems and assist in the formulation of public policy, at national and international levels (Macionis 2005). For example, the recognition of indigenous rights in many countries has led to the establishment of health initiatives involving community workers, health professionals and educators, all committed to addressing health inequalities amongst indigenous peoples and facilitated information sharing between indigenous peoples (Ellison-Loschmann and Pearce 2006).

Human Relations Theory

The social world of adults is primarily patterned around work activity and it is within this area that human relations theory first developed as part of a wider focus on organizational structure and management in the work place. These trends were enhanced with increasing industrialization and the era of mass production and assembly-line work which became more common from the mid 19th century onwards. Human relations theory was developed in the early 1920s based on the work of Elton Mayo who examined the effect of social relations, motivation, and employee satisfaction on factory productivity (Rotemberg 1994). Other schools were established, for example, the 'Neo-Human Relations School' introduced in the 1950s, by Abraham Maslow and Frederick Herzberg which focused primarily on the psychological needs of workers (Adair 1990). The human relations approach stressed that organizational structure did not necessarily take precedence over social and emotional aspects associated with being part of a team or

feelings of job security and recognition, which were all important aspects in employee motivation.

Human Relations and Health

Human relations are constantly changing, adjusting and shifting to fit the context and environment in which they occur and all of these changes have health effects (Pearce and McMichael 2001). The *agricultural revolution* probably began in the "fertile crescent" of Southwest Asia and involved major environmental changes from the development of organized agriculture and the establishment of cities. These changes were initially reflected in a smaller human body size and, apparently, shorter life expectancy, but were followed by increased population growth. The *industrial revolution*, and the associated period of imperialism and colonialism, commenced in Great Britain in the late 18th century, and initially involved widespread social, environmental and economic disruption and life expectancy initially fell before beginning to increase again in the second half of the nineteenth century. We are currently undergoing the *information technology revolution* and an associated process of economic, social and cultural globalization. In industrialized countries, this is likely to prolong life expectancy for some, but not all, sections of the population. In developing countries, the benefits have been even more mixed, while the countries of Eastern Europe are experiencing the largest sudden drop in life expectancy that has been observed in peacetime in recorded human history with a major rise in alcoholism and "forgotten" diseases such as tuberculosis and cholera (Men et al. 2005).

These changes particularly affect those who may be most vulnerable in a society due to, for example, poverty, ethnicity, illness or political beliefs. It has been recognized that indigenous peoples may be exposed to an unequal burden of risk as a result of historical injustices which are perpetuated by present day government policies. For example, the major restructuring of health and social services in New Zealand during the 1980s resulted in a widening gap in inequality as evidenced in key determinants of health such as income, employment, and housing between Māori, the indigenous people, and non-Māori (Ellison-Loschmann and Pearce 2006). More recently, a number of studies have shown associations between (lack of) social networks, income inequality and (lack of) social capital and poor health in populations, although it is not clear that the observed associations are causal (Pearce and Davey Smith 2003).

Conclusions

Human relations draws on an eclectic range of ideas from across a number of disciplines, notably sociology and psychology, in order to understand the behavior and interaction between individuals, groups, organizations and societies and the ways in which these varying levels of interaction may be used to promote and influence change both locally and globally. Developments in the way people thought about work in the early 20th century helped shift the focus from a purely productivity driven environment towards one recognizing the 'human' elements of organizations albeit focused primarily on maintaining profitability. The constantly changing nature of human relations has various health effects at the individual, societal and global levels. Negative health effects are more likely to be experienced by vulnerable populations and a recent focus in a number of countries has been on addressing inequalities amongst indigenous peoples across a range of areas such as culture, education, health, and social and economic development.

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Human Rights

Synonyms

Natural rights

Definition

Human rights are minimum standards of legal, civil, and political freedoms which guarantee dignity to people. To treat people as if they were not human beings is a violation of their rights. A basis for a universal and internationally protected code of human rights was established by the adoption and proclamation of the United Nations' Universal Declaration of Human Rights in 1948. The UN and other organizations work for the protection and promotion of human rights of all people around the world.

Human Rights and Public Health

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Synonyms

Basic rights; Natural rights

Definition

The human rights are the elementary, natural and inalienable rights attributed to all on account of their existence as human beings. Human rights represent the institutionalized legal, philosophical, political and moral considerations about the inherent dignity and equal rights all human beings are entitled to and which the state has to respect and protect. The human rights aim to provide individuals with the basic personal, political and property rights as well as the basic freedoms. They ensure the individual's protection from state actions ("defense rights") and provide them with claims vis-à-vis the state to ensure their participation in the society's political, cultural and social life.

Basic Characteristics

History of Human Rights

The institutionalization of human rights derives from the idea that all human beings are naturally provided with basic rights that are inalienable and must be respected by the state and its institutions. The history of human rights goes back to ancient times. As one of the earliest legal documents, the Magna Carta of England (synonym: Magna Carta Libertatum) from the year 1215 acclaimed the existence of certain personal rights vis-à-vis the kingdom's powers. Among others, the Magna Carta proclaimed the individual rights that no "free man" should become arrested, deprived of his properties, attacked or imprisoned without a "lawful judgment". The Magna Carta must be regarded as one of the fundamental documents for the institution of the contemporary constitutional state.

Later, in the 17th century, several acts were created that implemented human rights into national law, such as the Habeas Corpus Act (1679) in England, protecting persons from unlawful detentions and, particularly, the English Bill of Rights (1689). Therein, positive personal rights were codified, which becomes obvious when reviewing the longer original title of the bill "*An Act Declaring the Rights and Liberties of the Subject and Settling the Succession of the Crown*". The English Bill of Rights has influenced future national constitutional documents as well as the Universal Declaration of Human Rights proclaimed by the United Nations in 1948. For example, "The Virginia Declaration of Rights" (1776) and the "United States Bill of Rights" (1791) were declared. Article 1 of the Virginia Declaration of Rights stated "*[T]hat all men are by nature equally free and independent, and have certain inherent rights, of which, when they enter into a state of society, they cannot, by any compact, deprive or divest their posterity; namely, the enjoyment of life and liberty, with the means of acquiring and possessing property, and pursuing and obtaining happiness and safety.*"

In 1789, France proclaimed the "Declaration of Human and Citizen Rights" ("*Déclaration des Droits de l'Homme et du Citoyen*") which similarly included positive human rights. After World War II, the United Nations then took on and furthered the acceptance of human rights. On 10 December 1948, the General Assembly of the United Nations adopted and proclaimed the "Universal Declaration of Human Rights" (United Nations 1948). A profound explication of single human rights would go far beyond the scope of this essay. However, in order to provide a full picture of the protected rights and because of its fundamental world-

wide importance, the "Universal Declaration of Human Rights" is reproduced in verbatim:

"Universal Declaration of Human Rights

Adopted and proclaimed by General Assembly resolution 217 A (III) of 10 December 1948

On December 10, 1948 the General Assembly of the United Nations adopted and proclaimed the Universal Declaration of Human Rights the full text of which appears in the following pages. Following this historic act the Assembly called upon all Member countries to publicize the text of the Declaration and "to cause it to be disseminated, displayed, read and expounded principally in schools and other educational institutions, without distinction based on the political status of countries or territories."

PREAMBLE

Whereas recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of freedom, justice and peace in the world,

Whereas disregard and contempt for human rights have resulted in barbarous acts which have outraged the conscience of mankind, and the advent of a world in which human beings shall enjoy freedom of speech and belief and freedom from fear and want has been proclaimed as the highest aspiration of the common people,

Whereas it is essential, if man is not to be compelled to have recourse, as a last resort, to rebellion against tyranny and oppression, that human rights should be protected by the rule of law,

Whereas it is essential to promote the development of friendly relations between nations,

Whereas the peoples of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have determined to promote social progress and better standards of life in larger freedom,

Whereas Member States have pledged themselves to achieve, in co-operation with the United Nations, the promotion of universal respect for and observance of human rights and fundamental freedoms,

Whereas a common understanding of these rights and freedoms is of the greatest importance for the full realization of this pledge,

***Now, Therefore THE GENERAL ASSEMBLY proclaims THIS UNIVERSAL DECLARATION OF HUMAN RIGHTS** as a common standard of achievement for all peoples and all nations, to the end that every individual and every organ of society, keeping this Declaration constantly in mind, shall strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition and observance, both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction.*

Article 1.

All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.

Article 2.

Everyone is entitled to all the rights and freedoms set forth in this Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status. Furthermore, no distinction shall be made on the basis of the political, jurisdictional or international status of the country or territory to which a person belongs, whether it be independent, trust, non-self-governing or under any other limitation of sovereignty.

Article 3.

Everyone has the right to life, liberty and security of person.

Article 4.

No one shall be held in slavery or servitude; slavery and the slave trade shall be prohibited in all their forms.

Article 5.

No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment.

Article 6.

Everyone has the right to recognition everywhere as a person before the law.

Article 7.

All are equal before the law and are entitled without any discrimination to equal protection of the law. All are entitled to equal protection against any discrimination in violation of this Declaration and against any incitement to such discrimination.

Article 8.

Everyone has the right to an effective remedy by the competent national tribunals for acts violating the fun-

damental rights granted him by the constitution or by law.

Article 9.

No one shall be subjected to arbitrary arrest, detention or exile.

Article 10.

Everyone is entitled in full equality to a fair and public hearing by an independent and impartial tribunal, in the determination of his rights and obligations and of any criminal charge against him.

Article 11.

(1) *Everyone charged with a penal offence has the right to be presumed innocent until proved guilty according to law in a public trial at which he has had all the guarantees necessary for his defence.*

(2) *No one shall be held guilty of any penal offence on account of any act or omission which did not constitute a penal offence, under national or international law, at the time when it was committed. Nor shall a heavier penalty be imposed than the one that was applicable at the time the penal offence was committed.*

Article 12.

No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks.

Article 13.

(1) *Everyone has the right to freedom of movement and residence within the borders of each state.*

(2) *Everyone has the right to leave any country, including his own, and to return to his country.*

Article 14.

(1) *Everyone has the right to seek and to enjoy in other countries asylum from persecution.*

(2) *This right may not be invoked in the case of prosecutions genuinely arising from non-political crimes or from acts contrary to the purposes and principles of the United Nations.*

Article 15.

(1) *Everyone has the right to a nationality.*

(2) *No one shall be arbitrarily deprived of his nationality nor denied the right to change his nationality.*

Article 16.

(1) *Men and women of full age, without any limitation due to race, nationality or religion, have the right to marry and to found a family. They are entitled to equal rights as to marriage, during marriage and at its dissolution.*

(2) *Marriage shall be entered into only with the free and full consent of the intending spouses.*

(3) *The family is the natural and fundamental group unit of society and is entitled to protection by society and the State.*

Article 17.

(1) *Everyone has the right to own property alone as well as in association with others.*

(2) *No one shall be arbitrarily deprived of his property.*

Article 18.

Everyone has the right to freedom of thought, conscience and religion; this right includes freedom to change his religion or belief, and freedom, either alone or in community with others and in public or private, to manifest his religion or belief in teaching, practice, worship and observance.

Article 19.

Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

Article 20.

(1) *Everyone has the right to freedom of peaceful assembly and association.*

(2) *No one may be compelled to belong to an association.*

Article 21.

(1) *Everyone has the right to take part in the government of his country, directly or through freely chosen representatives.*

(2) *Everyone has the right of equal access to public service in his country.*

(3) *The will of the people shall be the basis of the authority of government; this will shall be expressed in periodic and genuine elections which shall be by universal and equal suffrage and shall be held by secret vote or by equivalent free voting procedures.*

Article 22.

Everyone, as a member of society, has the right to social security and is entitled to realization, through national effort and international co-operation and in accordance with the organization and resources of each State, of the economic, social and cultural rights indis-

pensable for his dignity and the free development of his personality.

Article 23.

(1) *Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment.*

(2) *Everyone, without any discrimination, has the right to equal pay for equal work.*

(3) *Everyone who works has the right to just and favourable remuneration ensuring for himself and his family an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection.*

(4) *Everyone has the right to form and to join trade unions for the protection of his interests.*

Article 24.

Everyone has the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay.

Article 25.

(1) *Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.*

(2) *Motherhood and childhood are entitled to special care and assistance. All children, whether born in or out of wedlock, shall enjoy the same social protection.*

Article 26.

(1) *Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.*

(2) *Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.*

(3) *Parents have a prior right to choose the kind of education that shall be given to their children.*

Article 27.

(1) *Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits.*

(2) *Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.*

Article 28.

Everyone is entitled to a social and international order in which the rights and freedoms set forth in this Declaration can be fully realized.

Article 29.

(1) *Everyone has duties to the community in which alone the free and full development of his personality is possible.*

(2) *In the exercise of his rights and freedoms, everyone shall be subject only to such limitations as are determined by law solely for the purpose of securing due recognition and respect for the rights and freedoms of others and of meeting the just requirements of morality, public order and the general welfare in a democratic society.*

(3) *These rights and freedoms may in no case be exercised contrary to the purposes and principles of the United Nations.*

Article 30.

Nothing in this Declaration may be interpreted as implying for any State, group or person any right to engage in any activity or to perform any act aimed at the destruction of any of the rights and freedoms set forth herein."

This declaration became internationally important and strengthened the basis and international acceptance of human rights even though it is not legally binding to the nations. This movement has led to the conclusion of international agreements on the furtherance of civil, political, cultural, economic and social rights and agreements against racial discrimination. The "Universal Declaration of Human Rights" formed the basis for the European "Convention for the Protection of Human Rights and Fundamental Freedoms" (synonym: "European Convention on Human Rights") in 1950. By virtue of this Convention, the "European Court of Human Rights" was instituted. Both the European Convention on Human Rights and the European Court of Human Rights have contributed significantly to the protection of human rights in Europe. Most national constitutions

worldwide have enacted national laws to include the human rights and values proclaimed in the "Universal Declaration of Human Rights" (Feldman 2006). The "Universal Declaration of Human Rights" is regarded as setting forth "the ethics of public health", as both pursue the same goal, which is "to provide the conditions under which people can flourish" (Annas 1998).

Human Rights and Public Health

With respect to the relation between human rights and public health practice, actions taken by public health departments can impact most of these human rights although some of them are more often affected. For example, isolations invade the individual's right to liberty, freedom of movement and assembly. Surveillance and data collection by public health departments invade the private sphere and the right to privacy, as may overreaching press coverage (*See* Kirchhoff 2005). Human rights with particular relevance in public health practice are the following:

- The right to life, liberty and security;
- The right to a standard of living adequate for health and well-being, including food and medical care;
- The right to social security;
- The right to property and not to be deprived of own property;
- The right to work and free choice of employment;
- The right to just and favorable conditions of work;
- The right to respect privacy and family life;
- The right to be treated equal before the law;
- The right to a fair trial (due process);
- The freedoms of movement and residence;
- The freedom from arbitrary arrest and detention;
- The freedom of expression and of assembly;
- The right to an effective remedy for violations of rights.

Human rights and public health are interwoven in many ways. As described in the essay about the legal basis of public health, the state's powers to conduct public health activities derive from the human rights of the people as members of the population. All individuals' rights to health, safety and life and their corresponding right to protect themselves (self-defense) are delegated to the state and its institutions. Therefore, it is the state's core duty and authorization to protect its people (i. e., the population) from harm to their health, safety and lives. Therefore, the public health service is not an end in itself but is aimed at the protection and promotion of the respective rights of the population. In this sense, the public health service is an instrument of human rights protection. Both act in the same direction and are "concordant in many important ways" (Bernheim et al. 2007) and "synergistic" (Mann 1997; Childress et al. 2003).

The concordance between public health practice and human rights is not disproved by the fact that public health actions may infringe the human rights of persons posing risks to the population. Public health practice has to protect the (rights to) health, safety and life of the population and, in so doing, must take measures against individuals who endanger the population. The elimination of risk by intruding individual rights is the result of prior legal balancing of the endangered human rights of the population and the human rights of the dangerous person. The fact that public health encroaches the rights of the latter in order to protect the rights of the former does not generally cause tension between human rights and public health. In such cases, the human rights of the population and the respective dangerous individual are in conflict and such conflicts must be resolved by legal balancing. In some situations, the public health actions may be inadmissible because the endangered goods of the population do not outweigh the affected individual's rights. In such cases, human rights are limits to public health practice. However, such conflicts do not constitute an antipodal position between human rights and public health.

Public health practice operates with relevance to human rights. The population members' rights to health, safety and life are the fundament, and the respective self-defense rights are the basis and justification for the existence of public health. In public health practice, conflicts regularly arise between the human rights of the protected population and the human rights of individuals who threaten the population's health (*See* also Childress et al. 2007). Such conflicts need legal resolution. This resolution must be grounded in a careful legal balancing of the conflicting rights.

Cross-References

- ► Administrative Law and Public Health
- ► Ethics
- ► Legal Balancing of Conflicting Rights
- ► Legal Basis of Public Health
- ► Public Health Law, Legal Means

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Human T-Cell Leukemia Virus Type III

► Human Immunodeficiency Virus (HIV)/ Acquired Immune Deficiency Syndrome (AIDS)

Human T-Cell Lymphotrophic Virus Type III

► Human Immunodeficiency Virus (HIV)/ Acquired Immune Deficiency Syndrome (AIDS)

Humidity

Synonyms

Moisture

Definition

Humidity is the amount of water vapor in an air sample. There are three different ways to measure humidity: *absolute* humidity, *relative* humidity, and *specific* humidity. Humidity is important in climate change (► climate and microclimate). Water vapor in the air, the humidity, plays an important part in the global climate. Like carbon dioxide, water vapor is a greenhouse gas. Relative humidity is the amount of water vapor actually in the air divided by the amount of water vapor the air can hold. Relative humidity is expressed as a percentage and can be computed in a variety of ways. One way is to divide the actual vapor pressure by the saturation vapor pressure and then multiply by 100 to convert to a percent. A device used to measure humidity is called a psychrometer or hygrometer. The US Environmental Protection Agency recommends keeping relative humidity between 30% and 60%, with below 50% preferred to control dust mites.

Hunter-Gatherers

► Indigenous Health Care Services

Hydatid Disease

► Echinococcosis

Hygiene

Definition

Hygiene is a discipline of social medicine. It refers to practices associated with ensuring good health and cleanliness. In a broader view, in scientific terms, hygiene is the maintenance of health and healthy living. Hygiene ranges from personal hygiene, through domestic, and up to occupational hygiene and public health.

Cross-References

► Public Health

Hygienic Hand Disinfection

Definition

Hygienic hand disinfection is performed to eliminate transient microorganisms from the skin. The hands are

rubbed with 3 ml of an alcoholic disinfectant (pressing twice on the pump dispenser) for at least 30 seconds. During the procedure, one has to bear in mind the nail folds and the area between the fingers. Rings and watches should not be worn. Hygienic hand disinfection should be performed before and after each contact with a patient, before and after contact with drains, urethral or venous catheters, tracheal tubes or other indwelling devices, and after contact with material which is suspected of contamination (blood, secretions, contaminated surfaces or objects). Furthermore, hygienic hand disinfection is necessary before all invasive procedures.

Hyperkinetic Disorder

Synonyms

Attention deficit/hyperactivity syndrome (ADHS); Attention deficit disorder (ADD); Attention deficit/hyperactivity disorder (ADHD); Childhood hyperkinesis

Definition

ADHD is a developmental and behavioral condition that affects children's ability to focus and pay attention. ADHD refers to inattentiveness, over-activity, impulsivity or a combination. Diagnosis of ADHD implies that the symptoms are out of the normal range of the child's age and development and affect family life, social life, and / or education. ADHD always begins in childhood but may also persist through adulthood. The disorder affects 3 to 5 percent of school-aged children.

Hyperkinetic Disorders

► Attention Deficit Hyperactivity Disorder (ADHD)

Hyperpyrexia

► Hyperthermia

Hypertension, Arterial

Synonyms

High blood pressure

Definition

Blood pressure is the force of the blood pushing against the walls of the arteries. Hypertension is defined as either systolic pressure consistently at 140 or higher or a diastolic pressure consistently at 90 or higher. The limits of a normal blood pressure are age-dependent. The higher the pressure over 120/80, the higher the risk of developing cardiovascular complications.

Hyperthermia

Synonyms

Hyperpyrexia; Heat stroke

Definition

Hyperthermia is an acute condition occurring when the body produces or absorbs more heat than it can dissipate. The heat-regulating mechanisms of the body eventually become overwhelmed and unable to effectively deal with the heat, and body temperature climbs uncontrollably. Symptoms include confusion, headaches, and low blood pressure, leading to possible fainting or dizziness. The skin is pale or bluish, and the subject complains of chills and trembling. This serious medical emergency requires immediate medical attention. Treatment includes immediate lowering of body temperature, and re-hydration.

Hypnotics and Sedatives

Synonyms

Tranquilizers; Depressants; Anxiolytics

Definition

Hypnotics and sedatives are central nervous system depressants with the capacity of relieving anxiety and inducing calmness and sleep. Several such drugs can

also induce loss of memory (amnesia), muscle relaxation or have anticonvulsant properties. In the past barbiturates were mainly prescribed as hypnotics and sedatives but their use decreased over the last decades because of a narrow therapeutic range. Today benzodiazepines as well as zolpidem and zopiclone are mainly prescribed.

Hypochondria

Synonyms

Health anxiety; Health phobia

Definition

Hypochondria is an exaggerated, uncorrectable fear that one is suffering from a physical illness even though, objectively, there is only a minor, if any, physical problem. The least variation of body function or feeling is constantly and erroneously interpreted as proof of a severe disease.

Cross-References

► Anxiety Disorders

Hypochondriacal Disorder

Definition

The essential feature of a hypochondriacal disorder is a persistent preoccupation with the possibility of having one or more serious and progressive physical disorders. Patients manifest persistent somatic complaints or a persistent preoccupation with their physical appearance. Normal or commonplace sensations and appearances are often interpreted by patients as abnormal and distressing, and attention is usually focused upon only one or two organs or systems of the body. Marked depression and anxiety are often present, and may justify additional diagnoses.

Hypomania

Definition

According to ICD-10, individuals with hypomania show a persistent mild elevation of mood, increased energy and activity, and usually marked feelings of well-being and both physical and mental efficiency. Increased sociability, talkativeness, over-familiarity, increased sexual energy, and a decreased need for sleep are often present but not to the extent that they lead to severe disruption of work or result in social rejection. Irritability, conceit, and boorish behavior may take the place of the more usual euphoric sociability. The disturbances of mood and behavior are not accompanied by hallucinations or delusions.

Hypothermia

Definition

Hypothermia is a medical condition in which the victim's core body temperature has dropped significantly below normal and normal metabolism begins to be impaired. This begins to occur when the core temperature drops below 35°C. If body temperature falls below 32°C, the condition can become critical and eventually fatal, and body temperatures below 27°C are almost uniformly fatal. Symptoms include ataxia, confusion, cold skin, gray complexion, peripheral cyanosis, shivering, tremor, weakness, and rapid breathing and heart rate, which slow and weaken as temperature decreases, leading to death. Treatment for hypothermia involves re-warming and warm intravenous fluids or "lavage" of the abdominal cavity with warmed fluids in a hospital setting.

Hypothesis Testing

Definition

Part of the statistical decision making process which uses sample data to evaluate the truthfulness of a hypothesis tested in a given population. The process is based on sample data with the aim of determining which of the two exclusion hypotheses (Null and Alternative Hypothesis) is probably true. Decision making regarding whether or not the null hypothesis is rejected is based on the group of observations. The process of statistical decision making regarding whether the results of the research depict only a coincidence or a real effect at the given probability level.

ICJ

► International Court of Justice

Identity

Synonyms

Personal identity; Individuality

Definition

Identity denotes distinct personality of an individual which is regarded as a persisting entity. It refers to distinct features in regard to manners, way of life, beliefs, culture, by which person may be identified. Also, it may be used to denote social, ethnic or ► cultural identity of distinct group.

IEC

► Ethics Committee, EC

Igorot

► Indigenous Health, Asian

IHTA

Definition

The International Health Technology Assessment (IHTA) Database was created as a part of ECRI's (the US Emergency Care Research Institute, a nonprofit health services research agency and a Collaborating Center of the World Health Organization) longstanding collaboration with the US National Library of Medicine. It encompasses both peer-reviewed literature and the "gray" literature of hard-to-find technology assessment documents.

Illness

Definition

Illness is the individual's experience of disease; it varies from culture to culture and from individual to individual. It includes the patient's:

- sensations, feelings, discomforts, defenses, fears, understanding and beliefs about the condition;
- decisions on where to get help and how to follow prescriptions;
- attitude towards diseases and toward the physician;
- perception of the effects that the condition has on private and social life.

Cross-References

► Ailment

Illumination

Synonyms

Lighting; Light

Definition

Illumination refers to either artificial light sources such as lamps or to natural illumination of interiors from daylight. It is a term to express the density of luminous

flux incident on a surface. The symbol of illumination is E, and the equation is $E = dF/dA$, where A is the area of the illuminated surface and F is the luminous flux. It is the degree of visibility of our environment.

Illusion

Definition

A real existing object (e. g., a tree) appears to be an animated object (e. g., an angel).

Immaterial

► Spiritual

Immune Globulins

► Antibodies
► Immunization, Passive

Immune Privilege

Definition

The immune cells of every individual organism mature by selection and enrichment of the immuno-competent cells, implying that the cells can recognize own and alien cells. The body's immune system recognizes cells like bacteria or transplants because these express unknown surface markers, the major histocompatibility complexes (MHCs). Since embryonic stem cells are assumed not to present mature MHCs to the immune cells, they may not be recognized. Hence, they are considered to be immune privileged without being rejected under non-immunosuppressed conditions.

Immune Prophylaxis

► Immunization
► Immunization, Active
► Immunization, Passive

Immunization

► Immunization, Passive
► Vaccination, Active

Immunization, Active

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Synonyms

Vaccination, active

Definition

Vaccination is a procedure following a fixed pattern, whereby weakened or dead pathogens or parts of the same are introduced into the organism, with the aim of inducing the production of specific antibodies. An antibody memory is created, with the result that, in the case of contact with the same pathogen, an onset of the disease will be prevented by the organism's own defense mechanism.

Basic Characteristics

History

For thousands of years, it has been known that infectious diseases cause protection against a similar infection in later life. Immunization results in reliable protection against various diseases, mostly produced by viruses or bacteria. Since ancient times, epidemics have repeatedly caused fear and alarm, with countless people falling victim, even in Europe in the 18th century. This is the origin of the aphorism, "No one is safe from love or the pox". In the case of smallpox, in China, India and Turkey prior to the discovery of the first vaccine, variolation was commonly practiced, whereby pus from persons suffering from mild pox was transferred to healthy subjects. At the beginning of the 18th century, this technique came to England and in the following years reached continental Europe. The English physician, Edward Jenner discovered that patients who

had been infected with harmless cow pox remained almost immune to small pox. In 1796, Jenner developed a ► vaccine from the contents of a pustule taken from a milkmaid who had been infected by cow pox, which he then injected into an 8-year-old boy. The child remained healthy despite a later small pox infection. Jenner's discovery led to the beginning of the era of vaccination. The term "vaccination" stems from the Latin word vacca, meaning cow. This newly developed method replaced the unreliable and dangerous variolation and quickly became widespread. Although the foundation for vaccination had already been dated to the beginning of the 18th century, it was not until much later that the underlying reasons – such as the immune reaction that is decisive for the success of the vaccine – were understood. Even today, development in this field of research is not yet finished. For many infectious diseases there is, as yet, no vaccine, pathogens alter themselves, new pathogens are discovered or known pathogens suddenly become relevant for mankind. In the case of existing vaccines, incomplete spread of immunization prevents optimal protection from infections and their consequences. In industrialized countries, despite the availability of vaccines, the best possible disease prevention is hindered by so-called vaccination fatigue. One should also mention the increasing frequency of long-haul journeys undertaken by the inhabitants of the industrialized nations, often combined with a certain recklessness concerning the risk of infectious diseases.

Active Immunization

One must distinguish between active and passive immunization. Simultaneous vaccination refers to both active and passive immunization occurring at the same time. Passive vaccination will be explained in detail in a separate section. Active immunity comes about when the organism itself confronts the pathogen and builds up antibodies. When a patient recovers from an infectious disease, he achieves natural immunity or insensitivity. Artificial immunity is produced through active vaccination, whereby weakened or dead pathogens or parts of the same are introduced into the organism. In both cases, the patient produces antibodies, which are quickly able to activate defense mechanisms through an "antibody memory" if the person comes into contact again with the same pathogen. In this way, either a new infection does not occur, or the infection at least shows a mild course.

General Vaccination Programs

Even babies in the womb can come in contact with pathogens. As long as the infection is not a new one, the unborn child is generally protected by the mother's antibodies (immunglobulin IgG), which can pass through the placenta. After birth, the protective effect of the mother's antibodies, the so-called nest protection, decreases. The infant is exposed to potentially dangerous pathogens, in the face of which its immune system, being not yet fully developed, is easily overstrained. This is one of the reasons why, in earlier times worldwide and even today in the developing countries, infant mortality rates are highest in the first year of life. In order to protect infants from possibly life-threatening diseases, a specified vaccination program is put into action from three months of age. Various vaccines are combined together. The administration of these combined vaccines (► combination vaccination) reduces the effort involved and achieves protection against several infectious diseases simultaneously. Repeated vaccinations are necessary to achieve sufficient immunity. This is known as ► basic immunization. The organism's "immune memory" of several pathogens lessens over time. For this reason, booster vaccinations are needed, usually at intervals of 10 years, in order to ensure lasting protection. An overview of recommended vaccinations for infants, children and adolescents in Europe, according to recommendations of the WHO, is shown in Table 1 (http://www.who.int/immunization_monitoring/en/globalsummary/scheduleselect.cfm). It covers vaccinations for protection against bacille Calmette-Guérin (► Bacille Calmette-Guérin (BCG) vaccination) (see also ► tuberculosis and other mycobacterioses), diphtheria (► diphtheria vaccination), pertussis (► pertussis vaccination), tetanus (► tetanus vaccination), *Haemophilus influenzae* (► *Haemophilus influenza* ► B (Hib) vaccination), poliomyelitis (► polio vaccination), hepatitis B (► hepatitis B vaccination), measles (► measles vaccination), mumps (► mumps vaccination), rubella (► rubella vaccination), varicella (► varicella vaccination), meningococca type C (► menigococcal vaccination), and pneumococca (► pneumococcal vaccination). In other countries, additional vaccinations may be generally recom-

Immunization, Active, Table 1 Overview of recommended vaccinations for children and adolescents in Europe according to immunization schedules of the WHO (http://www.who.int/immunization_monitoring/en/globalsummary/scheduleselect.cfm)

Vaccine / Antigen Combination	Age in completed months						Age in completed years		
	Birth	2	3–4	4–6	11–14	15–23[a)]	5–6[a)]	6–7	9–17[a)]
BCG[1)]	X							X[4)]	
DtaP[2)]		1.	2.	3.	4.				
Td[b)]							B		B
aP									B
Hib[2)]		1.	2.[c)]	3.	4.				
IPV[2)]		1.	2.[c)]	3.	4.				B
HB[2)]	See[d)]	1.	2.[c)]	3.	4.				I
MMR[3)]					1.	2.			
Varicella					1.				[a)]
Meningococca C[5) 7)]		1.	2.	3.					
Pneumococca[6) 7)]		1.	2.	3.					

1., 2., 3., 4. → Administration of vaccines
B: Booster – should preferably be given no sooner than 5 years after the previous dose.
I: Basic immunization of all children and adolescents with missing or incomplete vaccination series
[a)] At this point of time, vaccination status must be checked and completed if necessary.
[b)] From the age of 5–6 years, there's used a booster vaccine with a reduced contend of diphtheria toxoid
[c)] When using monovalent vaccines or combination vaccines without a pertussis component, this dose may be omitted.
[d)] For newborn infants hepatitis B-immunoprophylaxis may be necessary.
[1)] Bacille Calmette-Guérin
[2)] Intervals between vaccinations - minimum 4 weeks; interval between the last dose and that prior to it – minimum 6 months
[3)] Minimum interval between vaccinations - 4 weeks
[4)] Only if tuberculin test is negative
[5)] Vaccination with conjugate vaccine
[6)] Vaccination with conjugate vaccine
[7)] In the different countries recommendations concerning the age at vaccination may vary

mended. In this regard, one may refer to the vaccination program of the American CDC (Center of Disease Control), http://www.cdc.gov/nip/recs/child-schedule.htm.

Indication Vaccinations

Apart from vaccinations generally recommended, other vaccines may be administered as indication vaccinations. This category consists of vaccinations against pathogens that are only found in certain countries or regions, or vaccinations that are relevant only for certain subgroups of the population who are at particular risk. An increased risk may be the result of age, existing diseases, or profession. Indication vaccinations include vaccinations against hepatitis A (► hepatitis A vaccination), yellow fever (► yellow fever vaccination), cholera (► cholera vaccination), enteric fever (typhoid) (► typhoid vaccination), rabies (► rabies vaccination), influenza (► influenza vaccination) or TBE (tick-borne encephalitis) (► tick-borne encephalitis (TBE) vaccination).

The Role of Vaccinations in the Society

Vaccinations aim to minimize or eradicate the appearance of certain infectious diseases. Morbidity, the rate of complication or hospitalization, mortality and risk of infection for high-risk patients should thus be reduced. This carries a substantial significance for the economy of a country. In order to be successful, vaccination cover must be at least 85%. The less complex a vaccination program is, the more chance it has of reaching a wide range of the public. The importance of vaccination as a preventive measure must be repeatedly impressed upon the population. Education and continuous checking of the rate of vaccination are indispensable. The fact that some diseases have become more

rare thanks to vaccination does not make these diseases less dangerous when they do occur.

Development of New Vaccines

When new vaccines are introduced, they must be appraised for their usefulness. For example, in the case of enteritis through rotaviruses, the greatest burden of disease and mortality certainly occurs in the Third World. However, even in the industrialized countries, large costs are incurred for families and for society, both from hospitalization and from the treatment of outpatients. Whether a vaccine that is desperately needed in the developing world is actually produced and made available in sufficient quantity depends on whether the manufacturer of this vaccine can also find a market for it in the industrialized countries. ► Rotavirus vaccination has meanwhile been accepted to be a worthy completion of the vaccination calendar in babies.

Complications, Contraindications and Anomalies of Vaccination

Although modern vaccines are safe and effective, reactions of differing severity can occur at the time when a vaccine is administered. It is not always easy to establish whether this connection in time is coincidental or causal. The probability of a causal connection is sufficient for the legal recognition of injury as a result of vaccination. While localized reactions, fever and exanthema occur relatively frequently but are not long-lasting, serious complications are seldom found among healthy subjects. The situation is different in the presence of immune deficiency. Patients with immune deficiency cannot react adequately to protective vaccinations, particularly where living vaccines are involved, but may instead be endangered by them. For certain patients with immune deficiency, vaccination with living vaccines is therefore contraindicated. The administration of living vaccines during pregnancy is also to be avoided. When giving a vaccination, one should also take into consideration the possibility of allergy to the constituent elements. On the other hand, special efforts should be made to vaccinate people with chronic heart, lung, renal and metabolic diseases, because these patients are at greater risk for infectious diseases. The widest possible vaccination cover is desirable for residents of community institutions as well as for the staff who work there. In conclusion, one might say that vaccination is an important area of preventive medicine and is of particular value in pediatrics. Through this procedure, some infectious diseases that would otherwise be serious are no longer a threat. However, the success of vaccination is still dependent upon its implementation, its acceptance by the population and on a sufficiently high vaccination rate. For many diseases no vaccine has yet been found, with the result that development in this field is not yet concluded. Moreover, the appearance of new infectious diseases creates further challenges for modern medicine.

Cross-References

► Bacille Calmette-Guérin (BCG) Vaccination
► Basic Immunization
► Cholera Vaccination
► Combination Vaccination
► Diphtheria Vaccination
► Haemophilus influenza B (Hib) Vaccination
► Hepatitis B Vaccination
► Hepatitis A Vaccination
► Influenza Vaccination
► Measles Vaccination
► Menigococcal Vaccination
► Mumps Vaccination
► Pertussis Vaccination
► Pneumococcal Vaccination
► Polio Vaccination
► Rabies Vaccination
► Rotavirus Vaccination
► Rubella Vaccination
► Tetanus Vaccination
► Tick-Borne Encephalitis (TBE) Vaccination
► Typhoid Vaccination
► Vaccination, Active
► Vaccine
► Varicella Vaccination
► Yellow Fever Vaccination

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http://www.cdc.gov/nip/recs/child-schedule.htm.
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http://www.metrokc.gov/health/tb/bcgvaccine.htm
http://www.who.int/immunization_monitoring/en/globalsummary/scheduleselect.cfm
http://www.who.int/ith/en/

Immunization Against Tuberculosis

► Bacille Calmette-Guérin (BCG) Vaccination

Immunization, Passive

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Synonyms

Vaccination, passive; Inoculation, passive; Application of immune globulins; Immune prophylaxis

Definition

Passive immunization is a process by which ► antibodies are introduced into an organism. These antibodies, which are directed against a particular germ, provide an immediate protection and prevent any disease which may be caused by that particular pathogen.

Basic Characteristics

History

The first steps in passive immunization were taken in the late 19th century. The German physician and scientist Emil von Behring and the Japanese physician and bacteriologist Shibasaburo Kitasato worked together in Berlin, focusing their research on tetanus and diphtheria (http://nobelprize.org/nobel_prizes/medicine/articles/behring/index.html). In their immunological experiments they introduced blood from infected animals into healthy animals. Animals vaccinated by this technique proved to be immune against the given germ or its toxin. From this observation the scientists concluded that the antitoxins, which were transmitted by the vaccination, neutralized the bacterial toxins. Based on this discovery, they developed the first passive vaccine against diphtheria. During the 20th century medical research developed further vaccines. Both human and animal antibodies were used in their production. Recently, some monoclonal antibodies have been produced utilizing genetic technology, freeing the process of the need to rely on infected donors.

Characteristics of Passive Immunization

The essential characteristic of passive immunization is the transmission of antibodies. Due to these antibodies, the germ is combated immediately or its toxin is neutralized. The immune system of the vaccinated person is not stimulated, and thus no specific mechanisms of defence (building of antibodies) are initiated. For this reason, an immune (or antibody) memory is not built up. At a later date, the organism can neither "remember" the infection nor the passive vaccination. The antibodies vanish within 3–4 weeks; their protective effects weaken and slowly disappear. Because of the missing immune memory for the organism a new contact with the same germ is equivalent to a primary infection.

Use of Passive Immunization

The earliest passive immunization takes place in the womb during pregnancy, with maternal antibodies of the IgG type being transmitted to the unborn child. Thus the baby achieves an intrauterine protection against several infections the mother's immune system has already coped with and produced antibodies against. After birth the protection by maternal antibodies – the so-called ► nest protection – continues for a couple of months, supporting the still immature immune system of the baby. Later in life passive immunization may become necessary whenever an individual, who has come into contact with particular germs, does not have enough time to produce antibodies. This procedure is called ► post exposition prophylaxis. Most common examples are the passive immunizations against tetanus (► tetanus-vaccination, passive),

rabies (► rabies-vaccination, passive), rubella (German measles) (► rubella-vaccination, passive), varicella (► varicella immunization, passive) and hepatitis B (► hepatitis B-vaccination, passive). Furthermore, immune globulins can be administerd to prevent infectious diseases, like diphtheria, measles, mumps, hepatitis A, botulism and cytomegaly. A pre-exposition prophylaxis can be implemented to achieve protection against TBE (tick-borne encephalitis) (► TBE (tick--borne encephalitis)-vaccination, passive).

A person suffering from an immune deficiency or an immune defect will be unable to produce antibodies against particular pathogens. In this case, the administration of antibodies might be the only possible way to prevent serious infection. Moreover, several severe diseases (like cancer or chronic disease) or pregnancy can be an indication for the administration of passive immunization when there has been contact with particular pathogens.

Advantages and Disadvantages of Passive Immunization

As mentioned before, the greatest advantage of passive immunization is the immediately achieved protection. This might be the only possible way of protecting certain groups of people from life-threatening diseases. In most cases, passive vaccines are tolerated well. The disadvantages of passive immunization are the time-limited effect, the missing induction of an antibody-memory and the relatively high costs. And it cannot be ignored that most immune sera are still made of material extracted from human and animal donors; thus, there is always the risk of provoking an allergic reaction, and – despite all precautionary measures – there is always the risk of transmitting germs. In this connection, the possiblity of transmitting hepatitis B and HIV has to be mentioned. Recently, monoclonal antibodies have been produced by genetic technology, doing away with any need for donors; when using these products there is no risk of transmission of diseases or causing allergic reactions, moreover, by being independent of animal and human donors, a better availability of immune globulins can be achieved.

Cross-References

► Antibodies
► Hepatitis B-Vaccination, Passive
► Immunization, Passive
► Nest Protection
► Post Exposition Prophylaxis
► Rabies Vaccination, Passive
► Rubella-Vaccination, Passive
► TBE (Tick-borne Encephalitis)-Vaccination, Passive
► Tetanus-Vaccination, Passive
► Varicella Immunization

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Immunoglobulins

► Antibodies

Impact Evaluation

Definition

Impact evaluation refers to the immediate effect of a program or process and the term outcome refers to the distant or ultimate effect or following definition: impact refers to the extent to which the program has changed the behavior of the participants. An impact evaluation will often certainly seek “changes in the desired direction.” Impact evaluation measures the short term effects of the health promotion program and is concerned with whether the objectives were achieved. It measures any changes in behavior, environment, health knowledge, social lifestyle or risk factors that were identified in the objectives.

Impairment and Disability

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Synonyms

Activity limitations; Participation restrictions; Handicap

Definition

According to the International Classification of Functioning, Disability, and Health developed by the World Health Organization (WHO), disability is defined as "the outcome or result of a complex relationship between an individual's health condition and ► personal factors, and of the external factors that represent the circumstances in which the individual lives". Impairments are defined as "problems in ► body function or ► body structure such as significant deviation or loss". Disability serves as an umbrella term for impairments, activity limitations, and participation restrictions.

Basic Characteristics

Background

There are over half a billion people in the world who suffer some form of physical, mental, or intellectual disability, with one third of those people being children. Chronic conditions constitute the most common causes of disability; examples include cardiovascular and chronic respiratory diseases, cancer, and diabetes; injuries, like those due to road traffic crashes, falls and landmines; mental illness; malnutrition; and HIV/AIDS and other infectious diseases. The main drivers for the growth of the disabled population are factors like population growth, aging, and medical advances that preserve and prolong life. As a consequence, there is a significant and increasing demand for health and rehabilitation services and, furthermore, environmental and attitudinal changes are necessary. Poverty is one key reason behind many disabilities and disability itself increases poverty even further. About 80% of people with disabilities live in low-income countries and the lives of many of those people are characterized by poverty, isolation, and despair. In most cases, people living in poverty only have limited access to basic health services like rehabilitation and education. The majority of developmental initiatives ignore the needs of people with disabilities. There are, for example, around 70 million people worldwide with hearing impairment and it is projected that in the developing world alone there will be approximately 190 million people with disability related to communication within 25 years time. This will result in considerable service implications.

Medical Model of Disability

Based on the medical model of disability, illness or disability is the result of a physical condition and intrinsic to the individual (it is part of that individual's own body). It may reduce the individual's ► quality of life, and causes clear disadvantages to the individual. As a consequence, curing or managing illness or disability revolves around identifying the illness or disability, understanding it, and then learning to control and alter its course. Therefore, a compassionate or just society invests resources in health care and related services. This should enforce the medical curing of disabilities, expand functionality, and/or improve functioning to allow disabled persons a more "normal" life. The medical profession's responsibility and potential in this area is central.

The medical model of disability is often cited by disability rights groups when evaluating the costs and benefits of various interventions, be they medical, surgical, social, or occupational. Often, a medical model of disability is used to justify large investment in these procedures, technologies, and research, when adaptation of the disabled person's environment might ultimately be cheaper and more attainable. Some disability rights groups see the medical model of disability as a civil rights issue, and criticize charitable or medical initiatives that use it in their portrayal of disabled people, because it promotes a negative, disempowered image of people with disabilities, rather than identifying disability as a political, social, and environmental problem.

Social Model of Disability

The social model of disability proposes that barriers, prejudice, and exclusion by society (purposely or inad-

vertently) are the ultimate factors in defining who is disabled and who is not in a particular society. It recognizes that while some people have physical, intellectual, or psychological differences from a statistical norm, which may sometimes be due to impairments, these do not have to lead to disability unless society fails to accommodate and include them in the way it would those who are "normal". The phrase "differently abled" is sometimes used to convey an aspect of the social model of disability, although the model is not generally taken as denying that some attributes (or loss of) can be seen (when unaided) as impairments.

The approach behind the model can be traced to the 1960s. In 1976, the UK organization Union of the Physically Impaired Against Segregation (UPIAS) claimed that disability was: "the disadvantage or restriction of activity caused by a contemporary social organization which takes little or no account of people who have physical impairments and thus excludes them from participation in the mainstream of social activities". In 1983, the disabled academic Mike Oliver coined the phrase "social model of disability" in reference to these ideological developments. He focused on the idea of an individual model (of which the medical was a part) versus a social model, derived from the distinction originally made between impairment and disability by the UPIAS. The "social model" was extended and developed by academics and activists in the UK, US, and other countries, and extended to include all disabled people, including those seen as having mental impairments or disabilities.

Criticism of the social model has come from the disabled community for not taking into account the physical body in its analysis of disabling factors. It has been described as too unbending in its concentration on structural societal factors and criticized for neglecting the cultural and experiential aspects of disability. Much of the criticism can at first be seen as well-founded, on the grounds that both individual and social factors influence everyday life for a person with an impairment. Still, the social model perspective, with its separation of impairment and disability, has undoubtedly yielded many political benefits and given a theoretical starting point for research, activism, and discussion. The influence of the social model has still been limited and hindered by its stand-alone stance in relation to the fields of medicine, rehabilitation, and technology.

The Integrated Model and ICF

The integrated model of disability attempts to bring together the medical and social perspectives. It enables people with disabilities to have a number of different roles including citizen and patient, among many others. One of the operationalizations is the WHO's International Classification of Functioning, Disability, and Health (ICF). The ICF is the most well known existing framework used for analyzing the functioning of people with disabilities. The ICF has broadened the focus from its predecessor, ICIDH-1 (International Classification of Impairment, Disability, and Handicap). ICIDH-1 presented a primarily medical and individual model for explaining disability, whereas ICF includes environmental factors along with activities and participation. The introduction of environmental and social response variables is a big step forward since ICF will be used by many health professionals and policy makers. The hope is that functionality will not be assessed on its own, but be qualified in relation to all other dimensions. However, there are issues with combining the two paradigms, as ICF will remain an instrument for measuring and classifying individuals predominantly on the level of impairment. Consequently, this makes the use of ICF as an integrative model complicated both from an individual and social model perspective. It can still be concluded that one aim of the ICF is to provide a tool for international comparability of health information and in this respect it may be successful.

Conclusion

Disability is both a complex and topical issue, and health professionals all over the world face patients with a wide range of disabilities seeking personalized advice and help. Besides medical model approaches, social model perspectives are also needed in rehabilitating science and engineering as they are fundamental for the control and self-determination of people with disabilities. The strict dichotomy between the medical and the social models should be replaced by an integrative model; ICF seems to be a step towards the right direction but still needs to be further refined. The social model perspective should be included without compromising its political benefits. This could be achieved by directing its focus towards the space between the individual and his/her surroundings and towards the func-

tional need and wishes rather than the mere functioning of the individual.

Cross-References

- ► Body Function
- ► Body Structure
- ► Personal Factors
- ► Quality of Life

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Implicit Knowledge

Synonyms

Disease frequency

Definition

Implicit knowledge is the cumulative store of experiences, insights, expertise, know-how, trade secrets, understanding and learning. Implicit knowledge is embedded knowledge, unstructured and intangible, requires person-to-person contact to transfer and cannot be communicated on paper or electronically.

Improper Nutrition

► Malnutrition

Improvement by Symptomatic Therapy

► Symptom Relief in Palliative Medicine

Inactive Lifestyle

Definition

Intensity, duration and frequency of physical activity are used to set cut-points between physically inactive and active people. No unitary values are defined.

Inactivity

► Sedentary Lifestyle

INAHTA

Definition

INAHTA – The International Network of Agencies for Health Technology Assessment – has the mission of providing a forum for the identification and pursuit of interests common to HTA agencies. INAHTA was established in 1993 and has now grown to 45 member agencies from 23 countries. The Network stretches from North and Latin America to Europe, Australia, and New Zealand.

Inborn

► Native

Incidence

Definition

Incidence is a word used in ► epidemiology. It refers to the number of people newly affected by a certain condition in a specific period of time. It can be given as a number (e. g. in these past six months there have been 24 new cases of lung cancer) or as a ratio, having as denominator the total number of people who can possibly be affected by the mentioned condition (e. g. the incidence of lung cancer for these past six months has been 3/100,000).

Cross-References

► Disease Frequency

Incidence Rate

Definition

The incidence of disease is defined as the number of new cases of disease occurring in a population during a defined time interval. The number is useful as a measure of the risk of disease.
The incidence rate is defined as the incidence divided by the sum of the different times each individual was at risk of the disease.
► Disease Frequency, Measures

Incidence Rate in Occupational Medicine

Synonyms

Disease frequency measure

Definition

The incidence rate is the number of new cases of injury disease during the calendar year divided by the number of ► workers in the examined group during the year, multiplied by 100,000. The incidence rate is an important source of information on risk of injury in an examined group; it is also a useful tool for follow up of implemented preventive measures.

$$I = \frac{NC}{W} \times 100.000$$

I = Incidence rate
NC = Number of new cases of injury during the calendar year
W = Number of workers in the examined group during the year

Inclination

► Confounding and Interaction
► Prejudice

Income Solidarity

Definition

The term income solidarity refers to redistribution from individuals with high income toward individuals with low income.

Increasing Returns to Scale

► Economies of Scale

Increasing Worldwide Interdependence

► Globalization

Incremental Cost-Effectiveness Ratio

Synonyms

Incremental cost-outcome ratio; Incremental cost-outcome relation

Definition

The incremental cost-effectiveness ration (ICER) is the main result of the two forms of ► health economic evaluation: cost-effectiveness analysis and cost-utility analysis, and adapts the concept of incremental analysis to the health economic evaluation. The ICER is calculated by dividing the additional (= incremental) costs of a health care technology by the additional outcomes. Typical examples for ICER are the costs per event avoided, the costs per life year gained, and the costs per QALY (► quality-adjusted life years) gained.

Incubation

Synonyms

Incubation period

Definition

Incubation is the time interval between invasion by an infectious agent and appearance of the first sign or symptom of the disease in question.

Incubation Period

► Incubation

Incurable Disease

► End Stage Disease

Indemnity Health Plan

► Indemnity Insurance Plan

Indemnity Insurance Plan

Synonyms

Indemnity health plan; Fee-for-service; Health insurance plan; Indemnity plan

Definition

Indemnity insurance plans are the traditional health insurance plans that primarily existed before the rise of ► managed care in the US. An indemnity insurance plan reimburses medical expenses regardless of who provides the service. In some cases, the reimbursement amount may be limited. There are different types of indemnity insurance plans that use different methods for determining the percentage covered by the insurer. In general, the insured must satisfy a specific deductible after which the plan pays a percentage of covered expenses. The coverage of indemnity plans is often more limited than with other types of coverage.

Indemnity Plan

► Indemnity Insurance Plan

Independent Ethics Committee

► Ethics Committee, EC

Independent Groups Design

► Unpaired Groups Design

Independent Samples Design

► Unpaired Groups Design

Indian

► Indigenous Health, North America
► Indigenous Health, South America

Indicated Prevention of Mental Disorders

Definition

Preventions targets high-risk people who are identified as having minimal but detectable signs or symptoms foreshadowing mental disorder or biological markers indicating predisposition for mental disorder but who do not meet diagnostic criteria for disorder at that time (e. g., children with behavioral disturbances are at higher risk for suffering from mental disorders in later life).

Indication Vaccination

► Immunization, Active

Indicator

Definition

An indicator is a measurement that reflects the status of a system. Indicators reveal the direction of a system (a community, the economy, or the environment); if it is going forward or backward, increasing or decreasing, improving or deteriorating, or staying the same.

Indigenous

Synonyms

Aboriginal; Autochthonous; Native; Natural; First; Primitive

Definition

Indigenous may refer to objects and people with origins in particular location(s).

Cross-References

► Endemic
► Ethnic

Indigenous Africans

► Indigenous Health – Africa

Indigenous Australians

► Indigenous Health – Australooceanian

Indigenous Culture

Synonyms

Tradition

Definition

► Indigenous culture is defined as set of customs, beliefs, values and communications practiced by certain indigenous community. Each indigenous culture has its specific features that influence behavior of indigenous community members and therefore shape their health status, health needs and utilization of health care.

Indigenous Health – Africa

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Synonyms

Indigenous people; Indigenous Africans; Pigmy people (Central and Western Africa); Maasai (Eastern Africa, Kenya, Tanzania); Nuba (Eastern Africa, Sudan); Ogiek (Eastern Africa, Kenya); Berbers (Northern Africa, Tunisia, Algeria, Libya, Morroco); Tuareg (Northern Africa, Sahara); Bushmen; San (Southern Africa, Kalahari Desert, Namibia, Botswana); Baka (Western Africa, Cameroon, Congo, Gabon, Central African Republic); Duala people (Western Africa, Cameroon); Ogoni people (Western Africa, Nigeria); Tubu (Western Africa, Southern Sahel)

Definition

There is no single and accepted definition of indigenous peoples. The two distinguishing features characterizing indigenous peoples are the ancient relationship with a defined territory and ethnic distinctiveness.
Indigenous peoples of Africa are comprised of several different groups.

Health

Indigenous populations differ in levels, patterns, and trends of health.

The San

The San are the most impoverished, disempowered, and stigmatized ethnic group in Southern Africa. They are the indigenous people of the southern African region and have inhabited the land for around 27 000 years. It is estimated that there are between 85 000 and 90 000 San spread across six countries with a population growth rate of around 2%. Small populations live in Angola (1200), South Africa (4350), Zambia (300) and Zimbabwe (2500); with the vast majority in Botswana (47 000) and Namibia (32 000).
The health status of the San across Southern Africa is closely linked to their poverty.

Alcohol and Domestic Violence

Alcohol consumption is very high in San settlements. This is due to loss of land, resources, and community relationships. Traditional gender equality is lost and women are disempowered which leads to domestic violence. This problem is a consequence of poverty, the loss of land and livelihoods after resettlement without a viable alternative.

HIV/AIDS

HIV/► AIDS is a major cause of death in Namibia and Botswana. In Namibia, national adult prevalence rose from 4.2% in 1992 to 23.3% in 2002. It accounts for over 25% of deaths in health facilities.

Botswana had the worlds' highest mortality rate (28 per 1000 population) and lowest life expectancy at birth of 35 years, with very high adult HIV/AIDS prevalence of 37.3% (2004). Although formally disaggregated data are not available, in 2002 the rate for the San in Ganzi was lower at 21.4% than the national average of 35.4%, indicating that the remoteness of the San, particularly in the Central Reserve, might have protected them from the high rates recorded elsewhere.

It is estimated that the situation in the resettlement camps is far worse.

In Namibia, accurate data for the San population are not available. In more isolated parts, especially in the north, the prevalence is lower. In the settlements it tends to be much higher.

The Pygmies

The Pygmies are the indigenous hunter-gatherers of the central African forests. They are comprised of at least 15 distinct ethnolinguistic groups including the Gyéli, Kola, Baka, Aka, Bongo, Efe, Mbuti, western Twa, and eastern Twa living in ten central African countries: Angola, Cameroon, Equatorial Guinea, Central African Republic, Gabon, Republic of the Congo (Congo), Democratic Republic of the Congo, Uganda, Rwanda, and Burundi. Their estimated total number is from 300 000 to 500 000 people.

Mortality

Mortality and fertility rates are high in Pygmy communities. Low fertility of Efe women in the Democratic Republic of the Congo is associated with high rates of inter marriage with Bantu and the prevalence of venereal diseases. In Aka communities in the Central African Republic, infectious and parasitic diseases are the main causes of death at all ages, particularly for men and boys.

Infant mortality rates in forest-dwelling Aka in the Central African Republic during the 1980s, and former forest-dwelling Twa in Uganda at the turn of this century, are reported as 20–22% and 20–21%, respectively. These rates are more than twice the national infant mortality rates (9.8% and 9.7%, respectively) cited by the World Bank in 2000; and in the Ugandan study are 1.5–4 times higher than nearby non-Twa communities. For children younger than 5 years, mortality rates of 27% reported in forest dwelling Mbendjele in northern Congo in the mid-1990s were 1.5 times higher than neighboring Bantu. In the study of Ugandan Twa, mortality rates for children younger than 5 years (40%) were 1.8–2.4 times higher than in non-Twa villages.

Loss of a forest-based life can be associated with increased mortality. The crucial importance of land for survival is indicated by a reported drop in mortality in children younger than 5 years from 59% to 18% when Twa families in Uganda were given land. Major causes of childhood death include malaria and measles. In the Central African Republic, a measles ► epidemic in the late 1970s resulted in 12% of all Aka deaths in the communities studied, regarded as a very high percentage considering the short duration of the epidemic. In Congo, mortality from measles was five times higher in Mbendjele children than neighboring Bantu communities.

Morbidity

Compared with neighboring Bantu communities, studies of forest-based Mbendjele, Aka, and Baka communities have documented lower prevalence of malaria, rheumatism, respiratory infections, ► scabies, ► goitre, syphilis, ► hepatitis C (three to seven times lower than Bantu communities), high blood pressure, and dental caries. However, ► leprosy, ► conjunctivitis, periodontal disease, tooth loss, and splenomegaly are more prevalent than in Bantu communities. High ► intestinal parasite loads are reported from Mbuti in the Democratic Republic of the Congo and Baka in Cameroon. In forest-dwelling Mbendjele in Congo and semi-sedenterized Kola in Cameroon, intestinal parasite rates were lower than or similar to neighboring farming groups, but predominantly village-based Aka in Central African Republic had higher prevalence of helminth and protozoan parasites than did Bantu coworkers.

► Yaws, a painful skin infection that can progress to destruction of soft tissue, cartilage, and bone, is more prevalent in forest-dwelling Pygmy communities than in neighboring groups. In Cameroon, Central African Republic, and the Democratic Republic of the Congo between the 1970s and 1990s, 3–50% of Gyéli, Baka, Aka, Mbendjele, and Mbuti surveyed had clinical symptoms of yaws. Serological examinations showed 20–90% of the population, most of them children, had latent infections. Prevalence was lower in communi-

ties receiving good medical care and information about hygiene.

In Cameroon and Central African Republic during the 1990s, Gyéli, Baka, and Aka were more often seropositive for filoviruses causing hemorrhagic fevers, including Ebola, than were neighboring subsistence farmers. Kola communities in northeast Gabon were badly affected in Ebola outbreaks. However, in the area of an outbreak of Marburg hemorrhagic fever in the Democratic Republic of the Congo, Mbuti surveyed in 2002 were seronegative for Marburg virus despite substantially higher exposure to wild animals, especially bats – one of the presumed reservoirs of filoviruses – than the local population. The risks to Pygmy communities of filovirus infection via their hunting activities are not well understood. Where forest dietary resources are depleted by destructive logging or commercial poaching and Pygmy people do not have lands on which to grow alternative foods, nutritional status decreases. Children and pregnant women are especially vulnerable, the problem being exacerbated by the breakdown of traditional foodsharing systems. Loss of forests also deprives Pygmy communities of their renowned traditional herbal pharmacopeia, which contains compounds active against diseases including helminthiasis, guinea worm, jaundice, malaria, diarrhea, toothache, and cough. As Pygmy communities spend more time outside the forest in fixed settlements, malaria increases and parasites accumulate because of increased population density and poor sanitation. Heavy infestations of ► chiggers (burrowing fleas) cause crippling infections. Traditional cultural mechanisms for dealing with tension and discord (such as nocturnal singing ceremonies to restore harmony between the group members and the forest) are eroded; alcohol abuse and domestic violence against women increase. Twa communities no longer living in the forest report malaria, intestinal worms, diarrhea, and respiratory illnesses as their most serious health problems, a morbidity profile similar to that of their non-Pygmy neighbors. In Rwanda and Burundi, 43% and 53% of Twa households were reported to be landless in 2003 and 2001, respectively – 3.5 times more than the respective national populations. The situation of the Ugandan Twa is similar. Without land, Twa are unable to meet family food needs, contributing to the increased childhood mortality. Severely disadvantaged living conditions increase the risk of illness: prevalence of inadequate housing, poor sanitation, and lack of safe drinking water were, respectively, six times, seven times, and two times higher in Rwandan Twa households than the national population in 2003.

HIV-1

Studies in the 1980s and 1990s in Cameroon and the Republic of the Congo showed a generally lower baseline prevalence of HIV-1 in Baka and Aka people (range 0–1.6%) than in neighboring populations (range 0–5.4%). The lower prevalence of HIV (and hepatitis C) infection in Pygmy communities could be because intermarriage with Bantu people is infrequent and monogamy is more common than among Bantus. Where intermarriage occurs it is almost always Pygmy women marrying out of their communities, their lower bride price and perceived higher fertility making them a more attractive prospect for Bantu men. Nevertheless, HIV prevalence is increasing in Pygmy populations, probably through increased contact with Bantus. Between 1993 and 2003, HIV infection reportedly increased from 0.7% to 4% in Baka Pygmies in the Yokadouma region of eastern Cameroon. The spread of sexually transmitted diseases increases with the influx of transient labor employed on logging camps, road building, and infrastructure projects. Pygmy women are at particular risk of HIV infection through rape, especially in zones of armed conflict, and also because of the belief of other ethnic groups that sexual intercourse with a Pygmy woman protects against backache, AIDS, and other ailments.

Access to Health Care

In much of rural central Africa, primary health services are absent, function only in a rudimentary way, or have been destroyed during conflict. Even where health care facilities exist, many Pygmy people do not use them because they cannot pay for consultations and medicines, do not have the documents and identity cards needed to travel or obtain hospital treatment, or are subjected to humiliating and discriminatory treatment. More than inaccessibility, public health services can fail to reach Pygmy communities because of active ► discrimination. Vaccination campaigns in Congo during 1996 prioritized the Bantu community, and treatments dispensed by health posts reach the Bantu community more than Pygmies. Bantu intermediaries responsible for delivering leprosy medication to

Pygmies can extort payment or labor from them. The high mortality of Pygmy children from measles and the higher prevalence of ► endemic diseases such as yaws and leprosy in Pygmy communities than in Bantu communities indicates their exclusion from government health services. The prejudice against Pygmy people, coupled with their poverty and inadequate government policies, prevents them from gaining basic citizens' rights including access to health care and land, and to education, employment, and justice. In the absence of government policies and programs providing equitable access to health care, Pygmy communities often depend on missionaries, nongovernment organizations, and development agencies.

Some programs have trained Pygmy primary-care workers and established ► dispensaries that are run by the community. With proper planning, ► health campaigns can reach Pygmy communities, despite their mobility and remoteness. In the mid-1990s, a privately organized campaign gave hundreds of Aka people in northern Congo the single shot of penicillin needed to cure yaws. In 2002, UNICEF vaccinated Pygmy children in the Democratic Republic of the Congo, Congo, and Central African Republic against poliomyelitis.

Over the past 5 years, attitudes of health staff in some areas have begun to change, and through the raising of awareness more Pygmy communities now know about the free services provided by the government. In Rwanda, 68% of Twa women have received antenatal vaccinations, and 90% of children younger than 5 years have received one or more of the DTaP (diphtheria, tetanus, and pertussis), polio, tuberculosis, and measles vaccinations. Economic empowerment programs run by nongovernment organizations are enabling Twa to generate incomes and so join local health insurance schemes and improve their living conditions.

Health Issues

Life expectancy at birth is 10 to 20 years less for indigenous people than for the overall population in a country. Infant mortality rates are up to 3 times greater than the national average.

Malnutrition and communicable diseases, such as malaria, cholera and tuberculosis, continue to affect a large proportion of indigenous peoples.

In some instances, higher suicide rates are indicative of the deterioration in conditions that affect mental health. Smoking, alcohol and substance abuse are significant health and social problems.

Cardiovascular diseases, diabetes, cancer, unintentional injuries and domestic violence are significant health problems among indigenous peoples, and many of these illnesses are associated with lifestyle changes resulting from acculturation.

Land displacement and contamination affects the food supply of indigenous people, increasing the likelihood of malnutrition and starvation.

In the past the indigenous peoples were decimated by infectious diseases (measles, typhoid, tuberculosis, influenza, ► smallpox). At present, communicable diseases continue to affect large indigenous populations. However, similar to the non-indigenous populations, health problems are injuries, alcohol and drug misuse, cancer, ischemic heart disease, kidney disease, obesity, suicide, and diabetes. HIV/AIDS ► pandemic is engulfing the non-indigenous majority populations and spreading to the indigenous groups. At present, some estimates put the figure of prevalence in non-indigenous populations at 30% and in non-indigenous at 20%. Bearing in mind the slow and insidious course of HIV/AIDS it is certain that this disease is going to be the major health problem in the indigenous population in the future. Since they have lower exposure to the health care facilities it is possible that they are going to be the last to have comprehensive measures to fight AIDS implemented.

Summary

Precise numbers and health indicators and determinants of health in indigenous communities are lacking.

Indigenous peoples tend to die younger and generally have lower health status than other population groups.

Infectious diseases and so-called life-style, chronic non-communicable diseases show the highest rates among indigenous populations.

Genetic predisposition, cultural and religious beliefs, health knowledge and practices all influence the health status of indigenous populations.

Cross-References

► Dispensaries
► Endemic
► Health Campaigns
► Hepatitis

- ▶ HIV-Infection and AIDS
- ▶ Intestinal Parasite
- ▶ Leprosy
- ▶ Pandemic
- ▶ Smallpox

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Indigenous Health, Asian

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Synonyms

Tibetans (Central Asia); Ainu (Japan, Russia); Taiwanese aborigines (island of Taiwan), (East Asia); Northern indigenous people of Russia (Siberia and Russia); Sakha; Tuvans; Altayans; Titular nation of Altai Republic; Buryats; Khakas; Tungus (North Asia); Adivasi (scheduled tribes in India); Andamanese (India); Nicobari; Shompen; Naga (India) (South Asia); Bajau; Akha; Degar; Igorot; Lumad; Mangyan; Penan; Sakai; Semang (Southeast Asia); Syriacs (Aramaens, Maronites, Assyrians, Syriacs, Chaldeans) (Southwest Asia)

Definition

Indigenous peoples of Asia are different groups inhabiting vast regions of the (sub-) continent of Asia, including related islands, the Indian subcontinent, Central Asian Republics, the Middle East and Arabia.
The majority of the present-day indigenous peoples in the world (more than 150 million) inhabits the Asian continent and constitutes about 70% of the world's indigenous population.

Basic Characteristics

Demography and Contemporary Diversity

The contemporary indigenous population of Asia consists of culturally and linguistically different groups. Asia with its myriad of mainstream and indigenous languages poses a great challenge in the field of communication. Nowadays, many indigenous peoples in Asia speak a European language and have adopted the contemporary lifestyles of the nation states. At the same time there are a large number of Asian indigenous peoples who live in isolation within the nation states and do not have either linguistic or any other communication with the rest of the populations of these states.
Contemporary indigenous peoples in Asia mostly live in their own communities integrated within the present nation-states. Many of them have settled, for economic reasons, in industrial and agriculture centers, away from their native communities, where traditions are not handed down from the elders. Most Asian states deny that there are any indigenous peoples within their territories. Asians and their descendants are still facing deep-seated racism and xenophobia, lack access to economic, social and political opportunities, are deprived of their civil rights and liberties and are victims of violent hate crimes, racial profiling, discriminatory employment and unjust immigration policies and practices.

Contemporary Health Issues

The present situation of indigenous peoples in Asia in relation to health is, in many aspects, similar to problems of indigenous peoples worldwide. Indigenous peoples in Asia die younger and generally have lower health status in comparison with other population groups. Indigenous peoples suffer the worst health of any identifiable group in Asia.

Serious health problems from the past, such as different infectious diseases, still are an important cause of morbidity and mortality among indigenous peoples in Asia. Although the gap in health status between indigenous populations and the general populations has closed dramatically over the past generation, there is a continuing burden of disease with significant ► co-morbidity within the indigenous communities as compared to general population. What is more, the spectrum of disease differs, so skin infections, ear infections, trachoma and rheumatic fever are still predominant health issues in most indigenous communities. Most bear a triple burden of persisting infectious diseases, increasing chronic conditions, and a growing recognition of injuries and violence. Incomplete demographic transitions, HIV and AIDS, massive unplanned urbanization, and a host of social determinants of health compound these problems.

Indigenous communities are at greater risk from communicable diseases due to poor ► sanitation and hygiene practices. What is more, immunization programs are very inadequate or are used improperly in indigenous communities. Some serious health problems are caused by environmental issues such as pesticides, chemical fertilizers, and other kinds of pollution. On the other hand, certain cultural beliefs of indigenous peoples have negative consequences on health. There is an increase in ► sexually transmitted diseases including HIV/AIDS because of ► drug addiction, sexual trafficking and increased migrations, for example in North East India, Thailand and Burma. The World Health Organization data show that more than half of the indigenous children are deficient in calorie intake and ► malnutrition is still predominant, in comparison to overweight and obesity, among indigenous populations. However, pressure from centralized national governments has forced more and more indigenous peoples to adopt a ► sedentary lifestyle and therefore the number of nomadic tribes has decreased.

Health Services

One of the major problems is lack of data on health status, health needs and utilization of health care services as well as a scarcity of comprehensive research on health risks for indigenous peoples. One of the primary characteristics is lack to access to adequate and culturally appropriate health care. Very few indigenous individuals become health professionals. Another prominent feature is discrimination against traditional health practices. There are few existing guidelines that inform about optimal primary health care delivery and those that exist are often not relevant to the indigenous populations. Another common characteristic is that national estimates of health mask large variations within countries. One of the prominent features is weak public sector health care. Striking inequities in the provision of human resources, infrastructure, and effective services abound between regions of countries, socioeconomic classes, and rural and urban areas. There has been little improvement during the last decades, particularly in comparison with the international experience in comparable settings. Further research is essential to guide improvements in health systems and develop new initiatives.

Cross-References

► Co-Morbidity
► Drug Addiction
► Malnutrition
► Sanitation
► Sedentary Lifestyle
► Sexually Transmitted Diseases

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Indigenous Health – Australooceaninan

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Synonyms

Aboriginal people; Indigenous Australians; Torres Strait Islanders (Australia); Koori (New South Wales and Victoria); Murri (Queensland); Noongar (Southern and Western Australia); Yamatji (Central Western Australia); Wangkai (Western Australian goldfields); Nunga (Southern South Australia); Anangu (Northern South Australia); Yapa (Western Central North Territory); Yolngu (Eastern Arnhemland, NT); Palawah (Tasmania); Maori (New Zealand); Kanaka Maoli (Hawaii)

Definition

Indigenous peoples of Australia and Oceania are represented by large numbers of diverse communities and societies that inhabit the continental landmass of Australia and associated islands (Indigenous Australians, Torres Strait Islanders) as well as most islands of the Pacific Ocean and New Guinea.

The word "aboriginal" has been used in Australia to describe its indigenous peoples since 1789. But, the use of "aboriginal" as a noun has acquired negative, even derogatory connotation among some parts of the community who regard it as offensive. Some also tend to avoid widely accepted term "Australian aborigines" because of its historical association with colonialism. Since 1980s the most commonly used term to denote descendants of the first inhabitants of Australia is "indigenous Australians". Torres Strait Islanders' heritage and cultural history is distinct from mainland indigenous traits, but they are also referred to as indigenous Australians. The indigenous people of New Zealand are called Maori.

Basic Characteristics

Indigenous Australians

Origins There is no clear or accepted relationship between indigenous peoples of Australia with any nation worldwide. Although they migrated to Australia through Southeast Asia, they are not related either to any known Asian population, or to the peoples of Polynesia. On the basis of DNA analysis there is some speculation regarding their racial origins in India. During the course of time, they have been mostly isolated from other human populations, except from peoples of New Guinea due to trade and intermarriage in the years following the arrival of Europeans.

Demography At the time of of first European contact estimates say that between 250 000 and 1 million people lived in Australia. The greatest population density was found in the southern and eastern regions of the Australian continent, areas that are currently most populated. All indigenous Australians were hunter-gatherers and the ones living along the ocean and river coasts were also fishermen. None of the indigenous peoples practiced agriculture. Most indigenous communities were semi-nomadic, moving over a defined territory, following seasonal changes and food sources. They adapted well to great climatic changes that occurred over the years.

Contemporary indigenous Australians are mostly integrated within the modern nation-state of Australia but have kept their identity as indigenous peoples. In 2001, indigenous Australians constituted 2.4% of the total Australian population (492 700 people). Of the total number, 90% described themselves as Aboriginal, 6% as Torres Strait Islanders and 4% as both Aboriginal and Torres Strait Islanders. In comparison with the total Australian population, the indigenous Australian population is young: according to the data of the census on population and housing in 2001, half of the indigenous population was younger than 20.5 years as compared with 36 years for the non-indigenous population. Approximately 30% of the total indigenous Australians live in major Australian cities, but one in four (27%) live in rural and very remote areas constituting 45% of the population in remote regions.

Contemporary Health Issues Historical and political forces have shaped the present health status, health hazards and health care (► health care facility) in indigenous populations in Australia. Indigenous Australians suffer the worst health of any identifiable group in Australia. There has been little improvement during the last decades, particularly in comparison with

the international experience in comparable settings. The gap in health status between indigenous populations has closed dramatically over the past generation so that indigenous health is now comparable with that of the general populations.

The continuing ► burden of disease with significant comorbidity is greater in indigenous communities as compared to general populations. What is more, the spectrum of disease differs, so skin infections, ear infections, trachoma and rheumatic fever are still predominant health issues in most indigenous communities.

Over 60% of excess mortality in the indigenous Australian population is due to circulatory conditions (26%), injury and poisoning (16%), respiratory conditions (15%) and diabetes (8%).

Cardiovascular diseases are the leading cause of illness, hospitalization and death for both sexes in the indigenous population, responsible for 27% of male and 30% of female deaths. Standardized mortality rate ratios are 3.2 (men) and 2.8 (women) times higher in comparison with the total Australian population. Ishemic heart disease and cerebrovascular disease are the main causes. However, death rates due to chronic rheumatic heart disease are over ten times higher in comparison to the general Australian population.

Injury and poisoning are the second most common cause of death for men and third for women (particularly below 34 years of age for both sexes). Transport accidents account for 40% of the deaths in this category. Homicide and suicide are on the third place in this category and suicide mortality rates are 15 to 17 times higher in comparison to the general population.

For indigenous men the next most frequent causes of death are malignant neoplasia (rate ratio 3.0), respiratory disease (3.9) and endocrine, nutritional and metabolic disorders (mainly diabetes, 7.3). For indigenous women, after circulatory system disease, the most frequent causes of death are malignant diseases (1.6), endocrine, nutritional and metabolic disorders (11.7), injuries (2.9) and respiratory system diseases (3.6).

There is a marked rise of diabetes in the indigenous Australian population and decline of the diseases such as syphilis, tuberculosis, leprosy and bronchiectasis.

The estimated gap in ► life expectancy between indigenous and non-indigenous populations is 19–21 years. In 1998–2000, the life expectancy of an indigenous Australian was 21 years less for males and 20 years less for females than that of an average Australian.

In 2001, the age-standardized death rates for indigenous Australians were between two to four times that of no-indigenous Australians. The 2002 data show that age-specific death rate ratios are higher for indigenous Australians across all age groups, but rate ratios are particularly high for young to middle-aged adults. The extent of mortality rate variations between urban, rural and remote regions is uncertain, which indicates a problem with the quality of the data.

According to data on infant mortality rates, there have been improvements over the last 30 years. However, infant mortality rates remain three times higher in comparison with the total Australian population (for example in Western Australia 21.5 per 1000 live births). Indigenous Australian women contribute to 30% of total maternal mortality.

Poverty, unemployment, poor education, cultural disorientation, cultural beliefs, access to health care services are just a few major reasons for the poor health status of the indigenous Australians.

Health Services There is a lack in evidence-based information regarding health status, health needs and primary health care delivery and related problems in indigenous Australian communities. Existing guidelines that inform about optimal primary health care delivery are inflexible and often not relevant to indigenous populations. One of the problems is a continuous turnover of medical staff in the remote areas that are usually inhabited by indigenous people. Therefore, there is a continuous cycle of re-learning of optimal practice and a need to adjust to conditions that are very different from urban areas.

Since the 1970s the Aboriginal Community Controlled Health Services (ACCHS) have been implementing primary health care services in response to the indigenous peoples' perceptions that their health needs were not being met by the mainstream health services. The ACCHS model of participatory holistic primary heath care integrates illness care with disease prevention, intersectoral collaboration and advocacy for social justice. The factors identified as being responsible for poor health status are: discrimination, low income, poor education, substance abuse, remote locations with poor access to health services. For the urbanized indigenous Australians, other factors have been identified: social pressure which prevents access to health services as well as cultural differences resulting in poor com-

Indigenous Health – Australooceaninan, Table 1 Recommendations relating to indigenous primary health care.

Aboriginal and Torres Strait Targets, 1992	Increase to over 80% in 5 years and over 95% in 10 years, the proportion of Aboriginal and Torres Strait Islander communities that have access to community-controlled or community acceptable health service [target 3.17]. Within 5 years disparities in access to appropriate housing between Aboriginal and Torres Strait Islander communities and the wider societies will be reduced by 50%; and by 90% in 10 years [target 26.6].
National Aboriginal Health Strategy, 1989	The Working Party recommends that ... primary level Aboriginal health services presently being delivered by State governments should be transferred to existing or proposed Aboriginal community controlled primary level services.
ILO Convention Concerning in Independent Countries, 1989	Governments shall ensure that adequate health services are made available to the [indigenous and tribal] peoples concerned or shall provide them with resources to allow them to design and deliver such services under their own responsibility and control so that they may enjoy the highest attainable standard of physical and mental health.Health services shall, to the extent possible, be community based. These services shall be planned and administered in cooperation with the peoples concerned and take account of their economic, geographic, social and cultural conditions as well as their traditional preventive care, healing practices and medicines.The health care systems shall give preference to the training and employment of local community health workers and focus on primary health care while maintaining strong links with other levels of health care services. [article 25]

munication between indigenous Australians and health workers. Recommendations relating to indigenous primary health care are shown in Table 1

The Maori

Origins The ancestors of the Maori were Polynesian people originating from south-east Asia. In the Maori language the word *māori* means "normal" or "ordinary". In legends and other oral traditions, the word distinguished ordinary mortal human beings from deities and spirits. Early European visitors to the islands of New Zealand referred to the people they found there variously as "indians", "aborigines", "natives" or "New Zealanders". Māori remained the term used by Māori to describe themselves in a pan-tribal sense.

Demography Approximately half a million people constitute the Maori population in New Zealand that equals 14.7% of the total population. The median age of a Maori in 2001 was 21.9 years as compared to 34.8 years for the total New Zealand population.

Contemporary Health Issues As a population group, Maori have on average the poorest health status of any ethnic group in New Zealand. They inhabit the deprived geographical areas of New Zealand.
Compared to the increasing life expectancy for the non-Maori population since mid-1980s, little improvement has been seen in Maori life expectancy. Overall, Maori life expectancy at birth is more than 8 years less than non-Maori in 2001, for both genders.
The major causes of death are all chronic diseases. Cardiovascular disease, cancer, respiratory disease and injury are the major causes of death for both Maori and non-Maori. Ischemic heart disease is the leading cause of death for both Maori and non-Maori. Lung cancer was the second cause of death for Maori. Diabetes is among the top five causes of death for both genders in the Maori population, and is not so in the non-Maori population, either gender. The prevalence of heart disease among Maori is one a half times that in non-Maori. Total cardiovascular disease mortality is more than two and a half times higher for Maori than for non-Maori. The most common cancers registered for Maori females are breast, lung, colorectal, cervical and uterine, while in Maori males, lung, prostate, colorectal, stomach and liver are the most common.

Health Services There is evidence of disparities in access to health care between Maori and non-Maori people. The Government and the Ministry of Health have made it a key priority to reduce the health inequalities that affect Maori.
The ► maori health strategy (He Korowai Oranga) was launched in 2002 (Minister of Health and Associate Minister of Health 2002). It sets a new direction for Maori health development over 10 years, and provides

guidance at a strategic level on ways to achieve Maori health improvements and eliminate health inequalities. At the heart of He Korowai Oranga is the achievement of whānau ora, or healthy families. This includes public policies that actively:

- promote whānau well being;
- promote high-quality education;
- promote employment opportunities;
- promote suitable housing;
- promote safe working conditions;
- promote improvements in income and wealth; and
- address systemic barriers, including institutional racism.

Maori Health Action Plan (2002–2005) outlines what the health and disability sector will do to implement the strategy (including programs, policies and interventions). An updated Maori Health Action Plan (2006–2011) was released in June 2006. The New Zealand ► health strategy highlights the need for better access to relevant information to improve decision-making at both the health and disability sector level, and at the community level. Reducing inequalities in health is a key goal of the strategy.

The priority areas are:

- building quality data and monitoring Maori health;
- developing whānau ora based models;
- improving Maori participation at all levels of the health and disability sector, particularly workforce development and governance; and
- improving primary health care.

Maori Health Priorities are:

- immunization;
- injury prevention;
- diabetes;
- asthma;
- improving oral health;
- mental health;
- smoking;
- sexual & reproductive health; and
- drug & alcohol abuse.

Cross-References

► Burden of Disease
► Health Care Facility
► Health Strategy
► Life Expectancy
► Maori Health Strategy

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Indigenous Health Care

► Indigenous Health Services

Indigenous Health Care Services

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Synonyms

Indigenous medicine; Traditional medicine; Tribal medicine; Ethnomedicine; Folk medicine

First nations/people, Aboriginals, Ethnic groups; Occupational and geographical terms such as hunter-gatherers, Nomad, Hill people, etc.

Traditional healers: Medicine people; Bonesetter; Prayer-singers; Herbalists; Diviners;

Spiritual or faith healers; Traditional midwives; Birth attendants

Definition

The World Health Organization (WHO) has adopted a very general definition which describes traditional medicine (TM) as "knowledge based on the theories, beliefs and experiences ► indigenous to different cultures (► indigenous culture), either codified in writing or transmitted orally and used in maintenance of ► health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness. Traditional medicine includes diverse health practices, approaches, knowledge and beliefs incorporating plants, animals and/or mineral based medicine, spiritual therapies, manual techniques and exercises, applied singularly or in combination". One of the definitions given for 'African Traditional Medicine' by the WHO Centre for Health Development is "the sum total of all knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental, or societal imbalance, and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing".

Ethnomedicine is a multidisciplinary approach of societies and cultures integrating psychology, sociology, ethnology and epidemiology for a global understanding of the disease beyond its biological reality.

Basic Characteristics

Acceptability

Traditional health systems take into account physical, mental, spiritual, social and ecological dimensions of well-being in a culturally specific manner. Contrary to western medicine, which studies the human being mechanically, starting from its functions, traditional medicines consider the person in its totality, including the social and ecological dimensions. Belonging to the same community as the patient, traditional healers share their vision, thus inspiring more trust in the curative power of their methods rather than in western medicine. In many instances, indigenous medicine is indissolubly connected to every-day life, through food requirements, as well as through important rituals in the lives of both the individual and communities where health, rather than disease is emphasized.

Availability

The vast majority of the planet's population does not have access to formal ► health care systems and traditional healers are the only source for health care and education. In Sub-Saharan Africa, the ratio of traditional healers to the population is approximately 800 times higher than that of medical doctors (1 : 500 versus 1 : 40 000) (Asian and Pacific Women's Resource and Action Series 1989).

Indigenous ► health care services utilize local resources to provide effective remedies.

Accessibility

Traditional medicine is advantageous because it is cheaper and geographically more accessible. Especially from the point of view of women, traditional medicine is preferred because little or no physical examination is required and the healers are often women. It is also seen as "soft" medicine as compared to modern medicine which is deemed too "strong" for women and children by Asian and Pacific women (Asian and Pacific Women's Resource and Action Series 1989).

Quality

Healers help individuals, families and communities strive for balance, harmony and good health. The training of a healer involves a very long apprenticeship with a respected medicine person and the process is expected to last a lifetime. The hardships supposed to be encountered are usually compensated by the highly respected status healers usually command in the community. Traditional practitioners are at the confluence of a non-religious pursuit of the sacred and a non-medical pursuit of health (http://www.mapn.org/).

History

Indigenous medicine was practiced in every community since the dawn of humankind and fairly advanced knowledge of surgery, obstetrical procedures and medicinal plants is noted. Colonizers introduced not only new diseases, but also a system of treatment not suited to the beliefs and social structure of

► indigenous peoples. Thousands of years of carefully researched and implemented methods were seen as negative in the process of "civilizing".

The process of de-culturalization included policies aimed at making independent and proud people dependent. As a consequence, the health situation of indigenous people lags far behind that of the majority population in industrialized countries such as Australia, Canada, New Zealand, and the U.S.A.

In the past few decades the modern world has considered indigenous medicine as a vision of the past. However, in the context of geographical isolation, poor economical resources and a lack of quality in ► public health care services, a revival of indigenous ► healing methods can be observed.

The approach taken by traditional doctors addressing all aspects of the ailing person (mental, emotional, physical, spiritual as well as communal) has inspired also non-Natives who are looking for a holistic approach to medicine, closer to nature and thus perceived as "softer", without the negative side effects of modern drugs and therapeutic procedures. Therefore, in some countries, indigenous medicine is used as "Complementary and/or Alternative" medicine.

Indigenous Health Care Services

Health disparities are directly and indirectly associated with social, economic, cultural and political inequities, the end result of which is a disproportionate burden of ill health and social suffering upon the ► aboriginal populations.

Friction is evident between 'Western' medicine or biomedicine that look at a "material causation" to understand and treat an illness; and traditional medicine that generally looks towards the "spiritual" origin such as witchcraft and displeasure by ancestors in order to cure an ailment (► disease, ailment) (Jolles and Jolles 2000). Traditional religion is often seen as having negative influence on health care, since the spiritual explanation of events, including diseases may delay the use of modern services.

However, regional and international bodies consider that indigenous peoples have the right to specific measures to improve their access to health services (► indigenous health services) and care. These services should be culturally appropriate and designed by indigenous peoples themselves. Maori healers believe that traditional healing services should be part of the public health system but controlled by themselves.

Recently, discussion about incorporating traditional medicine into national health programs is taking place in many countries. For example, Ugandan authorities are in the process of defining their policy towards traditional healers by creating a legal framework with an aim of establishing a parallel health sector.

Success stories showed that incorporating trained traditional health practitioners in ► primary health care programs are cost effective in providing essential and culturally relevant health services in communities. The key to success seems to be the respectful collaboration between traditional healers and medical doctors.

Obstacles to Integration of Indigenous Medicines in Mainstream Public Health Systems

For Native peoples the connection to their *traditional territories* is very strong and breaking the symbiotic relationship with their lands has a deleterious effect on their health.

Involvement of the community in public health policies does not necessarily include participation of traditional healers.

The *regulation* of traditional systems of medicine and of the products used in these systems is weak in most countries. This leads to misuse of the medicines by unqualified practitioners and loss in the credibility of the system.

Traditional medicine practitioners and manufacturers usually oppose any steps to strengthen regulation by the health authorities due to fears that regulation such as that applied to allopathic medicine is not suitable for traditional medicine and may stifle the ancient methods.

Environmental changes have also affected vital medicinal plants, animals and minerals. The international market for natural products, including those originated from endangered species, is increasing demand; the lure of economic gain, together with lack of information is exacerbating the situation.

Education and *language constraints* also constitute an obstacle to mutual understanding between the two approaches in health care, traditional versus the modern.

Traditional medicinal practices have also unproven, ineffective or even dangerous aspects. Careful, sensitive research is needed to validate many rituals and substances used for health purposes since times immemo-

rial. Also, much patience and tact are expected in order to change such mentalities and practices.
International aid consisting of export of technology and know-how raises concerns about the acceptability and sustainability and at the same time is leading to irreparable loss of traditional knowledge.

Conclusion

Western ► health care systems are confronted with serious difficulties when asked to solve the medical problems of indigenous people because these maintain *particular views* on health, disease and life in general and the national health policies are usually not adapted to the socio-cultural realities of these peoples.
Indigenous health care services are providing essential health care and education to the majority of the Earth's population but are still largely not officially recognized. In order to offer culturally relevant medical services to indigenous people, the infrastructure already in place needs to be strengthened. Traditional medicine systems and providers should be integrated with the overall health care programs in a manner that mutually benefits the entire health care system. However, there are still many obstacles to this integration, stemming mainly from the mutual distrust of practitioners from both paradigms. As has been shown in successful examples of integration, the key is education for reciprocal respect and collaboration.

Cross-References

► Aboriginal
► Ailment
► Healing
► Health Care Systems
► Health Service
► Indigenous
► Indigenous Culture
► Indigenous Health Services
► Indigenous People
► Primary Health Care
► Public Health

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Indigenous Health Knowledge

► Health Knowledge, Traditional

Indigenous Health, North America

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Synonyms

Aboriginal peoples; Indian; Inuits; Métis (Canada); Native Americans; American Indian; Alaska Native; Eskimo (United States)

Definition

The Indigenous peoples are those peoples who inhabited the lands of Canada and the United States prior to the arrival of European explorers and colonists beginning in the late 15th century. Based on mitochondrial DNA (mtDNA) evidence, it is believed by scientists that these populations originally migrated into North America from Asia; estimates as to when this migration started vary from sometime between 60,000 years ago to as little as 12,000 years ago. Up to 5 distinct mtDNA lineages have been identified so far. The cultural, economic, political and social formations of these peoples at the time of contact were incredibly diverse. All of these cultural groups adapted to specific micro environments, and their social formations ranged from small, semi-nomadic hunting bands to densely populated, farming-based villages. After contact, rapid cultural changes ensued, the product of conflict with settlers, forced acculturation through government policies, inter-marriage, and the influences of an emerging North

American popular culture. In Canada, a unique mixed heritage (primarily Indian and French) group known as the Métis emerged at the end of the 18th century, and remain a distinct people today.

Basic Characteristics

Contemporary Diversity

The contemporary Indigenous population of North American is constituted by hundreds of culturally and linguistically diverse groups, sometimes referred to as bands or First Nations in Canada, and tribes in the United States. In the high arctic, the Inuit (► inuit) (Canada) and Eskimo (United States) populations can be found. Contemporary Indigenous peoples are now mostly integrated within the modern nation-states of Canada and the United States, yet also maintain separate identities as Indigenous peoples. There are some, however, especially in the more remote regions of northern Canada and Alaska, who remain more traditional in culture and language. Some Indigenous peoples are specifically recognized by the federal governments as such, while others are not. Such recognition renders the targeted Indigenous peoples the beneficiaries of federal aid programs, such as health and education.

Today, most Indigenous peoples speak a European language, sometimes in conjunction with their own language, and have adopted North American lifestyles to varying extents. A separate Indigenous identity remains, however.

Demography

There has been considerable debate over the question of population sizes for North American Indigenous people at the time of first contact with Europeans in the late 15th century. Estimates have ranged from one to two million up to 18 million; all such estimates suffer from a basic lack of data, however. What is certain is that the Indigenous population as a whole began to decline after contact, as a result of the spread of virgin soil epidemic diseases, conflict, dislocation, and the destruction of essential resources. The ► population nadir was reached in the early part of the 20th century, by which time some groups had disappeared altogether and others reduced in some cases by as much as 90%. After 1960, the Indigenous population began to increase significantly, although there has been some controversy over the identification of this population, given extensive inter-marriage with non-Indigenous peoples. By 2001, approximately 1.3 million Canadians claimed an Aboriginal ancestry; in the United States, some 2.4 million self-identified as American Indian or Alaska Native. This increase in population is reflected in a population pyramid weighted heavily toward the younger ages; in Canada, for instance, one-third of the Indigenous population is under age 15, compared to only 20% nationally.

There has also been a dramatic shift in residence experienced by the Indigenous population. While in both Canada and the United States tracts of land were set aside for some Indigenous peoples, known as reserves or reservations, beginning in the 3rd quarter of the 20th century a significant trend toward urbanization and off-reserve residence is noticeable. In Canada in 2001, about half of the Indigenous population lived in urban areas; at the same time in the United States, over 50% were living off reservation or in urban areas.

Contemporary Health Issues

The life-span of Indigenous peoples today, while improved, remains five to seven years less for men and women, respectively, than for the national populations. While morbidity and mortality from infectious diseases such as influenza, measles, poliomyelitis and diphtheria declined by the latter part of the 20th century, they were replaced by a variety of new health problems. Newly emerging infectious diseases, such as HIV/AIDS, combined with a resurgence in some areas of tuberculosis, demonstrate that infectious diseases remain a problem. Diseases such as diabetes, certain cancers (kidney, gall bladder, cervix), and cardiovascular diseases have increased in significance as causes of morbidity and mortality. Levels of obesity have also risen. There has also been an increase in injury and death due to alcoholism and substance abuse, accidents, violence, depression and suicide. These latter problems disproportionately impact individuals, especially males, in the 15 to 40 age ranges. Combined, all of these emerging health problems demonstrate the consequences of an historical process of colonization and the continued marginalization and poverty of the Indigenous population. Indigenous North Americans as a whole continue to experience disproportionally higher rates of unemployment, lower educational levels, and poorer hous-

ing and living conditions and community infrastructure, despite important strides made in the last few decades to erase health inequities.

Health Services

The respective federal governments are responsible for the delivery of health services to substantial portions of the Indigenous population. The First Nations and Inuit Health Branch in Canada and the Indian Health Service in the United States provide care to only some of the Indigenous population, however, that is, those officially designated as federal wards. Other Indigenous peoples must seek health services from provincial (Canada), state (United States) or municipal sources. Annual federal expenditures on health services are significant: nearly 700 million dollars in Canada, and over 2 billion dollars in the United States. Despite ever-increasing expenditures, however, consensus is emerging that health disparities will not be erased until broader political, social and economic changes ensue. In both countries, substantial health services are now delivered under local control as part of the broader movement of Indigenous self-determination, considered an important step in this direction.

Traditional Health Care Practices

At the time of first contact, Indigenous peoples had extensive health care systems involving, among other things, the use of plant medicines, basic surgery techniques, and ceremony. Spirituality was an essential component of much traditional health practice. There were a variety of health specialists, from herbalists (► herbalism) to ► bonesetters to ► shamans. Many of these practices eventually were threatened by colonial government policy and action, and much knowledge has since disappeared. However, in recent decades there has been a resurgence in traditional health practices, such as the ► sweat lodge and the use of symbolic healing ceremonies, as part of an Indigenous cultural revitalization. In many areas, these practices are being integrated with western biomedical and psychotherapeutic approaches to provide holistic care.

Cross-References

► Bonesetter
► Herbalism
► Inuit
► Population Nadir
► Shaman
► Sweat Lodge

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Indigenous Health Research

Synonyms

Indigenous medical research

Definition

Indigenous ► health research is defined as research projects in indigenous populations, led by indigenous people and based on indigenous methodologies and views. Collaborative research in various indigenous populations can contribute to improving health as well as organization and planning of health care services in indigenous communities.

Indigenous Health Services

Synonyms

Indigenous health care

Definition

► Indigenous health services are defined as ► health care services aimed at prevention and treatment of indigenous peoples. They provide a range of ► healing methods, including conventional professional services and traditional healing. Due to differences in terms of system of beliefs and values as well as understanding of health and illness, incorporation of practices of indigenous communities in provision of health care services is desirable. There are no accurate data on availability of indigenous health services in indigenous communities worldwide.

Indigenous Health, South America

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Synonyms

Native; Aboriginal; Indian; South american health

Definitions

Native South Americans

In the broad sense, they are the current inhabitants of South America who, independently from their degree of miscegenation and acculturation, identify themselves with the cultures and heritage of the original owners of the continent prior to the European invasion. Approximately 90% of them live in Peru, Bolivia, and Ecuador. In a narrower sense, particularly in these three countries, the 'natives' are a subset of the general population who have endured the invasion, mostly by living in remote areas of the Andes or Amazonia.

Indigenous Health

"Health for many Indigenous peoples is not merely absence of ill health, but also a state of spiritual, communal, and ecosystem equilibrium and wellbeing" (quoted in Stephens et al. 2006).

Basic Characteristics

Introduction

To deal with the topic of health among the native peoples of South America is dealing with the health levels of the poorest of the poor in the world. Even though there are no precise statistical data about their current health status, scattered evidence shows very grim figures. This situation of neglect cannot be explained just by the incompetence of the different medical systems of South American countries, but as the result of a historical process that began with the European invasion (Montenegro 2006).

The last continent to be peopled in the world, South America holds the complete cycle of human cultural development. This cycle, which ranges from the Paleolithic to the development of complex cultures, was abruptly interrupted at the end of the 15th century. Ever since, through war, imported diseases, slaving, and exploitation, this continent has witnessed their native inhabitants' near annihilation. Currently, our continent's indigenous peoples – the largest population of native inhabitants in the Americas – struggle to survive the indifference of mainstream culture.

Timeline

From public health's point of view, native life in the prehistoric period can be divided in two periods, Paleolithic and Civilization. The Paleolithic began around 12.000 B.P. with the arrival of the Paleoindians through the Panama strait, carrying along with them the seeds of civilization, as well as some well-humanized germs and parasites (e. g., tuberculosis). Civilization started approximately 5.000 B.P. in the central coast of Peru, with Caral pristine state based on fishing, agriculture, and trade.

1. **Paleolithic:** Physical anthropological studies on remains from different sites in the continent show different elements of the life of the earliest South Americans. First, they had a short lifespan, between 25 and 30 years of age. Second, although there was a high infantile rate of mortality, the scarcity of teeth and bone stress indicators account in general for a good nutritional level. Third, robust muscular insertions attest the tough active life of these ► nomadic hunters and gatherers.

   The settlers of South America brought with them a definite culture linked to a maritime lifestyle which

probably included some basic medical knowledge. The development of complex mummification techniques among the Chinchorro – 8.000 to 4.000 B.P. – cannot be understood as an isolated cultural achievement.

Among adults, most pathological conditions were linked to trauma with or without secondary infection (Verano and Lombardi 1999).

2. **Civilization:** Civilization in this part of the world started in the Central coast of Peru. As agriculture spread, population growth allowed the foundation of the first permanent settlements on especially selected places. This demographic growth determined the appearance of ruling classes, laws, and inequities. Therefore, the human remains from this period show a higher prevalence of chronic stress markers such as Harris lines and enamel hypoplasia, indicating a paradoxical deterioration of nutritional conditions (Cohen and Armelagos 1984).

   Although data are still scarce for this period, and considering the osteological 'blind spot' to detect acute illnesses, it is predictable that this period had an increase of infectious disease transmission among people living in towns and ► hamlets. Indeed, different intestinal parasitoses have been diagnosed both in coprolites and mummies dating from this period (Allison and Gerzsten 1998).

   On the other hand, there is a good record of chronic diseases and conditions, v.g. porotic hyperostosis and cribra orbitalia, representing chronic infantile anemia; clear cases of tuberculosis, syphilis and osteomielitis. Mummy studies have shown that many diseases that affect current populations existed in the past also in high levels (Allison and Gerzsten 1998). Recently, it has been shown that ► Chagas' disease has kept an almost constant high prevalence along millennia (Aufderheide et al. 2004).
3. **The Invasion:** When the Spanish and Portuguese conquistadors arrived in South America, their armies' path had been paved by lethal epidemics – smallpox, ► influenza, ► measles, better described as the 'McNeill effect' which, having arrived through land since Columbus's entrada, decimated the local populations and therefore, reduced the possibilities of resistance to a minimum level. Then, war, slavery, and oppression followed, which maximized the destruction of coastal and plains' populations and nearly did the same with the remnants of the Inca empire. Only very recently has paleopathology started to address this, less romantic, period of South American history (Verano and Lombardi 1999). There is no consensus on the figures, but Allison and Gerzsten have equated this process to a real holocaust (Allison and Gerzsten 1998).
4. **The Present:** The health statistics of South American native peoples, very often not directly recorded, show ► infant mortality, ► maternal mortality, life expectancy, and general morbidity rates worse than the local general statistics, which are themselves among the worst in the world. In addition to the traditional diseases introduced by the invaders, the imposition of western lifestyles and consumerism has created high rates of alcoholism, diabetes, STDs, and even AIDS among native populations. Moreover, the introduction of more modern problems such as drug trafficking, terrorism, and ► environmental poisoning, are damaging and endangering these feeble peoples even more.

   The best way to understand this phenomenon is through considering that there is still an ongoing cold war expressed by the ► disdain and even racism of mainstream South American societies towards the native minorities. This negative attitude permeates health systems which are "culturally inappropriate" (Montenegro 2006).

Conclusion

The poor level of health among indigenous South Americans today still represents the health level of their ancestors in their worst moment of history, the European invasion.

Since, as implied before, there is a fuzzy definition of what native means in this continent, it is important to understand that in a continuum of indigeneity, the more native the population, the more the chances for it to be poor and neglected by the formal health systems.

The historical evidence shows a continuum since the momentous episode of the European invasion until present. In order to face this shameful situation in a sustainable way, the real causes for it should be addressed, that is to end the war between the owners of the land and the heirs of the invaders, mainstream society. Such a process must have a multidisciplinary approach based on the indigenous peoples' initiative (Stephens et al. 2006).

Cross-References

- ► Chagas Disease
- ► Disdain
- ► Environment
- ► Infant Mortality
- ► Influenza
- ► Maternal Mortality
- ► Measles
- ► Nomad

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Indigenous Knowledge

Synonyms

Traditional knowledge

Definition

► Indigenous knowledge is defined as cultural and environmental knowledge of indigenous communities. It refers to traditions and practices related to way of life, diet, education, culture, health, etc.

Cross-References

- ► Traditional Knowledge

Indigenous Medical Research

- ► Indigenous Health Research

Indigenous Medicine

- ► Indigenous Health Care Services

Indigenous Music

Synonyms

Traditional or folk music

Definition

May refer to any of the musics of ► indigenous peoples, especially the folk, ceremonial or ritual, and religious traditions of these people. For example, Maori music of New Zealand.

Indigenous People

Synonyms

Aborigines; Natives; First people

Definition

There is no standard definition of ► indigenous peoples. The term indigenous may refer to any ethnic group (and its descendants) who inhabits the geographic region with which they have the earliest historical connection. Also, peoples who are self-identified as indigenous, and those recognized as such by other groups are also defined as indigenous. Indigenous peoples have maintained at least in part their distinct linguistic, cultural and social characteristics by which they differ from the surrounding social groups as well as from the culture of the nation-state.

Cross-References

- ► Indigenous Health – Africa
- ► Indigenous Health Care Services

Indigenous People of North America Eskimo (United States)

► Inuit

Indigenous People's Health

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Introduction

Discovery of the new continents half a millennium ago brought new inhabitants with different ways of life, cultures, religions, customs, and beliefs together. As invaders, the newcomers overpowered existing social, cultural, economic, and political structures of the host land. Colonial growth from the 15th century onward produced populations where only a group of people had ancestors who were inhabitants before the land was colonized. They survived in an atmosphere of severe disadvantage in relation to the newcomers. Although many of the countries have since regained their independence, the descendants of the colonizers have become the dominant group over the descendants of the original inhabitants, who became known as indigenous, native, or aboriginal.

Defining Indigenous Peoples

The term indigenous peoples has no universal, standard, or fixed definition. Although there is no single definition of indigenous peoples, an ancient relationship with a defined territory and ethnic distinctiveness are two distinguishing features (Durie 2003).

Usually, groups of people identified as "indigenous" are descended from the original or long-time inhabitants of lands now dominated by others. Nowadays, there are several widely accepted formulations made by internationally recognized organizations like the United Nations (UN), the International Labour Organization, the World Bank, the World Council of Indigenous Peoples, and national governments. According to these definitions, the contemporary working definition of "indigenous peoples" includes the following criteria to distinguish them:

- "Residence within or attachment to geographically distinct traditional habitats, ancestral territories, and natural resources in these habitats and territories;
- Maintenance of cultural and social identities, and social, economic, cultural and political institutions separate from mainstream or dominant societies and cultures;
- Descent from population groups present in a given area, most frequently before modern states or territories were created and current borders identified;
- Self-identification as being part of a distinct indigenous cultural group, and the display of desire to preserve that cultural identity" (WHO 2003).

Recently, in Erica Irene Daes' report of the Working Group on Indigenous Populations, indigenous peoples were defined according to the following:

- "Priority in time
- Voluntary perpetuation of their cultural distinctiveness
- Self-identification as indigenous
- Experience of subjugation, marginalization, dispossession, exclusion, and discrimination by the dominant society" (Havemann 1999).

Indigenous People's Health, Table 1 Characteristics of indigenity

Features	Key element
Primary characteristic:	
An enduring relationship between populations, their territories, and the natural environment	An ecological context for human endeavors
Secondary characteristics (derived from the relationship with the environment):	
The relationship endures over centuries	Time
The relationship is celebrated in custom and group inter-action	Identity
The relationship gives rise to a system of knowledge, distinctive methodologies, and an environmental ethic	Knowledge
The relationship facilitates balanced economic growth	Sustainability
The relationship contributes to the evolution and use of a unique language	Language

Source: Durie M. Indigenous Knowledge within a Global Knowledge System

The term "indigenous" denotes both common characteristics as well as differences between the peoples who are called indigenous, since there is great diversity among indigenous populations worldwide. Other related terms for indigenous peoples include aborigines, native peoples, first peoples, Fourth World, first nations, and autochthonous.

Characteristics of indigenity are shown in Table 1.

Population and Distribution of Indigenous Peoples

Indigenous populations are distributed in regions throughout the globe. They inhabit all climate zones and all continents. Due to inadequacies of available data, it is very difficult to make precise estimates of the total population of indigenous peoples. According to recent sources, there are some 5000 indigenous groups in over 70 countries, with a total population of about 300–350 million, or around 6% of the global population (Howitt 1996). The numbers, conditions, and experiences of indigenous groups vary within a given region. Indigenous population estimates in America are shown in Table 2, represented as a total and as a percent of the total population in selected countries.

Among many indigenous peoples are the Indians of the Americas (for example, the Mayas of Guatemala, Aboriginal peoples of Canada, the Mapuches from Chile and Argentina, and the Tupies from Brazil, Bolivia, Paraguay and Argentina), the Inuit and Innu from circumpolar regions, the Saami from Northern Europe, the Aborigines and Torres Strait Islanders of Australia and Oceania (► indigenous health, australoceanian), the Maori of New Zealand, the Maasai from Kenya and Tanzania, and Pygmy peoples from Central and Western Africa (► indigenous health, africa) (Fig. 1). These and many other indigenous populations have retained their social, cultural, economic, and political characteristics over the centuries, which are clearly distinct from those of others living on the same territory. However, during the course of time, many indigenous groups have undergone drastic changes, and survived with populations ranging from a few dozen to hundreds of thousands or more. Some indigenous populations have disappeared from the world map due to severe illnesses or devastation by settlers, but others have recovered to a certain extent. The indigenous populations worldwide have lived through great climatic changes and adapted successfully to their changing physical environment. Indigenous peoples have also modified their environment, adjusting it to their needs.

Many indigenous populations now have a diverse profile, although the level of integration with other populations varies greatly. Some indigenous communities no longer inhabit their primary lands due to voluntary or forced migration, relocation, or because of suppression by other ethnic or cultural groups. Some indigenous communities remain settled in a certain location, while others have a nomadic lifestyle. The interaction between indigenous and non-indigenous societies throughout history has been very complex, ranging from disputes, conflicts, and armed resistance, to some degree of mutual benefit and cultural transfer. All of these interactions have contributed to a change in the characteristics of indigenous peoples as we see them today. Characteristics that are common for many indigenous groups include predominantly non-urbanized societies whose members rely on agriculture, hunting, and gathering for survival (Fig. 2).

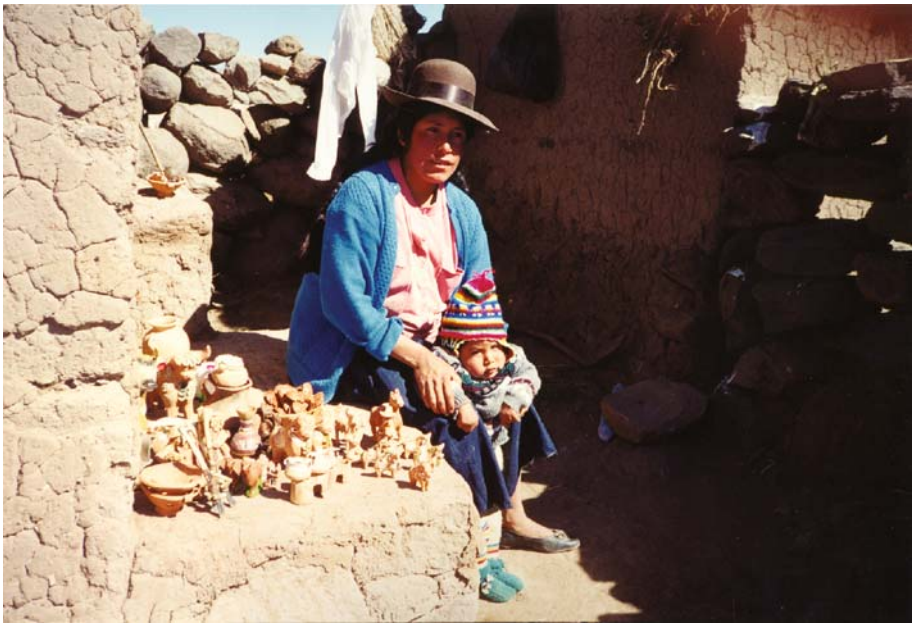
Indigenous People's Health, Table 2 Indigenous population estimates in America in total and as a percent of the total population in selected countries

%	Total indigenous population	
	< 100.000	> 500.000
> 40	–	Peru Guatemala Bolivia Ecuador
5–40	Guyana Belize Surinam	Mexico Chile Honduras
< 5	Costa Rica Guyana Jamaica Dominica	Canada Colombia United States of America

Source: Adapted according to Inter-American Development Bank, 2002. Reports on the Evaluation of the International Decade of the Indigenous Peoples of the World, PAHO 2004

Historical Perspective of Indigenous Cultures

Throughout the course of human history, migrations of different nations have contributed to changes of the



Indigenous People's Health, Figure 1 Aymara woman with child, farm in southern Peru

Indigenous People's Health, Figure 2 Aymara woman in front of house, farm in southern Peru

world map in respect to cultural, socio-economic, and political features of the peoples inhabiting certain territories, as well as regarding religion and health.

Since the European conquest of the new continents from the 15th century onwards, indigenous inhabitants of North and South America (► indigenous health, south america), Australia (► indigenous health, australoceanian), New Zealand, and ► africa (► indigenous health, africa), have been deprived not only of land rights and access to life-sustaining resources, but they have also suffered cultural, social, economic, and political discrimination, which exists in some form even today. Armed resistance, diplomacy, and law have been tools in the quest for survival. Indigenous peoples are marginalized in contemporary societies, which are pushed by internationally recognized bodies like the UN and World Health Organization (WHO) to make necessary changes and provide equity for all, regardless of race, ethnicity, religion, or socio-cultural or political background.

Rights of Indigenous Peoples

During the course of history, whenever dominant neighboring states expanded their territories or far-away conquistadors acquired new lands by force, existence but also freedom, language, culture, tradition, and the social, economic, and political structure of indigenous communities was jeopardized. The ways in which indigenous peoples struggle for their rights are different today than they were in the past, as are issues regarding the rights of indigenous peoples. Although some groups have been successful in regaining the majority of their rights, others still live in the shadow of dominant settlers. That is why indigenous peoples in most parts of the world still seek recognition of their identities.

Indigenous peoples worldwide are concerned about many issues relating to their rights. Despite cultural and ethnic diversity, there are similarities between the problems and interests of the various indigenous peoples. The UN recognized and adopted the concept of human rights in the Universal Declaration of Human Rights, 1948. This declaration is comprised of basic principles of the rights of human beings to life, liberty, security, non-discrimination, equal protection under the law, marriage and family, religion, free expression, work, education, and political and cultural life (Harrison 2001).

In this declaration, the rights of indigenous peoples are not explicit, and therefore the Draft Declaration on the Rights of Indigenous Peoples was developed by the UN Working Group on Indigenous Populations in 2001 (United Nations 2001). It is recognized that the establishment and protection of rights of indigenous peoples are an essential part of human rights and a concern of the international community. In the above-mentioned Draft Declaration, the main bodies of the UN confirmed the fundamental importance of the right of self-determination of all peoples. Other rights are granted for indigenous groups as well: the right not to be subject to genocide of any kind (article 7) or moved from their territories by force (article 10), and the right to practice and revitalize their culture, language, tradition, and customs (article 12), as well as to transmit them to future generations (article 14). The right for education in their educational systems and institutions, in their language, with teaching appropriate to their culture and traditions is also set out (article 15). Indigenous peoples also have the right to maintain and develop their political, economic, and social system (article 21).

Despite marked progress in retrieving rights for indigenous peoples, a lot more has to be done in future for satisfactory realization of issues confronting indigenous peoples and other ethnic or national groups; primarily land rights, but also ► preservation of language and other issues. The role of internationally recognized bodies and organizations such as the UN is to raise public awareness and understanding of indigenous peoples' rights in order to improve the quality of their lives.

Self-Determination of Indigenous Peoples

► Self-determination or the right to self-determination is a theoretical principle that a population ought to be able to determine their own governmental forms and structures. Different political movements aim at recognition of an indigenous people's status as an independent or sovereign nation by national governments and international organizations. Indigenous peoples, however, maintain the struggle to achieve self-determination in all aspects of life including economic development, education, health, family, religion, land, natural resources, language, and arts. The right to self-determination has been most effectively employed in the decolonization movement. At the ratification of the UN Charter in 1945, the signatories introduced the right of all people to self-determination into the framework of international law and diplomacy. The relationship between indigenous peoples and governments has been changing over time, and collaborative programs aiming to achieve equal rights for indigenous communities are of the utmost importance.

Indigenous Issues

Many interactions between indigenous and non-indigenous communities have resulted in issues and concerns associated not only with the existence of indigenous peoples per se but also with their quality of life, cultural and linguistic ► preservation, human and land rights, political orientation and autonomy, exploitation of natural resources, and above all, health.

Indigenous People Health

Indigenous populations differ in levels, patterns, and trends of health. A commonly used definition of indige-

nous health and well-being was proposed by the National Aboriginal Health Strategy (NAHS) Working Party in 1989:

"Not just the physical well-being of the individual but the social, emotional and cultural well-being of the whole community. This is the whole-of-life view and it also includes the cyclical concept of life-death-life." (National Aboriginal Health Strategy Working Party 1989).

This explains that achieving health and well-being is an attribute of communities as well as of the individuals within a community; and it identifies cultural well–being as equally as important as physical, social, and emotional well-being (Devitt et al. 2001).

The 1999 Declaration on the Health and Survival of Indigenous Peoples by the WHO proposed a definition of indigenous health:

"Indigenous peoples' concept of health and survival is both a collective and an individual inter-generational continuum encompassing a holistic perspective incorporating four distinct shared dimensions of life. These dimensions are the spiritual, the intellectual, physical, and emotional. Linking these four fundamental dimensions, health and survival manifests itself on multiple levels where the past, present, and future coexist simultaneously." (WHO Committee on Indigenous Health 1999).

The Committee on Indigenous Health (COIH) was established in 1997 to:

1. Ensure indigenous representation and participation in development and planning related to health issues, policy, and initiatives.
2. Assess the globalization impact on indigenous health, from environment degradation, rights violation, and forced relocation.
3. Provide a consistent interface with international and intergovernmental agencies and to ensure the dissemination of information to the widest possible extent among indigenous peoples, the national government, and other stakeholders.

The COIH has been working closely with the Working Group on Indigenous Populations since 1997. The Committee has adopted a broader, holistic concept of health, as perceived by indigenous peoples. The Permanent Forum for Indigenous Issues was established under the auspices of the Economic and Social Council of the UN in 2002, and comprises 16 independent experts, half of whom are indigenous representatives.

Although the standards of health of indigenous peoples show differences between groups, similarities exist in worldviews, patterns of disease, health determinants, and healthcare strategies. What are common are the unacceptably large differences between the health of indigenous and non-indigenous populations in developed nations (Ring and Brown 2003). Poor socioeconomic conditions together with the loss of cultural cohesion, as stated in the report of the executive board of the WHO, have adversely influenced indigenous peoples' health. Indigenous inhabitants suffered from violence and loss of their land, resources, and political autonomy. Socio-cultural structures were imposed by settlers, and diseases introduced by conquerors drastically decreased the number of inhabitants in indigenous communities. Access to medical care and health services as well as access to health promotion and prevention programs were and, to a certain extent, still are limited, inadequate, and often culturally inappropriate for indigenous peoples. What is more, due to weak demographic and health information systems, there are obscure information on the number in the population as well as on health status, health indicators, and determinants of health in indigenous communities. There are differences between official statistical data and independent statistical estimates. Ethnicity together with poverty was proven to contribute significantly to disparities in health between population groups. Furthermore, insufficient research on health risk together with the above-mentioned differences represents an obstacle for making both local and global action plans for improving the health of indigenous peoples successful. One of the reasons for this may be the fact that health research still often fails to involve indigenous people in investigations; their viewpoint would contribute to more precise information and better understanding of health problems in indigenous communities.

Data indicate that indigenous people not only die younger, but also generally have lower health status compared with other population groups. For example, in the 18th and 19th century, infectious diseases such as measles, typhoid fever, tuberculosis, and influenza almost extinguished the Maori in New Zealand, Australian Aborigines, native Hawaiians, the Saami of Norway, native Americans, and the First Nations of Canada (Kunitz 1994). Epidemics of smallpox induced even greater impairment of health and higher mortality rates

(Waldram et al. 1995). The death rate was relatively low in regions where settlers did not invade vast land areas (Kunitz 1994; Waldram et al. 1995). Rates of malnutrition, tuberculosis, and dysentery were higher among Indians than in any other group in the United States, and infant mortality was two times higher among Indians than among other Canadians. In Australia, the death rate from infectious diseases was nine times higher on the Aboriginal reserves than in the rest of the nation. Health problems were related to economic status; therefore, poor health is an indicator of the social position of indigenous communities.

Industrialization, urbanization, and technological progress have brought along other health risks. The dynamics of the transition from various infectious diseases to so-called lifestyle illnesses differ in Western and indigenous communities. While the transition period in Western societies stretched over centuries, this process was compacted in time for most indigenous populations.

We witness the rise in lifestyle-related chronic diseases: vulnerability to injury, alcohol and drug misuse, cancer, ischemic heart disease, kidney disease, obesity, suicide, and diabetes have become the modern indigenous health hazards. Higher incidences of most noncommunicable diseases together with generally lower life expectancy are features that distinguish indigenous communities (Kunitz 1994). The estimated gap in life expectancy between indigenous and non-indigenous populations is 19–21 years in Australia, 8 years in New Zealand, 5–7 years in Canada, and 4–5 years in the United States (Australian Bureau of Statistics 2002; Ministry of Health, New Zealand 1999; Health Canada, First Nations and Inuit Health Branch, 2004; US Department of Health and Human Services, Indian Health Service, 1998). In Canada, for example, 31% of native people report some form of disability linked to high accident rates, poor housing, substance abuse, and chronic diseases like diabetes (PAHO 1998). Alaskan natives have the highest smoking prevalence, births to teenagers, and unintentional death rates compared with other ethnic groups. Hospitalization rates for cervical cancer among Maori women are three to four times higher than among European or other women.

There are at least four possible causes for such health status in indigenous populations: genetic vulnerability, socio-economic disadvantage, resource alienation, and political oppression.

Genetic factors do have a large influence on health, but constant interaction between our genes and the environment modifies the initial picture. This implies that few diseases are purely hereditary. Genetic causes have been investigated in diabetes, alcohol related disorders, and some cancers. Nevertheless, genetic factors seem to be less significant in comparison to socio-economic disadvantage, which often seems to be the principal cause of ill health in indigenous peoples. Poor living conditions, low education, unemployment, and low income are socio-economic determinants of ill health for many lifestyle-related diseases as well as injuries (National Health Committee 1998).

Both alienation from natural resources and cultural alienation are important factors for health status and health care: the former as a direct cause of poor health and the latter as a distinctive factor of effective health care. Susceptibility to disease and injury rises with loss of human rights together with dispossession of land, political autonomy, and loss of natural resources (Kunitz 1994).

Some of the above-mentioned factors have effect in a short period of time, such as direct influence of physical, i. e. environmental factors on health, while others, such as government policies and health care systems, have a long-term effect on health status, and not only in indigenous communities. Values, lifestyles, culture, and religion lie in between the two extremes.

Ethnicity, Culture, Religion, and Indigenous Health

Evidence shows that ethnicity, particularly in conjunction with poverty, contributes strongly to disparities in health between population groups. ► Ethnicity is a complex term that denotes common genealogy or ancestry, and cultural, behavioral, linguistic, and religious practices, all of which can affect health (Foliaki and Pearce 2003; Fig.s 3, 4).

An ethnic group may be referred to as a cultural community based on shared cultural, behavioral, linguistic, or religious practices. Existing differences in morbidity and mortality within and between ethnic groups can be explained by great lifestyle diversities (diet, housing, alcohol intake, smoking, physical activity, etc.) that emphasize the importance of environmental factors. High morbidity and mortality rates occurred in newly discovered lands, mainly after the indigenous people's land had been taken, destroying their economic base,

Indigenous People's Health, Figure 3 Traditional Indian Dance in Mexico

natural resources, food supply, and social networks; this is in contrast to the better preservation of land property by settlers from far-away regions that resulted in a lower occurrence of illness and death. More recent examples of disparities in incidence and prevalence of chronic diseases are those occurring in Eastern European and Pacific countries.

Access to health care is another important issue related to different ethnic groups. This refers primarily to the system of health care delivery including the profile of health professionals, availability of medical equipment, and location of facilities, but also to involvement of ethnic groups in modeling health policy and allocation of resources provided by health care systems. Access to medical care depends on many cultural landmarks, individual preferences of patients, and practices of health professionals (as discrimination, bias, and stereotyping, to mention a few; Evans et al. 2001).

A widely spread opinion is that ► culture is not something inherited, but something we learn throughout life. The definition of culture given by Wolcott, quoting Herskovits, gives the basis for understanding of the cultural concept: "Customary ways of thinking and acting" (Harrison 2001; Fig. 5).

Culture is defined by modern anthropologists as a system of shared beliefs, values, customs, behaviors, and artifacts that the members of society use to cope with their world and with one another, and that are transmitted from generation to generation through learning. Although there are many definitions of culture, all of them stress that all cultures are equally developed according to their own priorities and values; none is better, more advanced, or less primitive than any other is.

Understanding of the concept of culture is important for those living and working in communities different from their own, and especially for medical care professionals. Without understanding of the cultural concept, behavior that we come across that is different from what we are used to may appear illogical, strange, sometimes even frightening and stupid, and may be explained in a way that can damage or even endanger others.

Cultural concepts are rapidly changing, especially due to intercultural contact. The nature and status of interactions with other communities shapes the community's traits. Therefore, updating of information is necessary for those working in indigenous communities because their notions about certain cultures may be insufficient or inadequate due to changes over time. Moreover, special attention should be paid to avoiding stereotypes, i. e., expecting members of a certain cultural group to behave in exactly the same way as the majority of the group. In terms of health care, this means that each patient should be regarded as an individual, regardless of cultural traits expressed.

For indigenous populations it is important to recognize and acknowledge the value of their traditional culture as well as their right to preserve that culture if they choose to.

Religious practices have to be considered in terms of either health benefits or possible disturbing factors in the utilization of health care, depending on features of the specific indigenous group. For example, ► religion appears to be associated with health status in indigenous populations in North America (► indigenous health, north america), but there is little evidence

Indigenous People's Health, Figure 4 Fijian Traditional Dance

Indigenous People's Health, Figure 5 Traditional handcrafts and house wall decorations in Ghadames, Libya, Africa

for that in the indigenous peoples of Australia (Koenig et al. 2001).

Health professionals working in indigenous communities have to be aware of religious practices and beliefs of the indigenous group and trained for situations where it is indicated during assessment that religious issues might interfere with the treatment, so that they can react. There is a growing need for further research into the relationship between spirituality and health of indigenous groups for better understanding of patterns of ill health in such communities.

Health Knowledge and Health Practices – Traditional vs. Western

The concept of "indigenous medicine" is frequently defined as ▶ traditional medicine, i. e., any non-Western allopathic treatment or practice. However, in indige-

nous communities, the type of indigenous medicine is specific to that community as there are differences between indigenous communities. Cultural, traditional, and religious beliefs all influence both health knowledge and health practices of indigenous peoples. Understanding of illness as well as methods to overcome different ailments varies greatly not only between indigenous and other population groups but also within different indigenous communities. However, a holistic approach to health and disease is the cornerstone of health practices in indigenous communities. The ultimate goal is to reinstate the individual to a harmonious relationship with the social order; in that way, every aspect of an individual's well-being is taken into consideration and treated. In ► western medicine, healing strategies are focused on the physical condition of the patient. Because of the different approaches, each community has difficulty in accepting the other method.

Native Indians in America have a concept of wellness instead of health and illness. "Wellness" can be defined as the state when the mind, the body, and the spirit are all connected and in balance. One cannot be separated from the other. The medicine circle – having no beginning and no end – represents this concept of harmonious unity. The same principle exists in Asian cultures (► indigenous health, asia), where harmony of the two opposite forces of yin and yang is a prerequisite of good health.

According to data from the WHO, two thirds of today's world population primarily or exclusively uses traditional diagnostic and treatment practices. So-called Western medicine has been rooted in traditional health practices since the Hippocrates era. Advances in evidence-based scientific procedures and technologies have improved health knowledge, but in spite of evident improvements in health practices, there is a constant rise in morbidity and mortality of so-called noncommunicable diseases. There are several possible reasons for this. The apparent gap between Western and indigenous practices may explain such trends. Consideration of the entire country's health needs, the available resources and their utilization to benefit all members of society, including indigenous populations, is one of the issues of disagreement. The actual cause of the disparity may be the different health care priorities of indigenous and other population groups within the state. Moreover, according to health specialists, there are basic criteria all health operations should follow in terms of estimated needs, efficacy, and safety when providing health care. Medical practices must meet specific criteria. For indigenous communities, indigenous health practitioners are a legitimate reference source. However, Western societies often do not comply with practices that are not evidence-based and for which there is no adequate reference, which in turn raises the question of acceptable methodology to evaluate indigenous medical treatments. The scope of health conditions under the auspices of the national health care system has to be carefully defined.

Indigenous Health Services

There is a growing need for improvement of indigenous health services, which should provide a range of healing methods, including conventional professional services and traditional healing. Improved access to medical services for indigenous people enables earlier intervention, better scope, higher levels of compliance, and a greater sense of community participation and ownership (Evans et al. 2001).

Health practitioners in indigenous communities address illness in a different way compared with Western medicine doctors. There is a tendency to view illness as a consequence of or imbalance in nature or personal behavior. What is more, they link family, society, and the environment, and tend to treat the particular patient, not the disease.

It is important to recognize the limitations of both Western and indigenous medical practices and, especially areas in which they can complement one another. Sometimes, benefits from both health care systems are not available simply because there is no understanding or acceptance of the other ways of healing, with claims that they are not evidence-based or are even harmful. Some people from indigenous communities tend to refuse other forms of medical care since not only are they not familiar with modern technology and achievements but they also believe it could harm them. Therefore, health professionals in indigenous communities must have knowledge about the culture, beliefs, tradition, and religion of the population group. Only in that way can an applied health system be of benefit to society. Provision of health care should take into consideration all the above issues and the health care system should be reorganized in a way that is suitable for specific indigenous communities. Public health pro-

grams and services should also be extended to indigenous communities, as stated in the World Bank report of 2001 about indigenous peoples' health. Such programs should be appropriate to the particular community and its needs, for example, hiring or training bilingual staff, modifying the design of health care facilities (intercultural hospitals), paying attention to taboos related to age and gender differences, etc. What is more, indigenous medical practitioners should be valued as part of the health care system where possible. It is also necessary to coordinate and supervise treatments given to the same patient in order to avoid complications.

Of course, many problems occur in putting the changes detailed above into practice. Importance of priorities, criteria for determination of legitimate medical practices, and the scope of the health sector are the most important issues.

Many chronic, non-communicable health impairments can be avoided through primary, secondary, or tertiary ► health care services. Rates of avoidable mortality in indigenous communities are higher as compared with their non-indigenous counterparts. However, a large spectrum of these preventable diseases remains undiagnosed and untreated. For example, cardiovascular diseases, which account for the highest morbidity and mortality in indigenous communities, are preventable through regular, systematic diagnosis and treatment procedures. Regardless of the differences between health patterns and determinants of ill health in different indigenous groups, the most prominent issue is adequate primary health care services for prevention, and early diagnosis and treatment of conditions and illnesses that are widely spread in indigenous populations.

Another important issue is education of health professionals and inclusion of indigenous health practitioners. Together with socio-economic and macropolitical interventions in the domain of health care services, this will contribute to better organization and functioning of the health care system, incorporating traditional practices into Westernized medical care structure.

Health promotion activities including preparation and dissemination of culturally appropriate health materials in native languages, and inclusion of indigenous health practitioners in health promotion activities are important, as are promotion of mutual learning, capacity building, and sharing information through workshops.

Health for All – Inequities in Health

Inequalities in health status are an important measure of the quality of the health system. As indigenous peoples are not living in isolation from the nation state, they have equal rights to the guarantees of health for all citizens. In order to accomplish such a guarantee, policies need to assure that health services and programs are appropriate for the indigenous culture and coordinated according to the community's practices. This requires reconciliation between indigenous, i. e. traditional, and orthodox, i. e. Western, medical practices. The quality and scope of the health care system should be broadened in order to accommodate the needs of indigenous peoples. What is more, medical practitioners must have at least basic knowledge about important determinants of health in indigenous communities, above all their views of health and illness, and cultural and religious beliefs so that they can provide them with the most appropriate health care. This also includes the importance of health determinants outside the health sector that relate to those determinants. Health status depends on combined economic, social, environmental, cultural, and political factors. It cannot be addressed in isolation from them.

It is important to map the extent and nature of inequities in health, since without reliable data on disparities in health, policy makers and populations are less equipped to demand change and monitor progress. One of the basic problems is the inability to provide complete population health status data. Many factors underlie the cultural norms that generate and maintain inequities in health; these include gender discrimination, racism, corruption, and the joint effects of household income and race/ethnicity on health outcomes (social burden of ill health – example of the United States; Evans et al. 2001). Health care at all levels from primary care to public health interventions are more likely to be accessed by the rich than by the poor. The feasibility of designing and implementing a global strategy solely on indigenous people's health has to be considered for various reasons.

Health Research and Indigenous Peoples

Research projects in indigenous populations in the past were initiated and controlled by research institutions. There is evidence that shows ► health research contributes to improvement of health. Research projects

need to be carefully planned and well organized. Indigenous approaches to learning and health knowledge differ from orthodox Western practices, and therefore indigenous researchers are important contributors. Mainstream approaches may be effective as long as the requirement for responsiveness to the needs and expectations of the indigenous peoples is met. The value of specific research projects in indigenous communities led by indigenous people and based on indigenous methodologies and views is becoming increasingly apparent. Some approaches incorporate many contemporary and Western developments; still others prefer usage of traditional medicines and practices such as spiritual and traditional healing approaches.

Collaborative research in various indigenous populations can contribute to improving health as well as organization and planning of ► health care services in indigenous communities. In 2002, Australia, Canada, and New Zealand signed a memorandum of understanding on health research for indigenous health. This means that all three countries will equally participate in research with unique funding and research methodology, and that they will share the outcomes of research performed and use them to make policies for collaborative research between the three countries.

It is customary to make a research agreement before a research proposal is submitted for scientific and ethical review. This helps accomplish mutual understanding as well as reducing problems that may arise during research. Cultural and other traits of indigenous peoples are not sufficiently included by scientific or ethics guidelines and therefore indigenous peoples are reluctant to participate in projects. Clear direction, well defined funding, and inclusion of indigenous representatives enable more accurate research results to be obtained (WHO 2003).

Summary

Indigenous, native, aboriginal, or first peoples are descendants of the original or long-time inhabitants of lands now dominated by others. They are self-identified as indigenous and recognized as such by others.

Over the centuries, indigenous peoples have retained their social, cultural, economic, and political characteristics, which are clearly distinct from others living on the same territory. However, during the course of time, many indigenous groups have undergone drastic changes as a result of interactions between indigenous and non-indigenous societies. Characteristics common for many indigenous groups, even today, include predominantly non-urbanized societies whose members rely on agriculture, hunting, and gathering for survival. Throughout history, indigenous peoples have lived in an atmosphere of severe repression and disadvantage relative to others. They were deprived of their land rights and access to natural resources and have struggled to survive and preserve their language, culture, traditions, and socio-economic and political features. Discrimination exists, in some form, even today. Armed resistance, diplomacy, and law have been tools in the quest for the rights of indigenous peoples; for many centuries, they have struggled to regain their human rights. Today, it is recognized that the establishment and protection of rights of indigenous peoples are an essential part of human rights and a concern of the international community.

Despite cultural and ethnic diversity, there are similarities between the problems and interests of the various indigenous peoples. Indigenous populations differ in levels, patterns, and trends of health. The standards of health of indigenous peoples are different, but similarities exist in worldviews, patterns of disease, health determinants, and healthcare strategies.

Because of weak demographic and health information systems, there is obscure information on the number in the population as well as on health status, health indicators, and determinants of health in indigenous communities. Indigenous peoples tend to die younger and generally have lower health status than other population groups. Possible reasons for this are limited access to medical care and health promotion and prevention programs, and health services that are inadequate and often culturally inappropriate for indigenous peoples.

Infectious diseases in the past and so-called life-style, chronic, non-communicable diseases today (diabetes, cardio and cerebro-vascular diseases, cancer, alcoholism, and substance abuse) show the highest rates among indigenous populations. Genetic predisposition, cultural and religious beliefs, and health knowledge and practices all influence the health status of indigenous populations.

There is a growing need for improvement of indigenous health services to enable earlier diagnosis and treatment. It is important to recognize the limitations

of both Western and indigenous medical practices and, especially, to identify areas in which they can complement one another. Consideration of the entire country's health needs and the available resources, as well as their utilization to benefit all members of society, sets the basis for improvement of indigenous peoples' health as well as the population as a whole.

Regardless of the differences between health patterns and determinants of ill health in different indigenous groups, the most prominent issue is adequate primary ► health care services for prevention. Education of health professionals is equally important, especially in relation to ethnicity, religion, and culture of specific indigenous groups.

Research contributes to improvement of health. Research projects need to be carefully planned and well organized, and they must include indigenous health care professionals for more complete and valuable results.

Cross-References

► Cultural Preservation and Protection
► Health Care Services
► Health Research
► Indigenous Health – Africa
► Indigenous Health, Asian
► Indigenous Health – Australooceaninan
► Indigenous Health, North America
► Indigenous Health, South America
► Self-Determination
► Traditional Medicine
► Western Medicine

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Indigenous Representation Organizations

Definition

► Indigenous representation organizations are defined as organizations and bodies that represent rights and interests of indigenous peoples (► indigenous peoples, ► indigenous rights). In the United Nations indigenous peoples have representatives in form of the Working Group on Indigenous Populations (WGIP). In April 2000 the United Nations Commission on Human Rights adopted a resolution to establish the United Nations Permanent Forum on Indigenous Issues (PFII) as an advisory body to the Economic and Social Council with a mandate to review indigenous issues.

Also various organizations are devoted to the preservation or study of indigenous peoples, such as International Working Group on Indigenous Affairs (IWGIA), Indigenous Peoples of Africa Co-ordinating Committee (IPACC), Movement in the Amazon for Tribal Substinence and Economic Sustainability, Indigenous Dialogues, and others.

Indigenous Rights

Synonyms

Rights of indigenous people

Definition

The collective human rights of ► indigenous and local communities has been increasingly recognized – such as in the International Labor Organization (ILO) Convention 169 (1989) and the Draft Declaration on the Rights of ► indigenous peoples (1982–2006). The Rio Declaration (1992), endorsed by the presidents and ministers of the majority of the countries of the world, recognized indigenous and local communities as distinct groups with special concerns that should be addressed by states.

Indirect Costs

Definition

Value of the lost output (i. e., impairment or disability to work of a person) due to a disease or disorder, either short-term or long-term.

In health economics, the term indirect cost refers to all costs to the national economy of the society due to productivity loss. Indirect costs can be due to decreased efficiency, total absence from work through an illness, or premature death. Indirect costs can be estimated using the human capital approach or the friction cost method. Both approaches are based on the assumption that the lost productivity can be valued by the achievable gross income of the employed population.

Indirect Standardization

Definition

Applies the stratum specific rates of the standard population to the number of individuals in the corresponding stratum in each of the populations being compared. This method is called "indirect" because it does not use the actual morbidity and mortality rates of the populations being compared. This method yields standardized morbidity or mortality ratios (SMRs), one for each population being compared.

Individual Case Description

Synonyms

Case Report

Definition

An individual case description is the most basic type of descriptive study of individuals, consisting of a detailed report of the diagnosis, treatment, and follow-up of a single patient. It also contains some demographic information about the patient.

Individual Factors

► Personal Factors

Individual Health Factors

Synonyms

Personal Health Factors

Definition

The personal factors of an individual are the background features of the individual's life that are not part of a health condition or health state. Features like age, race, gender, educational background, personality, aptitudes, fitness, lifestyle, habits, upbringing, social background, profession, and past and current experience are examples of personal factors. Unlike for ► body functions and ► body structures, there is no official classification for personal factors.

Individuality

► Identity

Individual Susceptibility

Synonyms

Susceptibility; Vulnerability

Definition

Individual susceptibility is diversity in responsiveness among individuals to occupational and environmental exposures. It makes it difficult to determine actual risks, particularly at the low levels to which most people are exposed. The individual susceptibility is largely determined by genetic factors, which are very complex in nature. For example the toxicity of a number environmental and workplace chemicals is determined by a complicated balance of its toxicity and metabolic biotransformation. These processes are largely influenced by individual genetic factors, which are crucial in individual susceptibility. So, effects of exposure to a certain chemical are related to its toxic effects, intensity of exposure and individual susceptibility.

Indoor Air Quality

► Sick Building Syndrome

Indoor Climate

► Climate and Microclimate

Induction

Synonyms

Induction period

Definition

Induction is the interval between the causal action of a factor and the initiation of the disease.

Induction Period

► Induction

Industrial Physician

► Occupational Health Physician

Industrial Revolution

Definition

During the eighteenth century and particularly the nineteenth century, there was a dramatic change in both social and working practices throughout Europe. Much more emphasis was placed on industrial rather than farming practices.

Inequality

► Health Disparities

Inequality in Health

Definition

Inequalities in health refer to differences in both health experience and health status between countries, regions, and socioeconomic groups. Some inequalities are biological (e. g. genetic), others reflect socially determined population differences (environmental factors, behavior). Making valid comparisons of inequalities in health is very difficult, because the socioeconomic groups can be defined in various ways, including by occupation,

social class, or educational level, and because it is not possible to measure health status of each individual in a population by an objective health index.

Inequity in Health

Definition

Health inequities refer to the systematic, unfair, and unjust, yet potentially avoidable differences in access to health services across socially, economically, demographically, or geographically defined population groups or subgroups. Health systems are consistently inequitable, providing more and higher quality services to the well off, who need them less, than to the poor, who are unable to obtain them.

Infant and Child Mortality

Synonyms

Infant mortality; Under-five mortality

Definition

Infant and child mortality are deaths to children under age 1 and age 5. The infant ► mortality rate (IMR) is usually calculated by the number of deaths to infants under age one per thousand births in a given year. Despite its name, the IMR is not a rate; rather the IMR approximates the probability of dying before age 1. Child mortality (often called under-five mortality) is measured as probability, or the proportion of children dying before their fifth birthday. Like the IMR, under-five mortality is often reported per-thousand births. Child mortality can be determined using mortality rates, where available, or indirectly based on census data. Although infant and child survivorship have greatly improved throughout the world, mortality remains high in many developing countries. In Africa, about 10 percent of all children born will die before their first birthday; by age 5 the total proportion dead will exceed 17 percent.

Infant Health

► Child Health and Development

Infantile Paralysis

► Polio
► Poliomyelitis

Infant Mortality

Definition

Infant mortality is defined as probability of dying between birth and exactly one year of age expressed per 1000 live births.

Cross-References

► Infant and Child Mortality

Infant Mortality Rate

Synonyms

Infant death rate

Definition

The infant mortality rate is the number of deaths of infants under a year of age per one thousand live births during a calendar year. This rate is a useful indicator of the general level of health in a community. A high rate has been taken to indicate unfavorable external factors (poor water quality, inadequate food supply, inadequate education, substandard medical care), especially in developing countries. Infant mortality rates have significantly declined in developed countries, mainly due to improvements in basic health care.

Infection with Ancylostoma duodenale

Synonyms

Ancylostomiasis; Hookworm infection

Definition

The larvae of the hookworm can penetrate the intact skin. Via the blood they reach the lungs, where they can cause a hemorrhagic pneumonia. From the lungs

the larvae get into the bronchial system and the pharynx, where they are swallowed. In the intestines they develop into adult worms. The presence of hookworms in the bowel leads to abdominal pain, nausea and diarrhea. *Ancylostoma duodenale* is most frequently found in the Mediterranean area and in Eastern Asia. A similar worm causing the same symptoms is the *Necator americans*, which is mainly found in tropical Africa and America.

Infection with Bordetella pertussis

► Whooping Cough

Infection with Borrelia burgdorferi

► Lyme Borreliosis (LB)

Infection of Brain Tissue

► Encephalitis

Infection with Brucella

► Brucellosis

Infection with Clamydia trachomatis

► Chlamydia trachomatis Infection
► Teratoma

Infection with Clostridium botulinum

Synonyms

Botulism

Cross-References

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Infection Control

► Hospital Epidemiology

Infection with Cryptosporidi

Synonyms

Cryptosporidiosis

Cross-References

► Zoonotic and Parasitic Infections

Infection with Cryptosporidia

► Cryptosporidiosis

Infection with Dog Tapeworm

► Echinococcosis

Infection with Dog Tenia

► Echinococcosis

Infection with Ebolavirus

Synonyms

Ebola disease; Ebola fever

Definition

Ebola disease, which appears in Africa, occurs after an incubation period of 2–21 days. Lethality is 50–80%. The main source of primary infection is not really known yet. Ebola fever can be transmitted by monkeys or from one individual to another by contact with contagious body fluids. A vaccination is not available.

Cross-References

► Ebola Hemorrhagic Fever

Infection with Echinococcus alveolaris

▶ Echinococcosis

Infection with Echinococcus granulosus

▶ Echinococcosis

Infection with Echinococcus multilocularis

▶ Echinococcosis

Infection with Entamoeba histolytica

▶ Amebiasis

Infection with Entamoeba hystolyticum

▶ Amebic Dysentery

Infection with Enterobius vermicularis

▶ Enterobiasis

Infection with Flukes

▶ Trematodes

Infection with Fox Tapeworm

▶ Echinococcosis

Infection with Fox Tenia

▶ Echinococcosis

Infection with Giardia lamblia

▶ Giardiasis
▶ Lambliasis

Infection with HPvirus

▶ Condyloma

Infection with Human Herpesvirus 6

▶ Erythema subitum

Infection with Human Immunodeficiency Virus

▶ HIV-Infection and AIDS

Infection with Human Papilloma Virus

▶ Condyloma

Infection with Influenza Virus

▶ Flu
▶ Influenza

Infection with Larvae of the Pork Tapeworm

▶ Cysticercosis

Infection with Legionella pneumophila

▶ Legionellosis

Infection with Leishmania

▶ Leishmaniasis

Infection of the Meninges

▶ Meningitis

Infection with Onchocercus volvulus

► Onchocerciasis

Infection with Plasmodia

► Malaria

Infection with Rickettsia tsutsugamushi

► Tsutsugamushi Fever

Infection with Salmonella typhi

► Typhoid Fever/Paratyphoid

Infection with Salmonella typhi murium

► Typhoid Fever/Paratyphoid

Infection with Sarcoptes scabiei

Synonyms

Itch

Definition

Sarcoptes Scabiei causes an infectious parasitic skin disease caused by the itch mite (*Sarcoptes scabiei*). It is acquired through close contact with an infested individual or contaminated clothing. The highest prevalence is in overcrowded and unhygienic communities. All clothing and bedding of the victim and his household should be disinfected. Disinfestation of the skin is accomplished by applying creams or ointments containing gamma benzene hexachloride or benzyl benzoate.

Cross-References

► Scabies
► Sexually Transmitted Diseases

Infection with Schistosomes

► Schistosomiasis

Infection with Schistosomes, Bilharzia

► Schistosomiasis

Infections by Contaminated Food

► Fecal-Orally Transmitted Diseases
► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Infections with Hospital Germs

► Nosocomial Infections

Infections with Hospital Pathogens

► Nosocomial Infections

Infections Occurring in Hospital Patients

► Nosocomial Infections

Infections Originating in Medical Facilities

► Nosocomial Infections

Infections of Quarantine

► Quarantine Diseases

Infections Transmitted by Animals

► Parasitic and Zoonotic Infections

Infections Transmitted by Parasites

▶ Parasitic and Zoonotic Infections

Infections Transmitted by Parasitic Organisms

▶ Parasitic and Zoonotic Infections

Infection with Strongylodes stercoralis

▶ Strongyloidiasis

Infection with Tichinella

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▶ Toxoplasmosis

Infection with Trichomonas vaginalis

▶ Trichomoniasis

Infection with Trichuris trichiura

▶ Trichuriasis

Infection with Trypanosoma brucei (T. brucei gambiense and T. brucei rhodesiense)

▶ Sleeping Sickness

Infection with Trypanosoma cruzi

▶ Chagas Disease

Infection with the West Nile Fever

Synonyms

West Nile virus fever

Cross-References

▶ Tropical Diseases and Travel Medicine
▶ West Nile Fever

Infection with Yersinia pestis

▶ Bubonic Plague

Infectious Disease

Synonyms

Communicable disease; Transmissible disease

Definition

Disease, resulting from the presence of microbial vectors that can be transmitted from one person or species to another.

Infectious Disease Epidemiology

Definition

Infectious disease epidemiology describes and analyses the mechanisms of transmission of infectious agents (e. g. airborne, vector-borne, sexual transmission), the biology of the infectious agent (e. g. infectivity, life cycle) including molecular epidemiologic features, the biology of possible vectors (e. g. mosquitoes or ticks), environmental factors (e. g. temperature) and the dynamics of infections in populations.

Infectious Diseases

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Synonyms

Communicable diseases; Transmissible diseases

Introduction

Infectious diseases have forever played an important role for mankind. For thousands of years, they were the most frequent cause of death, even in wealthy countries. Due to their sometimes disastrous effects they had great influence on both society and human beings' behavior. When infant mortality was high, family sizes were correspondingly high, to ensure heirs. Having an infectious disease could lead to social discrimination or even to complete isolation of the infected person. Even though therapeutic possibilities have improved, especially during the last century, infectious diseases remain a serious danger to public health; worldwide, they are responsible for millions of deaths every year (Table 1) and it is most probable that the infectious diseases will continue to be of global significance in the future. The multifaceted nature and mutability of infectious diseases remain a challenge for medical research. However, the unequal distribution of medical resources seems to be an indissoluble problem in worldwide health endeavors.

An infectious disease occurs when pathogens – primarily microorganisms – actively or passively get into a macroorganism (host), where they reproduce and cause symptoms, which lead to a more or less severe impairment of the host's health. Thus, exogenous agents are something that all the infectious diseases have in common. Otherwise, they are a very heterogeneous group of diseases which can be classified in various ways. To begin with, the pathogens themselves can be differentiated. Moreover, the origin of the germs and the routes of transmission vary. As for the macroorganism, different organs or organ systems can be involved, infection can be local or systematic, the course can be mild or severe, and long-term damage may or may not occur. Therapeutic and prophylactic measures do not only depend on the characteristics of the pathogen, but also on the characteristics of the macroorganism. Besides the general constitution and the presence of defense mechanisms (immune status), the success of a treatment is determined by the accessibility of the affected organ system. If prophylaxis is to be successful, it is necessary to take into consideration the mode of transmission so that certain hygienic rules and protective measures can be followed to avoid infection. The general population has to have an appropriate level of information; an understanding of reasons underlying the recommendations is indispensable for a successful fight against infectious diseases. A further important pillar of prevention is immunization, active (► immunization, active) and/or passive (► immunization, passive).

Research has shown that infectious diseases can have shared properties or extreme differences. Altogether, there is a complicated network and relationship between the microorganism – if harmless or pathogenic – and the macroorganism. To get an overview of the effects of infectious diseases many different aspects have to be considered.

Infectious Diseases, Table 1 Deaths caused by infectious diseases (WHO reports)

Infectious disease	1996 (in millions)	2004 (in millions)
Lower respiratory tract infection	4.4	3.9
Diarrheal diseases	3.1	2.2
Tuberculosis	3.1	1.6
Malaria	2.1	1.3
Hepatitis B	> 1.1	1
HIV/AIDS	> 1	2.8
Measles	> 1	0.454

Microorganisms

A microorganism is a microscopic entity with its own metabolism. Most microorganisms are unicellular bacteria, fungi, microscopic algae or protozoa. Viruses are responsible for most of the infectious diseases but, in the proper meaning of the word, they do not belong to the classification 'microorganism' as they cannot reproduce on their own, and they are dependent on a host's cell for their metabolic processes; viruses can only replicate intracellularly. Their classification is made according to their viral genome (nucleic acids RNA or DNA) and the shape of the protein coat (capsid). Prions (proteinaceous infectious particles), which were detected at the end of the last century, do not belong to the classification microorganism either.

Bacteria are unicellular organisms with a cell wall, but without a real nucleus. They are spherical or rod-

shaped and have a size of 0.5–5 µm. Reproduction, which is performed by binary fission, most frequently takes place extracellularly, but in some bacterial species reproduction can be either intra- or extracellular, and in a few only intracellular. In some cases, when conditions are unfavorable, some species can construct so-called spores. These are capsules which are resistant against extreme environmental influences.

Fungi (mycophyta) are classified according to their way of reproduction and construction of hyphae (a network of long hollow tubes). Their reproduction is both sexual and asexual. Some fungi produce highly-poisonous substances, so-called toxins. Like bacteria, fungi are widespread in nature. Yeasts, a special species of fungi, were used in Egypt for baking and brewing more than 5000 years ago. An infectious disease caused by fungi is called a mycosis. In humans, the most common fungus is the yeast *Candida albicans*. It can often be found on mucous membranes where it causes no harm.

Microscopic algae do not play any role in infectious diseases.

Protozoa are unicellular organisms with a cell wall, a nucleus and cell organelles. As a rule, reproduction takes place by dichotomy. In some species of protozoa (like sporozoa), however, during their developing cycle in the final host, the processes of reproduction is sexual. Protozoa, which show this phase of sexual reproduction, are, for example, plasmodia which cause malaria. Some, like ameba, can build spores, which are resistant to environmental influences and can survive and remain contagious outside of their hosts for a long time.

Microorganisms have existed for about 3.8 billion years, and they are the root of life on earth. In comparison with microorganisms, multicellular creatures appeared on our planet about 600 million years ago, and modern humans about 130,000 years ago. Microorganisms represent about 70% of the biomass on earth, their biodiversity is estimated to be about 2–3 billions species. Microorganisms can exist despite extreme environmental conditions, like great heat, extreme cold or complete darkness. Their various functions include different geochemical processes, which are essential for life on earth, like the production of elementary oxygen. Microorganisms which cause disease are said to be pathogenic and the virulence of a single strain within a bacterial species is the degree of its pathogenicity. Important factors affecting the level of pathogenicity are the poisons (toxins) which are produced by the bacteria.

One billion (10^{15}) microorganisms exist within the human body, which is 10–100-fold the total amount of cells making up the body itself. These microorganisms primarily are bacteria. In a healthy individual, the bacterial population (physiological flora) of the skin, eyes, respiratory, intestinal, urinary and genital tracts is similar. The urinary bladder, uterus and tubes in general are sterile. With a population of 100–10,000 bacteria per cm^2 of skin surface, the skin shows a low microbiological contamination. In a milliliter of spittle there can be found 10^9 bacteria, in a gram of stool up to 10^{12}. Among the intestinal bacteria, the highest percentage is made up of *Escherichia coli* (*E. coli*). The concentration of coli bacteria is used as an assessment of water quality (► water quality and waterborne infectious diseases), as it is an indicator of fecal contamination. The composition of bacteria and other microorganisms forms an ecologic balance. According to the requirements of the different regions, a characteristic milieu is built up. An acid pH-value provides protection against pathogens. This milieu is not only important for the skin, but also for the female genital tract. The acid pH-value of vaginal secretions, which is needed to prevent ascending infections, is maintained by lactobacilli (Dederlein flora). For an efficient digestion of food in the intestinal tract and for the production of vitamin K, different bacterial metabolic processes are necessary. In many regions of the body, macro- and microorganism live in a symbiotic relationship, to the benefit of both.

Most microorganisms do not cause any diseases; they are apathogenic, at least, as long as they stay in their appropriate location. However, if introduced to inappropriate locations, e. g. penetration into the tissues through lesions of the skin or the mucous membranes or into organ systems by other means, diseases can occur. Urinary tract infections, for example, are often caused by *E. coli*. Particularly in females, who have a very short urethra, germs can easily get into the urinary tract and cause an inflammation if cleansing of the anogenital region is not correctly carried out. The human defense system (immune system) recognizes germs as foreign material and builds up antibodies against them. Obligatory pathogen microorganisms cause infectious disease in all non-immune individuals. If the immune system is compromised, organisms which are normally

harmless to a healthy organism can become pathogenic causing disease.

Multicellular Parasites, Macroparasites

Multicellular parasites are divided into two groups, endo- and ectoparasites. As they are visible to the naked eye, they have been known since ancient times. Ectoparasites found in humans are the arthropods lice, fleas, mites, predatory bugs and ticks. Most of the ectoparasites closely adhere to the skin and feed on blood; mites causing scabies live in the upper layers of skin and feed on danders. If an ectoparasite is infected with a pathogen the germ can be transmitted to the blood during feeding. Thus, epidemic typhus is transmitted by lice, plague by fleas, chagas disease by predatory bugs and borreliosis and tick-borne encephalitis (TBE) by ticks. Endoparasites are found living inside the human organism, e. g. worms (vermes, helminthes). Worms are divided into roundworms (nematodes) and flatworms, e. g. tapeworms (cestodes) and flukes (trematodes). Worms can cause damage to tissues or block the lumen of the intestines, causing indigestion or even ileus. The presence of tapeworms in the gut leads to competition for nutrients; despite a sufficient food supply a loss of weight or symptoms of nutritional deficiency can appear. Hookworms, which feed on blood, can cause anemia.

History of Infectious Diseases

Although the history of infectious diseases is as old as mankind, it was not until the last few centuries that an understanding of these diseases was fully achieved. Throughout human evolution, from hunter-gatherer to farmer, humans have been confronted by animal germs, but as people crowded into cities and increased trade contacts epidemics developed. In medieval times, and beyond, people assumed that diseases were caused by a pollution of the air, the so-called miasma. This theory was thought to explain why some regions were prone to mass diseases of their populations. As for therapy, treatment of the air was considered to be effective; fire or balmy essences were thought to cleanse the atmosphere. Even before that, in the pre-Christian era, Hippocrates and Galen were famous supporters of the miasma theory. Also, disease was thought to be a punishment from the gods. Recovery from an infectious disease or the failure of its appearance was either explained by individual constitutions or by living conditions. Therefore, therapeutic recommendations primarily concerned changes in the way of life. So, it can be seen that throughout history theory determined treatment. The opinions of dictators, of the religious community and of society were determining factors and the Arts provided not only illustrations but reinforcement. Again and again, the fear of epidemics could be instrumental in influencing the population.

Historically, descriptions of epidemics were primarily produced by non-physicians. They observed that disease occurred in a healthy individual after contact with an infected person. Due to this empirical knowledge, people assumed that a contagious substance, the "contagiosum," was transmitted from one human to another. Thus, as early as in the Middle Ages, people used to burn the clothing of a person infected with black plague in order to avoid spreading the disease. The recognition of the transmissibility of diseases also led to the introduction of quarantine measures. As early as in 1500 AD, people in China and India, in their fight against smallpox, performed a procedure in which healthy children were exposed to infected material from a person suffering from smallpox (by scoring the child's arm veins). At the beginning of the 18th century, this technique of variolation was brought to England. Following empirical observations about cowpox and smallpox, at the end of the 18th century, Edward Jenner developed the first vaccine against smallpox. Jenner thus set the foundation stone of the era of active immunization (► immunization, active). Even though the development of the first vaccine was a decisive breakthrough, the principles of immunization could not be explained at that point in time. Ignaz Semmelweis, the renowned Hungarian gynecologist, who is accepted to be the founder of antisepsis (and glory is due to his efforts in the fight against childbed fever), could only explain his successes empirically as microbiological methods were not then available to him.

During the course of the 19th century, the primary philosophical analysis of infectious diseases was replaced by the scientific approach. If pathogens could be seen it would prove that they actually existed, so, the development of microscopy and the coloring methods established by Ehrlich (1882) and Gram (1884), which made bacteria visible, were great endorsements of the scientific method. The Frenchman Louis Pasteur (1822–1895) and the German Robert Koch (1842–

1910) were famous scientists and microbiologists of the 19th century well versed in the scientific method. Pasteur performed fundamental research into germ theory. He succeeded in proving that microorganisms were responsible for the processes of fermentation and decay. Moreover, he discovered that anthrax infection is caused by *Bacillus anthracis*. Robert Koch detected *Mycobacterium tuberculosis*, the pathogen which causes tuberculosis (► tuberculosis and other mycobacterioses). He managed to show that after isolating a germ from an infected individual and growing the pathogen in pure culture, the transmission of that culture to another person or an animal could cause the same disease. From these experiments, Koch advanced his theory on infectious diseases. During the second half of the 19th century many more infectious bacteria were detected. Within the course of the 20th century, specific therapeutics were developed; in 1945, for instance, the Scottish bacteriologist Sir Alexander Fleming was a co-winner of the Nobel Prize for the discovery of penicillin.

Today, a great number of antibiotics are available, effective against a variety of bacteria. Nevertheless, due to the ever-changing features of pathogens and the evolving of resistances, the development of new antibiotics is not yet finished. Thanks to technological progress and the development of the electron microscope, several viruses have been detected during the course of the 20th century. Scientists have succeeded in cultivating viruses and, utilizing the progress made in immunology, serologic methods have become available to detect viral infections. In 1977, aciclovir was licensed as the first virustatic drug, which is specifically effective against herpes viruses and varicellae. The development of vaccines has been driven forward since the end of the 19th century (Table 2). During the course of the 20th century, area-wide immunizations were carried out to provide protection for a high percentage of the population against infectious diseases. Vaccination programs for babies were established.

Documentation has always been an important part of medical activity. In communicable diseases, the registration of data is of special significance. This is due to the fact that although, initially, only a single individual may be infected, depending on the pathogen, a further spreading of the disease has to be feared. There is always the possibility that large numbers of the population might become infected and, thus, special measures might become necessary to control the infection. In 1948, the World Health Organization (WHO) was founded as a superordinate international institution of surveillance; further international, national and regional institutions form a network which deals with surveillance and outbreak management of transmissible diseases (► outbreak management and surveillance of infectious diseases). Nowadays, data interchange is considerably facilitated by modern communication techniques.

Due to the mutability of microorganisms, the history of infectious diseases will have no ending. New pathogens could appear and provide great diagnostic and therapeutic challenges to modern medicine, as HIV-infection (► HIV-infection and AIDS) and SARS showed only a few years ago. Also, already well known germs can make therapy difficult by the development of resis-

Infectious Diseases, Table 2 Chronological list of the introduction of vaccines

Year	Vaccine against
1796	Smallpox
1880	Cholera
1881	Anthrax infection
1884	Rabies
1906	Tuberculosis
1925	Diphtheria
1925	Tetanus
1937	Yellow fever
1940	Typhoid fever
1945	Influenza
1954	Pertussis (Whooping cough)
1955	Poliomyelitis
1963	Measles
1967	Mumps
1969	Rubella
1974	*Haemophilus influenzae* B
1974	Tick-borne encephalitis
1981	Hepatitis B
1985	Pneumococci
1995	Varicellae (chicken pox)
1996	Hepatitis A
1997	Rotaviruses
1999	Meningococci C
2006	Human papilloma virus (HPV)

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tances. This problem especially has to be faced in tuberculosis (► tuberculosis and other mycobacterioses) and ► nosocomial infections. The unrestricted use of antibiotics and chemotherapeutics for medicinal therapy or animal fattening has led to the development of resistant and highly virulent pathogens. And through the influence mankind has on the environment, global warming and climatic changes, human beings will over and over again be confronted with new or changing and possibly pathogenic microorganisms.

Ways of Transmission

Infections can be transmitted directly from one individual to another or indirectly by different vectors. Infectious diseases which are transmitted to humans by vertebrates are called zoonoses (► zoonotic and parasitic infections). Several pathogens can be transmitted directly and indirectly. Depending on their resistibility, some germs can survive outside of their hosts for a time. One of the ways direct transmission takes place is by droplets: coughing or sneezing. Respiratory tract infections are primarily transmitted in this way. Besides simple upper airway infections, more serious diseases, like pneumonia, infectious mononucleosis or tuberculosis (► tuberculosis and other mycobacterioses), can occur. Moreover, most of the so-called childhood diseases like chicken pox or measles are transmitted by droplets. A further possibility of direct transmission is by smear infection, which takes place by contact with the skin or the mucous membranes. Communicable diseases in this category are primarily ► sexually transmitted diseases (STDs), and include ► HIV-infection and AIDS. Some ► parasitoses (► zoonotic and parasitic infections) are also transmitted from one individual to another by close contact, for example lice, fleas or scabies mites. In an intrauterine infection, pathogens from the maternal circulatory system reach the unborn child via the placenta. An infection inside the womb can kill the baby, lead to miscarriage or premature birth or cause dysplasias or impairment in the child's development. A transmission of an infectious disease can take place during birth. As for indirect transmission of diseases, there are several possibilities. Pathogens can easily enter an organism through open wounds. Wound infections with high lethality are tetanus and gas gangrene. Both diseases are caused by spore-building bacteria, which are found in the soil or in dust. A great number of infectious diseases are transmitted by foods or drinking water, polluted by human or animal excrement. Besides worm infections, the most typical fecal-orally transmitted (► food-safety and fecal-orally transmitted infectious diseases) or waterborne infectious diseases (► water quality and waterborne infectious diseases) are diarrheal in nature. The bite of a bloodsucking insect is a further mode of transmission. The type of insects responsible for spreading particular diseases depend on environmental factors, e. g. a high percentage of disease-spreading insects are primarily found in warmer regions – that is why the corresponding diseases are called tropical diseases (► tropical diseases and travel medicine). Due to the rising mobility of people and the increasing popularity of long-distance journeys, diseases transmitted by (tropical) insects also play a role in travel medicine (► tropical diseases and travel medicine). Among the tropical diseases, ► malaria, which is transmitted by the *Anopheles* mosquito, has far-reaching effects worldwide; however, yellow fever, sleeping sickness and leishmaniasis are of certain significance as well, especially in tropical regions. Fortunately, very few germs can penetrate the intact skin of a person. However, diseases are not only transmitted by insects; rabies is a very dangerous infection with a high lethality and is caused by the bite of an infected vertebrate and bilharziasis is a familiar infectious disease caused by *Schistosoma*, a genus of trematodes, which lay eggs within the host. As for health care services, there is the danger of transmitting infectious diseases by the hands of the staff or by contaminated material; pathogens can be transmitted by venous cannulae, central vein catheters, urinary (urethral) catheters, mechanical ventilation and surgical interventions. Germs, which are transmitted by blood or blood products, can get into a patient's circulatory system by a contaminated blood transfusion. Thanks to a careful examination of blood donors and blood conserves, nowadays, the transmission of disease by blood transfusion seldom occurs – at least in the industrialized nations. Apart from acquisition of droplet- and smear infections, medical staff face an enlarged risk of infection due to needle stick – or other injuries – when dealing with infected patients or contagious material. In this context, the transmission of hepatitis B and AIDS are of particular significance. Out with the health care system, transmission of infectious diseases takes place among drug addicts who re-use contaminated needles.

Course of Infectious Diseases

An infectious disease starts after a defined incubation period, the time interval between contact with the germ and the appearance of symptoms. While the incubation period is very short in food poisoning by bacterial toxins (only a few hours), it can last up to several decades in other transmissible diseases, like AIDS or leprosy. As a rule of thumb it can be said that the typical incubation period is about one week for bacterial infections and between one and four weeks for viral infections. As for worm infections, the incubation period lasts longer than a month. The severity of an infectious disease depends on various factors; the characteristics of the pathogen, the immune status of the affected organism and the therapeutic measures employed. Some germs can cause ► acute life-threatening infections. When the course of the disease is rapid and severe it is described as being fulminant. There is no time for therapeutic interventions, and one has to be prepared for a high lethality. Such acute infections develop quickly; they seem to start out of completely inconspicuous physical conditions. Very frequently, an acute course is seen in ► infectious diseases in pediatrics. But there are a number of infections with acute courses, which occur in all age groups, like ► influenza (► influenza and avian influenza) or diarrheal diseases. A less sudden course of infection is labeled subacute; chronic infectious diseases start slowly and last a long time. An acute infection can turn into a chronic disease, for example, hepatitis B. In recurrent infections the same germ is responsible for each episode. Relapses typically occur if there is an underlying disease or an immune deficiency. Latent infections extend over a long period of time with asymptomatic intervals in between. Thus people with syphilis or leishmaniasis can stay free of symptoms for years. The same situation is found in HIV infection; AIDS usually develops after a long temporary delay. So-called opportunistic infections only occur under particular circumstances, for example, in persons with a weakened immune system. Some pathogens can remain dormant for long periods, but, if anything causes pressure on the immune system an outbreak of the disease can result. Such negative influences can be stress, a medicinal suppression of the immune defense (e. g. corticosteroid therapy following transplantation) or the onset of immune deficiency. In general, with the recovery from an infectious disease, the pathogens are completely eliminated by the body's defense mechanisms. However, some previously infected individuals continue to expel pathogens after they become asymptomatic; they are called (permanent) shedders.

Defense Against Infectious Diseases

When a pathogen comes into contact with a host, it is recognized as a foreign substance, as an antigen. The macroorganism grapples with the germ and – most probably – tries to eliminate it. One has to differentiate between specific and non-specific means of defense. The skin is a part of the non-specific defense system. Its horny layers and its acid pH-value form a barrier, which hinders the entry of germs into the deeper layers of tissue. Spittle and tears contain lysozyme and other substances, which are able to kill bacteria or impede their growth; gastric acid can also kill various microorganisms. The ciliary cells of the upper respiratory tract waft incoming particles back up the tract. If pathogens reach the circulatory system, they are ingested by "eating cells" (phagocytes) and – if possible – killed. Additionally, blood serum contains proteins which form the complement system that supports the functions of non-specific defenses. The specific defense systems consist of two components: B-lymphocytes representing humoral defense and T-lymphocytes cellular defense. Contact with an antigen stimulates the lymphocytes to build antibodies (immune globulins, Ig), which are specifically directed against this antigen. While antibodies produced by the B-lymphocytes are released into the blood, antibodies produced by T-lymphocytes multiply at the cell membrane. T-lymphocytes directly interact with the antigen; the destruction of the pathogen is supported by macrophages. In a number of defense processes, B- and T-lymphocytes work together. In this cooperation, T-lymphocytes can either support (helper T cells) or suppress (suppressor T-cells) the activity of B-lymphocytes. After contact with an antigen, both B- and T-lymphocytes build memory cells. If a new contact with the same antigen occurs, the memory cells guarantee a quick response of specific defense mechanisms by releasing antibodies or immunocompetent T-lymphocytes. In immunocompromised individuals, the humoral, the cellular or both mechanisms of defense can be impaired.

Symptoms of an Infection

Inflammatory reactions are typical symptoms of infectious disease. Even in ancient times, the characteristics "dolor, rubor, calor et functio laesa" (pain, redness, heat and loss of function) were described. However, the inflammatory response can occur for other reasons than infection. Many infectious diseases also cause general feelings of illness, exhaustion, headache and rheumatic pains. Another common symptom is fever. Especially in children, a sudden increase of body temperature has to be expected. Further symptoms are due to the localization of the infection. Upper airway infections lead to colds with coughing and sneezing and may be accompanied by hoarseness and swallowing difficulties. When the lower respiratory tract is involved, sputum production and difficulties in breathing can occur. Infections of the gastrointestinal tract cause stomach ache or cramps, nausea, vomiting and diarrhea. If the central nervous system is affected then headache, impaired consciousness and neurological disorders predominate. Infections of the urogenital tract are characterized by discharge, burning micturition and itching.

Extension of Infections

When the infection is confined to the site of pathogenic entry it is called a local infection. The symptoms are restricted to a limited area, for example, wound infections. Moreover, ► sexually transmitted diseases (STD), like gonorrhea, trichomoniasis, condylomas and herpes genitalis, often initially only appear at the place of entry, e. g. the genital organs. If the whole intestinal tract can be taken as a single unit, then most diarrheal diseases and worm infestations could be classified as local. A focal infection is said to have occurred if pathogens travel to other organs via the blood. Some species of streptococci are known to spread into other organs when insufficient treatment has been given; specifically, they cause inflammation of cardiac valves and kidneys. After ingestion, flukes wander into various organs, where they cause symptoms; most frequently, liver and lungs are involved. The spread of pathogens throughout a whole organ system, or even over the whole organism, is called systemic infection. An inflammatory reaction, which concerns the whole body (SIRS = systemic inflammatory response syndrome), is called sepsis. Sepsis entails bacteremia, tachycardia, a changed body temperature (fever or hypothermia) and a changed white cell count (> 12 cells/nl or < 4 cells/nl).

Infectious Diseases Related to Organs and Organ Systems

Certain organs or organ systems are especially affected by infectious diseases. These are the airways and the gastrointestinal tract. Respiratory tract infections, which are most frequently transmitted by droplets, range from simple colds to severe pneumonias. Airway infections also include ► influenza and avian influenza. Another disease, which primarily concerns the lungs, is tuberculosis (► tuberculosis and other mycobacterioses). Respiratory tract infections are found in every age group. Worldwide, 3.9 million people die due to airway infections every year, further 1.6 million deaths are caused by tuberculosis. Pertussis is responsible for 300,000 deaths yearly. It is most dangerous for babies, as in this age group the infection can cause apnea. Due to infections in the pharyngeal region, especially in small children, a swelling of the mucous membranes leads to an impairment of ventilation in the middle ear, which results in the development of otitis media. A common form of gastrointestinal infection is diarrhea, which worldwide causes 2.2 million deaths a year. Diarrheal diseases, which are nearly exclusively transmitted fecal-orally, principally concern children. In general, the severity of the infection is determined by the amount of fluid loss. Due to a lack of therapeutic facilities, a great number of deaths occur in the developing countries. Infections of the liver usually do not show a deadly outcome in the acute phase; the problems arise when the disease turns chronic and progressive organic failure ensues. In comparison with other systems, infectious diseases of the central nervous system are quite rare. Unfortunately, these infections often show a more serious course. In a number of cases, persistent defects with neurological sequelae have to be expected. Some of the ► sexually transmitted diseases (STD) primarily or exclusively affect the genital organs, like herpes genitalis, condylomas or trichomoniasis, others spread into adjacent tissues or organs (like gonorrhea). Syphilis, which at first only concerns the genitals, can affect nearly all organs during the later stages of the disease. Hepatitis B and AIDS are sexually transmitted diseases which do not manifest in the genital organs at all. Infections of the muscular and skeletal systems, kid-

neys and lower urinary tract are not major public health issues as they have low transmissibility; these diseases are not transmitted from one individual to another, so there is no fear of spread to large groups of people.

Diagnostics of Infectious Diseases

Taking a case history and recording clinical features is the first step in the diagnosis of an infectious disease. For instance, typical childhood diseases, like chicken pox or measles, demonstrate characteristic rashes from which diagnoses can readily be made. The responsible pathogen does not always have to be detected by using expensive laboratory procedures; diagnostic costs should be reasonable. However, if therapeutic benefits are dependent on identification of a pathogen then any necessary investigations should be undertaken. But, in certain given situations, the expense of detection cannot be justified because it is hardly ever successful, e. g. countless numbers of viruses could be responsible for simple upper airway infections.

Some parasites, like lice, are visible with the naked eye, and it is also not difficult to diagnose an infestation of worms, like ascarides or pinworms, when they appear in the stool. Proglottides, which are segments of tapeworm, are also easily recognized, although worm eggs need to be detected microscopically.

Infections can be diagnosed by identifying the pathogens found in various body substances. To begin with, body fluids, like blood, urine or cerebrospinal fluid, can be examined. Most of the germs that cause gastrointestinal infections are detected in the stool. Moreover, sputum, pus, wound secretions or punctates of effusions can be used as well as samples from surgical interventions, biopsies or autopsies. Smear tests can be taken from different regions of the body (nose, throat, rectum, wounds).

Sampling and consignment of material must satisfy particular requirements. The transport container must be sterile, otherwise the sample may be contaminated by other pathogens. If the expected pathogen is sensitive to environmental influences, then further conditions might be necessary, like correct timing of sampling, special nutrient media, humidity, immediate processing, or transport at a definite temperature. An explicit labeling of the sample is necessary to ensure its correct allocation. The label has to contain the location from which the sample was taken and the patient's particulars. Blood agars and other media are used to culture bacteria and fungi. Large colonies can be seen with the naked eye, and the pattern of growth can lead to the identification of the bacterial family. Following staining a more detailed analysis can be performed under the microscope. Once a pure culture of bacteria has grown, the efficiency of antibiotics can be tested in vitro; depending on the impairment of bacterial growth, an antibiogram is made. Tuberculosis infection can also be detected by a skin test. Viruses grow in cell cultures, but they are only visible using electron microscopy. For clinical use, it is more practical to detect viruses by other methods.

Serological tests are based on antigen-antibody-reactions, which can be detected or made visible by various means, such as, complement binding reaction (CBR), hemagglutination inhibition test (HIT) and neutralization test (NT). Tests, which provide a differentiation of the immunoglobulin classes IgM, IgG and IgA, are immunfluorescence test (IFT) and enzyme immuno assay (EIA). The so-called "titer" is detected by stages of dilution. The titer is the highest dilution at which a reaction can clearly be seen. A 4-fold increase in titer within 10–14 days can be taken as proof of an acute infection. Besides serological methods, molecular biological tests can be used for the detection of pathogens. The presence of bacterial or viral nucleic acids can be proved by PCR (polymerase chain reaction) or LCR (ligase chain reaction); moreover, gene probes can be used.

Therapy of Infectious Diseases

The ► therapy of infectious diseases depends on the microorganism itself and on the individual features of the macroorganism. Because of a person's age, constitution or state of immunity, one and the same germ can cause an infection to take different courses, which might require varying therapeutic measures. Symptomatic and specific or causal treatments can be differentiated. Often a combination of therapy is necessary. Symptomatic therapy treats the symptoms of an infection, for example, fever, pain and fluid loss. A causal or specific therapy is directed against the pathogen itself. While there is a great number of effective antibiotics and chemotherapeutics for the treatment of bacterial infections, viral infection causal treatments are restricted to a few substances. In the industrialized countries,

one can treat symptoms and administer antibiotic and antiviral drugs even if the treatment is very expensive. Whereas in developing countries even necessary therapies cannot be carried through due to a lack of resources; as a result treatable infectious diseases may prove lethal.

Prevention of Infectious Diseases

Prophylactic measures aim at the avoidance of infectious diseases. General means of prevention are a healthy nutrition, a sufficient standard of living and a balanced way of life. A predisposition towards infectious diseases can be increased by various psychological or physical stress factors weakening the immune system. In socially underdeveloped regions, infectious diseases spread easily. These regions are not only found in the developing countries, but also in the slums or other poor districts of cities. Wars, refugee movements, impoverishment and the breakdown of public health systems facilitate the development of infectious diseases. Reducing poverty and bringing about peace in war-torn countries are thus important measures in the prevention of infectious diseases.

Preventative measures can be divided into exposition- and disposition prophylaxis. Exposition prophylaxis aims at avoiding contact with pathogens. It involves general protective measures, hygienic rules and recommendations that deal with infected humans or animals. All these measures help to stop the spread of an infectious disease. However, the success of preventative measures depends on a sufficient public knowledge about the characteristics of a given pathogen and its mode of transmission. In the case of sexually transmitted diseases, social taboos can be a hindrance to providing the population with the necessary information. A lack of appreciation of the problem and a high readiness to take risks makes sexually transmitted diseases a big problem among teenager and young adult groups. Large-scale educational campaigns primarily only deal with AIDS and give less attention to the other sexually transmitted diseases.

To avoid the bites of disease transmitting insects in tropical regions, various measures are recommended: the use of repellents, the wearing of covering clothing and the use of mosquito nets. As most of these insects are night-active, it is best to avoid being out of doors in the evening and at night. In tropical regions, people are warned not to bathe in stagnant waters to avoid the risk of infection by *Schistosoma (Bilharzia)*. Animals are another source of possible infection especially if in close contact, e. g. sharing living accommodation, or if professional work brings an individual into daily proximity (animal keepers, veterinarians or farmers).

Hygienic rules and instructions apply to the private sphere as well as to the food industry, waste- and effluent disposal systems and the public health system. Besides washing with clean water, the recommendation “cook it, boil it, peel it, or forget it” plays an important role wherever foodstuffs may be contaminated by pathogens, especially fecal germs. As pathogens reproduce more quickly at higher temperatures, there is a greater risk of fecal-orally transmitted infectious diseases (► food-safety and fecal-orally transmitted infectious diseases) in warmer countries. Where the water quality is poor and there is fecal contamination, waterborne infectious diseases can occur (► water quality and waterborne infectious diseases). In the prevention of transmissible diseases the guarantee of a sufficient supply of drinking water is of great significance. As for the food industry, special regulations have to be followed to avoid transmission of infectious diseases to/from employees and to keep products germ free. Due to the possibility of high contamination with pathogenic microorganisms, waste and sewage have to be strictly separated from the sources of drinking water. These conditions frequently cannot be fulfilled in the developing world and in these poorer countries, human and animal excrement often gets into the water, which is then used as a source of drinking water.

A problem, which also exists in the industrial nations, is the transmission of infections during hospital admissions. Due to the high resistance developed by hospital pathogens, these so-called ► nosocomial infections often are difficult to treat. Prevention requires that certain hygienic instructions have to be followed when dealing with patients. A transmission of pathogens on the hands of staff, or used instruments and materials, should be avoided as far as possible. In this connection, disinfection (hands, other parts of the skin, surfaces) and sterilization (instruments, gloves, surgical clothing and sheets) are important preventative measures. Standard hygienic procedures should become automatic processes. Infection control officers should enforce compliance to hygienic instructions and the achievement of quality standards.

If a contact with pathogens cannot be avoided or if a contact at least has to be expected, then disposition prophylaxis takes effect. Disposition prophylaxis aims at reducing an individual's susceptibility to pathogens. Possible measures are immunizations and chemoprophylaxis. Vaccination is classified into active (► immunization, active) and passive immunization (► immunization, passive). In active vaccination, weakened or inactivated pathogens, antigenic parts or germ products are inoculated into an individual. The immune system responds to these substances and builds up antibodies. When active immunization is completed, any new contact with the pathogen will evoke a defensive response, the organism is immune, that means it is protected against the infection. In general, immunity lasts for several years, and in some cases it can even be lifelong. In passive immunization an immediate protection against an infectious disease is achieved by the administration of antibodies (immune globulins). This kind of vaccination can be performed, within a certain time limit after contact with a pathogen, as a so-called postexposition prophylaxis. In passive immunization, the organism does not produce any antibodies of its own; the protective effect only lasts for 4–6 weeks.

Chemoprophylaxis entails the administration of antibiotics or chemotherapeutics. The best-known form is malaria prophylaxis, which is recommended for travelers going to endemic regions. Individuals who have been in close contact with people who have infections due to particular bacteria, like meningococci or *Bordetella pertussis* (whooping cough), should receive chemoprophylaxis. When congenital cardiac defects are present or a person has undergone cardiac valve replacement, antibiotic prophylaxis should be performed to prevent endocarditis, whenever surgical or dental interventions with gingival bleedings are necessary (Kirch 2003). Further indications for chemoprophylaxis are the presence of certain immune deficiencies, chronic diseases and vesicoureteral reflux (VUR). Moreover, splenectomized persons should receive an antibiotic prophylaxis.

Summary

Infectious diseases are caused by viruses, bacteria, fungi, protozoa, prions or parasites. These pathogens get into the human organism by different routes. The severity of the infection can vary from hardly noticeable to lethal. The human race has always been confronted by pathogens; infectious diseases have shaped and still shape society and contemporary history. Even in wealthy countries they have been the most frequent cause of death for thousands of years. Up to the 19th century the cause of infectious diseases was unknown and the measures which were performed could only be justified empirically. Then, thanks to the progress in microbiology, bacteria were detected as the cause of infectious diseases, vaccines were established for the prevention of transmission and effective treatments were developed. Modern diagnostic methods enable the detection of a great number of pathogens. Due to the variety and the mutability of microorganisms, new infectious diseases can still appear or well known diseases can become more difficult to treat because of the development of resistances. Thus, concerning diagnostic, therapeutic and prophylactic measures, the fight against infectious diseases remains a challenge for medical science. With the rising mobility of people, infectious diseases have become a subject of worldwide interest. As well as regional and national documentation and control, a worldwide network of surveillance and global recommendations concerning outbreak management is useful. A big problem, which particularly has to be faced in the developing countries, is the discrepancy between the measures which can theoretically be performed, and those, which – due to restricted resources – are actually available.

Cross-References

► Acute Life-Threatening Infections
► Communicable Diseases
► Food-Safety and Fecal-Orally Transmitted Infectious Diseases
► HIV-Infection and AIDS
► Immunization, Active
► Immunization, Passive
► Infectious Diseases in Pediatrics
► Influenza and Avian Influenza
► Malaria
► Nosocomial Infections
► Outbreak Management and Surveillance of Infectious Diseases
► Sexually Transmitted Diseases
► Therapy of Infectious Diseases
► Tropical Diseases and Travel Medicine

► Tuberculosis and Other Mycobacterioses
► Water Quality and Waterborne Infectious Diseases
► Zoonotic and Parasitic Infections

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Infectious Diseases Acquired on Journeys

► Tropical Diseases and Travel Medicine

Infectious Diseases in Childhood

► Infectious Diseases in Pediatrics

Infectious Diseases Due to Contaminated Water

Synonyms

Infectious diseases due to polluted water; Waterborne infectious diseases

Cross-References

► Waterborne Infectious Diseases
► Water Quality and Pollution
► Water Quality and Waterborne Infectious Diseases

Infectious Diseases Control Law

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Synonyms

Contagious diseases control law; Communicable diseases control law

Definition

Infectious diseases control law comprises the legal rules that are aimed at the prevention, detection and abatement of infectious diseases and the health risks resulting from such diseases. These legal rules regulate a central field of public health law.

Basic Characteristics

Background

Government activities to control and combat infectious diseases probably form the "oldest field of public health" (Grad 1990). Correspondingly, infectious diseases control law is probably the oldest branch of public health law. Many of the earliest public health interventions relate to the control of infectious diseases. In the Middle Ages, the plague (the black death) was devastating to Europe, leading to millions of deaths. In the 14th century, so-called "*Pestschriften*" were published in German, which translates as "*the Plague Writings*". These documents among others provided instructions to avert the risks of a plague epidemic and stand for early "epidemics-police" related activities (Schumacher and Meyn 1992). The instructions included notification of the disease, isolation of infected persons, quarantine for areas or whole cities, protective clothes for doctors and prohibition of immigration from plague affected places (Schumacher and Meyn 1992). In light of the plague threats, administrations and communities in the Middle Ages implemented measures like quarantine and isolation, which are still central tools in contemporary infectious diseases control. Many other infectious diseases (e. g., smallpox, tuberculosis, pneumonia, venereal diseases, AIDS) have played central roles in the development of public health and public health laws.

Infectious diseases are still a major practice area of contemporary public health. All jurisdictions have tak-

en measures to battle against infectious diseases and to prevent epidemics. Constitutions in some countries (e. g., Germany) even grant explicit authorization to control and abate communicable diseases. As with all other branches of public health law, infectious disease control laws also have certain characteristics.

General Legal Remarks

Public health actions to control infectious diseases have various sensitive contact points with individual rights. Some measures, like compulsory hospitalizations, significantly invade the individual's fundamental rights and autonomy. Legal measures to control infectious diseases may curtail numerous basic rights. The personal freedoms and rights regularly affected include personal autonomy, the right to privacy, the right to personal liberty, the freedom of movement, the right to bodily integrity and the freedom of religion, profession and occupational exercise as well as property rights. In light of the legal importance of these rights, public health actions must rely on law. This means that such actions need sufficient legal authorization and prior procedural and substantive legal balancing. Actions affecting constitutional rights must be based on law and are limited by the principle of proportionality as outlined in the essay on legal balancing of conflicting rights. As this area of public health operates very close to the individual's sphere, it is under regular scrutiny by affected individuals (by litigation) as well as the general public. Infectious diseases control laws are interwoven with several other branches of public health law. As such, the legal regulation of some products is close to the control of infectious diseases, particularly the regulation of drugs, vaccines and food. Food regulation laws are particularly aimed at the control of foodborne infectious diseases (e. g., botulism, enteric diseases, typhoid fever) and have significantly contributed to the reduction of these diseases (Kux et al. 2007). Infectious disease control laws are intertwined with the regulation of professions and businesses (e. g., health professionals, cooks, restaurants, food-processing businesses). In addition, environmental laws unfold supportive effects on the control of infectious diseases (e. g., water regulation). As another example, infectious disease regulation also has contact points with criminal law, which becomes apparent when reviewing court decisions that punish infectious persons who negligently or intentionally infect others (e. g., HIV-positive individuals having unprotected intercourse without disclosing their infection). Criminal law and tort law may also become relevant if public health officials enforce infectious disease control measures that are disproportionate and violate individual rights. The officials may be criminally prosecuted and they – together with their agency – may be liable for damages. In conclusion, infectious disease control operates in a complex and sensitive legal surrounding.

Traditionally, the laws related to the control of infectious diseases focused on the detection, treatment and combat of infectious diseases. Over time, this focus has shifted and nowadays additionally includes the prevention of infectious diseases. In contemporary public health practice, the prevention of infectious diseases is as important as the detection and handling of disease outbreaks. In most jurisdictions, the infectious disease control laws differentiate gradually between public health measures to prevent, to detect and to treat communicable diseases. Therefore, the legal means provided in this field will be discussed below based on this distinction.

Laws for Infectious Diseases Prevention

Law provides for infrastructural and operational public health means that also assist infectious disease prevention (*See* Gerberding et al. 2003; Gostin 2000). With respect to infrastructural means, law provides for the infrastructural creation of specialized regulatory agencies in charge of surveillance and the control of risks arising from the various sources. As such, the agencies in charge of food safety enforce strict food laws and take steps to combat foodborne diseases. Other agencies are in charge of vaccines or pharmaceuticals (e. g., antibiotics, antiviral drugs). Additionally, law allows the creation and funding of scientific institutions that conduct research to better understand illnesses and develop prevention strategies.

As *operational means*, law grants authority to fund information and health promotion campaigns. In the realm of infectious diseases control, worldwide campaigns for safer sex for the prevention of sexually transmitted diseases, particularly, HIV, are a well-known example. Information and education of the population is an increasingly important tool of contemporary public health. For prevention of infectious diseases (partic-

ularly, HIV/AIDS, hepatitis), the law also grants authority and funding for the supply of sterile needles to drug addicts.

Vaccinations are the central tool of infectious diseases prevention. The success of vaccinations is valued as one of the great public health achievements in the 20th century (CDC 1999). The immunization of the population (or parts of it) against certain pathogens has not only contributed to the battle against numerous infectious diseases (among others, the eradication of smallpox); vaccinations have also been subject to numerous lawsuits and legal disputes. Maybe the most influential decision was issued by the U.S. Supreme Court in 1905 when it decided the case of *Jacobson versus Massachusetts*. There, the court upheld mandatory smallpox vaccination in Massachusetts, which Reverend Henning Jacobson had challenged. The confirmation of the constitutionality of compulsory vaccinations by the U.S. Supreme Court significantly promoted the vaccination practice. This contributed to infectious diseases control in the past century and bolstered other areas of public health laws (Parmet et al. 2005). For example, in some jurisdictions mandatory vaccinations are provided before school admission or before taking on certain employments. In most jurisdictions, there are also laws that provide incentives for voluntary vaccinations.

For the prevention of infectious diseases, laws impose restrictions on access to certain professions. In most jurisdictions, carriers or persons under suspicion of being infected among others with the pathogens causing cholera, typhoid fever, hepatitis A or hepatitis E, will not be allowed to work in businesses or locations where food is processed. The same is true for eliminators of these germs. Therefore, it is part of infectious disease prevention that all persons are medically examined before carrying out or starting such employments. In addition, professional work with pathogens is normally limited by law. Regularly, such work is only allowed with a corresponding license granted to a limited group of professions like specialized medical doctors or microbiologists. Here, public health law limits the freedom of professional conduct in the name of the protection of the population.

Another part of infectious diseases prevention encompasses legal means that abate sources of infections. As an example, for the prevention of the spread of HIV/AIDS, in 1986 the Supreme Court of New York upheld the closure of the bathhouse New St. Mark's Baths in New York City. The closure was ordered by the administration as homosexual men met in the bathhouse and practiced high-risk sexual activities on a regular basis (Supreme Court of New York 1986). Such measures collide with the economic and professional rights of the bathhouse holder and the personal rights and freedoms of the bathhouse visitors (*See* Gostin and Jacobson 2006). The court's decision contains legal balancing between these rights and interests with the community interest in disease prevention.

Prevention of infectious diseases may also include advising partners of infected persons of the infection if there is reason that the infected will endanger them. Conversely, criminal laws prohibit and punish the negligent or willful infection of sexual partners by infected persons and, in this way, deter persons from such acts and contribute to the prevention of infectious diseases.

Laws for Infectious Diseases Detection

For infectious diseases detection, the establishment of a regulatory agency infrastructure is necessary. These agencies must be authorized to carry out surveillance and to collect information even if it is sensitive information affecting privacy. A central tool of infectious diseases detection is the establishment of a reporting system to obtain information about infectious persons and disease outbreaks. Most jurisdictions provide for laws imposing reporting and notification obligations on medical doctors, laboratories and other health professionals when they notice certain infectious diseases. For many diseases, laws impose duties to report the infection and personal information about the carrier. For some infections, it is sufficient only to report the infection without personal information. Such reporting obligations not only affect the privacy of the infected but also affect the freedom of occupation of the reporting health professionals.

Law also allows screening examinations in certain professions and population groups. The screening of pregnant women for a number of infectious diseases, including HIV-infection, is one example. The screening of schoolchildren, health professionals, prostitutes or food processing professionals are further examples.

Compulsory medical examinations and testing as well as involuntary commitment or hospitalization are means provided by law for the detection of infectious

diseases. These actions infringe the personal rights and freedoms of those persons suspected of being infected (Grad 1990; Gostin 2000). Therefore, such actions need sufficient legal authorization. Without such authorization, the conduct of compulsory examinations and compulsory hospitalizations would lead to criminal prosecution of the public health officers. If it turns out that the suspected persons were infected, laws must allow tracing of contacts and identification of persons potentially infected by the carriers (Gostin and Jacobson 2006; Moulton et al. 2007). Contact tracing, however, affects the privacy rights of the contact persons and of the infected person. Therefore, such action must be allowed by law.

Laws for Infectious Diseases Combat

Law provides tools in case of detected infectious diseases. Well-known instruments of infectious diseases control include the isolation of infected persons or the quarantine of potentially infected persons. Isolation and quarantine may be imposed on a mandatory basis as well as on a voluntary basis. Infected persons may be subject to involuntary commitment or hospitalization. Within hospitalization, they may be offered medical treatment. If necessary and if the person refuses such treatment, public health officials may order compulsory medical treatment if the disease would otherwise pose a significant risk. Such compulsory medical treatment combined with involuntary confinement is probably the most intrusive tool of infectious disease control. Therefore, it can only be applied in very few cases, where strict criteria are fulfilled (Gostin 2000; Grad 1990). Among others, the compulsory treatment must be performed *lege artis* and be in the interest of the infected as well as the community. According to legal balancing rules, the treatment must be effective in combating the risks and must be the least intrusive alternative.

The diagnosis of a contagious disease may lead to additional personal restrictions. Corresponding to the preventive measures above, a person may not be admitted or may no longer be allowed to practice professions in areas where the infection may cause health threats (e. g., food processing professions, health professions). Persons can even be subject to a ban from a profession. To cope with epidemic threats, governments and public institutions buy large amounts of antibiotics and other medications in order to be prepared for emergencies. Similarly, most governments have stocked up on vaccines. Against the background of the risks resulting from bioterrorist attacks, governments have also built stocks of antibiotics and antitoxins against relevant pathogens (*See* in the U.S. the "Strategic National Stockpile"). Such additional infectious disease control activities also need legal foundation, as the government must be authorized to pursue such measures, including their funding.

Perspectives

Infectious diseases control law has always been a major part of public health law. These laws increasingly focus on disease prevention. Contemporary infectious diseases control laws face new challenges from new pathogens and new disease mechanisms (e. g., SARS, avian influenza virus, HIV/AIDS). In addition, worldwide globalization and increased mobility and travel further facilitate the spread of (old and new) communicable diseases. As noted above, there are also new types of human-made public health threats, which particularly include bioterrorism.

Many of these new threats call for modifications of the traditional infectious diseases control strategies. They particularly call for intensification of international public health strategies; more so as most of these threats have to be regarded as global threats and not purely national issues. Therefore, international legal documents to combat infectious diseases like the International Health Regulations of the WHO may gain increasing relevance (*See* Gostin and Jacobson 2006). To a certain extent, globalization of infectious disease control laws should be underway. In summary, infectious diseases control law, which belongs to the oldest branch of public health, will remain a central part of public health practice and public health law.

Cross-References

- ▶ Criminal Law and Public Health
- ▶ Environmental Law and Public Health
- ▶ Epidemiology
- ▶ Health Campaigns
- ▶ Health Promotion
- ▶ Infectious Diseases
- ▶ Legal Balancing of Conflicting Rights
- ▶ Legal Regulation of Professions, Businesses, and Products

► Public Health Law, Information and Communication
► Public Health Law, Legal Means

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Infectious Diseases with a Critical Course

► Acute Life-Threatening Infections

Infectious Diseases Due to Leeches

► Zoonotic and Parasitic Infections

Infectious Diseases in Pediatrics

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Synonyms

Infectious diseases in childhood; Childrens' diseases; Childhood diseases

Definition

Due to their frequency in childhood, infectious diseases play an important role in pediatrics. They are divided into infections that exclusively or predominantly appear in children, or at particular stages of childhood (e. g. newborns or babies), and those which occur both in children and adults. The severity of an infectious disease can vary considerably at different phases of life.

Basic Characteristics

Special Features in Pediatrics

Children are not simply little adults. Even though they are targets of the same pathogens as adults, the consequences of an infection for children can be quite different. As the body surface is relatively greater in children, as is the percentage of water, clearly when replacement is required there is a relatively higher need for fluids and electrolytes per kilogram body weight. The younger a child is, the more it is endangered by fluid loss due to feverish infections or diarrhea.

At the time of birth, the immune system is still immature; thus infectious diseases in newborns and young babies can have severe or even deadly consequences. Pathogens can be transmitted intrauterinally, leading to congenital infections. On the other hand, directly after birth, children are protected against several – predominantly viral – infections by maternal ► antibodies, which they received intrauterinally. This so-called ► nest protection lasts for a couple of months.

As to the treatment of infectious diseases, again differences between children and adults are to be found. Besides the special features regarding ► body fluid balance, the treatment of infectious diseases in children can present specific problems, e. g. antibiotics can have developmental side-effects (like discoloration of teeth due to tetracyclines or damage to connective tissue and cartilage due to gyrase inhibitors) and several drugs are not licensed for children, due to a lack of evidence-based experience or for other reasons.

Even the transmission of infectious diseases has special pediatric features. Children often attend communal services (day-nurseries, kindergartens) or spend long

hours in large groups (for example in school or sports clubs). Their play and social behavior is characterized by close contact. Especially in younger children, there often is a common use of toys and other objects, like hygienic articles, dinner-services and drinking vessels; meals are frequently eaten together, sweets are often shared by biting off or licking. Due to these special environmental and behavioral conditions, the risk of transmission of infectious diseases is considerably increased. The close contact enables the spread of those organisms which need direct contact for their transmission, like ► lice (primarily head lice) and ► scabies. Early childhood is thus a time of exposure to highly contagious infectious diseases. A further aspect which has to be considered is the lack of, or at least an insufficient, knowledge of hygiene in children which puts them at high risk of the ► fecal-orally transmitted diseases.

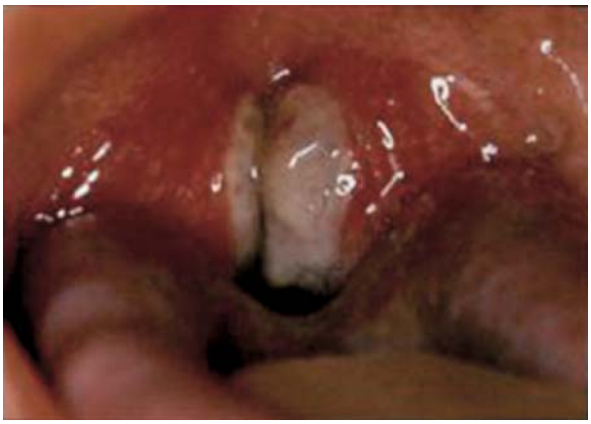
The liability to infectious diseases is increased by insufficient nutrition. This factor is particularly significant in developing countries.

In infectious diseases, children often develop ► fever, and in younger children, ► febrile seizures frequently appear. An inflammation of the bones (osteomyelitits) has to be taken very seriously in childhood as damage to the epiphysis can impair bone length growth. Due to their mode of transmission, ► sexually transmitted diseases (STD) do not play a significant role in the field of pediatrics, however, on the one hand, some of the STDs can be transmitted to the child during pregnancy or birth, and, on the other hand, due to promiscuity and child prostitution, these social diseases do occur in children. Also, sexual abuse has to be taken into consideration.

Classic Childhood Diseases

Diseases, said to be classic childhood diseases, fulfill typical conditions: they are highly contagious (without preventive measure they appear in more than 90% of all children up to the age of five), and they usually leave a lifelong immunity.

Most of the pathogens are viruses. Since there are only restricted possibilities concerning the treatment of viral infections, active vaccination (► vaccination, active) plays a significant role in the prevention of childhood diseases. Vaccination programs concentrate on the first 18 months of life with boosters – or ► indication vaccinations – being given later in life. Consistent execution of the recommended vaccinations is still important.

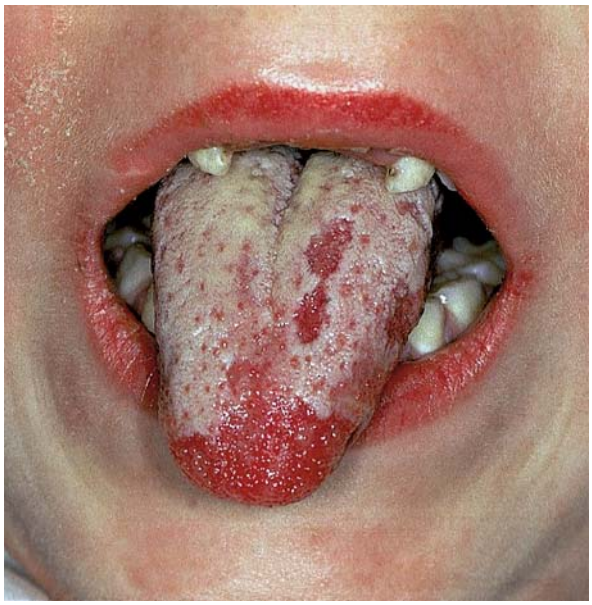


Infectious Diseases in Pediatrics, Figure 1 Membraneous tonsillitis in infectious mononucleosis; photo kindly provided by Prof. Wilhelm Kirch, Dresden

The term "childhood diseases" sounds harmless and children's diseases are overcome without consequences in a high percentage of cases, but complications are possible and, at times, the diseases can be anything but harmless. For example serious infections are found in immunodeficient children; furthermore, childhood disease occurring later in life (in teenagers or adults) can run much more severe courses. As an example of the perilous nature of a childhood disease one has just to look at the history of ► measles. In the 16th century, the virus was brought to America by the Spanish conquistadores. As the natives did not have any means of defense (antibodies) against the disease, an outbreak of measles occurred leading to a great number of deaths. Besides measles, ► whooping cough, ► mumps, ► rubella, ► chicken pox, ► poliomyelitis and ► diphtheria belong to the classic childhood diseases. Other infections, which are commonly found in children, are ► erythema infectiosum, ► exanthem subitum, ► infectious mononucleosis (Fig. 1) and ► scarlet fever (Fig. 2). ► Tetanus is a transmissible disease, which can occur at any stage of life; the infection can be prevented by active and – if necessary – passive vaccination, even in babies.

Congenital and Neonatal Infections

In congenital infections, the pathogens have been transmitted to the unborn child via the placenta. In gener-



Infectious Diseases in Pediatrics, Figure 2 Early development of raspberry tongue in a 7-year-old boy with scarlet fever (2nd day of disease) (Lentze et al. 2002)

al, infections of the fetus only occur when the mother has no antibodies against the disease. As sensitivity to the different germs varies during pregnancy, the time of infection significantly determines the extent of the damage suffered by the unborn child. The important congenital infections are ► toxoplasmosis, rubella (► congenital rubella syndrome (CRS)), ► erythema infectiosum (► congenital erythema infectiosum), ► cytomegaly (CMV) (► congenital cytomegaly (CMV)), varicella (► congenital varicella) and syphilis (► congenital syphilis). If a newborn baby is suspected of having a congenital infection, a ► TORCH serology can be performed. Malaria can also be transmitted during pregnancy; but this problem quite exclusively concerns non-immune pregnant women who undertake a journey to tropical or subtropical regions. Since the 1980s, congenital ► HIV-infection and AIDS have gained in significance. Further congenital infections, which have to be mentioned, are ► hepatitis B infection and ► congenital listeriosis. Directly before or during birth, the child can be infected with germs from the mother's genital tract. Thus, infections with *Listeria* (► congenital listeriosis), herpes-simplex viruses (► congenital herpes-simplex infection), gonorrhea (► congenital gonorrhea), syphilis (► congenital syphilis), *Chlamydia trachomatis* (► *Chlamydia trachomatis* infection) or *Ureaplasma urealyticum* (► *Ureaplasma urealyticum* infection) can occur. Infections in newborns develop if amniotic infection syndrome or a premature rupture of the amnion is present. Ascending pathogens get into the amniotic fluid and are swallowed by the baby. They are resorbed in the intestinal tract and spread via the blood vessels. Often, the symptoms of a neonatal infection are non-specific (reduced muscle tonus, changed skin color, instability of body temperature) and require great experience on the observer's behalf. The most common pathogens in the first three days of life are Group B streptococci (GBS), *E. coli* and *Klebsiellae*. *Listeria* monocytogenes also play a certain role in neonatal infections. As the infecting pathogen is generally initially unknown, a fixed regimen of a combined antibiotic therapy is prescribed.

Respiratory Tract Infections

Respiratory tract infections are the most frequent infections at all stages of life (see sysnopsis), but there are some special features relevant to childhood. During the first 10 years of life, on average, every child falls sick with 3–8 respiratory tract infections every year, without an underlying increased liability to infections. Transmission takes place by droplets or direct contact with contagious secretions. Apart from time spent in communal services (kindergartens, schools), passive smoking is a risk factor of respiratory tract infections. Due to special anatomic features, babies can suck (drink) and breathe simultaneously. As they usually nearly exclusively breathe through their noses, a simple cold with impairment of nasal breathing causes considerable discomfort. An impaired ventilation of the auditory tube (eustachian tube), which connects the pharynx with the middle ear, leads to otitis media (an inflammation of the middle ear). Otitis media is most frequently seen in younger children due to their relatively large adenoids. Chronic effusion in the tympanic cavity can impair hearing and impede language development. In cases of recurring inflammations of the middle ear surgical interventions may be necessary, e. g. the removal of the adenoids (adenotomy), an incision of the eardrum (paracentesis) or the insertion of eartubes into the tympanic membrane. The airways of a child are narrower than those of adults. In children, a swelling of the mucous membranes leads to an impairment of breathing more readily than in adults. This is due to the dif-

ferences in the relative circular areas of the windpipe and bronchi ($A = \pi \times r^2$). The narrowness of the airway system plays an important role in ► spasmodic croup, which is a typical disease in younger children, as well as in bronchitis and ► bronchiolitis. The latter is frequently caused by ► respiratory-syncytial-virus (RSV) infection. ► Epiglottitis, which was feared in earlier times, nowadays seldomly occurs due to active HIB vaccination (► HIB vaccination, active). As for pneumonia, in general, the germs are the same in children as in adults, but some pathogens predominantly occur in particular age-groups. *Chlamydia*, for example, causes pneumonia in newborns, only plays a minor role in younger children, and again becomes more frequent in schoolchildren. In comparison with the incidence in adulthood, ► tuberculosis is quite rare in children.

Infectious Diseases of the Gastrointestinal Tract/Enteritis

Usually, infections of the gastrointestinal tract are ► fecal-orally transmitted diseases, with pathogens being swallowed in food, ► contaminated drinking water or after finger-to-mouth direct contact with the source of infection. The responsible germs are the same in children and adults but, due to the special features of children's anatomy and physiology, social associations and social behaviors, infectious enteritis is much more frequent and often takes a more serious course in childhood than in adulthood. As for babies and small children, enteritis due to rotavirus (► rotavirus infection) or ► Norwalk virus infection have to be mentioned as well as ► infection with *Clostridium botulinum* which is particularly dangerous in babies. To prevent rotavirus infection, an active rotavirus vaccination (► rotavirus vaccination , active) is available.

Urinary Tract Infections

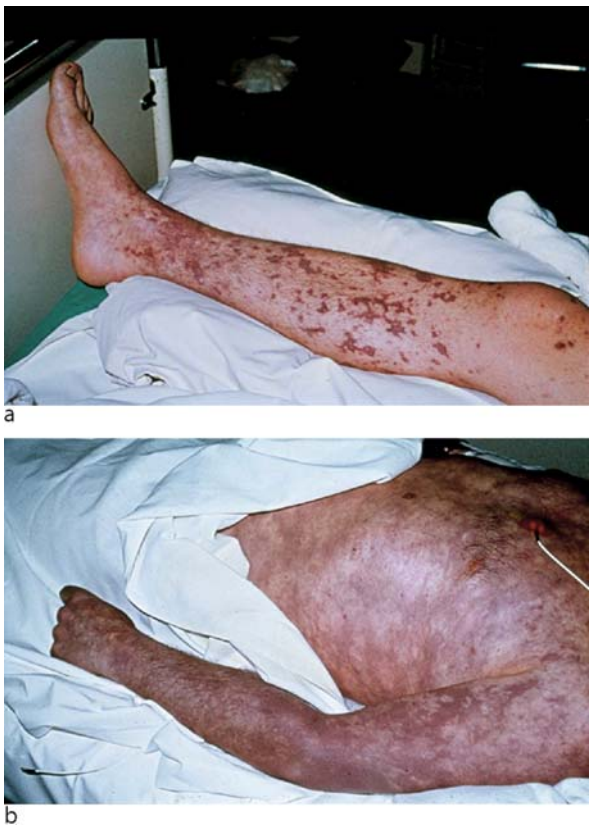
Urinary tract infections are a common disease in childhood. In newborns, the infection is most frequently caused by a hematogenic spread (via blood vessels); in later age groups, infections usually ascend from the lower urinary tract. The severity of disease depends on whether infections concern the bladder (cystitis) or affect the kidneys (pyelonephritis). The appearance of urinary tract infections or of relapses is facilitated by anatomical abnormalities and functional disorders. The younger a child is the less specific are the symptoms. During the first months of life, urinary tract infections often present as a septic disease. Up to the eighth year of life, general symptoms of illness predominate, e. g. loss of appetite, stomach ache and an increased body temperature. Older children primarily report local symptoms, like frequent micturition (polyuria), dysuria or burning micturition. During urinary tract infections, a child, who is usually dry, may suffer nocturnal enuresis (bed-wetting). More than 80% of urinary tract infections are caused by *Escherichia coli*. *Proteus mirabilis*, *Klebsiella pneumoniae* and enterococci each are responsible for 3–5% of the infections. Diagnosis is made by the detection of an elevated amount of pathogens in the urine (>10^5 germs/µl in ► midstream urine). In younger children, urine usually has to be collected in plastic bags with an adhesive paper on one end; thus contamination is an easy possibility. Therapy depends on the severity of the infection and the sensitivity of the pathogens. In general, trimethoprim, aminopenicillins and cephalosporines are used. To avoid urinary tract infections, intestinal pathogens should be prevented from reaching the opening of the urethra. Particularly in girls, one has to pay attention to the correct cleansing of the anogenital region: it has to be wiped from the front to back and rubbing should be avoided. It is important to teach children this technique during their toilet training. In cases of known anatomical abnormalities, functional disorders or other risks of recurrent urinary tract infections, an antibiotic relapse prophylaxis may be necessary; usually, trimethoprim, cephalosporines or nitrofurantoin are prescribed.

Encephalitis/Meningitis

An inflammation of the brain tissue (► encephalitis) can be caused by a number of pathogens. While most infections can appear in all age groups, encephalitis due to ► congenital herpes simplex infection and congenital ► toxoplasmosis are more prevelant in newborns. Up to 65–80% of the bacterial inflammations of the membranes that envelop the brain (► meningitis) occur in childhood, especially during the first two years of life. In newborns, meningitis is treated with a combination of a 3rd generation cephalosporine (cefotaxime) and a broad-spectrum penicillin; for later age groups, ceftriaxone monotherapy is prescribed.

Septic Courses of Diseases

A ► sepsis is a systemic inflammatory reaction, which can lead to shock and organ failure with a possible lethal outcome. It is not very common in childhood; but one has to be prepared for sepsis in pediatric oncology and intensive care medicine. A feared septic disease in pediatrics is ► Waterhouse–Friderichsen syndrome (Fig. 3).



Infectious Diseases in Pediatrics, Figure 3 Waterhouse–Friderichsen syndrome in meningococcal sepsis. **a** Skin bleedings. **b** Intravital livor mortes. Photographs kindly provided by Prof. Wilhelm Kirch, Dresden

Cross-References

- ► Antibodies
- ► Body Fluid Household
- ► Bronchiolitis
- ► Chicken Pox
- ► Chlamydia trachomatis Infection
- ► Congenital Cytomegaly (CMV)
- ► Congenital Erythema infectiosum
- ► Congenital Gonorrhea
- ► Congenital Herpes simplex Infection
- ► Congenital Listeriosis
- ► Congenital Rubella Syndrome (CRS)
- ► Congenital Syphilis
- ► Congenital Varicella
- ► Cytomegaly (CMV)
- ► Diphtheria
- ► Encephalitis
- ► Epiglottitis
- ► Erythema Infectiosum
- ► Erythema subitum
- ► Febrile Seizures
- ► Fever
- ► Food-Safety and Fecal-Orally Transmitted Infectious Diseases
- ► HIB-Vaccination, Active
- ► HIV-Infection and AIDS
- ► Immunization, Active
- ► Immunization, Passive
- ► Infection with *Clostridium botulinum*
- ► Infectious Mononucleosis
- ► Lice
- ► Measles
- ► Meningitis
- ► Midstream Urine
- ► Mumps
- ► Nest Protection
- ► Norwalk Virus Infection
- ► Poliomyelitis
- ► Respiratory-Syncytial-Virus (RSV) Infection
- ► Rotavirus Vaccination, Active
- ► Rubella
- ► Scabies
- ► Scarlet Fever
- ► Sepsis
- ► Sexually Transmitted Diseases
- ► Spasmodic Croup
- ► Tetanus
- ► TORCH Serology
- ► Toxoplasmosis
- ► Tuberculosis
- ► Ureaplasma urealyticum Infection
- ► Vaccination, Active
- ► Waterhouse–Friederichsen Syndrome
- ► Water Quality and Waterborne Infectious Diseases
- ► Whooping Cough

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Infectious Diseases Due to Polluted Water

► Infectious Diseases due to Contaminated Water
► Waterborne Infectious Diseases
► Water Quality and Pollution
► Water Quality and Waterborne Infectious Diseases

Infectious Diseases Requiring Isolation

► Quarantine Diseases

Infectious Diseases Due to Sponges

► Zoonotic and Parasitic Infections

Infectious Diseases Transmitted by Animals

► Zoonotic and Parasitic Infections

Infectious Diseases Typical for Tropical Regions

► Tropical Diseases
► Tropical Diseases and Travel Medicine

Infectious Hospitalism

► Nosocomial Infections

Infectious Mononucleosis

Synonyme

Mononucleosis Infectiosa; Glandular fever; Pfeiffer's disease; Monocyte angina; Infection with Epstein–Barr virus (EBV); Kissing disease

Definition

The Epstein–Barr virus belongs to the herpes group and is spread by droplets or direct contact. Following an incubation period of 8–21 days, Pfeiffer's disease starts with fever, fatigue and an angina involving the tonsils (ulcerated tonsils with white blobs); enlarged and tender lymph nodes are especially found in the cervical and occipital region and behind the ears. Furthermore, there is an enlargement of the spleen (splenomegaly) and the liver (hepatomegaly) and a mild jaundice (icterus). The infections shows a characteristic white cell count with the hallmark being so-called atypical lymphocytes; in most cases an elevation of the liver enzymes is also seen. Therapy is only symptomatic, the administration of ampcillin can cause an intense exanthem. Possible complications are myocarditis, nephritis and central nervous system involvement (meningitis, radiculitis). Due to the splenomegaly, in rare cases a rupture of the organ can appear even without trauma or following a trifling accident.

Infecundity

Synonyms

Sterility

Definition

Infecundity refers to the inability of a woman to conceive a viable ► pregnancy or of a man to impregnate a woman.

Cross-References

► Infertility

Inferential Statistical Tests

Definition

Employs data in order to draw inferences (i. e., derive conclusions) or make predictions. Typically, in inferential statistics, sample data are employed to draw inferences about one or more populations from which the samples have been derived.

Cross-References

► Statistical Tests

Inferential Statistics

Definition

Inferential statistics are statistical methods that make it possible to draw tentative conclusions (inferences) about a population based on observations of a sample selected from that population and, furthermore, to make a probability statement about those conclusions to aid in their evaluation. Inferential statistical methods allow us to compare small random samples and then to make statements about the much larger populations they represent with known probabilities of truth. Inferential methods typically take the form of confidence intervals and statistical tests.

Infertility

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Synonyms

Infecundity; Sterility; Childlessness

Definition

Infertility is the inability to produce a ► live birth, usually after one or two years of regular, unprotected sexual intercourse. Clinically infertility is defined as one year of unwanted non-conception with unprotected intercourse in the fertile phase of the menstrual cycles (Evers 2002). There are two types of infertility: primary infertility, which is the inability to produce any live birth, and secondary infertility, which is the inability to produce a live birth after the birth of at least one child. These terms are related to fecundity, or the physiological ability to become pregnant (or impregnate a woman). ► infecundity, or primary sterility, refers to the inability to become pregnant at all, while secondary sterility refers to the inability to become pregnant after at least one conception. Frequently, infertility is used in reference to any point in the fertility process, capturing the inability to conceive, impregnate, carry a pregnancy to term, or produce a live birth.

Basic Characteristics

Levels and Trends

More than 80 million people around the world, or between 8–12% of couples, are affected by infertility at some point during their reproductive lives (Daar 2002). The majority of these people live in developing countries. Primary infertility (► infertility, primary) is the most common type of infertility worldwide, although Sub-Saharan Africa is an exception, where approximately 52% of infertile couples have been estimated to experience secondary infertility (► infertility, secondary) (Cates et al. 1985). Levels of infertility vary widely across regions and between countries. Historically, the "► infertility belt" of Central Africa has exhibited the highest rates of infertility. In past decades, infertility in these countries, which includes the Central African Republic, Cameroon, Chad, Niger and Nigeria,

is estimated to have affected as many as one-third of all couples trying to conceive.

Throughout the 1990s there has been a global reduction in the rates of primary infertility in women aged 45–49, fueled in large part by reductions of infertility in Africa. Improved nutrition in childhood is speculated to be a primary reason for declines in national infertility levels. The percent of women aged 45–49 childless in the Central African Republic dropped from 17% in 1975 to 8.4% in 1994 and in Mozambique from 12.3% in 1980 to 8.4% in 1997 (UN 2004).

A baseline of 5% of all couples is estimated to be sterile, irrespective of nationality. Table 1 shows primary infertility prevalence among women in the Sub-Saharan African region at the end of their childbearing years to be highest at 10.1%, while the lowest prevalence is among North African/Western Asian and Latin American women. Secondary infertility is relatively prevalent among women in North America, the Caribbean and Europe, ranging between 7 to 19%, with Asian women not far behind (6 to 14%).

Infertility, Table 1 Estimates of Infertility Prevalence by Region among Women 40–44 or 45–49

Region	Primary infertility %	Estimated range (%) of secondary infertility
Northern America	6.0	7–17
Caribbean	6.5	7–19
Europe	5.4	7–15
Latin America	3.1	4–9
Northern Africa and Western Asia	3.0	4–9
Sub-Saharan Africa	10.1	12–29
Asia and Oceania	4.8	6–14

Source: UN 2003

Measurement

Clinical studies are the principal means by which to obtain data on cases of medically verified infertility and cause of infertility. Couples seeking pregnancy undergo physical examinations of cervical or uterine well-being and are followed up to assess semen quality, hormonal patterns during menstrual cycles and environmental exposures. Conversely, self-reports of infertility obtained from population-based studies, though medically unverifiable, can be used to measure the social burden of infertility as perceived by women and men themselves. Behavioral measures of infertility are drawn from data collected in censuses, large scale population-based surveys, vital statistics, epidemiological surveys, facility based studies, and clinical studies. Infertility is then approximated from the recorded absence of a ► live birth by age 40–44 among ever married women or from an open birth interval of five or more years among married women who are not using contraception and who do not report themselves as infecund.

Causes

Infertility can result from a number of preventable and non-preventable conditions related to the female (► "female factor infertility"), the male ("► male factor infertility") or the couple. While women are typically held responsible for fertility problems, male-factor conditions are present for at least half of all infertile couples. Non-preventable conditions leading to infertility include various anatomical, genetic, hormonal, and immunological problems that prevent a successful pregnancy. The prevalence of these non-preventable conditions do not vary much across or within populations, and are responsible for the core 5% of infertile couples. More often, infertility stems from preventable conditions and it is because these preventable conditions are more or less prevalent in any given population that variation in infertility rates can be significant. Preventable causes of infertility result from various infectious, environmental, or occupational factors. ► Pelvic inflammatory disease and ► tubal occlusions are two frequent and direct causes of infertility arising from ► reproductive tract infections.

Sexually transmitted infections (STIs) related to infertility include chlamydia, gonorrhea, trichomoniasis, and syphilis, which because of their asymptomatic nature are often not detected until permanent damage has occurred (Boerma, Mgalla 2001). The historically high prevalence of STIs in Central Africa is considered to be the main reason why infertility was so high in the region, and with the improvement of diagnosis and treatment, a main reason why infertility rates seem to be declining. HIV infection has also been linked to higher

► infecundity and intrauterine mortality. Other infectious and parasitic diseases associated with increased risk of infertility include tuberculosis, schistosomiasis, malaria, and sickle cell disease.

Certain health care procedures and practices also result in infections capable of leading to permanent damage of the reproductive tract. These include harmful sexual initiation rites and unhygienic obstetric practices in some parts of the developing world. Poor hygiene can lead to postpartum infection and sepsis, infection following the insertion of an intrauterine device (IUD), or septic abortion and subsequent complications. Largely because of the quality of health care, women in industrialized countries have a lower probability than their counterparts in developing countries of experiencing nosocomial infections that lead to infertility.

Some causes of infertility are related to exposure to potentially toxic substances found in the environment, such as arsenic, aflatoxins, or pesticides. Lower sperm count and quality have been linked to pesticide exposure. The ingestion of potentially toxic substances, such as caffeine, tobacco, or alcohol, can also result in abnormal sperm production leading to infertility.

Consequences

Infertility is a serious reproductive health problem that can have far reaching effects on women, men and communities (Van Balen, Inhorn 2002). In many cultures, infertility is highly stigmatized and can result in discrimination, exclusion, ridicule, and even abuse. In a number of societies infertility is an acceptable reason for divorce. Even in cultures where childlessness is socially acceptable, infertile couples may still struggle with feelings of inadequacy, shame, depression, and grief. Women usually bear the brunt of the blame and carry the heaviest burden of the problem.

The heavy psychological costs of infertility result in high social costs as well. Where infertility rates are high or the social consequences of infertility are severe, there is a general reluctance among women to practice contraception for fear of jeopardizing future fertility. Couples seeking help for infertility can burden limited health care resources. In cultures where traditional healers are commonly consulted, treatments can be painful, ineffective, and potentially harmful. In both developed and developing countries there has been a marked increase in the demand for infertility services, including ► advanced reproductive technologies (ART). In the United States, for example, 58,574 ART cycles were initiated in 1996 and 122,872 were initiated in 2003, an increase of almost 110% in seven years (CDC 2006). These procedures are expensive and produce a higher number of multiple births, thus increasing both the risk of serious health consequences for mothers and infants and the need for costly interventions.

Conclusion

Infertility should be an important public health concern, though it has often been treated as a "personal problem". Historically, more attention has been paid to addressing high fertility levels in developing countries rather than in assisting couples to meet their fertility goals. Infertility treatment can be costly and is not always effective. Conversely, efforts made at the prevention of infertility are less expensive and more often effective. Such prevention efforts include finding ways to assure adequate nutrition for females and to reduce ► reproductive tract infections (by increasing access to and improving STI services, implementing safer birth practices, promoting family planning, providing access to safe abortion services, etc); reducing the prevalence of endemic diseases such as malaria and tuberculosis, and providing education about the consumption of potentially harmful substances. Infertile couples who repeatedly seek help for insoluble problems place a burden on health care resources. Treating infertile couples should therefore also include sensitive counseling to avoid inappropriate treatment and discourage unnecessary help-seeking at multiple clinics; to help couples cope with the social and psychological consequences of infertility; and to help couples to consider non-medical options such as adoption.

Cross-References

► Advanced Reproductive Technologies
► Female-Factor Infertility
► Infecundity
► "Infertility Belt"
► Infertility, Primary
► Infertility, Secondary
► Live Birth
► Male-Factor Infertility
► Pelvic Inflammatory Disease (PID)
► Reproductive Health

► Reproductive Tract Infection (RTI)
► Tubal Occlusion

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"Infertility Belt"

Definition

The "infertility belt" is a region in Central Africa stretching from countries in West Africa to the Sudan, in which ► infertility has been estimated to affect as many as one-third of all couples.

Infertility, Primary

Synonyms

Childlessness

Definition

Primary ► infertility refers to the inability to produce a ► live birth among individuals who have never produced a live birth.

Infertility, Secondary

Definition

Secondary ► infertility refers to the inability to produce a ► live birth among individuals that have had at least one previous live birth.

Inflammation of Brain Tissue

► Encephalitis

Inflammation of Bronchioli

► Bronchiolitis

Inflammation of Conjuctiva

► Conjunctivitis

Inflammation of the Epiglottis

► Epiglottitis

Inflammation of the Liver

► Hepatitis

Inflammation of the Meninges

► Meningitis

Inflammation of Small Bronchi

► Bronchiolitis

Influenza

Synonyms

Flu; Infection with Influenza Virus

I

Definition

Influenza or flu, is an acute, highly infectious disease caused by a virus. There are three types of the virus, designated A, B, and C, but only types A and B cause more serious contagious infections. Influenza is difficult to diagnose in the absence of an epidemic, since it resembles many common respiratory ailments. It is characterized by sudden fever, prostration, weakness, and sometimes severe muscular aches and pains. Complications include bronchitis and pneumonia, that may be dangerous for infants and elderly.

Cross-References

► Influenza and Avian Influenza

Influenza and Avian Influenza

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Synonyms

Flu; Grippe; Fowl pest; Fowl plague

Definition

Influenza is a worldwide infection of the upper respiratory tract, which is caused by strains of the influenza virus (A, B or C). Due to the high variability of the viruses and the resulting possibility of reoccurring epidemics and pandemics, surveillance programs and the yearly new development of an effective vaccine play important roles in the fight against influenza. Avian influenza is a disease in birds which is caused by different strains of influenza viruses; some of the subtypes can also be transmitted to humans.

Basic Characteristics

History of Influenza

In the writings of Hippocrates there is a description of an ► epidemic in North Greece with symptoms similar to influenza. The term influenza stems from the Latin word influere, which means 'flowing into' or 'creeping into.' Influenza ► pandemics have been reported since the 16th century, with the occurrence of at least 3 pandemics each century. The last century pandemics were Spanish flu in 1918, Asian flu in 1957, Hong Kong flu in 1968 and another pandemic that occurred in France and England in 1989. The worst of these pandemics was the Spanish flu, in which 500 million people were infected and about 40 million died. In 1931, the ► influenza A virus was detected in pigs by Richard Shope, in 1933, the research team of Wilson Smith, Christopher Andrewes and Patrick Laidlew detected it in humans. In 1940 the ► influenza B virus was isolated and the ► influenza C virus in 1949. Since 1945, an active influenza vaccination (► influenza vaccination, active) has been available. Because of the ability of the influenza virus to change its structure (variability), an influenza surveillance program was established by the WHO in 1946 (► WHO influenza surveillance program).

Characteristics of the Influenza Virus

Different surface glucoproteins are responsible for the antigenic qualities of influenza viruses. The most important glucoproteins and surface antigens are ► hemagglutinin (H) and ► neuraminidase (NA). Due to changes (mutations) of the glycoproteins, antibodies face difficulties in detecting the viral variants. Even if an influenza virus changes only slightly a new infection is possible. The switch of surface antigens is called antigen drift. In a simultaneous infection with two different influenza subtypes, an exchange of genetic material (genome segments) can take place. This procedure, which only seldomly occurs, is called antigen shift. Antigen shift leads to a much more pronounced change in surface antigens than antigen drift; it can result in a pandemic.

Classification of Influenza Viruses

When classifying influenza viruses, the subtype, location of first isolation, number and year of isolation are recorded. For influenza A viruses, the surface antigens hemagglutinin (HA) and neuraminidase (NA) are additionally recorded; the classification number of the subtype is noted (A/Hx Nx). Thus, the Spanish flu was classified as A (H1 N1), the Asian flu as A (H2 N2) and the Hong Kong flu as A (H3 N2).

Ways of Transmission and Course of Influenza

People often speak of 'flu' or 'the grip' when referring to harmless flu-like infections. Actually, flu is an infection with the influenza virus. Influenza is an infection of surfaces as the virus settles on the mucous membranes of the upper respiratory tract. Influenza viruses exist worldwide; they are transmitted by droplets and as direct contact or smear infections. Due to their resistance against frost, viruses can also be transmitted by contaminated water during the cold seasons. The incubation period lasts between a few hours and a couple of days; during this time infected persons are already contagious. The spread of influenza viruses, and the reason for the occurrence of pandemics, is due to the travel behavior of people or bird migration. A characteristic of influenza is its sudden onset. Usually, there is a general feeling of illness, with fever, shivering fits, headache, rheumatic pains, cough and cold symptoms. In mild cases patients recover within 1–2 weeks. Possible complications of influenza are pneumonia, inflammation of the brain (encephalitis) or the cardiac muscle (myocarditis). In severe cases acute respiratory insufficiency with an irreversible edema of the lungs can develop, which has a lethal outcome within a few hours.

Therapy and Prophylaxis of Influenza

Besides ► symptomatic therapy, influenza can be treated successfully by the administration of ► neuraminidase inhibitors. As their use requires careful assessment, amantadine (Symmetrel®, Pk-Merz®) and rimantadine (Flumandine®) meanwhile play only a minor role in influenza therapy. In cases of bacterial superinfection, antibiotics are administered. The most important prophylactic measure is active influenza vaccination (► influenza vaccination, active), which is carried out in October and November – just before the onset of the influenza season. Due to the variability of the virus, vaccination has to be repeated every year.

Occurrence and Transmission of Avian Influenza

Avian flu or fowl pest is a disease of birds, which has been known for more than 100 years. Primarily, it concerns poultry stocks. Pigeons, swallows, sparrows and songbirds are less susceptible for the infection. Fowl plague is caused by subtypes of the influenza A virus, the presence of hemagglutinin types 5 and 7 is responsible for severe courses. The subtype H9 N2, which is also found in birds, only causes mild symptoms in humans. The avian flu virus is transmitted in the feces of infected animals, primarily chicken. Humans can be infected by breathing in contaminated dust particles, having close contact with sick animals or failing to have hygienic habits (especially concerning hand washing). A high risk of transmission has to be assumed for people who live in close contact with poultry, maybe even in the same room, as well as for people who have professional contact with Galliformes (like chickenfarmers or veterinarians). Starting in Asia, infections of humans with the influenza A subtype H5 N1 appeared at the end of 2003. By the end of April 2006, worldwide, nearly 200 cases were registered by WHO; in Southeast Asia 50% took a lethal course. The symptoms and treatment of avian flu are similar to those of influenza (see above).

Prophylaxis of Avian Influenza

To prevent an infection with avian influenza, contact with ill or dead birds, especially wild birds, should be avoided. These rules of behavior should also be taught to children. The finding of dead wild birds should be reported to responsible authorities: police, fire department or the department of veterinary medicine. During the disposal of dead animals, the wearing of a protective equipment is recommended (gloves, mouth-nose mask and protective clothing). If suspicion of avian influenza in a dead animal is confirmed by laboratory tests, restricted areas (3 km) and areas of surveillance (10 km) have to be established around the location where the animal was found in order to prevent a further spread of the disease. As human infection due to transmission by dogs and cats cannot be excluded, pets should not be allowed to run free in these security areas. Moreover, feathers should not be collected. Special regulation of poultry stocking should be imposed (like a temporary prohibition of free-range farming). When journeying to regions at high risk of avian flu, people should avoid visiting animal markets and poultry farms. As influenza viruses are killed by temperatures of > 70°C, poultry products should be sufficiently heated before consumption. It has to be pointed out that fowl pest primarily is a disease in birds and that as long as the necessary security measures are followed, the risk of transmission to humans is small; thus hysteria is unfounded. Influenza vaccination does not protect against fowl

plague, but it helps to prevent a simultaneous infection by both viruses which could otherwise lead to new and possibly extremely dangerous influenza subtypes.
In conclusion, influenza and avian flu are infections of the upper respiratory tract with high fever, which are primarily (influenza) or exclusively (avian flu) caused by influenza A viruses. To avoid lethality, treatment with neuraminidase inhibitors should be introduced quickly. Surveillance programs and thought-through outbreak controls play important roles in the management of influenza and fowl plague.

Cross-References

- ► Epidemic
- ► Hemagglutinin
- ► Influenza B Virus
- ► Influenza C Virus
- ► Influenza Vaccination, Active
- ► Influenza A Virus
- ► Neuraminidase Inhibitors
- ► Neuraminidase (NA)
- ► Pandemic
- ► Symptomatic Therapy
- ► WHO Influenza Surveillance Program

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Influenza A Virus

Definition

Influenza A viruses are characterized by a high frequency of genetic changes (mutations) and the formation of new groups. They are able to cause pandemics. The various subtypes of the virus prefer specific hosts. Humans and other mammals (e. g. pigs and horses) act as hosts. The main reservoirs of influenza A viruses are waterfowl.

Influenza B Virus

Definition

The influenza B virus was first isolated by Thomas Francis in 1940. It is only found in humans. Influenza B viruses are divided into two strains, the B/Victoria strain and the B/Yagamata strain.

Influenza C Virus

Definition

Influenza C virus was first isolated by RM Taylor in 1949. It is found in humans and pigs, and, in general, the course of the infection is mild. Influenza C viruses are not widespread. In contrast to the types A and B, influenza C viruses do not build neuraminidase. As there are only minor differences between the strains, subtypes were not defined.

Influenza Vaccination

Synonyms

Influenza immunization

Definition

The influenza vaccination has been available in the United States since 1945. It is recommended for persons suffering from chronic illnesses, in case of immune deficiency, if one's profession involves a risk of infection and for more elderly patients (60 years or more). Since influenza viruses are constantly changing, a new combined ► vaccine, which confronts the virus types currently in circulation, has to be developed every year. Therefore, vaccination must also take place annually. The rate of protection achieved is 70–90%. Contraindications for the influenza vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccine, as well as a relevant allergy to chicken protein.

Influenza Vaccination, Active

Synonyms

Active influenza immunization; Active flu vaccination; Active flu immunization

Cross-References

► Immunization, active

Informal Care

Definition

Informal care includes services that are not conducted by health professionals but are provided by family members and friends who are not paid for their support. In most cases, these informal care services are provided to disabled or ill people. Informal care services are an essential complement to the formal care given to people with ► chronic diseases and disabilities. Informal care givers support different aspects of personal care, e. g. administering medication and other treatments, providing nutrition and exercise regimens, assisting with personal hygienic activities, providing transportation to medical facilities and emotional support through complex illnesses. Another branch of informal care is the development of self-care which is relevant for people with acute and chronic diseases as they usually have to take part in their own care. Self-care also includes health promotion and disease prevention.

Cross-References

► Community Care

Informal Channels

Definition

Informal channels of communication are contact between the primary researcher and the literature researcher. There are no restrictions on the kinds of information that can be exchanged through informal channels. These channels do not have a third party that mediates the exchange of information. There are five principal forms of informal communication: personal contacts, solicitation letters, traditional invisible colleges, electronic invisible colleges, and the World Wide Web.

Information Architecture

Definition

Information architecture refers to a systematic, planned approach to building information systems. Information architecture includes databases, application standards, procedures, information use, confidentiality policies, information technology, hardware, software, and networks.

Information Asymmetry

Synonyms

Asymmetry of information; Asymmetric information

Definition

Information asymmetry is a situation in which the parties on opposite sites of a transaction have different information that is pertinent to the transaction. In health economics, the term usually applies to transactions between patients and health care professionals (physicians or nurses) or to transactions between health insurers and enrollees. Information asymmetries in health care are rather pervasive and have far-reaching consequences for the organization and regulation of health care markets.

Information Content

Definition

Information content often describes only the editorial content – the way data (as carriers of information) are represented to the viewer. This refers to the optical or audiovisual form of the data – text, image, video clip, or physical data. Information content is also described as the union of different information. Typically, information content consists of three parts: raw content, definition of structure and presentation form. Modern ► content management systems can separate these three parts, enabling automatic transport of knowledge.

Information Design

Definition

Information design is the science and practice of designing forms, reports, and computer screens, etc., so that the information they contain can be found rapidly and interpreted without error. Information design is based on psychological and graphical design theories, and empirical studies of human perception and decision making, using alternative formats for information.

Information Presentation

Definition

The use of information and creation of knowledge depends highly on its presentation. Information can be presented in several forms: as tables, graphics, images, video, sounds, signals etc.

Information Retrieval (IR)

Definition

Information retrieval is the process of accessing information from the computer's memory. There are several types of information retrieval systems. Systems based on the Boolean model retrieve information by creating an expression consisting of the desired terms and operators with the meanings "AND", "OR", and "NOT". Systems based on the ranking model retrieve information by creating a list of terms (without the need for operators), and the documents in the collection are ranked according to their similarity to the terms. Similarly, Relevance-Feedback is a model that ranks information by validity obtained from many users of the system. The information most frequently chosen is ranked higher in terms of relevance. The Thesauri model uses a thesaurus to capture relevant words and phrases and then lists a short definition of every word as well as its relationship to other words (synonyms, antonyms, special terms, etc.). Semantic nets are an expansion of the Thesauri model, where the relationship between terms is more generally captured – the relationship between words can be defined as "class", "subclass of" or "a part of".

Information System (IS)

Definition

An information system is a technologically implemented medium for recording, storing, and disseminating information, as well as for drawing conclusions from such information.

Information Technology

Definition

Information technology (IT) includes all matters concerned with the furtherance of computer science and technology and with the design, development, installation, and implementation of information systems and applications. IT architecture is an integrated framework for acquiring and evolving IT in order to achieve strategic goals. It has both logical and technical components. Logical components include system configurations, information flows, and mission, functional, and information requirements. Technical components include IT standards and rules that will be used to implement the logical architecture.

Informed Consent

Synonyms

Adequate understanding

Definition

The advance, written consent of an individual (or her legal guardian) to allow the acquisition, use, or disclosure of identifiable health information.

It should be voluntarily given by a competent patient when undergoing some procedures (e. g. invasive procedures) or when enrolling as a subject in medical research.. For the consent to be "informed" it is essential that proper and sufficient information should be given to the patient about the object of the consent, including its risks, for an adequate understanding of what is going to happen to him/her; however, together with what the informant (health worker, researcher, etc.) has said, it is also important to check that the person actually understands about the content of the consent. The

informed consent is based on the principle of ▶ autonomy and it is meant to protect the individual's right over his own body and health.

Informed Consent Form

Definition

An informed consent form is a document that includes details about the study, duration, procedures, risks, and benefits of the trial. Informed consent is a process by which people learn the important facts about the trial, which can help them to decide whether to participate or not. People who agree to take part in the study are asked to sign an informed consent form. Signing the form does not mean that people must stay in the study until its end. They can leave the study at any time.

The informed consent form has to inform subjects, or their legally acceptable representatives, about the project in such a way that it enables them to make, after ample time and an opportunity to inquire about the details of the trial, a decision on whether to participate or not in the trial, based on an appropriate knowledge of the potential risks and benefits of the project.

A written informed consent form, and any other written information to be provided to subjects, should contain certain information:

- the purpose of the trial (e. g. research);
- the trial treatment/s;
- the probability for random assignment to each treatment;
- the trial procedures to be followed, including all invasive procedures;
- the subject's responsibilities;
- those aspects of the trial that are experimental;
- the reasonably foreseeable risks or inconveniences to the subject and, when applicable, to an embryo, fetus, or nursing infant;
- the reasonably expected benefits, or that no benefits could be expected;
- alternative procedure/s or treatment/s that may be available to the subject, and their important potential benefits and risks;
- the compensation and/or treatment available to the subject in the event of trial-related injury;
- the anticipated prorated payment, if any, to the subject for participating in the trial, and the anticipated expenses, if any, to the subject for participating in the trial;
- that the participation in the trial is voluntary and that the subject may refuse to participate or withdraw from the trial, at any time, without penalty or loss of benefits to which the subject is otherwise entitled;
- that monitors, auditors, the EC, and the regulatory authority/ies will be granted direct access to the subject's original medical records for verification of clinical trial procedures and/or data, without violating the confidentiality of the subject, to the extent permitted by the applicable laws and regulations and that, by signing a written informed consent form, the subject or the subject's legally acceptable representative is authorizing such access;
- that records identifying the subject will be kept confidential and, to the extent permitted by the applicable laws and/or regulations, will not be made publicly available;
- if the results of the trial are published, the subject's identity will remain confidential;
- that the subject or the subject's legally acceptable representative will be informed in a timely manner if information becomes available that may be relevant to the subject's willingness to continue participation in the trial;
- the person/s to contact for further information regarding the trial and the rights of trial subjects, and whom to contact in the event of trial-related injury;
- the foreseeable circumstances and/or reasons under which the subject's participation in the trial may be terminated;
- the expected duration of the subject's participation in the trial, and the approximate number of subjects involved in the trial.

The text has to be written in such a way that it does not coerce or unduly influence a subject to participate or to continue to participate in a trial, it should not causes the subject or the subject's legally acceptable representative to waive or to appear to waive any legal rights, or releases or appears to release the investigator, the institution, the sponsor, or their agents from liability for negligence; it should be written as non-technically as practical and should be understandable to the subject or the subject's legally acceptable representative.

Prior to a subject's participation in the trial, the written informed consent form should be signed and personally

dated by the subject or by the subject's legally acceptable representative.

Infrastructure of Public Health

Definition

Public health infrastructure is the system supporting planning, performance, and evaluation of ► functions of public health and ► essential public health services in every community. It consists of three basic components: 1. human resources – professionals and public health agencies, 2. information systems – for efficient communication between public and private health organizations, the media, and the public, and 3. organizational and financial resources – the consortium of local and state ► public health departments and private partners.

Infrastructure and Service Delivery

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Synonyms

Service provision and infrastructure

Definition

Health care service delivery and the associated infrastructure encompass the full spectrum of health care services available in a country, their organization and delivery structures as well as their organizational interaction. Health care service delivery (or health care service provision) comprises the following main service sectors: Ambulatory or outpatient health care and dentistry, inpatient hospital health care, nursing and residential care facilities, provision of drugs and other medical goods, public health programs and general health administration and insurance. Each service sector has its own organization of service providers operating within a regulatory framework specific to that sector. All service sectors together form the infrastructure of the health care system providing access to goods for health for individuals on a local, regional and national level.

The scope and quality of health care service delivery and infrastructure vary from country to country and depend largely on the financial resources spent on health care as well as on the organization and processes of health care services.

Basic Characteristics

Sectors of Health Care Service Delivery

In most member countries of the Organisation for Economic Co-Operation and Development (OECD) a wide range of health care service providers can be observed. In order to compare countries in terms of health care provision and health care financing, OECD published the International Classification for Health Accounts (ICHA) which covers three dimensions: health care by functions of care, providers of health care services and sources of funding. The classification of health care providers gives a general overview of the different sectors of health care provision (OECD 2000):

Ambulatory or ► outpatient health care comprises offices of doctors or physicians, dentists and other health practitioners such as chiropractors, mental health specialists, speech therapists and physiotherapists. Other ambulatory services are delivered by medical and diagnostic laboratories, providers of home health care services, ambulance services (first aid), blood and organ banks and outpatient care centers for family planning, mental health, ► substance abuse, ► ambulatory surgery and dialysis.

Inpatient hospital health care is delivered either by general hospitals or by specialized hospitals such as mental health and substance abuse hospitals or other specialty hospitals. General hospitals are licensed establishments to provide surgical and non-surgical diagnostic and medical treatment for inpatients using specialized facilities and equipment. In some countries a minimum number of beds is a required condition for registration as a hospital. Hospitals can be run by the government on a national, regional or community level (e. g. general acute hospitals, army and police hospitals, prison hospitals), by private non-profit organizations (e. g. the Red Cross) and by universities (teaching

hospitals). Mental health and substance abuse hospitals provide whole spectrum of inpatient services needed for mentally ill people or people with substance abuse disorders with typically longer lengths of stay (i. e. psychological, psychiatric and other social services). Specialty hospitals comprise licensed establishments for patients with a specific type of disease or medical condition. For example, specialized emergency centers, hospitals for tropical diseases, orthopedic hospitals, sanatoriums for rehabilitation or prevention (► hospitals).

Nursing and residential care facilities comprise establishments providing a mix of health and social services for an extended period of time. Depending on a country's specific organization of the long-term care process, there are different types of nursing and residential care facilities. Nursing care facilities typically mean convalescent homes or nursing homes for the elderly. Residential mental retardation facilities address alcohol and drug addiction as well as mental convalescence. Community care facilities for the elderly consist of assisted living facilities or continuing care retirement facilities without nursing care. Moreover, there are group homes for the hearing or visually impaired as well as for disabled people without the need of nursing care.

Providers of drugs and other medical goods have organizations responsible for research and development, manufacture and sale. Pharmaceutical companies are in charge of the research and development as well as of the manufacturing of drugs. Pharmaceutical distribution companies assure the safe distribution of drugs to hospitals or pharmacies. Drugs are dispensed to the general public either by pharmacies or hospitals. Other medical goods are produced by specialized companies and sold by specialized suppliers who also often provide fitting and repairing services. Examples are suppliers of optical glasses and other vision products, suppliers of hearing aids and suppliers of other medical appliances.

Public health programs are provided publicly by a ministry of health or other governmental agency and privately by non-profit organizations in order to promote, protect and improve public health. Programs encompass disease prevention measures, health education, immunization programs, control of communicable diseases, sanitary measures, and protection against environmental hazards (► public health services).

General health administration and insurance companies are institutions and organizations engaged in the regulation of health care activities, the administration of health policy and health insurance. The government administration of health (e. g. Ministry of Health) formulates and administers the government policy in health, sets standards for the regulation and licensing of health care providers as well as for medical personnel in hospitals. Other agencies setting public health standards are the Food and Drug Regulation Agencies and agencies regulating safety in the workplace. The social health insurance funds administer publicly-provided compulsory social security programs for employees in the private sector, in the public sector (army, public transport, police) and for employers. These programs compensate the individual for the loss of income and the additional charges due to sickness. Private health insurance funds are fulfilling the same goals as the social insurance funds if they are substitutes for social insurance or they operate as a complementary insurance to the existing social insurance system (► health insurance).

Determinants of the Health Care Infrastructure

The infrastructure for the delivery of health care services depends on the resources which are spent on it, the political commitment and leadership to set standards for the health care delivery system. According to ► medical ethics, the health care infrastructure aims to assure equitable access to health care services for all individuals living in a country, sufficient health care for people in need, the prevention of damage as well as the respect for the rights and autonomy of individuals while services are being provided (Schwartz et al. 2003).

Although health care service delivery plays an important role in industrialized high income nations and infrastructure is generally well developed, most developing countries lack the resources and the political commitment to build the necessary infrastructure for health care services. Compared to the ideals of health care coverage and quality formulated in the industrialized world, health services in developing countries are still in their infancy.

Process of Change in Health Care Provision

Despite existing financial resources, industrialized countries are increasingly confronted with the financial

constraints of the ideal health care infrastructure. In the context of rapid scientific and technological progress, the coverage of the whole population with adequate health care services has become more and more expensive. As a consequence, the notion of cost-efficiency has entered the medical health care environment confronting health care providers with economic controlling mechanism and ► rationing. As a result, many countries have observed an orientation towards economic success (1) and a specialization of their health care service sectors (2).

1) The optimal provision of health care services in terms of quantity and quality have to be connected with economic success. Hospitals, for example, need the cooperation of their medical and management staff in order to produce effective and cost-efficient health care services. The application of ► diagnosis related groups (DRGs) as well as ► disease management programs (DMPs) are examples for the process of change in health care provision.
2) The independent provision of efficient health care services often lacks integration which is a unique success factor for service sectors like prevention, long-term care and rehabilitation.

In the future, industrialized nations will have to deal with changing environment patterns for their health care systems. The main future challenges for the service delivery and infrastructure can be summarized as follows:

- Epidemiological and demographic changes enhance the need for chronic care, home care and care for the elderly, thus challenging the actual health care delivery structure
- Economic pressure will influence the structure of service providers towards rationalized integrated care units
- Technological change will increase the economic pressure with new expensive therapeutic procedures and pharmacies, but also the influence on health care provision methods, for example with ► telemedicine.

Cross-References

► Ambulatory Surgery
► Diagnosis Related Groups (DRGs)
► Disease Management Programs
► Health Insurance
► Hospitals
► Medical Ethics
► Outpatient Health Care
► Public Health Services
► Rationing
► Substance Abuse
► Telemedicine

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Ingestion

► Nutrition

Inguinal Bubo

► Ulcus Molle

Inherited

► Native

Inherited Knowledge

► Traditional Knowledge

INHPF

Definition

The International Network of Health Promotion Foundations (INHPF) was founded in 1999. This network is established to advance the work of health promotion foundations around the world. To accomplish this, INHPF engages in two core activities: The first core activity is enhancing the performance of existing Health Promotion Foundations (HPFs) through exchange, mutual learning and joint action. The second core activity is to mentor and support the establishment of new HPFs. Members of the International Network of Health Promotion Foundations are the following:

- Austrian Health Promotion Foundation
- British Columbia Coalition for Health Promotion
- Health Promotion Switzerland
- Health 21 Hungarian Foundation
- Korean Health Promotion Foundation
- Malaysian Health Promotion Foundation Initiative
- Polish Health Promotion Foundation
- Thai Health Promotion Foundation (ThaiHealth)
- South African Health Promotion Foundation Initiative
- Victorian Health Promotion Foundation (VicHealth)
- Western Australian Health Promotion Foundation (Healthway)

Initiation of the Menstrual Function

► Menarche

Inlay, Onlay

Definition

A fixed intracoronal dental restoration made outside of a tooth to correspond to the form of the prepared cavity, which is then luted into the tooth. In- or onlays are mostly made from gold alloy or ceramic.

Inoculation, Passive

► Immunization, Passive

Inpatient Care

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Synonyms

Hospital care

Definition

Inpatient care is the treatment and/or care that is provided to a patient in a ► hospital, clinic, or other institution and which requires at least one overnight stay. The term inpatient dates back to at least 1760. Inpatients have to go through the full admission procedure and occupy a bed in an inpatient department of the institution. There is a tendency towards decreasing the number of hospital inpatients and strengthening ► outpatient care.

Basic Characteristics

Key Data

Inpatient care expenditures account for around 31% (excluding long-term care) of the total health care expenditures of the Organisation for Economic Co-operation and Development (OECD) countries, with a range from 21% (USA) to 42% (Iceland). Based on 2005 OECD data, there are on average around 4 ► acute care beds per 1000 population, ranging from 8.2 beds in Japan to 1 bed in Mexico. This can be compared with an average of 4.6 beds per 1000 population in 1990; this is in total contrast to the corresponding costs, which are mainly driven by advancements in ► health technology. The average length of inpatient stay in hospitals has steadily declined over recent years, mainly due to less invasive surgical treatments and ongoing efforts to control costs. The average length of stay for acute hospital care thus decreased from 8.8 days on average in 1990 to 6.6 days in 2004. This was primarily driven by the decline in length of stay in the European countries, especially the Nordic countries, Denmark, Finland, and Sweden. The average hospital spending per inpatient acute care day in the OECD

countries in 2004 was $793 (adjusted for differences in cost of living).

Structural Changes of Inpatient Care Delivery

Driven by changing disease patterns (like for example the increase of ► chronic diseases), there has also been a change in treatment methods. The inpatient structures in hospitals have developed accordingly, towards offering more integrated and interdisciplinary services. This integration goes beyond the boundaries of the hospitals themselves as it also includes integration with the other players in the health care chain like ► primary care and tertiary care, ► prevention, home care, ► long-term care, and rehabilitation. Furthermore, there are ongoing advances in both the health technology area and information technology. These advances have led to a significant reduction in length of stay as stated above and many hospitals had to face a reduction in number of beds and a higher turnover of patients. Consequently, many hospitals realized that they had to put more emphasis on recruiting not only medical but also managerial talent able to drive the required changes in administrative structures and procedures. Hospital management has emerged as an important discipline at the interface of health care and business administration. The hospital managers also have to cope with the fact that there is increasing consumer influence in the hospital sector, making patient satisfaction an important element of competitive differentiation as those satisfied patients might be willing to recommend or return to the hospital.

Competitive Pressure

In many countries, there is increasing competition in the inpatient care sector. The introduction of per-case payments like DRGs has resulted in a significant decrease in length of stays and put increasing cost and competitive pressure on the hospitals. The per-case payments allow for easier comparison of key outcome parameters of different hospitals like, for example, mortality rates or complication rates for specific tracer diagnoses. The outcome measures can be interpreted as an indicator of the quality of care of the hospitals besides other parameters like patient satisfaction rates, frequency of procedures, and waiting times. These quality of care parameters have increasingly become elements of a potential competitive differentiation in countries like the USA where part of this information is made publicly available and allows for comparison of hospitals. Dependent on the respective health care system, this information can furthermore be used by the health care payers as input for selective contracting negotiations with the hospitals.

Conclusion

The inpatient care sector around the world is struggling with the challenge to reduce utilization and length of stay in order to counteract steadily rising health care expenditures. Many countries promote outpatient care settings and shift services that have previously been performed on an inpatient basis to outpatient settings. In many developed countries, it can be expected that the number of inpatient settings will be reduced in the coming years. Hospital mergers and acquisitions with the objective of achieving ► economies of scale and ► economies of scope can be expected to rise, as already the case in several countries like the USA and Germany.

Cross-References

► Acute Care Bed
► Economies of Scale
► Economies of Scope
► Health Technology

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Inpatient Health Care

Definition

Inpatient health care includes all health care services that are delivered in hospitals or other medical institutions in which patients are staying overnight. It is delivered either by general hospitals or by specialized hospitals such as mental health and substance abuse hospitals or other specialty hospitals. Inpatient health care can also be delivered as long-term care in so-called nursing and residential care facilities comprising establishments with a mix of health and social services for an extended period of time. Moreover, there are group homes for the hearing or visually impaired as well as for disabled people without the need of nursing care.

In-Plant Health Service

Definition

In-plant health service refers to occupational health care services provided within an employer's facilities. In-plant health service is organized as a plant dispensary or infirmary. It usually employs a plant physician or occupational medicine specialist, a nurse or nurse practitioner. Responsibilities of in-plant health service may range from simple triage and first aid to fairly comprehensive primary care. Usually, large companies organized multidisciplinary occupational health departments with comprehensive health care units that, in addition to occupational health services, provide primary health services for the employees and, sometimes for employees' family members too.

In recent times "off-site" or community-based health care facilities have displaced in-plant services as the principal form of organization for providing occupational health services.

Insensitivity

► Resistance

Insolation

Synonyms

Solar radiation

Definition

Insolation is the incoming solar radiation that reaches a planet and its atmosphere or, by extension, any object exposed to solar rays, such as a spacecraft or building. It is exposure of an object to the Sun, or the intensity of incoming solar radiation incident on a units horizontal surface at a specific level. In construction, it is an important consideration when designing a building for a certain climate (► climate and microclimate). It is one of the most important climate variables for human comfort and building energy efficiency. Insolation depends on several factors: (1) the solar constant – that is, the amount of energy in a unit of time that reaches a unit plane surface perpendicular to the Sun's rays outside the Earth's atmosphere, when the Earth is at its mean distance from the Sun; (2) the Sun's elevation in the sky; (3) the amount of solar radiation returned to space at the Earth-atmosphere boundary; and (4) the amount of solar radiation absorbed by the atmosphere and the amount of solar radiation reflected at the lower boundary of the Earth. Insolation is commonly expressed in units of watts per square meter.

Inspection of the Workplace

Synonyms

Workplace monitoring

Definition

The most effective method of identifying health hazards (► workplace hazards) is through the systematic inspection of the workplace. Inspecting the workplace is the most obvious way to identify health hazards. An important purpose of an inspection is to observe the actual conditions in the workplace. An inspection should

locate any previously unidentified agents in the workplace and find out what they are. A review of identified hazards and a check for substances not properly identified or not included in the workplace inventory of hazardous substances should be carried out. Questions should be asked of workers and supervisors and hazard indicators, warning properties and health effects should be noted.

Institutional Health Services

Definition

Institutional health services are ► health services delivered either on an inpatient basis, in hospitals, nursing homes, or other inpatient institutions, or on an outpatient basis by departments of such institutions.

Integrated Care Pathways

► Clinical Pathways

Integrated Environment-Related Public Health Reporting

Definition

In the context of the public health action cycle, the environment and public health reporting services play a central role at the federal, state, municipal and communal levels. While public health reporting provides the data and information necessary for setting political public health priorities, environment-related reporting deals with assessing developments of environmental goals. The top priorities of environment-related reporting are therefore the various parts of the environment and the burden they can support. Public health reporting, on the other hand, focuses on health effects. A strict separation of environment-related and public health reporting is hardly possible, however. Accordingly, topics covered by environment-related reporting regularly touch on public health (e. g., contaminated land, air pollution), and topics covered by public health reporting likewise touch on the environment (e. g., diseases of the airways caused by exposure to fine particulate matter).

Since reporting is traditionally resource-related, environmental and public health data are not usually linked. This link is now to be established through interdisciplinary cooperation. Integrated environment-related and public health reporting should meet the growing need of experts and the general public alike for reliable and understandable information about the effects of environmental burdens on human health. However, environment-related public health reporting in Germany is only in its beginnings. As integrated reporting develops, indicator systems are needed to gauge factors like mobility, the living environment, food toxin burden, environmental behavior, etc. and the exposure or basic health risks resulting from them. The approach used by the German Environmental Office shows promise at the national level, and the WHO environmental health indicators at the international level.

Integrated Health Care

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Definition

Integrated Health Care describes a system of health care provision that combines all necessary health care services of inpatient and outpatient health care with a health insurance to provide the complete spectrum of medical care for the insured. Ideally, all parties involved, i. e. health care providers (physicians, hospitals, etc.), beneficiaries (patients) and purchasers (health insurances) are in balance meaning "that the medical resources match with the needs of patients and purchasers" (Coddington et al. 1994). According to the World Health Organization (WHO), the approach of integrated health care stands for an improved access to family- and community oriented ► primary care services, ensures ► continuity of care through an efficient and cost-effective system of secondary and tertiary hospital care (Gröne and Garcia-Barbero 2001).

Basic Characteristics

Background

In all countries with well developed health care systems, the provision of health care has become increasingly complex. Due to rapid technological progress, the delivery of medical services can be realized at different levels of care as demonstrated by the shift from inpatient to outpatient care. The changes in demographic and epidemiological patterns, e. g. people living longer and the increase of chronic diseases, require health ► prevention, treatment, and rehabilitation in multiple settings including long term care. Besides, there is a growing economic pressure claiming ► cost-efficiency and effectiveness of health care services. In this context, the notion of integrated health care has been born, calling for an improved coordination of different service levels, cooperation of all service providers and the involvement of the patients.

Health care delivery systems with a low integration level have experienced a certain number of inefficiencies over the past years, for example:

- Conflicting recommendations on treatment and medication
- Repetition of diagnostic procedures
- Inadequate transfer of patients between different care levels
- Late detection of complications or ► co-morbidities
- Lack of a comprehensive care strategy for chronically ill

As a result, many countries with developed health care systems, have adopted the approach of integrated health care in order to cope with current and future health care services demand focusing on improved access, quality and effectiveness as well as on economic efficiency (► infrastructure and service delivery).

Goals

According to the WHO European Office for Integrated Health Care Services, the goals of the concept of Integrated Health Care are twofold:

1. To bring together management, organization and delivery of services related to diagnosis, treatment, rehabilitation and ► health promotion.
2. To improve health care services in relation to access, quality (► health care quality), patient's satisfaction and cost-efficiency. This means in particular that countries should develop comprehensive primary health care services with family health physicians and nurses working with multi-professional teams. To assure ► continuity of care, the primary health care services are supported by a flexible system of hospital services ensuring patients' participation.

Scope

Many countries with well developed health care systems have adopted a wide range of strategies to achieve better integrated health care systems. According to the health care system in place, strategies vary from decentralization to centralization of health care services, the redefinition of the functions of inpatient health care to primary outpatient care. Some countries concentrate on horizontal integration in order to form multidisciplinary teams in one health care sector, others prefer vertical integration, meaning the integration of different sectors of care linking primary, secondary and tertiary care (► secondary care, ► tertiary care). Not only the type of integration varies from country to country but also their goals. Some integration strategies are mainly implemented to reduce cost, while others clearly focus on patient satisfaction, quality of care, and health outcome besides efficiency.

As the scope of the strategies varies from country to country, the terminology of integrated health care varies too. Depending on the country-specific environment, terms associated with health care integration strategies are "shared care", "seamless care", "disease management", "continuous care", "integrated care pathways" or "integrated delivery networks."

Some of the most discussed activities and measures towards integrated health care are:

- Linking levels of care to improve the coordination between primary health care, hospital care and home care and to enhance equity in access.
- Developing family medicine, the family physician and family nurse in order to broaden the approach of ► primary care by the integration of a multiprofessional health care team in primary care.
- Developing ► telemedicine (or ► e-health applications) as an important tool to improve access to services for patients in more remote areas and to offer distance learning for health care professionals.
- Improving hospital management with introduction of performance evaluation, incentives for health care professionals to promote health outcomes and

quality of care under the existing financial restrictions.
- Enhancing financing of health care through the identification of country-specific financing options to support health outcome, equity and ► cost-efficiency.
- Developing home health care on the community level for diseases best suited for home care in order to offer a valuable alternative to inpatient long term care facilities.

Strengths and Weaknesses

The concept of Integrated Health Care has a number of advantages concerning finances, access and organization issues:
- An integrated network of provider benefits from a cost-effective administration, group purchasing discounts and increased financial security due to a higher market share.
- As provider networks are typically of a larger size, they improve access to other providers and support systems, such as educational support and data and information systems.
- The organization of a large provider network allows strategic planning, a greater attention to health needs of the community and increased patient satisfaction.

But a few potential weaknesses of the concept of Integrated Health Care have to be mentioned:
- The convergence of providers requires that physicians are flexible and open toward changes that contrast with their former independency of practice. As physicians used to following their own professional rules, they may be reluctant to give up a certain degree of independence in order to follow new practice guidelines and comprehensive care approaches.
- The large size of a typical provider network requires connections through a sophisticated information system to assure the transfer of all relevant data. In reality, different providers often use different information systems and integration of these providers creates a risk of duplication or loss of information. The convergence of providers is a real challenge for the management of complex health care data (► health data management).
- Some provider networks may be challenged by the geographical distances between providers and the structural differences in the organization and care delivery process as well as the differences in services and staff.

Examples

World Health Organization (WHO) The areas of work of the WHO encompass various programs to develop knowledge, design suitable strategies towards integrated health care and advise member states how to better link the different levels of care. Ongoing activities are:
- development of performance indicators to evaluate integrated health provision systems
- identification and development of strategies to better link and coordinate health care services
- development and improvement of systems for planning and delivering health services

USA In the United States, several hundred integrated health care delivery systems have developed towards the provision of the whole range of necessary health care services in a user friendly environment without costly intermediaries and with the goal of continuous improvement of health outcomes. Integrated health care systems include a high degree of coordination of care with strong links between physicians and hospitals as well as many other integration aspects such as quality management, utilization controls, geographic reach and cost-efficient organization.
Furthermore, the recent development of Integrated Health Care Clinics has been very popular. These clinics offer comprehensive multidisciplinary health care facilities focusing on disease ► prevention, early detection, healthy lifestyle coaching, and include ► telemedicine.

UK In the UK, integration of health care has a long history in the National Health Service (NHS). Several reforms during the past decades aimed to administer and fund the different health care sectors in a coherent and efficient way. In 2006, the community services White Paper introduced a new approach to interprofessional and inter-agency coordination in which health care services are designed around the needs of the patient, rather than the patient being forced to fit around the services already provided. The aims of this approach of integration are focused on prevention, ► health promotion for all, the expansion of the delivery

of care and the improvement of flexibility and responsiveness. To achieve better integration of health care services in the UK, four priorities have been set:

1. User empowerment to put people more in control of their own health
2. Supporting self care to enable and enhance people's capacities of health independence
3. Better access to community services to ensure rapid and convenient health care provision
4. Integrated operational agreements to assure the provision of high-quality and cost-effective care

Cross-References

- ▶ Co-morbidity
- ▶ Continuity of Care
- ▶ Cost-Efficiency
- ▶ e-Health
- ▶ Health Campaigns
- ▶ Health Care Quality
- ▶ Health Data Management
- ▶ Health Promotion
- ▶ Infrastructure and Service Delivery
- ▶ Primary Care
- ▶ Secondary Care
- ▶ Telemedicine
- ▶ Tertiary Care

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Integrated Health Care Delivery

▶ Managed Care

Integrative Research Review

▶ Systematic Reviews

Intentional Killing

▶ Euthanasia

Intentionally Self-Killing

▶ Suicide

Interaction

Definition

The interdependent operation of two or more causes to produce or prevent an effect is an interaction. Biological interaction means the interdependent operation of two or more causes to produce, prevent, or control disease.

Interaction: Effect Modification

▶ Bias, Confounding and Interaction

Interchange

Definition

Interchange is the process of exchange of information between users (human or automated), either face-to-face or using paper or electronic media. In order to support contact between various users of information, communication requires the use of a shared language and understanding of common ground.

Cross-References

- ▶ Communication

Intercultural Communication

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Definition

Intercultural communication (► cross-cultural communication) refers to the ways in which people from different cultures comprehend each other and share information. ► Communication can take many forms and the potential for misinterpretation is high especially where language, behavior, values, customs, and expectations are sufficiently different to prevent a common basis for understanding. While language is a major form of communication, that can lead to an impasse where there is no common tongue, it is not necessarily the main impediment to understanding. Even when words are jointly understood, the nuances and world views which add value to them, can lead to quite divergent meanings and intentions. Nor are words the sole form of intercultural communication – artistic creations, rituals, social behavior, views on gender, age and disability, and perspectives on health and wellbeing color patterns of communication. Without an understanding of the cultural context within which communication occurs, inferences and implications can be wrongly drawn, simply not noticed, or incompletely appreciated.

Basic Characteristics

Language

The single most reliable pathway to culture is language. The language spoken by a group contains subtleties of meaning and idioms that are not always accessible in formal speech, the written word, or through second language acquisition. Language not only provides a means for the dissemination of information, but codifies world views, draws on metaphor and allusion, allows for wider social conventions to shape patterns of verbal exchange, and evokes emotional and spiritual triggers as much as cognitive prompts. Understanding the gist of words is a start towards communication with people from other cultures but does not necessarily lead to a complete appreciation of the meaning behind the words.

In some cultures it is polite to agree, especially with people who may be seen as important or superior. For example in response to questions from a doctor who is trying to establish the nature of pain by raising possible characteristics, a patient may agree with all suggestions (radiating, localized, dull, sharp, constant, intermittent) because it would be bad mannered to answer 'no'. Similarly in some cultures not answering a question can be a silent form of disagreement whereas in others it can be a proxy for assent.

As nations become more and more diverse and societies contain peoples from many cultures and languages, clearly it will become increasingly difficult to be sure that communication is always clear and well understood. This will present challenges for health workers. Though possibly conversant in two or three other languages they will not necessarily be familiar with the nuances of meaning across society as a whole. It may be more important to know when a communication barrier exists than to assume that limited language competency from either party will result in a good enough understanding.

Values

Underlying most cultures is a set of values that may be taken-for-granted by members of the group; in that sense are not openly discussed nor widely publicized outside the group. They are applied intuitively as a matter of course. Difficulties arise when a person with a different value system is not able to interact at the intuitive level so that the subtleties of interaction are missed or even unintentionally dismissed.

Time and Space To illustrate the point, people often hold different values related to the utilization of space and time. In some cultures, to pave the way for a closer relationship, physical distance is maintained until certain formalities have been completed. Traversing the distance prematurely can cause offence and create disquiet since space allows any risk from an encounter to be assessed before a commitment is made. However, in other cultures maintaining space creates unease and a sense of separation; the tendency will be to bridge the gap as quickly as possible in order to minimize anxiety and create a friendly environment. Formalities may be immediately replaced by first name informality, even a warm hug.

Similarly cultures have different understandings of time. Being 'on time' may be seen as less critical than allowing sufficient time, even if it goes against the dictates of the clock. In this instance priority is given to enabling the completion of essential tasks in an unhurried manner and not proceeding until a prior step has been ratified; the amount of time taken is considered a good investment for future relationships. Values surrounding time can be easily misconstrued in the clinical setting. The limited time available to do each patient justice can result in medical schedules that are time-based rather than patient-based. Many patients, however, will be reluctant to engage in an encounter if it seems they will be unable to complete follow through, and may simply opt for a face-saving superficial encounter that falls short of an adequate history and bypasses the substantial matter.

Diagnostic Confusion

Despite the acceptance of culture as an important ingredient in both assessment and management, a failure to appreciate the impact of culture on clinical realities has often led to misdiagnosis and gross mismanagement among ethnic minority groups. Schizophrenia has been over-diagnosed in African Americans and Hispanics living in the Unites States of America, especially among patients who meet the criteria for an affective disorder with psychotic features. Culture can also impact on the way a disorder is subjectively experienced. In some cultures depression might be experienced as a type of brain disorder, in others as a loss of body fluids such as semen, or as a possession by an external force.

Culture-based idioms of distress lead people from different cultures to different sources of help. Many people will seek medical advice, but others might rigorously avoid asking for help especially if the problem is perceived as a weakness or the result of some cultural infringement. And rather than seeking medical advice, help might be sought from an elder or community healer with whom there is a sense of rapport based on cultural alignment.

Many psychological assessment tools are culture bound or culture loaded. Quite apart from administration, they may not be sensitive enough to capture different cultural norms, or alternatively might suggest a higher level of distress than is actually experienced. Some people are reluctant to talk openly about emotions or personal distress but are less shy about describing symptoms on paper. In contrast, some respondents feel more or less obliged to satisfy the interviewer by ensuring that there are not too many questions left unanswered, or answered negatively. For most of the commonly used psychological assessment tools, standardization reflects predominantly white middle-class samples for which results may be inappropriately applied to other ethnicities.

Translating tests is an important step in making psychological tools accessible. Translation, provided it is not literal, nor simply based on transliterations, can communicate the intended concept with greater accuracy. Sometimes a back translation, into the sourced version is useful to respondents who may not be fluent in their customary language despite having retained customary ideas. The 'revised' version is in a conceptual form which makes sense. To be most useful, however, translation of assessment questionnaire schedules should also ensure that the format is consistent with cultural norms.

Cross-References

► Cross-Cultural Communication

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Interdisciplinary Palliative Care Groups

► Health Care Teams in Palliative Care

Interest Groups

► Stakeholders

Interim Injunction

► Preliminary Injunction

Internal Medicine

Synonyms

Non-surgical diagnostics and therapy

Definition

Internal medicine is the branch and specialty of medicine that is dedicated to the diagnosis and medical non-surgical treatment of adults, especially of their internal organs. Physicians who specialize in internal medicine are called internists. A significant part of medical school and postgraduate training is focused on the prevention, diagnosis, and treatment of diseases of adults. There are numerous subspecialties of internal medicine like allergy and immunology, cardiology (heart), endocrinology (hormone disorders), hematology (blood disorders), infectious diseases, gastroenterology (diseases of the gut), nephrology (kidney diseases), oncology (► cancer), pulmonology (lung disorders), and rheumatology (arthritis and musculoskeletal disorders).

Internal Motivation

► Intrinsic Motivation

Internal Review Board

► Ethics Committee, EC

International Chemical Control Toolkit

Definition

In 2004, a Global Implementation Strategy was established under the auspices of the International Programme on Chemical Safety (IPCS). This Global Implementation Strategy aims to build and implement an Occupational Risk Management Toolbox, containing toolkits to manage different workplace hazards. The first such toolkit is the International Chemical Control Toolkit, which is available on the Internet through the ILO SafeWork Website. The hazard information employed by the Toolkit is either European Union (EU) label Risk (R) phrases or the hazard statements of the Globally Harmonized System for Classification and Labeling (GHS). The target for global implementation of the GHS is 2008.

International Classification of Functioning, Disability and Health (ICF)

Definition

The ICF is a classification of health and health related domains that describe body functions and structures, activities and participation. The domains are classified from body, individual and societal perspectives. Since an individual's functioning and disability occurs in a context, the ICF also includes a list of environmental factors.

International Conference of Harmonization ICH Harmonized Tripartite Guideline

Definition

The International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) was a consultation exercise undertaken by the regulatory authorities of Europe (European Medicines Evaluation Agency [EMEA]), the US (Food and Drug Agency [FDA]) and Japan (Ministry of Health and Welfare, Tokyo) and representatives of the pharmaceutical industry, to discuss the requirements for drug evaluation and registration and to file guidelines. The Tripartite Guidelines is a system of guidelines that are legally binding in all three areas. Due to the fact that these regions represent an overwhelming share of the pharmaceutical world and that many other countries use either home certificates (pharmaceutical products that are registered in their country

of manufacture do not need registration/authorization after import) or accept documentation according to the Tripartite Guidelines for their own registration process, these Tripartite Guidelines are close to a global legal system. One of the Tripartite Guidelines is the guideline on ► good clinical practice.

International Court of Justice

Synonyms

World court; ICJ

Definition

The International Court of Justice is the primary judicial organ of the United Nations. It is located at the Peace Palace in The Hague, Netherlands. Its main functions are to settle legal disputes in accordance with international law submitted to it by states and to give advisory opinions on legal questions submitted to it by duly authorized international organs and agencies. The Court is made up of 15 judges voted by the United Nations General Assembly and the Security Council for nine-year terms of office.

International Decade of the World's Indigenous People

Definition

The United Nations General Assembly proclaimed 2005 to 2014, the Second International Decade of the World's ► Indigenous Peoples. The main goal of the new decade will be to strengthen international cooperation around resolving the problems faced by indigenous people in areas such as culture, education, health, human rights, the environment, and social and economic development.

International Ergonomics Association

Definition

The International Ergonomics Association (IEA) is the federation of forty-two individual ► ergonomics organizations from around the world. The IEA is governed by a Council with representatives from the Federated societies. The administration is performed by the Executive Committee that comprises the elected Officers and Chairs of the Standing Committees.

International Health Regulations

Definition

The International Health Regulations (IHR) are an international legal instrument which is legally binding on all WHO Member States who have not rejected them and on all Non-Member States of the WHO that have agreed to be bound by them. The purpose of the IHR, adopted in 1969, is to ensure maximum security against the international spread of diseases with a minimum interference with world traffic. The original IHR (1969) only applied to three infectious diseases: cholera, plague, and yellow fever. Because of their narrow scope of application, among other reasons, the IHR (1969) were revised by the WHO Member States. In May 2005, the World Health Assembly adopted the revised IHR (2005). The purpose and scope of the IHR (2005) are to prevent, protect against, control, and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade. The IHR (2005) also establish a single code of procedures and practices for routine public health measures at international airports, ports, and some ground crossings.

International Health Services

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Definition

The international health service is a system of health institutions that provide health services to people living in different regions, continents, or around the world. The essential function of the international health service

is to produce international public goods that transcend the borders of any given nation.

Basic Characteristics

Challenges of Globalization

► Globalization is the process of increasing economic, political, and social interdependence, and global integration, which occurs as capital, traded goods, people, concepts, images, ideas, and values diffuse across national boundaries (Taylor 2002).

Globalization has eroded national borders, making countries increasingly dependent on international trade. Even in the field of health, we are witnessing the worldwide distribution of both infective and non-communicable diseases, so that countries are facing similar health problems. Furthermore, global environmental threats pose a challenge to human health; e. g. ozone layer depletion has led to an increase in the incidence of skin cancer; and land degradation, air and water pollution, and the greenhouse effect are indirectly affecting health through various environmental alterations. Among the most powerful global forces are liberalization of trade, especially of harmful legal products such as tobacco, which has resulted in an increase in tobacco-related deaths worldwide; international transfer of illegal drugs (heroin, cocaine); and diffusion of medical technologies (which may have adverse health effects). Finally, numerous health problems occur as a consequence of population migrations, either due to war, environmental crisis, or economic collapse, and the increasing number of people traveling internationally every year contributes to the international spread of various diseases (Frenk et al. 1997).

As a consequence of globalization, governments of both developed and developing countries are turning to international cooperation to attain national public health objectives and improve the health status of their populations. The implementation of international laws can provide a legal foundation for international health commitments, financial and technical assistance, information exchange, scientific research, and surveillance worldwide (► global health policy).

Global Trade in Health Services

► Global trade in health services is the union of several global processes occurring in globalization that impact on health services (UNCTAD 1997; Chanda 2001; European Commission 2001). Global trade in health services is manifested in several ways.

First, it is reflected in the growing cross-border delivery of health services, both via traditional mail channels, and by electronic services or ► telehealth. The main idea of ► telemedicine was to provide health care to remote populations and to improve the quality of diagnosis and treatment, but the lack of supporting technology and infrastructure at present makes it ineffective in many developing countries.

Another global phenomenon is movement of personnel and consumers from one country to another. ► Consumers are moving to the countries that provide the best, safest, or cheapest service for diagnosis and treatment. Health care providers are moving around the world, seeking the best education, employment, or career opportunities. This global trade of people, services, and foreign investments has induced the establishment of many collaborative arrangements in health care – hospitals, clinics, and diagnostic and treatment centers, which can provide expensive and specialized medical services. Theoretically, this kind of trade should have improved health systems, but it might result in the development of a dual market, consisting of expensive health centers providing higher-quality health services to wealthy nationals and foreigners, and much lower quality, resource-constrained centers providing health services to the poor. The implications of global movement of health care providers can be both positive and negative. On one hand, transient mobility of health care providers certainly promotes exchange of knowledge among professionals, and upgrades skills and standards in the country of interest. However, a permanent outflow of health care providers presents a significant loss for the source country, both in the loss of highly trained personnel and loss of the public resources invested in their training (Chanda 2001).

Nevertheless, globalization is not to blame for all of these problems. It is the poor infrastructure, low standards, poor employment opportunities, loose health system, and low-quality health services in the source countries that cause global movement of consumers and health care providers. It is equally clear that, for many countries, some components of globalization, such as trade liberalization and technology transfer, could increase efficiency, welfare, and health. In gen-

eral, a gradual and selective investment in human and physical resources in the health sector, implementation of health policies, and strengthening of health systems is a highly preferable path of globalization of developing countries (Cornia 2001).

Just as national ► health systems are facing reforms in the light of globalization, the world health system must reinvent itself to meet the challenges of the future. The essential function of international health services is to produce international public goods that transcend the borders of any given nation. Those functions, referring to prevention, diagnosis, and treatment of diseases of global importance, are listed in the Health information section (► health information).

History of International Organizations

The first efforts to establish international health cooperation date from the mid-19th century, and the First International Sanitary Conference held in Paris in 1851. It was the first international convention organized in Europe to deal with the arrival and spread of pestilent diseases, particularly cholera, which was epidemic at that time. In 1902, the International Sanitary Bureau was established. This was the predecessor of the current Pan American Health Organization, an agency of the League of Nations, which was founded in Geneva in 1919. In 1945, three physicians, Drs. Szeming Sze of China, Karl Evang of Norway, and Geraldo de Paula Souza of Brazil, proposed the formulation of a single health organization that would address the health needs of the world's people. Their joint declaration to establish an international health organization was approved when the constitution of the **World Health Organization** (WHO) was adopted in 1946. April 7th 1948 was the date of implementation of the constitutional act of the WHO and has been celebrated as World Health Day ever since.

International Health Services Today

The WHO, through its six autonomous Regional Offices, is the leader in defining health goals in various regions of the world. In 1980, the Regional Office for Europe adopted a long-term European strategy "Health for All", which was expanded in 1998 into the policy named "Health21 – health for all in the 21st century" (WHO 1998). The two main aims of this policy – health promotion and protection, and reduction of diseases – are to be fulfilled through twenty-one targets for health. Some of these targets are focused on health systems, their gradual orientation towards better health gain, equity and cost-effectiveness, and the implementation of new policies and strategies based on the health for all principles. ► Equity, ► equality and solidarity in health development between and within countries are also supported. Other targets are more individual and oriented toward strengthening health throughout the life cycle; improving the physical, economic, social and cultural environment; and reducing diseases and injuries.

The WHO is dedicated to many international health programs:

- Global Strategy on Diet, Physical Activity and Health, which was developed and adopted in the 2004 World Health Assembly – it was recognized that a few largely preventable risk factors account for most of the world's disease burden. This strategy intends to provide significant change in diet habits and physical activity levels worldwide.
- Diabetes Action Now is a joint program of the WHO and the International Diabetes Federation. The overall goal is to raise awareness about diabetes and its complications, particularly in low- and middle-income countries, and to stimulate effective measures for the surveillance, prevention, and control of diabetes.
- The WHO Mental Health Policy Project is a comprehensive strategy to improve the mental health of the population using existing resources to achieve maximal benefits, to provide effective services to those in need, and to assist reintegration of people with mental disorders into community life.
- The Countrywide Integrated Noncommunicable Diseases Intervention (CINDI) program was established in the European Region. It presently includes 27 participant countries. It was developed with the aim of reducing modifiable risk factors, such as smoking and high blood pressure, by integrating health promotion and disease prevention.
- The Global School Health Initiative was established to increase the number of schools that can truly be called "Health-Promoting Schools". The aim is to mobilize and strengthen health promotion and education activities at the local, national, regional, and global levels. The Initiative is designed to improve the health of students, school person-

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nel, families, and other members of the community through schools.
- The Healthy Cities Project was developed to support the solving of local problems in various communities. Whether the primary reason people convene involves children, environmental concerns, homelessness, safety, education, or other issues, the approach is to establish a collaboration among citizens and people from business, the government, and other sectors of society who recognize that their interconnection can be used to impact on the well-being of the entire community.

Critiques on the Work of International Health Organizations

Analysts criticize international health agencies for their bureaucracy, lack of coordination, and waste of resources, often leading to increased inequities and inequalities in health care (► inequity in health, ► inequality in health) for the world's most vulnerable populations, instead of improving health. Furthermore, international health agencies are said to be neglecting the new global health challenges, not only new emerging diseases and health risks, but also issues regarding the development of new medical technologies, interventions and research, the design and implementation of information systems, the status and reforms of national health systems, consumers' health protection, etc. (Antezana 1997; Frenk 1997).

Given the rising trends in globalization, it is inevitable that a question on equity in access to health services occurs. It is often true that cost-effective public health interventions do not reach the populations who need them. International agencies are constantly putting new conditions on governance, making their support dependent on implementation of patents, legislation, sanitary and veterinary norms, social clauses, etc.

Another critical failing in the work of international agencies is the implementation of health interventions in a way that is inadequate or unsuitable according to the epidemiological profile of the population. Due to the short-term funding of public health programs and rapid staff turnover in governments, donors and international agencies, and technical assistance groups, health interventions often have low coverage and do not contribute to the building of sustainable health systems (Victora et al. 2004).

Role of International Health Organizations in the 21st Century

Bearing all this in mind, the proposed role of the WHO in the 21st century is to (Antezana 1997):
- Be the world's health conscience: be an advocate for health, advance global health equity, and identify policies and practices that are beneficial or harmful for health,
- Provide leadership to a global alliance for health,
- Provide technical cooperation, with special attention being given to the poorest countries and communities,
- Establish global ethical and scientific norms and standards,
- Perform global surveillance and establish early warning systems for transnational threats to health,
- Initialize, undertake, and control global eradication, elimination, or control of selected diseases,
- Promote innovation in science and technology for health,
- Mobilize and be an advocate for resources for the poorest countries and communities.

European Community and Health Care

The activities of the European Community include a contribution to the attainment of a high level of health protection. The right to "Health Care" is described in the "Charter of Fundamental Rights of the European Union", agreed in Nice in 2000. This Right is defined as "Everyone has the right of access to preventive health care and the right to benefit from medical treatment under the conditions established by national laws and practices". The EU Committee on Health is very much concerned with the health systems of Member States, especially the flow of services, financing, quality of services, and education and training of professionals. Another important issue, yet not thoroughly developed, regulated, and implemented is cross-border health care. The ► EU Legislation and the Delivery of Services to Patients coordinates and regulates the delivery of health services between Member States (European Commission 2001).

Conclusion

Globalization, environmental changes, economic development, population explosion, urbanization, and

changes in health care systems have increased the need for international health services. Some developing health systems are unable to provide even basic health services and they would certainly benefit from preventive health, public health care, and education as a means of addressing current health threats. In such cases, international health organizations play an important role in supporting governments, national health systems, communities, and individuals in promoting health and preventing disease, or providing educational, technical, or organizational assistance in diagnostics, treatment, and rehabilitation of diseases.

Cross-References

- ▶ Consumer
- ▶ Equality
- ▶ Equity
- ▶ EU Legislation and the Delivery of Services to Patients
- ▶ Global Health Policy
- ▶ Globalization
- ▶ Global Trade in Health Services
- ▶ Health Information
- ▶ Health Systems
- ▶ Inequality in Health
- ▶ Inequity in Health
- ▶ Telehealth
- ▶ Telemedicine

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International Programme on Chemical Safety

Definition

The International Programme on Chemical Safety (IPCS), established in 1980, is a joint program of three Cooperating Organizations – ILO, UNEP and the WHO – who implement activities related to chemical safety. The WHO is the Executing Agency of the IPCS, whose main roles are to establish the scientific basis for safe use of chemicals, and to strengthen national capabilities and capacities for chemical safety.

International Red Cross and Red Crescent Movement

Synonyms

Red cross

Definition

The International Red Cross and Red Crescent Movement is the world's largest international network whose stated principles are based on the concepts of humanity, impartiality, neutrality, independence, voluntary service, unity, and universality. The movement consists of the Geneva-based International Committee of the Red Cross, the International Federation of Red Cross and Red Crescent Societies, and numerous national societies. Currently, it is present and active in almost every country to protect human life and health, to ensure respect for the individual, and to prevent and alleviate human suffering without any discrimination based on nationality, race, religious beliefs, class or political opinions. The commonly used term "International Red Cross" is actually a misnomer because no official organization bearing that name exists.

International Research

Definition

The word "international" is used when a research project involves various countries. It is a very important factor for regulating a research protocol especially if one or more of the involved countries are of different cultures or socio-economic levels, which could lead to exploitation.

Internet

Definition

The Internet is technically a network of computer networks, or a set of protocols enabling connection and communication between computers.

Interpersonal

► Human Relations

Interpersonal Relations

► Social Relations

Intersectoral Cooperation

Synonyms

Multisectoral cooperation

Definition

Intersectorial cooperation is a recognized relationship between part or parts of different sectors of society that have been formed to take action on an issue to achieve health outcomes, or intermediate health outcomes, in a way which is more effective, efficient or sustainable than might be achieved by the health sector acting alone. Intersectoral action for health is seen as central aim for the achievement of greater equity in health, especially where progress depends upon decisions and actions in other sectors, such as agriculture, education, and finance. A major goal in intersectoral action is to achieve greater awareness of the health consequences of policy decisions and organizational practice in different sectors, and through this, movement in the direction of healthy public policy and practice. Increasingly intersectoral collaboration is understood as cooperation between different sectors of society such as the public sector, civil society and the private sector.

Interval Estimation

► Confidence Intervals

Intervention Concepts in Prevention

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Synonyms

Program planning

Definition

An *intervention* is an intended, planned, and targeted operation in a system or process which aims at removing or preventing an undesirable phenomenon. In the context of health promotion and prevention, an intervention is a planned and systematically implemented activity taking place in current social structures, which aims at changing knowledge, attitude or behavior of a person, an organization, or a population. For this goal, an intervention can also target determinants of health behavior, e. g. the physical environment and political context. Usually, an intervention is part of a study and thus subject to evaluation (► evaluation, models) and assessment.

An *intervention concept* is a scheme for the different elements and activities that are required to achieve the intended outcome of a program. A concept is usually developed in the beginning of a health promotion and prevention activity, and it maps out detailed steps that have to be taken to design, implement and evaluate a prevention program. A concept usually encompasses the whole program cycle: analysis, strategy, implementation, evaluation, and sustainability.

Basic Characteristics

Background: Need for Procedural Concepts

The past three decades have seen a rapid growth in the quantity and range of preventive interventions. It became soon clear, however, that poorly defined and resourced programs had only modest impact, or led to social benefits which were hard to measure. In addition, with the expansion of innovative approaches, the skills and experience to translate program objectives into practice have not always kept up with the rapid changes. Over the past few years, increasing attention has thus been given to the question of how an intervention can be planned and managed, not only to ensure that programs are established on a secure footing, but also that they should meet measurable objectives and be sustainable over time.

Frameworks and Models for Intervention Concepts

As a consequence, several frameworks for a systematic planning process in prevention and health promotion have been developed since the 1980s. These frameworks offer guidance for designing intervention concepts, but it has to be kept in mind that there is no "one size fits all" concept for preventive interventions. The models for intervention concepts are procedural resources that map the path from the recognition of a need or problem to the identification of a solution. They are designed to enhance quality management of health promotion and prevention programs, but cannot provide solutions.

PRECEDE-PROCEED Model One of the most popular concepts is the PRECEDE-PROCEED framework, which has been proposed by Green and Kreuter in the early 1980s. The PRECEDE framework (referring to predisposing, reinforcing and enabling constructs in educational diagnosis and evaluation) is a framework for the process of systematic development and evaluation of health education programs. In this model, appropriate health education is considered to be the intervention (treatment) for a properly diagnosed problem in a ► target group, or target population. This model is founded in the social/behavioral sciences, epidemiology, administration and education. As such, it recognizes that health and health behaviors have multiple causations which must be evaluated in order to assure appropriate intervention. The PRECEDE model was subsequently expanded to become the framework to capture environmental factors influencing health, thus becoming a health promotion framework (PROCEED referring to policy, regularly and organizational constructs for educational and environmental development). This comprehensive framework has been used for the conceptualization of countless programs in numerous countries, forcing program designers to thoughtfully consider a wide range of individual and environmental determinants of health behavior and disease.

Social Marketing The concept of social marketing has evolved from the commercial sector; it is especially appropriate for ► mass media campaigns. Introduced by Kotler and Zaltman in 1971, this concept combines traditional approaches to social change with commercial marketing and advertising techniques in order to promote socially beneficial behavior change. The systematic planning process of social marketing makes use of methods from the commercial sector: setting measurable objectives; doing continual ► market research focusing attitudes, motives and behavioral patterns of the target group; combining strategic key procedures; developing products and services that correspond to genuine needs; creating demand for them through advertising; perpetually evaluating all procedures. In Anglo-Saxon countries, the social marketing concept has received widespread adoption and is subject to controversial scientific discussions.

Other Models Since the publication of the PRECEDE-PROCEED model, the health promotion and prevention area has recognized the importance of careful theory-based intervention planning. Similar planning frameworks have been developed. With a special focus on community-based interventions, the American Centers for Disease Control and Prevention (CDC) introduced The Planned Approach To Community Health (PATCH) in the mid-1980s, which is a process that involves and enables members of a ► community to plan, implement, and evaluate health promotion and disease prevention programs. The PATCH process helps a community establish a health promotion team, collect and use local data, set health priorities, and design and evaluate interventions. In 1998, Bartholomew et al. described a process for developing theory- and evidence-based health education programs

that they call "Intervention mapping". Another example is the "Generalized Model", a very straightforward and systematic concept that has been proposed by McKenzie and Smeltzer (2001) for program planning in health education.

Steps in Planning Prevention Interventions

Despite different underlying philosophies, there are some core elements that can be found in almost every prevention program concept. The process of an intervention development is usually composed of a series of steps, which are labeled differently in different frameworks, but comprise similar characteristics:

1. background analysis and needs assessment
2. priority setting, development of goals and objectives
3. development of action plan, strategies and materials
4. evaluation (► evaluation, models) of processes and results

Background Analysis and Needs Assessment Most conceptualization models begin by identifying peoples' quality of life concerns, their health problems, and the behavioral and environmental factors that cause the health problem. This requires program planners to conduct consultations and to collect comprehensive data on vital statistics including ► disability, ► prevalence, ► morbidity and ► mortality, on environmental factors such as climate, workplace, the adequacy of health care facilities, etc. In addition, the focus of this phase is to acknowledge the unique characteristics of the population to be served, inherent opportunities and challenges, to assess the capacity, including budgets and potential partners, and to identify preliminary areas of focus. This initial groundwork provides contextual information and a foundation for future planning activity. It generally narrows the scope of activity on a single or limited number of priorities and delimits the scope of activity to appropriate audience segments.

Development of Goals and Objectives The definition of the overall program goal and specific program objectives is a hallmark of health education planning processes. Using the scientific analysis of health problems and problem causing factors, the planners should now be able to identify health problems that are serious and/or prevalent enough to justify spending time, money and other resources, to establish priorities, and to pinpoint the factors that are amenable to intervention. In this phase, the time-frame of the goal as well as the target-group should be defined as well. The key components to good objectives have been described with the term SMART: specific, measurable, attainable, relevant, and time-bound. It is crucial to ensure that the goals and objectives are realistic and achievable.

Development of Appropriate Interventions After the development of program goals and objectives, every model addresses the development of the action plan. It is the selection of theory-based intervention methods and practical strategies to change (determinants of) health-related behavior and the production of the program components. This includes the methods of communication for reaching the target group, the message and material development, and the strategy formation. The strategies have to be organized into a sequence of tasks. This phase also focuses on clarifying roles and responsibilities, allocating resources and constructing a time frame.

Development of Evaluation Plan Tracking and assessment are common characteristics of every concept framework. Whereas the process evaluation is used to monitor the entire intervention process and examines whether the intervention or components of the intervention should be refined or modified, the impact or outcome evaluation measures the program effectiveness by assessing whether the intervention is achieving its objectives. It is important to clarify the purpose of the evaluation, select its scale and scope, determine the methodology and organize how the evaluation will be conducted.

Conclusion

Planning skills belong to the essential responsibilities of practitioners working in prevention and health education. Different procedural frameworks that guide the conceptualization of an intervention are available by now. If used effectively, these models force program designers to critically review experience and existing evidence about health promotion problems, and to carefully consider designing comprehensive programs that attempt to intervene on factors that are both important and changeable. Although the application of some of the models can be challenging, it encourages, never-

theless, thoughtful planning and contributes to quality management in prevention and health promotion.

Cross-References

- ► Community
- ► Disability
- ► Evaluation, Models
- ► Market Research
- ► Mass Media
- ► Morbidity
- ► Mortality
- ► Prevalence
- ► Target Group

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Intervention Strategies in Prevention

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Definition

A strategy is a long term plan of action designed to achieve a particular goal. Originally confined to a military context (strategos: Greek "commander"), the term is increasingly used in public health. In health promotion and prevention activities, strategies are a set of decisions and actions that determine the long-run performance of an intervention. An intervention strategy is usually an umbrella plan encompassing a number of smaller plans and elements targeted at a defined population in order to prevent a specific health problem.

Basic Characteristics

Steps of an Intervention Strategy

An intervention's strategy aims to reach a ► target group in order to initiate and effect changes in their ideas and preventive behavior. Most strategies depend on a three-step process: analyzing the current situation, defining goals and/or objectives, and mapping a possible route to these objectives.

The starting point of the strategy development is thoroughly analyzing the psycho-social and demographic factors that determine the behavior of the target audience through market research. For preventive interventions, it is crucial to assess which factors determine health behavior, and to identify how people can be assisted in changing their behavior.

The strategy chosen for a campaign must correspond to the target group's special needs and preferences and also be compatible with its cultural and religious traditions. In addition, the strategy needs to be appropriate for the intervention's resources, environmental circumstances, and core objectives.

Strategies to influence health behavior, e. g. in terms of smoking, encompass a wide range from communication activities, aimed at the individual, to political interventions, aimed at the physical or legal context of the health problem (Table 1).

Communication Strategies

As ► health literacy is a necessary condition for preventive behavior, health education and information form an essential part of almost any preventive intervention. Communication of health related facts and promotion of the intended preventive behavior are thus important strategic aspects of an intervention. Interventions can

Intervention Strategies in Prevention, Table 1 Strategies to influence (determinants of) preventive behavior

Strategy	Example
Communication:	
• Health education, information, counseling	– mass media educative campaign on the prevention of tobacco use
• Motivation, attitudes	– mass media campaign using emotional appeals (e. g. drastically presenting perils or benefits of a behavior) and connecting image factors with a behavior
Political Interventions:	
• Supporting Measures	
– Changing the environment and context	– extending smoke-free areas in a community – removing vending machines for cigarettes
– Incentives	– Increasing taxes for tobacco – reducing insurance premiums for utilizing preventive services, e. g. joining quit programs
• Restrictive policy	– ban on tobacco advertising – smoking bans in public places

use different strategies to reach and communicate with the target group. Two main aspects that have to be considered for communication strategies are 1, the choice of communication channels, and 2, the message.

Distribution Channels: Mass Media Campaigns and Interpersonal Communication ► Mass media are undoubtedly the most important "vehicles" for creating awareness of health problems and their prevention, although their effectiveness varies greatly. Television, cinema, and radio (with due attention to the right broadcasting time) as well as magazines, newspapers, posters, brochures, leaflets, and other print media can be effective, depending on the target group. As a rule, the communication channels selected should be ones the target audience comes into contact with on a regular basis as well as perceives as being credible. Since the impact of mass media is only fleeting, however, the message has to be periodically repeated for a sustained effect. It is also essential to change the "advertising" campaign from time to time.

Notwithstanding the great importance and obvious success of mass media in preventive campaigns, interpersonal contacts and the services associated with them remain indispensable. Mass media can arouse interest, but personal consultation, motivation by promoters, or a doctor's concern can make all the difference between merely knowing about a preventive behavior, having a positive attitude toward it, and actually adopting the new behavior. With the special target group of children and adolescents, interactive measures have proven particularly effective, e. g. facilitated exhibitions offering quiz and discussion elements, group counselings or working with peer educators (► peer education).

It is advisable to combine both mass media and personal communication in the intervention strategy, as it was, for example, successfully realized in the German AIDS awareness campaign "Gib AIDS keine Chance" (*"Don't give AIDS a chance"*).

Promoting the Healthy Behavior: The Message Promoting preventive behavior, e. g. to quit smoking or to utilize cancer ► screening tests, is challenging. Although the offered behavior undoubtedly has a basic benefit (reduction of health risks in the long run), it is mostly one difficult to impart, as the behavior is usually associated with inconvenience and expenditures. Factors typically involved are the time lost or spent (e. g. in traveling and waiting for screening tests or courses), together with perceived barriers to adoption – be they psychological, social, or physical (fear of side effects or of missing an enjoyable habit). Connecting the preventive behavior with additional benefits and symbolic goods is crucial for promoting the behavior, e. g. by emphasizing the fun and better body feeling of doing sports, the opportunities that a long life offers etc. Whether subconscious and conscious fears and concerns can be dispelled and the target individuals can be persuaded of the advantages they may expect mainly depends on the clarity of the message, its sensitivity to the ► target group's concerns and language, and cultural considerations.

Therefore, great importance is attached to the selection of the message and the ways of communicating it to the target group. When employing mass media campaigns, it is important to decide whether the message should be delivered in a neutral and informative way, or whether certain emotions should come into play, e. g. humor or fear. Working with shock motives or slogans, e. g. showing severely ill patients suffering from lung cancer or AIDS, can have a high emotional impact on target individuals with high potential for changing behavior. However, shocking methods are controversial, for they have been shown to have effects to the contrary as well: if the message is too terrifying and threatening, people tend to suppress and negate its meaning. Using humor, e. g. by showing funny spots on the use of condoms, can normalize a formerly uncommon and socially unaccepted behavior, but not everybody understands all kinds of humor.

Another strategy, which is adopted from the commercial marketing and increasingly used in prevention campaigns, is celebrity testimonials: famous actors or sports stars describe their experience with and benefits of a preventive behavior. For example, numerous international soccer stars were involved in an EU nonsmoking campaign ("Feel free to say no"), and the German Felix-Burda-Foundation for Colorectal Cancer Research regularly launches a mass media campaign in magazines and broadcast media where German celebrities urge people to undergo screening for colorectal cancer. When using testimonials, the credibility of the chosen personalities with regard to the target group has to be considered.

It is indispensable that the message and the materials used for communication are pre-tested with representatives of the target group.

Capacity-Building and Management

Strategy implementation in preventive intervention involves the allocation of sufficient resources (financial, personnel, time, technology support), and assigning responsibility of specific tasks or processes to specific individuals or groups. In health promotion and prevention, the process of establishing a system's ability to perform or produce desired outcomes is known as "capacity-building". So in addition to mapping out strategies in order to reach the target group, planners of an intervention also need to build the necessary infrastructure and problem-solving capabilities.

Especially community-based multi-faceted prevention efforts depend on an organizational infrastructure which incorporates partnerships, alliances, networks, and ► community-organizing, in order to facilitate processes and to ensure sustainability. For example, if a local public health agency plans to start a campaign against drug abuse directed at young Russian immigrants, it is crucial to involve other people and organizations that are in contact with this target group. This can be social workers, drug counselors, language schools, orthodox churches, Russian youth clubs, etc. Furthermore, the program planners need to ensure that those social workers and practitioners involved in the program receive adequate teaching as to the background of the problem, the psychosocial features (attitudes, motivations, values, behavioral patterns) and needs of the concerned adolescents, and special problem-solving skills.

The strategy of an intervention also involves managing the process. This includes monitoring results, comparing to benchmarks and best practices, evaluating (► evaluation, models) the ► efficacy and efficiency of the intervention, and making adjustments and modifications to the intervention elements as necessary.

Cross-References

► Community
► Efficacy
► Evaluation, Models
► Health Literacy
► Mass Media
► Peer Education
► Screening
► Target Group

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Intervention Studies

► Experimental Studies

Intestinal Infection with Cestodes

► Intestinal Tapeworms

Intestinal Parasite

Definition

Intestinal parasites are parasites that populate the gastro-intestinal tract. In humans, they are often spread by poor hygiene related to feces, contact with animals, or poorly cooked food containing parasites. Parasites can get into the intestine through the mouth from uncooked or unwashed food, contaminated water, or hands, or by skin contact with larva infected soil. People can also become infected with intestinal parasites if they have mouth contact with the genital or rectal area of a sexual partner who is infected (e. g. oral sex). The most common groups of parasites are protozoans and parasitic worms.

Intestinal Tapeworms

Synonyms

Taeniasis; Intestinal infection with cestodes

Definition

Cestodes consist of a head (scolex) with suckers (by which it attaches to the intestine of the host), a kind of neck and several segments, the proglottids. The proglottids, which contain eggs, are expelled with the stool to ensure the spread of the worm. Humans are the definite host for beef tapeworms (*Taenia saginata*, 6–10m long), pork tapeworms (*Taenia solium*, 3–4m long) and the nearly extinct broad fish tapeworms (*Diphyllobothium latum*, up to 20m long); the corresponding animals are the intermediate hosts. Cestodes are spread worldwide. Infection is transmitted by the ingestion of meat or sausages containing the larval stages of tapeworms. In the gut the larvae develop to adult worms. Larvae of the pork tapeworm can also reach other organs, causing cysticercosis. An infection with the broad fish tapeworm is caused by the ingestion of fish that is infected with plerocercoids (larval stages). Symptoms of taenisasis can be nausea, vomiting and malaise. Moreover, there can be a loss of weight despite of an adequate food intake.

Intimate Partner Violence

Synonyms

Domestic violence; Family violence

Definition

Intimate partner violence (IPV) refers to sexual abuse, physical aggression and/or psychological abuse by an intimate partner. IPV includes harmful and potentially harmful acts, sexual coercion or assaults, threats to kill or to harm, restraint of normal activities or freedom and denial of access to resources. IPV may also be continuous exposure to behaviors designed to control and dominate.

Intoxication

Definition

Intoxication as the major acute impairment after heavy use of psychoactive substances is characterised by direct substance related effects: overreaching emotions, reduced inhibitions and uncontrolled behaviour (e. g. impaired balance).

Intracranial Injury

► Traumatic Brain Injury

Intranet

Definition

An intranet is a form of computer network, based upon ► world wide web and ► internet technologies, but whose scope is limited to one organization. Contrary to the Internet, access to an intranet is limited to defined users or user groups. An intranet may be connected to the Internet, so that there can be communication and flow of information between it and other intranets.

Intrauterine Growth Retardation (IUGR)

Synonyms

Intrauterine growth restriction

Definition

Intrauterine growth retardation is the growth restriction of a fetus resulting in a small for gestation age baby whose birth weight is below the 10th percentile for that gestation age. Depending on when during pregnancy the growth restriction occurs, you can have asymmetrical or symmetrical growth restriction. Asymmetrical growth restriction which is more common, is defined as growth retardation that occurs in the 3rd trimester, whereas symmetrical growth restriction results from growth restriction in the 1st or 2nd trimester.

Intrauterine Mortality

Synonyms

Fetal mortality; Fetal death

Definition

Intrauterine mortality refers to death prior to birth at any gestational age. Fetal deaths may be early (less than 20 weeks), intermediate (20 to 27 weeks), or late (more than 27 weeks). The birth of a dead fetus or infant is called stillbirth. The absence of breathing, heart beats, pulsation of the umbilical cord and definite movements of voluntary muscles are the signs of a stillbirth. Causes of intrauterine mortality may be genetic defects, infection (e. g. measles), maternal diseases (e. g. diabetes), dysfunction of the placenta, or other, unknown, causes.

Intrinsic Motivation

Synonyms

Internal motivation

Definition

The motivation or desire to do something based on the enjoyment of the behavior itself rather than relying on or requiring external reinforcement. It is evident when people engage in an activity for its own sake, without obvious external incentives (e. g. a hobby).

Inuits

Synonyms

Native Americans; Indigenous people of North America Eskimo (United States)

Definition

Inuit are Indigenous people inhabiting the far north regions of North America from northern Alaska to eastern Canada and Greenland.

Investigation

► Ethics, Aspects of Public Health Research

Investigational Protocol

Synonyms

Study protocol

Definition

The protocol is the set of rules by which a study is conducted. It usually contains information about the

objective, design, methodology, and organization of the experimental study. The protocol is carefully designed to safeguard the health of subjects in the study.

Cross-References

► Study Protocol

Investigator's Brochure

Definition

The investigators brochure describes the characteristics of the drugs or devices to be tested in a clinical trial. It has to contain an executive summary for quick reference, data concerning the physical, chemical, and pharmaceutical properties and formulation of the product (e. g. chemical name, generic and trade name when approved, all active ingredients, the investigational products pharmacological class and its expected position within this class), the results of all relevant nonclinical pharmacology and toxicology (e. g. single dose, repeated dose, carcinogenicity, irritancy and sensitization), reproductive toxicity, genotoxicity (mutagenicity), pharmacokinetic, and investigational product metabolism studies performed in-vitro or in animals, data concerning the investigated therapeutic and the possible unfavorable and unintended effects of the product, all previous established data concerning effects in humans like pharmacokinetics and product metabolism data, including metabolism and absorption, plasma protein binding, distribution, and elimination, bioavailability of the investigational product (absolute, and/or relative) using a reference dosage form, population subgroups (e. g. gender, age, and impaired organ function like kidney and liver), interactions (e. g. product–product interactions and effects of food), data on safety and efficacy and dose response that were obtained from preceding trials in humans (healthy volunteers and/or patients) and if applicable data from marketing experience.

Furthermore, the investigators brochure should contain the rationale for performing research with the investigational product, and the anticipated prophylactic, therapeutic, or diagnostic indication as well as a general risk–benefit evaluation of the product.

Involuntary Inhalation of Tobacco Smoke

► Passive Smoking

Involuntary Smoking

► Passive Smoking

Involvement

► Health Promotion Engagement
► Participation

IQWiG

Definition

In 2003, as part of Germany's health system reform and modernization, legislation called for the establishment of a new national institute for German health care. The "Institute for Quality and Efficiency in Health Care" (IQWiG = Institut fuer Qualitaet und Wirtschaftlichkeit im Gesundheitswesen) was established as a private foundation by the Federal Joint Committee (G-BA), which self-administers the health services in Germany. The IQWiG is responsible for scientific evaluation of the use, quality, and efficiency of health care services and pharmaceuticals in Germany. Additional roles include the evaluation of clinical practice guidelines, making recommendations to disease management programs, and the publication of health information for patients and consumers. As a professionally independent scientific establishment, the Institute addresses questions relating to the quality and efficiency of services provided by statutory health insurance, and considering people's age, gender and living conditions.

IRB

► Ethics Committee, EC

Isolation in Clinical Medicine

Definition

In ► hospital epidemiology, isolation refers to the precautions that are taken in the hospital to prevent the spread of infection from an infected or colonized patient to susceptible persons. The CDC (► Centers for Disease Control and Prevention) and the Hospital Infection Control Practice Advisory Committee have prepared a guideline for isolation precautions in hospitals. This guideline contains two levels of precautions. The first level is Standard Precautions, designed for the care of all patients in hospitals regardless of their diagnosis or presumed infection status, because signs and symptoms of infection are not always obvious. Isolation practices include hand hygiene; the use of protective barriers such as masks, gowns and gloves; special handling of contaminated articles; and patients' placement in a private room or other alternatives. The second level (known as Transmission-Based Precautions), is designed for individuals documented or suspected to be infected or colonized with highly transmissible or epidemiologically important pathogens. There are three types of Transmission-Based Precautions: Airborne Precautions, Droplet Precautions, and Contact Precautions. They may be combined for diseases that have multiple routes of transmission.

Isolation of Persons to Prevent Transmission of Diseases

► Quarantine

Isolation in Public Health

Definition

Isolation in the public health context refers to the separation of individuals known to be affected by an ► infectious disease from the rest of the community.

Itch

► Infection with Sarcoptes Scabiei
► Scabies

Itching

Synonyms

Feeling of itchiness; Pruritus

Definition

Itching is an uncomfortable irritation of the skin, which causes the desire to scratch. It arises by a stimulation of free nerve endings, the transmission of the sensation to the brain shares common nerve pathways with the sensation of pain. The primary chemical in itching is histamine, which is released from mast cells. Histamine leads to a widening of the blood vessels with an increase in their permeability. With the inflow of fluids into the tissue free nerve endings are stimulated causing the sensation of itching. To soothe itching antihistamines (histamine-H1-receptor antagonists) can be used. They can be applied locally as ointments, creams or gels or systemically (oral or parenteral administration). Antihistamines are divided in two generations. The representatives of the first generation show additional sedating effects.

IUHPE

Definition

The international union for health promotion and education (IUHPE) is an international non governmental organization. Established for 50 years ago and located in Saint-Denis Cedex, France. IUHPE is a leading global network working to promote health worldwide and contribute to the achievement of equity in health between and within countries. The network is divided in regional offices that represent the organization all over the world. The mission of the International Union for Health Promotion and Education (the IUHPE) is to promote global health and to contribute to the achievement of X1equity in health between and within countries of the world considering the principles of the Ottawa Charter. The IUHPE is in close cooperation with ► WHO, UNESCO, UNICEF, and other major inter-governmental and non governmental organizations to influence and facilitate the development of health promotion strategies and projects all over the world.

Japan Encephalitis

Synonyms

Japanese encephalitis

Definition

Japan encephalitis is a virus infection transmitted by a mosquito, which is primarily found in Eastern and Southeast Asia. Following an incubation period of 4–14 days fever, severe headache, stomach ache, nausea and vomiting occur. Further symptoms are confusion and agitation. The disease can progress to a serious infection of the brain with motor or cranial nerve paresis, movement disorders and seizures. Reconvalescence can take several months, major neurologic sequelae can remain. For prophylaxis travelers into endemic regions should receive an active immunization. The vaccine is given on the days 0, 7 and 30.

Cross-References

► Acute Life-Threatening Infections

Jarisch-Herxheimer Reaction

Synonyms

Herxheimer reaction

Definition

A Jarisch–Herxheimer reaction can appear a short time after the onset of antibiotic therapy. Due to a massive destruction of pathogens, toxins are set free. These toxins cause a release of substances which support the inflammatory reaction (so-called mediators of inflammation). A Jarisch–Herxheimer reaction is characterized by flu-like symptoms, as fever, shivering fits, aching muscles and arthritic pain. It can be prevented or at least moderated by the administration of steroidsm (prednisolone) prior to the onset of antibiotic therapy.

Jawbone

Definition

The jawbone is the bone of the jaw, which comprises an upper jaw and a lower jaw. The lower jaw is the mobile component. It articulates at its posterior processes with the temporal bones of the skull on either side, called the mandibular/jaw joint. The upper jaw is more or less fixed with the skull. Jaws accommodate teeth.

Jaw Joint

► Jawbone

Jigger

► Chiggers (Burrowing Fleas)

Job-Related Stress

Synonyms

Job stress; Work stress; Workplace stress; Stress at work

Definition

Job-related stress can be considered to be a disturbed relationship between the worker and his or her ► work-

ing environment. It is a state characterized by high levels of arousal and distress and often by feelings of not coping. The experience of job-related stress is treated as essentially emotional in nature.
It originates, at least in part, with exposure to environmental agents that are generally referred to as "work-related stressors". Exposure to work-related stressors contributes to acute psychological, physiological, and/or behavioral changes. If these changes are persistent or recurrent, the onset of symptoms and subsequent (stress-related) illness may occur. The causes of job-related stress may also originate in factors intrinsic to the work content (workload, pace of work, design of work) and work context (role ambiguity, relationships with others, non-supportive organizational climate at workplace). Individual factors, such as personality and coping, as well as non-work factors (family demands and non-work-related social support), play a role as moderators of the relationship between job stressors and acute and chronic stress reactions. Current theories and models of job-related stress (the demand-control model – DC model; the effort-reward imbalance model – ERI model; the transactional model – TA model) are distinguished by major theoretical differences.

Job Stress

► Job-Related Stress

Job Task

Synonyms

Workplace conditions; Working environment

Definition

The term job task refers to working conditions, machinery, tools, layout, factory premises, or working climate that covers the ► workplace environment. It can also be workers' physical, social and mental workload; the psychosocial and organizational context of tasks (of the job) under which the work has to be performed or which influence the work (or job tasks); or the ► working environment.

Job Task Environment

Synonyms

Working conditions; Working environment

Definition

The working environment includes the surroundings, conditions and influences at work and ► workplace that affect an employee. In occupational health it refers to physical (physical, biological, chemical and ergonomic factors at work) and psychosocial work environments (work organization, inter-individual relationships at work, work culture, job security, etc.). The working environment may be considered as a part of a general environment, and there is an obvious inter-relationship between the working environment and the general environment. The identification of the working environment is essential if occupational health preventive actions are to change the working environment and prevent harm or promote benefit.

Cross-References

► Job Task
► Working Conditions

Judaism

Definition

The Jewish lifestyle revolves around religion in all aspects of daily life, in society, culture, and religion, its history and tradition. This includes the belief that Israel is the Promised Land.

Judgment

► Measurement
► Measurement: Accuracy and Precision, Reliability and Validity

Justice

Definition

Justice, in the public health context, means distributing benefits, risks and costs fairly among all members of a community.

Kala-Azar

► Visceral Leishmaniasis

Kanaka Maoli (Hawaii)

► Indigenous Health – Australooceaninan

Kaplan-Meier Curve

► Kaplan-Meier Survival Plot

Kaplan-Meier Method

Definition

A distinguishing feature of survival data is the inevitable presence of incomplete observations. In these situations, each patient has a different length of follow-up. It is difficult to assign meaning to the term "proportion surviving" without specifying a fixed period of observation common to all patients. The Kaplan-Meier method can estimate the probability of surviving when patients have different lengths of follow-up. In the Kaplan-Meier method, the percentage of survivors at each death time is recalculated.
The chance of surviving one year is therefore

$$S_{365} = C_1 \times C_2 \times C_3 \times \ldots \times C_{364} \times C_{365}\,.$$

C_1 is the chance of surviving the first day,
C_2 is the chance of surviving the second day having already survived day one,
C_3 is the chance of surviving the third day having already survived days one and two, ...
C_{364} is the chance of surviving day 364 having already survived days one to 363, and
C_{365} is the chance of surviving day 365 having already survived days one to 364.

Kaplan-Meier Survival Plot

Synonyms

Kaplan-Meier curve; Time-to-event curve; Survival curve

Definition

Time-to-event analysis is a potentially powerful and informative method of analysis. In this analysis, clinical trials commonly record the length of time from study entry to disease endpoint for a treatment group and a control group. These data are commonly depicted by a Kaplan-Meier survival plot, from which the median and the mean can be derived. In Kaplan-Meier survival plot, the percentage of survivors is recalculated at each death time so that the curve takes on a characteristic appearance of horizontal and vertical lines when plotted.

Kappa Coefficient

Synonyms

Kappa statistics

Definition

Kappa coefficient is a measure of ► agreement between raters or measurement procedures for categorical data, such as diagnosis. This measure indicates the proportion of agreement that remains after correction for

agreement expected by chance. Kappa coefficient value less than 0.4 can be considered as poor, from 0.4 to 0.75 fair to good, and over 0.75 excellent agreement. A kappa coefficient of zero indicates agreement only by chance. Values of 1.0 and –1.0 indicate perfect agreement and perfect disagreement, respectively.

Kappa Statistics

► Kappa Coefficient

Katayama Fever

Synonyms

Systemic schistomoniasis; Systemic bilharziasis

Definition

Katayama fever appears when schistosomas release their eggs for the first time. According to the worm species this can be between two weeks and two months after the infection. Katayama fever is characterized by shivering fits, fever, cough and headache. Furthermore, there can be swellings of the lymph nodes and an enlargement of the liver and spleen. In most cases, the symptoms vanish within a couple of weeks, but severe courses with a lethal outcome are possible.

Kcal – Kilocalories

Definition

Physical value, used by nutritionists to characterize the energy-producing potential in food or by sport scientists to characterize energy consumption of exercise types.

Khakas

► Indigenous Health, Asian

Ki Denga Pepo

► Dengue Fever

King's Evil

► Morbus Koch (Koch's Disease)
► Tuberculosis
► Tuberculosis and Other Mycobacterioses

Knowledge-Based Information

Definition

The knowledge-based information is information derived from professional literature of a field of knowledge. In health care, knowledge-based information is derived from observations, interventions or research on many patients. Its purpose is to create new knowledge in the field of medicine, based on evidence, which in turn will be applied in the treatment of individual patients. Three categories are identified: primary knowledge-based information – original research reports in medical literature; secondary knowledge-based information – information that indexes the primary literature (i. e. Medline); and tertiary knowledge-based information – reviews or summaries of primary literature (textbooks, monographs, review articles).

Knowledge Management

Definition

Knowledge management is the process of the identification, mobilization and use of knowledge to improve decisions and actions. Medical knowledge management relates to the collection and studying of knowledge obtained from investigation studies, or systemic reviews in order to make it applicable and useful for medical purposes.

Kolmogorov-Smirnov Test

Synonyms

K-S test

Definition

The Kolmogorov-Smirnov one-sample test for normality is one of the most commonly used ► goodness-of-fit

tests. This test compares the sample cumulative distribution with the cumulative distribution function specified by the null hypothesis. The test is based on the maximum difference (D-statistic) between these two distributions. The K-S test is limited to continuous variables only. The null hypothesis states that the empirical distribution does not differ from normal distribution. If the D-statistic is greater than the critical one and the null hypothesis is rejected, it is concluded that the empirical distribution is not normal. The Shapiro-Wilk test is a more powerful alternative to the Kolmogorov-Smirnov one-sample test for testing normality.
The Kolmogorov-Smirnov two-sample test compares two empirical distributions and is based on the maximum difference between two cumulative distributions.

Koori (New South Wales and Victoria)

► Indigenous Health – Australooceaninan

Koran

Definition

It contains the holy scriptures of Islam, which represent the Muslim god, and the recognition of the prophet Mohammed, through angel Gabriel.

Korean Hemorrhagic Fever (KHF)

► Hanta Fever

Kruskal-Wallis Test

Synonyms

One-way ANOVA by ranks

Definition

One of the non-parametric tests equivalent to one-way ANOVA that are used to compare multiple independent samples (another one is the Median test). This test assesses the hypothesis that the different samples in the comparison were drawn from the same distribution or from distributions with the same median. It can be used to analyze ordinal variables.

K-S Test

► Kolmogorov-Smirnov Test

Labeling of Mental Disorders

► Stigma of Mental Disorders

Labor Inspectorate

Synonyms

Workplace inspectorate; Work inspectorate

Definition

Labor inspectorate usually means a governmental inspection agency established by the national or municipal competent authority or other related authority for the purpose of labor force inspection. The purposes of labor inspection are the: maintenance of occupational safety and health, protection of workers' right and benefits, enhancement of harmonious relationships between workers and management, thus raising productivity and promoting social reconstruction and economic development. Labor inspections are carried out by public officials to secure the enforcement of the legal provisions relating to conditions of work and the protection of workers. Among the main tasks of the labor inspectorate the following are emphasized – inspection of dangerous machinery and equipment, examination and inspection of hazardous working sites, and, especially, education, training, publicity and guidance in the field of occupational health and safety.

Labor Market

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Definition

Health economics analyzes the labor market from several perspectives. One important approach concerns the repercussions of health care financing on employment. Direct links between rising health care costs and labor costs may result in rising labor costs and a drain on employment. Alternatively, a direct link between rising health care costs and labor costs may lead to less coverage – as has been the case in employer-sponsored health insurance in the United States (US). Another important approach analyzes indirect costs. Indirect costs are defined as the productivity loss due to a limitation of the health state by additional days of absence from work, early retirement, or premature death. Indirect costs are approximated by the average labor costs to compensate for the loss of productivity. The human capital approach and the friction cost method are two methodological tools to estimate indirect costs.

Basic Characteristics

Health Financing and the Labor Market

An important aspect of the design of ► health financing is the repercussion of health financing schemes on employment. If there is a direct link between health care expenditures and labor costs, rising health care expenditures lead directly to rising labor costs. If this is the case, rising health care expenditures increasingly drive a wedge between labor costs of the employer and net wages of the employee. As a consequence, microeconomic labor market theory generally assumes that incentives for the employee to work diminish. What is more, incentives for the employer to substi-

tute capital for labor – or to substitute cheaper labor from abroad for domestic labor – increase. Therefore, all other things being equal, employment goes down.

The macroeconomic consequences of a direct link between rising health care expenditures and labor costs for employment are less straightforward. Rising health care expenditures are spent on health care services, which in turn provide additional employment. The net employment consequences depend on the productivity of industries. If, for example, employment is lost in the manufacturing industry due to rising labor costs, the net employment effect is probably positive. Health care services are usually less productive due to a higher ratio between labor and capital. Nonetheless, if the link between rising health care costs and labor costs is weak rather than strong, the positive net employment effect of rising health care costs can possibly be increased.

In ► social health insurance systems with income-dependent premiums, the link between health care expenditures and labor costs is very strong – more so if employers pay for at least a part of income-dependent premiums, as is the case in Germany and the Netherlands. If health care expenditures increase, income-dependent premiums go up. Labor costs and the wedge between labor costs and net wages increase straightaway. Moreover, incentives for the substitution of labor by capital increase. All other things being equal, employment goes down.

In social health insurance systems with ► community-rated premiums, the link between health care expenditures and employment is less obvious. Rising premiums will not automatically lead to rising labor costs but to a decrease in disposable income of employees. This in turn will lead to less consumption or less savings for employees, but incentives for employment remain unchanged – at least in the short run. In the long run, rising health insurance premiums might lead to rising wage demands and – if the bargaining position of employees is strong – to rising labor costs for the employer.

In tax-funded health care financing systems, the strength of the link between health care costs and labor costs is different for direct taxes on income and indirect taxes on consumption. The link between health care expenditures and labor costs is very strong in tax-funded systems that rely on direct taxes to finance health care. This link is stronger the more the tax-system depends on income from employment as a tax-base. If health care expenditures increase, governments need to raise direct taxes on income. Again, all other things being equal, employment goes down because the wedge between labor costs and net wages goes up. Repercussions on employment will be even more pronounced if taxes on profits are increased as well.

The link between health care expenditures and labor costs is less pronounced in tax-funded systems that rely primarily on indirect taxes to finance health care. If health care expenditures increase, the government needs to increase indirect taxes. In the short run, incentives for the demand and supply of labor remain unchanged.

In the US, the majority of the non-elderly population takes out health insurance coverage through their employer or the employer of a family member. The link between health care costs and labor costs is even more direct than in social health insurance and tax-financed schemes, because employers pay the majority of health insurance premiums. However, in contrast to social health insurance schemes and tax-financed systems, employer-sponsored health insurance in the US is not legislatively mandated and is far from universal (Amelung et al. 2003; Greß et al. 2004). As a consequence, the long-standing link between work and employer-sponsored health insurance becomes weaker as health care expenditures and health insurance premiums rise and employers cut down coverage: "Because employer-sponsored insurance is voluntary on the part of businesses and employees, not all firms offer health benefits, not all workers are eligible for coverage, and not all employees choose to participate or can afford their share of the health premium" (Clemans-Cope and Garrett 2006, p. 1).

Indirect Costs

The costs of an illness or disease are differentiated into the direct cost related to diagnosis and treatment in or outside the health care system and the indirect costs (► costs of illness/costing process). Indirect costs are the key element in estimating the costs from a ► societal perspective. From all other perspectives to be chosen for the costing process, indirect costs are not considered in the estimation.

Indirect costs express the influence of a loss of productivity of the labor force due to ill health on the national economy. Indirect costs can be due to decreased efficiency or total absence from work through an illness – for a limited number of days of absence or early retirement – or due to premature death. In the latter case, the time period before the average age of retirement is taken into consideration in the estimation of indirect costs. There are two ways of calculating the indirect costs: (1) the human capital approach and (2) the friction cost approach. Both approaches are based on the assumption that the lost productivity can be valued by the achievable gross income of the employed population, and by that giving the labor a defined value. Using the human capital approach, the entire period of absence from work due to illness is considered and valued by the achievable gross income. Thus, for example, for an individual dying prematurely at an age of 35, the entire period of 25 to 30 years until the average age at the end of employment (retirement) is calculated. The human capital approach is based on economic theory and gives a maximum of the possible productivity loss (Sculpher 2001). The friction cost method more accurately estimates the actual loss of productivity in western industrial countries. It takes two main aspects of criticism against the human capital approach into consideration. First, a relevant part of the short-term absence from work, due to an influenza infection for example, is compensated for either by colleagues or by the employee himself when back at work. Second, in societies with a relevant percentage of unemployed people, a large percentage of positions will be taken by a previously unemployed individual after a certain time called the friction period (Koopmanschap et al. 1995). Using the friction cost method, only the shorter friction period is valued using the average achievable gross income. For the above-mentioned example of an individual dying at 35 years of age, the friction cost method gives a much lower estimation of the indirect costs compared with the human capital approach, which overestimates the actual productivity loss.

The human capital approach is considered to be the simpler and more frequently used approach and is therefore recommended by the majority of recommendations for economic evaluation studies, although it is also recommended that the friction cost approach should be calculated in an additional scenario or at least a ► sensitivity analysis should be carried out (Gold et al. 1996).

Cross-References

► Community-Rated Premiums
► Health Financing
► Sensitivity Analysis
► Social Health Insurance
► Societal Perspective

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Labor and Occupational Safety Law

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Synonyms

Employment and workers safety law

Definition

Labor and occupational safety law comprises the legal rules that govern three aspects. Labor law regulates the legal relationship between employers and employees (including worker unions) with respect to the employment and the corresponding rights and duties resulting therefrom. Occupational safety laws encompass the body of law that provides for both the safety and health of employees at the workplace as well as the compen-

sation of employees for work-related injuries and diseases.

Basic Characteristics

Background and Context

The safety and health of employees at work was already historically a main concern of public health practice. Occupational safety is still one of the core fields of public health law. The achievement "safer workplaces" was among the CDC's ten great milestones of public health in the 20th century (CDC 1999). In most jurisdictions, the laws governing occupational safety and health have been consolidated in distinct statutes (e. g., in the U.S., Germany, the UK, Australia). As a field of law, occupational safety laws may be regarded as a part of both public health law and labor law.

Labor law (synonym: employment law) must be differentiated from occupational safety laws even though both are associated with employment. Labor law is formed by the laws that govern the legal relationship between ► employers and their ► employees with respect to the mutual rights and duties arising from the employment. The subjects of labor law include the legal governance of employment contracts, wages, conditions and causes of termination, collective labor agreements, co-determination, employee participation and vacation entitlements. Labor law also provides for legal rules providing maternity protection (maternity leave), which have also contributed to "healthier mothers and babies", one of the ten great public health achievements of the 20th century (CDC 1999).

Occupational safety and health law focuses on two main concerns. *First*, it provides the rules to safeguard and promote the health of workers and their families by ensuring safer workplaces and healthier work conditions and, in so doing, also protects the community from health risks. *Second*, a part of occupational safety laws focuses on the handling (medical treatment, rehabilitation) and the compensation of work-related injuries and diseases (Reynolds 1995). Thus, occupational safety law focuses on the protection of workers, their families and the population.

The reason for the existence of distinct occupational safety laws is grounded in the factual and legal complexity of work life. *First*, there is a multitude of workplaces with a corresponding multitude of health and safety risks. This is particularly true in conjunction with the complexity of work processes, which need regulatory governance to protect all actors exposed to these threats. *Second*, work life is characterized by the legal dependence of employees on their employers. Without legal and administrative governance and standard setting activities, employees would hardly be able to enforce the same level of occupational safety from their employers. On the other hand, workplace safety is also in the employers' interest so that all three actors (employee, employer and administration) share this principal objective. However, occupational safety is associated with significant costs, which mainly the employer has to bear, again causing concerns for the employer. In light of this conflict-filled legal and factual environment, workplace safety and health as a public health concern needs strong legal and administrative supervision by specific public health laws and specialized administrative authorities. Occupational safety cannot be left to case-by-case-decisions between employees and employers.

Legal Means of Occupational Safety Law

Because of the multiplicity of health risks and the complexity of work life, the legal means of occupational health and safety regulation are manifold. They may be differentiated based on their starting points.

First, occupational safety laws provide for general legal means and authorizations. As such, the legislator has granted authorization to the government to establish and fund specialized occupational safety agencies. Within the scope of their targeted missions, these agencies dispose of legal powers and authorities vis-à-vis the public, employers and employees. Fundamentally, the agencies carry out the regulatory supervision of workplaces. They are also entitled to conduct their own research, set safety and health related standards and make rules. In doing so, the legislator makes laws with particular safety-related rules (e. g., maximum work hours). The government issues recommendations and "technical rules" which reflect the present state-of-the-art of workplace safety (Koyuncu and Kamann 2007). In this function, the administration has the additional right and duty to advise the employers and employees and support them in implementing new safety measures.

The role of the occupational safety agencies is embedded in a much more cooperative approach than in

other fields of public health law (Rischitelli and Silverstein 2007; Reynolds 1995). Nevertheless, occupational safety agencies are administrative agencies with sovereign powers. The regulatory supervision includes, among others, inspections, surveillance activities (e. g., reporting duties, data collection, inquiries) and administrative, civil and criminal penalties in the case of legal non-compliance, as well as drastic risk reduction measures like the closure of businesses and workplaces.

Second, occupational safety means are attached to employers. In most jurisdictions, occupational safety laws *inter alia* provide for:

- Mandatory (work-related) preventive medical examinations and exposure-dependent follow-up examinations at the expense of the employer;
- The right of employees to be informed about risks and hazards of the equipment and substances they handle at work (*See* Rischitelli and Silverstein 2007, on the "Hazard Communication Standard" in U.S. occupational safety and health law). These laws in favor of employees are also denoted as "right-to-know laws" (Judson et al. 2006): These public health laws grant the employees the right to know the risks and hazards of the substances and materials they work with;
- Safety related training: instructions whereby the employees may be statutorily obliged to attend such training as a prerequisite for commencing or continuing the employment;
- The use of personal protective equipment at work;
- Protection for particular groups (maternity protection, protection of disabled).

These measures are interwoven with further legal means of occupational safety regulation that focus on particular workplaces, their environment and the employer.

Third, occupational safety means are attached to the workplaces, work equipment and substances dealt with at work. These measures aim to realize the employers' duty to provide workers with workplaces and instruments that are as safe and healthy as possible. This general employer obligation can be subdivided into the following duties:

- Conduct exposure and hazard assessments for the workplaces;
- Provide employees with safe instruments and equipment;
- Limit the use of hazardous substances and, when such substances are used, inform the employees accordingly (hazard communication);
- Provide employees free of charge with personal protective equipment (e. g., earplugs, helmets, protective shoes, safety glasses, gloves. *See* Rischitelli and Silverstein 2007 for further examples);
- Pay for protective vaccination of employees (e. g., nurses, physicians, veterinarians, public health officers);
- Depending on the size of the workplace, they may have a duty to employ a company medical officer overseeing the workplace risks, examining, educating and training the employees and advising the employer on necessary safety measures;
- Reporting obligation with respect to work incidents and safety issues;
- Comply with government safety standards and recommendations;
- Keep records on workplace risks, accidents and medical findings of the employees;
- Implement protective measures for certain employee groups (mothers, pregnant women, disabled employees), including discrimination and mobbing protection.

The legal duties of employers with respect to occupational safety are multifaceted and dynamic in nature. Therefore, this non-exhaustive enumeration shall provide an insight into the spectrum of occupational safety and health regulation. These duties may vary and alter depending on the circumstances and the present risk-profile of the workplace, the equipment or the processed substances.

Fourth, occupational safety and health statutes govern the handling of work-related injuries and diseases. There is a duty to compensate workers as well as to support their rehabilitation and return to work. In many jurisdictions, laws have imposed a duty for the employers to insure the employees against work accidents and diseases. Such statutory insurances exist in most countries (e. g., "*gesetzliche Unfallversicherung*" in German speaking jurisdictions, "workers' compensation" in English speaking jurisdictions. *See* Judson et al. 2006, for the U.S.). This insurance, regularly funded by employers, covers medical and rehabilitation expenses after occupational injuries and diseases.

Particular Aspects

Occupational safety and health regulation is designed to protect workers and the public. At the same time, this public health area significantly affects the employers' economic rights, property and business interests. Therefore, a careful legal balancing between the protected public health interests and the infringed employers' rights is a fundamental prerequisite for occupational safety and health regulation. This is true on both the macro-level of legislation and the micro-level of case-by-case decision-making. Most occupational safety laws are the result of such legal balancing by legislators, which included the relevant stakeholders (worker and trade unions, employers' unions, public health agencies) in the legislation process.

Law-making and regulation in the realm of labor and occupational safety law must also respect the collective bargaining rights of worker and employer unions (► tariff autonomy). To a certain extent, such bargaining includes occupational safety aspects. As in labor law, the interests of employees and employers regularly collide; the collective bargaining rights are special institutionalizations of the legal balancing process in this realm.

Occupational health and safety is also a concern of international organizations and international law. Thus, since its foundation in 1919, the International Labor Organization (ILO) has also pursued workers' health and safety matters. The protection of workers against sickness, disease and injury arising out of their employment is one of the central practice areas of this organization. ILO activities include setting of labor-standards and guidelines as well as legislation proposals for implementation by the ILO Member States.

For the realization of occupational safety, cooperation between employers, employees and public health agencies is necessary. Occupational safety is in the interest of all these actors and in the population's interest. Thus, it is commented that the "tripartism" of employers, employees and regulatory agencies is a characteristic of contemporary occupational safety law (Reynolds 1995). In light of constantly altering work life, new techniques and newly emerging occupational health risks, teamwork between the three central characters of occupational safety will have to continue.

Cross-References

- ► Administrative Law and Public Health
- ► Environmental Law and Public Health
- ► Epidemiology
- ► Health Campaigns
- ► Infectious Diseases
- ► Infectious Diseases Control Law
- ► Legal Balancing of Conflicting Rights
- ► Legal Regulation of Professions, Businesses, and Products
- ► Occupational and Environmental Health
- ► Public Health Law, Legal Means

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Lambliasis

Synonyms

Giardiasis; Infection with Giardia lamblia; Dysentery by Giardia lamblia

Definition

Giardia lamblia was named after its discoverers, Alfred Mathieu Giard and Vilem Dusan Lambl. It is a flagellate protozoon of worldwide significance which causes 200 million cases yearly. It is distinguished between active (trophozoites) and passive forms (cysts). The cysts are highly resistant against environmental influences and can survive in water for up to 4 months. In most cases the infection is caused by the ingestion of cysts in

contaminated water or food. Other vectors of transmission are flies. It has to be mentioned, that disease can occur with the ingestion of as few as 10 cysts. In the upper parts of the intestines the cysts change into trophozoites. After an incubation period of 1–10 weeks symptoms like diarrhea, flatulence and stomach ache can develop. Often the course of the disease is asymptomatic. In the lower part of the small intestine trophozoites change again into cysts, which are then expelled with the feces. Therapy consists of the administration of metronidazole, tinidazole or ornidazole; without treatment recurrent episodes of diarrhea are possible.

Land

► Country

Landfill

Synonyms

Dump; Tip; Hole

Definition

Landfill, also known as a *dump* (US) or a *tip* (UK), is a site for the disposal of waste materials by burial and is the oldest form of ► waste treatment. Historically, landfills have been one of the most common methods of organized waste management (along with incineration), and remain so in many places around the world. A method for final disposal of solid waste on land. The refuse is spread and compacted and a cover of soil applied so that effects on the environment (including public health and safety) are minimized. Under current regulations, landfills are required to have liners and leachate treatment systems to prevent contamination of ground water and surface waters. Most modern landfills are classified according to the type(s) of waste material disposed of into them: hazardous waste landfill, sanitary landfills, inert waste landfill and dumps. To be commercially and environmentally viable a landfill must be constructed in accordance with specific requirements, which are related to: location, stability, capacity and protection of soil and water through. In the late 20th century, alternative methods of waste disposal to landfill and incineration have begun to gain acceptance. Anaerobic digestion, composting, mechanical biological treatment, pyrolysis and gasification all began to be established in the market.

Land Pollution

► Soil Pollution

Language Retardation

► Speech and Language Developmental Disorders

Lasers

Definition

LASER is an acronym for *Light Amplification by Stimulated Emission of Radiation*. A device that produces coherent electromagnetic ► radiation is a laser. All of the energy of emitted electromagnetic radiation is monochromatic—of one single color (essentially a single frequency or a single wavelength) focused in a very thin beam, with all its waves moving along together in the same phase. All other forms of radiation from ordinary natural or artificial sources are incoherent, containing many colors randomly arranged during propagation through the space. Depending on the type of laser, emitted radiation may be in any part of the so-called optical radiation range: a) ultraviolet spectral region; b) visible light; or c) any part of the infrared spectral band. There are a variety of useful applications of lasers in scientific laboratories, military devices, industry, medicine (e. g. eye surgery), optical fiber communications (radio, telephone, TV), laser screen pointers, and even in households, e. g. audio and video compact disk recorders/players, and laser printers. In enclosed systems under normal use, there is no health risk for consumers, but in other situations, this very intense energy can be harmful for human health. In those cases, adequate safety measures are required to protect eyes (from permanent retinal injuries or cataracts), and skin (damages range from minor skin reddening to severe burns). Depending on the total power output, all lasers are classified into four classes.

Lassa Fever

Definition

Lassa fever primarily appears in West Africa during the dry season. It is transmitted by feces or urine of infected rats (by ingestion of contaminated foodstuffs) or by direct contact with an infected individual. Without treatment, the infection takes a lethal course in 40% of cases. In 25%, massive internal bleeding occurs. Besides an inflammation of the heart sac (pericarditis), meningitis as well as cardiocirculatory and renal failure can develop. As a vaccination is not available, the compliance to hygienic rules and the avoidance of contact with rats play an important role in the prevention of Lassa fever. Moreover, special precautionary measures are necessary concerning contact with infected individuals.

Latency

Synonyms

Latent period

Definition

The term "latent period" is often used synonymously with "induction period", that is, the period between exposure to a disease-causing agent and the appearance of manifestation of the disease. It has been also defined as the period from disease initiation to disease detection.

Late Neonatal Mortality

Definition

Late neonatal mortality is defined as the death of an infant between 7 and 29 days of life.

Latent Period

► Latency

Latent Schizophrenia

► Schizotypal Disorder

Latent Schizophrenic Reaction

► Schizotypal Disorder

Lateral Sclerosis

► Motor Neuron Diseases

Law

Definition

The term law encompasses the sum of the rules within a community, which are accepted as binding and which regulate the legal relationships among people, between people and state institutions and among the state institutions. Laws form the body of the basic rules of order in the community. Such rules can be laid down in legislated legal rules, thus, statutory laws like acts and bills (statutory law). Such rules can also be made through court decisions so that they are denoted as "case-law" or "common law". In addition, unwritten legal rules exist, deriving from long-standing and accepted customs, which are named customary law (in German-based jurisdictions "*Gewohnheitsrecht*").

Law of Delict

► Tort Law and Public Health

Law of Medical Informatics

Definition

The process of creating health information is complicated, since it includes skills of interpretating, organizing and structuring data obtained from the patient together with medical knowledge. Therefore, the information depends on the context of its production, which is formulated as the law of medical informatics: "Data shall

be used only for the purpose for which they were collected. If no purpose was defined prior to collection of the data, then the data should not be used."

Law in Public Health

Definition

Public health law is the authority and responsibility of the government to prevent and promote the population's health, at the same time respecting the rights of the person's privacy and property, as well as the rights of all groups in the society. Public health authorities have the power to regulate persons, health professionals and businesses in the health sector. Since public health is for the common good, public health policies can be put above individual privacy.

Law of Torts

► Tort Law and Public Health

Layman

Definition

A layman/laywoman is a member of an ethics committee who does not have specialized or professional knowledge of the area of research to be evaluated. It is important to have such members on ethics committees to ensure the legibility and comprehensibility of information materials prepared for "ordinary" patients and to provide a "common sense" approach to the evaluation of research projects.

Leading Health Indicators (LHI)

Definition

The Leading Health Indicators are a set of ► health indicators proposed within the "Healthy People 2010" objectives for measurement of the health of the U.S. nation in the 21st century. The Leading Health Indicators are physical activity, overweight and obesity, tobacco use, substance abuse, responsible sexual behavior, mental health, injury and violence, environmental quality, immunization, and access to health care. These indicators were selected because of their ability to motivate action, the availability of data to measure progress, and their importance as public health issues.

League Table

Definition

In league tables, health care technologies and interventions are ranked according to their relative cost-outcome ratio. The most prominent form is the QALY league table, which ranks according to the cost per QALY (► quality-adjusted life years). League tables might support health care decision makers in resource allocation decisions. Due to a number of methodological as well as ethical arguments against league tables, they are seen more as a source for further discussion than as an appropriate instrument to solely base resource allocation decisions on.

Learning Theory

► Conditioning Model

Least Squares Method

► Fisher LSD

Legal Balancing of Conflicting Rights

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Synonyms

Legal conflict resolution; Balancing of legal interests

Definitions

Legal balancing of conflicting rights is a tool for legal conflict resolution. It is relevant in situations where protected rights collide. Here, collision means that the

rights are in conflict as the pursuit, exercise or protection of one will limit the exercise of the other right. Broadly understood, legal balancing encompasses procedural and substantive law requirements. Public health administration has to balance conflicting rights by, first, observing procedural rights of affected individuals. Second, the administration must analyze, weigh and balance all involved rights within the decision-making process under the principle of proportionality.

Basic Characteristics

Conflicting Rights in Public Health Practice

In public health practice, there are many situations where individual rights collide with the population's health interests, for example, if a person is isolated because of an infectious disease. This isolation has been ordered in order to save the population's health. However, the isolation burdens the individual's rights and freedom. Therefore, before the decision to isolate a person is made, the individual's rights and freedoms must have been balanced with the population's interests, as these are the goods to be protected by the isolation. The public health officer has to balance the public interests with the individual's interests. Public health must protect the population from health risks without unduly violating the rights of those who cause the risks. In addition, public health practice has to balance the interests of the community and of those community members who do not want to be protected. This may be the case with mentally ill persons or persons refusing vaccinations or similar public health services (Jacobson et al. 2007).

Public health operates on sensitive grounds. It has the responsibility for the health, safety and well-being of the populations but public health also has to respect the rights of those who cause risks. The law protects both the population's and the individual's interests. In doing so, law limits the reach of public health practice. Many public health actions cannot be exercised as they would unjustifiably infringe individual rights. Here, it again becomes clear that law is "not necessarily an ally" of public health (Parmet 2007) and that public health law limits the exercise of powers by authorities (Gostin et al. 2007). The laws providing for the basic rights of the people impose limits on public health practice. As scholars comment, simultaneously representing the interests of the community as well as the interests of people who do not want to be protected or who may be burdened by public health practice "is challenging" (Jacobson et al. 2007). In practice, this challenge is met by legal balancing of the conflicting rights.

It is a central responsibility of public health agencies to balance "individual rights against public health necessities" (Gostin 1986). Public health law must not only balance conflicts between individuals and the public interest, it also commonly has to balance:

- Individual rights with other individual rights (e. g., occupational safety balances the employee's with the employer's rights);
- Individual rights with the rights of companies/businesses (e. g., when deciding to recall a consumer product from the market);
- The rights of companies/businesses with the rights of other companies/businesses (e. g., legal business and products regulation practice).

As the U.S. Supreme Court stressed in the famous *Jacobson v. Massachusetts* (1905) judgment, every member of the community is and remains "subject to manifold restraints for the common good". Public health law and, particularly, legal balancing have to ensure that these restraints do not exceed the necessary degree required for the protection of the population.

Practical Legal Balancing

Legal balancing of conflicting rights comprises the analysis of the dimension of a particular public health risk and the corresponding analysis of the restraints put on others by the public health actions. Based on the analyzed information, the legal balancing must weigh the benefits and burdens of the available public health actions in the particular case context and, conversely, weigh the affected personal rights. Figuratively, the population's interests and the individual's rights must be placed in each of the two bowls of a set of scales. Then, the two scale bowls must be balanced with each other in order to determine the lawful public health action. Legal balancing is a case-facts dependent procedure and is not mechanistic or mathematically calculable. However, it can be subdivided into two main stages:

- *First*, the process of information obtaining and analysis with respect to the public health risks, the available risk mitigation measures and the rights of potentially affected persons by these actions. In the fol-

lowing, this first component of legal balancing will be elucidated as "*procedural legal balancing*".

- *Second*, the weighing and balancing of the endangered public health and the rights and interests affected by public health agency actions in the particular context. Below, this second element will be discussed as "*substantive legal balancing*".

The two stages of legal balancing are interrelated. The careful *procedural legal balancing* lays the factual basis for the *substantive legal balancing*. Failures at each stage may lead to unlawfulness of a public health action. Therefore, when public health actions are legally challenged before courts, both stages of the legal balancing process are under scrutiny.

Procedural Legal Balancing

The procedural part of legal balancing shall guarantee a fair procedure and ensure that public decision-makers include all relevant facts in their decision-making process before burdening individual rights. Under U.S. law, this section of legal balancing is also known as "procedural due process" (*See* Stier and Nicks 2007 with U.S. Supreme Court decisions). Through this procedure, the administration shall become aware of all involved rights and interests that have to be considered. From the individual's perspective, this means that the procedural legal balancing provides him with procedural rights within the decision-making process. These rights are established for the protection of individual rights from undue deprivation by public authorities.

Individuals have several rights when they are subject to administrative proceedings. The law must design and the administration must carry out the administrative decision-making process transparently, objectively and impartially. Furthermore, all relevant case facts must be investigated comprehensively and form the basis for the final administrative order. These general requirements are composed of a number of specific procedural rights (*See* Stier and Nicks 2007; Grad 1990). They *inter alia* include the following ten basic elements:

1. The establishment of a general administrative decision-making procedure with transparent and clear criteria;
2. The exclusion of potentially partial persons (with conflict of interest) from the decision-making procedure;
3. The prior written notification of an envisioned administrative act to the addressees (an individual or legal entity). This notification must be complete and timely;
4. The duty of the administration to conduct ► hearings of affected individuals/entities;
5. The right of affected individuals/entities to access the underlying proceeding records;
6. The right of affected individuals/entities to file objections against the administration's opinion and facts;
7. The right of affected individuals/entities to challenge administrative findings, witnesses and expert opinions in conjunction with the right to present their own facts and evidence;
8. The right of affected individuals/entities to be represented by attorneys and legal counsel during the whole administrative proceeding;
9. The procedural right of affected individuals/entities to receive the reasons when a decision is made;
10. The right of affected individuals/entities to access judiciary review and, there, to challenge the administrative orders. The law must guarantee effective legal protection against undue infringements of individual rights by creating and funding an effective court system.

These procedural rights of affected individuals and, conversely, the administration's duties particularly guarantee that administrative agencies do not make decisions before having heard the affected individuals (or legal entities) or having given them the opportunity to present their own facts, opinions and means of evidence. Overall, these procedural elements ensure that authorities include all relevant facts in their administrative proceedings. In most jurisdictions, these procedural rights and duties are implemented into national administrative procedure laws. In doing so, the procedural legal balancing also serves the public trust and the "public accountability" of administrative agencies and their decisions (*See* Childress et al. 2002). The transparent and impartial administrative procedure is a critical element of procedural legal balancing.

Substantive Legal Balancing

Procedural legal balancing ensures that the public health agency investigates all relevant case facts and is aware of all involved rights and interests before a pub-

lic health action is ordered or enforced. After having obtained all relevant case facts, the agency has to carry out the *substantive legal balancing* (in the U.S.: "substantive due process"). Here, the agency has to sort the facts pro and contra its envisioned action and then weigh the arguments on both sides. In the next step, the identified public health interests and the rights and interests affected by the agency's action have to be balanced. As commented, balancing the population's interest with individual rights infringements is "one of the most complicated problems" of public health law (Gostin 2000a).

The outcome of substantive legal balancing might be an "all-or-nothing" decision for or against a public health action. It may, however, result in a compromise decision such that, instead of the initially envisioned action, a modified one is selected. Practically, substantive legal balancing encompasses several legal review steps. In the following, they are outlined in brief.

The public health agency has to evaluate the public health risks and assess whether the threats are in the scope of its mission and competency. The agency must determine whether there is legal necessity for it to exercise sovereign powers. Then, the risks must be analyzed (gravity, endangered population, dimension as to region and time, reparability). When the agency has identified risk-mitigation actions, it must assess which rights of individuals or legal entities might be impacted by the actions. If the conclusion is drawn that the action will intervene with rights of others and that these rights collide with the population's health interest, it has to enter the core substantive legal balancing process.

As the starting point for substantive legal balancing, it must be analyzed whether the legal system has already ruled that certain rights may not be infringed at all (e. g., a person may not be killed in the interest of the common welfare – the constitutional right to live does not allow altruistic executions). Many jurisdictions also set forth a hierarchy of rights spelling out that certain rights outweigh others. In public health practice, these considerations are particularly relevant on the legislation and policy-making level. For day-to-day practice, it can be noted that in public health practice, the populations' right to health and safety regularly collides with rights of individuals and other legal entities. As to weight and hierarchy, the public health interest tends to outweigh affected individual rights as behind the population's right to health there are hundreds and thousands of individuals. Nevertheless, the substantive legal balancing has to be performed on a case-by-case basis considering all case circumstances.

The core legal balancing of the population's health interests and the affected rights of individuals or legal entities has to ensure that these affections are as mild as possible (prohibition of excessive means) without selecting insufficient actions (prohibition of underusage). Overall, the public health agency should try to protect both colliding rights and, therefore, try to balance them in a way that, despite the necessity for public health actions, both rights are preserved as far as possible in that particular situation. Here, the constitutional law doctrine in Germany has established the "principle of practical concordance" (Hesse 1995: "*Prinzip praktischer Konkordanz*"). This principle requires that in cases of colliding constitutional rights, the conflict solving process should find a sound balance where both rights can still be exercised even though one might be impacted by the other. This means that administrators should try to avoid the eventuality where one of the colliding rights totally squeezes out the others. Therefore, administrative actions must be proportional with respect to the protected and the affected rights. To ensure practical concordance, the administrations follow the principle of proportionality (synonyms: principle of commensurability or – in German – *Grundsatz der Verhältnismäßigkeit*).

The principle of proportionality is an integral part of the constitutional state principle and also adheres to the constitutional rights. It is composed of five main criteria:

1. Legitimate objective
   The administrative action must be intended in the interest of the public health and common welfare and pursue a legitimate objective (Childress et al. 2002: "public justification").
2. Suitability (synonym: effectiveness; in German: *Geeignetheit*)
   The administration should only use means that can contribute to the public health objective (i. e., the averting of a particular danger). The action must at least be able to foster this achievement (Jarass and Pieroth 2007, with references to German Constitutional Court decisions). For example, the isolation of a patient with an infectious disease is suitable to mitigate the risk of an epidemic.

3. Necessity (German: *Erforderlichkeit*)
   The administration must select only such actions that do not overreach the level of intrusion that is necessary for the achievement of the public health objective ("least restrictive means" Gostin 2000b; Childress et al. 2002: "least infringement"). The criterion is violated if the end would have been achieved with less restrictive means. For example, the isolation of a patient with an infectious disease is necessary if no other means are available to control the risk of an epidemic spread. If, however, the usage of a mask or a voluntary treatment were equally protective, the isolation violates the principle of proportionality, as it was not necessary.
4. Reasonableness (synonym: reasonability, acceptability; German: *Angemessenheit*)
   When balancing the affected rights in light of all case facts, the means must be in reasonable relation to the end (in German: *Zweck-Mittel-Relation*. Gostin 2000b, for the U.S: "means/ends test" which is almost a verbatim translation of the German term). Obviously, there is a common understanding about the proportionality criteria in most jurisdictions. The reasonableness test requires that all circumstances of the individual case are balanced (Jarass and Pieroth 2007). The benefits of the action are balanced with its negative effects on individuals and legal entities. The scope and importance of these affected rights and the intensity of their invasion must be balanced with the scope and importance of the protected public interest. The intensity of the public health threat plays a crucial role for the balancing. Additional factors may be relevant (e. g., the costs of the action). Particularly, the extent of coercion and intrusion of individual rights and the subsequent compensations of affected persons play a role (e. g., monetary compensation after a condemnation).
5. Limitation
   The public health action that invades rights of individuals or legal entities may only last until the legitimate goal is achieved or it has turned out that this goal is no longer achievable.

The principle of proportionality is the fundament of the substantive legal balancing of conflicting rights. As such, it is accepted in most jurisdictions. In some jurisdictions, it is explicitly codified (e. g., Germany). The European Court of Justice has acknowledged that the "principle of proportionality" is an element of primary European Community Law. It is noteworthy that the principle of proportionality not only limits but also provides legal and moral guidance for the exercise of sovereign powers.

Relevance on all Levels of Public Health

Legal balancing of conflicting rights is relevant on all levels of public health law. Hence, it is part of the day-to-day practice of public health agencies, public health lawyers, courts and legislators and their legislative draftsmen. In their decision-making process, all of these actors have to meet the criteria of procedural and substantive legal balancing. Analysis of the public health threats and weighing of the negative consequences of public health actions is a necessary element of public health practice. It is critical to ensure that no rights of others are unduly infringed.

With respect to procedural legal balancing, on all levels of public health law, procedural instruments are in place to ensure that the persons affected by the decisions have the opportunity to present their arguments and facts (e. g., procedure laws at court, parliamentary hearings, administrative procedure laws and hearings). Thus, the decision-maker must become aware of all involved rights. Then, the substantive legal balancing weighs and adjusts the involved rights in order to find a reasonable solution to the conflict. In conclusion, legal balancing resolves legal conflicts. It belongs to the most important but also most challenging tasks of public health practice.

Cross-References

- ▶ Administrative Law and Public Health
- ▶ Criminal Law and Public Health
- ▶ Ethics
- ▶ Human Rights and Public Health
- ▶ Legal Basis of Public Health
- ▶ Public Health Law, Legal Means
- ▶ Tort Law and Public Health

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Legal Basis of Public Health

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Synonyms

Legal foundation of public health; Legal fundament of public health

Definition

The legal basis of public health is rooted in the population's rights to health, safety and life. As the population is the sum of its individual members, it stands for the sum of the interests and rights of these individuals. The populations mandate the state via constitutions to safeguard and promote their health and to protect them from harm. The population's right to health, safety and life and the respective right to self-defense are the basis and justification for the existence of public health. Public health is not an end in itself. It is a state service and duty vis-à-vis the people, from whom all powers in the state derive. The state has to ensure a functioning public health system to safeguard and promote the population's health.

Basic Characteristics

Sources of Powers

States need sufficient legal powers to install public health systems and enforce individual public health measures. The main public health-related powers derive from the respective nation's ► constitution, which itself derives from the people. Each individual has the right to health, safety, life and self-defense, which is the right to protect himself from harm. Correspondingly, populations, which represent the sum of these individuals, also have the right to protect themselves from health threats. All populations have the right to protect themselves from harm to their health, safety and the lives of their members. In addition, the population – as each individual – has the right to take measures to promote its health. In democratic nations, the populations delegate these rights and powers through their national constitution to the state. All state powers derive from the people. Both the population's right to self-defense from harm and its right to promote its health are delegated to the state.

The state is the guardian of the common welfare and the individual rights and, therefore, has the constitutional duty and powers to take the appropriate measures to safeguard and promote the population's health. These powers are (in some jurisdictions) known as the "► police powers" (e. g., in the U.S.) or as "the danger defense powers" or in German speaking jurisdictions as *"Gefahrenabwehrrecht"*. The term "police" is rooted in the 19th century concept of the material "police", which included all state activities to avert dangers to public security and order and to eliminate offenses (Weber 2007). These powers include public health actions to protect individuals from harm to them-

selves, which is practically relevant for mentally ill persons or minors. In some jurisdictions, these paternalistic actions performed for the individual's own benefit are attributed to so-called ► *parens patriae* power of the state (Grad 1990; Gostin 2000; Bernheim et al. 2007).

In addition to the police powers, sources for state powers to safeguard and promote the public's health can derive from the power to regulate commerce and trade, the powers to collect taxes and the budget power, including the power to spend (Grad 1990; Gostin 2000). These additional state powers provide effective control tools as well as behavior-influencing means in the interest of the community's health and safety. For example, the power to control commerce allows the legal regulation of businesses and products as well as enabling the legal regulation of professions. The power to regulate trade allows the import of potentially harmful goods to be controlled and restricted. The tax power is a strong tool for influencing the behavior of individuals and companies as well as local municipalities. Through tax law, the state may create incentives for favorable behavior or may impose additional taxes on harmful products and acts to influence the population's behavior. The state also has the power to spend. Exemplarily, the U.S. Constitution authorizes the Congress (the U.S. legislator) to make "expenditures expressly for the public's health, safety, and well-being" (Gostin 2000). Similar laws exist in other jurisdictions, authorizing the state to spend in the name of the public's health. Overall, the police powers, the power to regulate commerce, trade and to collect taxes and the power to spend bestow the state with strong tools. In addition, constitutions regularly grant further powers to the state to provide additional means to directly or indirectly safeguard and promote the population's health. These powers particularly include the power to regulate the fields of labor, traffic, criminal law (► criminal law and public health), tort law, antitrust or environmental law (► environmental law and public health).

In conclusion, the legal basis of public health is rooted in the population's mandate to the state to protect it from harm. The legal means of public health are based on a variety of constitutional powers granted to the state. These allow it to take a broad range of measures to directly or indirectly safeguard and promote the public's health.

The Constitution and the State Organization

As highlighted above, the state's powers derive from the people. This assignment of powers is realized via the state's constitution. The constitution as the basic legal document of a state not only assigns powers to the state but also governs the state organization. In democratic jurisdictions, the constitutions provide the basis for the state organization and the powers allocated at the state institutions.

First, most constitutions institute a separation of powers in the country between the legislative, the executive and the judiciary powers.

Second, the constitutions arrange the legal responsibilities, authorities, duties and the scope of the powers granted to the respective state institutions. The constitutional state organization with its separation of powers and the attribution of responsibilities among these institutions is crucial for the understanding of how public health is practiced and which roles the state institutions play. The separation of powers is based on the split of the overall state powers into three separate areas. This leads to three different power fractions. As such, the legislative powers are assigned to the parliaments, the executive powers are assigned to the governments and the judiciary powers are with the courts.

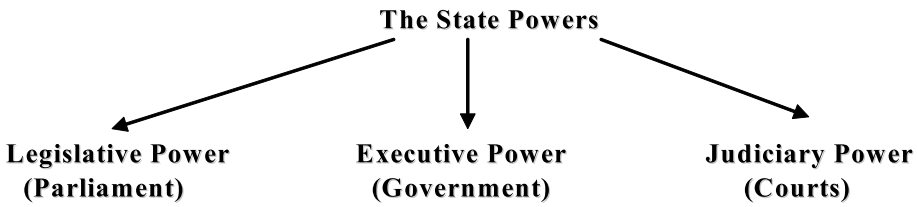
The separation of powers is intended to avoid an inadequate concentration of powers in one hand. By this separation, a system of checks and balances is installed (*See* also Gostin 2000). This constitutional separation of powers, as demonstrated in Fig. 1, describes the *horizontal separation of powers* on the national level in a country.

In addition to the horizontal separation of powers, for many countries a "vertical separation of powers" can be differentiated. This term refers to the differentiation and separation of:

- Federal powers;
- State powers of single states; and
- Local powers of municipal governments (self-administration).

The vertical separation of powers is particularly relevant in countries with a federal state organization consisting of a federal government and autonomous states with their own state governments and state constitutions (e. g., USA, Germany).

The two types of separation of powers play significant roles in the practice of public health. As such,



Legal Basis of Public Health, Figure 1 The Separation of Powers

► law has to clarify the responsibilities, competencies and interrelationships between the parties. With respect to the vertical separation of powers, law has to assign responsibilities among the three levels and provide for rules when federal competencies preempt state competencies. Particularly, to ensure emergency preparedness, law has to be made to dictate which institutions are in charge in an emergency situation and who is entitled to give instructions within the involved institutions. For example, after Hurricane Katrina in the U.S. (2005), the mayor of New Orleans complained that the federal government failed to adequately support the local institutions in coping with the natural disaster. Thus, it must be clear who of the three vertical powers is the responsible party when handling a certain public health threat, e. g., a natural catastrophe. In certain cases, it might be necessary that all three powers act to avert the threat. Therefore, a functioning public health system needs rules that provide for the competencies of the administrative institutions on the federal, state and municipal level. These rules are laid down in laws.

Correspondingly, rules are necessary to provide guidance in case of conflicting laws between the levels. Therefore, the constitution or enacted laws must provide for a clear hierarchy of laws. For example, for cases with conflicting legal rules for the same facts, the German law constitution ruled that "federal law breaks state law" (similarly, in the U.S.: "the federal law preempts the state law", Goodman et al. 2007).

Legal Actors in Public Health

The *parliament as the legislator* is the country's lawmaker. By law-making, the legislator is able to build the fundament of public health practice. The legislation follows a specific procedure laid down in the underlying constitution. The law-making process regularly includes public hearings and the involvement of practitioners as well as public health agencies. The parliament enacts statutes (e. g., bills or acts) and creates and funds state institutions. In addition, the parliament has the power to collect taxes, to budget and to spend so that major decisions on expenditures depend on the parliament.

The *government as the executive power* in the state is the central actor with respect to public health and ► public health law. As the executive power, the government is the central addressee of the people's (the population's) mandate to protect their health and safety. As early as 1776, the Virginia Declaration of Rights stated "[T]hat government is, or ought to be, instituted for the common benefit, protection, and security of the people, nation or community; of all the various modes and forms of government that is best, which is capable of producing the greatest degree of happiness and safety and …". The government must be the central actor of public health practice. Protecting public health and safety is probably the most important obligation and power of the government.

The government heads the state's administration. It oversees numerous administrative agencies, which may be regulatory or non-regulatory, and delegates powers to these agencies to accomplish their mission. The governments are entitled to draft and promulgate regulations. Administrative regulations are not statutes but they are nevertheless legally binding rules. They commonly specify general or abstract legal terms and rules (e. g., the current "state of the art").

Another powerful tool of the government and its agencies is the right to set standards and rules (e. g., for the maximum concentration of certain substances in the air). The setting of standards and rules is a widely used tool, particularly in environmental law and occupational safety law. Finally, the government and the administrative agencies are entitled to issue administrative orders to regulate individual cases.

The *courts represent the judiciary power*. Courts review enacted laws and interpret their legal rules. They enforce laws and resolve legal conflicts. They may

repeal laws as being in breach of the constitution. Courts are crucial for the enforcement of laws and they may be called if preliminary injunctions are necessary. Only courts are authorized to sentence a person to criminal punishment. Courts may grant remedies if individuals were improperly affected by the state institutions. They may also stop administrative actions and, in doing so, limit the power of the government.

As a new model of lawsuits, cases are brought to court where individuals demand the (state or local) government to take measures against a certain public health risk. As such, in Germany, a city government was convicted by the Federal Administrative Court to take appropriate public health measures to reduce the air pollution with regards to dangerous micro dust particles. This type of lawsuit is filed by private persons or public health advocacy organizations. It primarily intends to ensure and promote the public's health by calling for safeguarding government action.

Where statutory laws were lacking sufficient rules, courts have developed legal doctrines by case-law throughout all jurisdictions worldwide, not only in the common-law countries (for tort law, *See* McClurg et al. 2007). Overall, courts and judges have contributed significantly to the assurance and promotion of the public's health (Parmet and Daynard 2000). Their importance in contemporary public health seems to be increasing.

Among the *other actors*, private sector entities regularly act in the realm of public health. Governments and administrative agencies are entitled to include private sector service providers in the supply of public health services. Such cooperations need to be based on a corresponding ► contract. Non-governmental organizations also play an important role in the day-to-day public health service. In addition, international organizations with public health missions as well as international legal documents with public health relevance deserve particular attention. The international institutions, particularly, the World Health Organization (WHO), the United Nations Environment Program (UNEP) or the World Trade Organization (WTO) play increasingly important roles in an ever more globalized world. The legal handling of global public health activities will require legal grounding (e. g., international agreements), which might lead to a modification of the legal basis of public health.

Cross-References

► Administrative Law and Public Health
► Ethics
► Health Information
► Human Rights and Public Health
► Public Health Law, Legal Means

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Legal Conflict Resolution

► Legal Balancing of Conflicting Rights

Legal Foundation of Public Health

► Legal Basis of Public Health

Legal Fundament of Public Health

► Legal Basis of Public Health

Legal Instruments of Public Health

► Public Health Law, Legal Means

Legal Issues in Public Health Genetics

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Definition

The communal and individualistic legal issues pertaining to the field of genetic science that assesses the impact of genes and their interaction with behavior, diet, and the environment on the public's health.

Basic Characteristics

Legal Issues Overview

Developments and advancements in genetic technology implicate a number of legal and ethical issues that must be considered when planning for and developing policies regarding public health genetics. Legislation and administrative regulations emphasize the importance of an individual's right to specific, written ► informed consent prior to ► genetic testing or screening. As the ability to access and identify individual ► genetic information has improved, individuals have become more concerned about the ► privacy of their identifiable data and potential unwarranted discrimination, particularly by employers and insurance providers, that could result from their disclosure. Additionally, advances in technology have enabled wider use of genetic information for public health, research, and forensic purposes through the creation of DNA databanks. The development and maintenance of DNA databanks have raised additional privacy concerns regarding the use and storage of genetic information.

In response to these concerns, laws have increasingly focused on issues related to public health genetics and the collection and use of genetic information. These laws tend to treat genetic information or genetic tests differently from other personally-identifiable health information by attempting to establish heightened protections for genetic data or tests. This legal trend is often referred to as ► genetic exceptionalism.

Informed Consent

Principles of ► autonomy strongly support an individual's right to informed consent prior to genetic testing or screening for public health purposes. Prior to the administration of a test, patients are entitled to explanations of the nature and scope of the information to be gathered, the meaning of positive test results, the underlying disease or condition, and any appreciable risks involved in the testing or activities following a positive result (Beauchamp and Childress 1994). With this information, patients can weigh the benefits of genetic testing against appreciable risks and make an informed decision. However, misunderstanding of complex genetic science and uncertainties in the meaning of test results can blur the value of informed consent (Gostin et al. 2001). Under most circumstances, there is little justification to mandate genetic testing or screening without informed consent in a public health context. Some public health initiatives involving genetic testing, such as mandatory newborn screening programs, are justified without consent by legal principles (a.k.a. parens patriae powers) allowing the state to protect the health of children (Khoury et al. 2000).

Privacy and Discrimination

Advances in technology in recent years have improved the ability to collect and store individual genetic data in electronic and inchoate databases. The proliferation of the databases and expanding demands for genetic data uses and disclosures contribute to individual concerns about the privacy of genetic data. Unauthorized uses or disclosures can lead (and have led) to discrimination on an individual or group basis through insurers, employers, government agencies, and others (Husted and Goldman 2002). Health, life, and disability insurers may seek to use genetic test results to limit or deny coverage (Hodge, Health Information Privacy 2004). They maintain that genetic information is necessary to

effectively assess risk and determine appropriate coverage. However, use of this information could unfairly limit access to health or life insurance, particularly for high-risk individuals for whom adequate coverage is essential. In an employment context, individuals fear that employers may reject applicants for positions or advancement based on their genetic information for two primary reasons: (1) to avoid having to pay high health care or health insurance costs in the future; and (2) to limit the costs of employing an individual with a disability or illness that could potentially hinder his or her production. Federal and state anti-discrimination laws (genetic-specific or otherwise) attempt to limit stigmatization of individuals on genetic bases (Rothstein 1998).

Though important, individual privacy interests in genetic information are not absolute. Others may have a "right to know" about an individual's genetic profile. Spouses, offspring, and close family members may claim a right to share in the knowledge of an individual's genetic test results. Public health officials conducting surveillance or health researchers performing longitudinal genetic studies also have legitimate claims to access an individual's genetic data (Hodge and Fuse Brown 2005). Such individual or communal needs for individual genetic information are supported by normative principles of beneficence or justice, or utilitarian ideals, but can impinge the privacy rights of individuals participating in public health ► genetic screening programs. Effectuating an appropriate balance between respecting individual interests and communal public health is critical (Gostin 2000).

DNA Databanks

The ability to use and store ► genetic information has increased significantly in recent years, mainly through the development of DNA databanks. DNA databanks are used in a public health context to gather large, representative samples of health data from patients and their health care providers. Genetic information is also used and stored for forensic purposes: to allow investigators to identify potential suspects in a criminal setting; to help identify victims of catastrophes; and to determine family relationships, such as paternity, between individuals. In addition, it can aid in matching organ donors and recipients who need transplants (Gostin et al. 2001).

Genetic collaborations among clinicians, researchers, and public health practitioners is ongoing. The federal Centers for Disease Control and Prevention (CDC) has gathered and banked over 19,000 DNA samples in the Third National Health and Nutrition Examination Survey (NHANES III) among non-institutionalized civilians in the United States between 1999 and 2000. Greater than 80% of the citizens of Iceland participated in a massive collection of identifiable genetic data for pharmaceutical research purposes in the late 1990's. Genetic researchers have used population-based disease registries to estimate absolute and relative risks of breast cancer for those with BRCA1/BRCA2 mutations. Through preventive screening, health promotion, and education, public health programs have the ability to bridge research findings with clinical and public health practice (McQuillan et al. 2003). Genetic databanks further this purpose by allowing genetic information to be efficiently organized and stored and making it readily available to public health practitioners. Yet, privacy concerns abound, thus necessitating strong ► confidentiality and security protections for public health genetic data (Gostin et al. 2001).

Genetic Exceptionalism

As mentioned above, individual ► privacy and anti-discrimination concerns relating to ► genetic testing have led many states to adopt genetic-specific privacy and anti-discrimination laws to protect persons from wrongful acquisitions, uses, or disclosures of individually-identifiable genetic data (Hodge, Ethical Issues Concerning Genetic Testing 2004). These laws treat genetic information differently from other personally identifiable health information and typically establish heightened protections. The premise underlying ► genetic exceptionalism is that genetic information needs special protections because it is different from other health data for many reasons (Gostin and Hodge 1999). Foremost among these is the predictive nature of genetic data. Unlike most other medical records that describe an individual's past or current health condition, genetic tests can identify (with varying degrees of confidence) increased risks of future diseases in otherwise healthy individuals (Gostin et al. 2001). However, considerable debate exists as to whether genetic data are sufficiently unique to garner additional protections that exceed other health information. Increasingly, federal and state

policymakers are refining legal privacy and antidiscrimination protections of genetic data or tests to reflect the view that such data or tests are part of the continuum of an individual's longitudinal health record. As a result, broader health privacy and antidiscrimination protections that include genetic data proliferate (Centers for Disease Control 2001).

Cross-References

- ► Autonomy
- ► Confidentiality
- ► Genetic Exceptionalism
- ► Genetic Information
- ► Genetic Screening
- ► Genetic Testing
- ► Informed Consent
- ► Privacy

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Legal Regulation of Professions, Businesses, and Products

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Synonyms

Commercial regulation

Definition

Legal regulation of professions, businesses, and products comprises the legal supervision of the entry of businesses and professions as well as their conduct. Another focus of this field is the regulation of public health relevant products, which includes control of the placement of products on the market, safety vigilance, and consumer oriented duties (e. g., information and instruction) during product marketing. Legal regulation of businesses and products also governs business or product-related commercial speech.

Basic Characteristics

Background and Context

Public health practice has to observe the conduct of a large number of businesses and the health effects of numerous products. Naturally, a wide range of public health risks is linked with the conduct of certain businesses and professions. The same is true for the marketing and use of a multitude of industrial goods and consumer products. Therefore, legal regulation of businesses and products is a major component and the centerline of contemporary public health practice. On the other hand, the rights to choose and conduct a profession and business as well as product-related property rights (e. g., a ► patent) are under the particular protection of the constitution. Therefore, the regulation of professions, businesses, and products operates on sensitive legal ground.

Among the ten great public health achievements of the 20th century in the U.S., published by the CDC, three are directly related to the public health regulation of businesses and products. These achievements are "safer and healthier foods", "motor vehicle safety", and "recognition of tobacco use as a health hazard"

(CDC 1999). The three achievements have particularly been realized through legal regulation of the respective business sections and products. This regulation included supervision of business conduct and product marketing, obligatory safety precautions, safety surveillance in the marketing period, and the regulatory accompaniment of these products and associated businesses that handle food, motor vehicles, or tobacco. In addition, among the ten great achievements, "safer workplaces" can be traced back to the regulation of industries and businesses as well as health relevant products (e. g., asbestos). This essay therefore deals with an essential working field of contemporary public health. For this field, a sufficient legal underpinning is essential.

Subjects of Legal Regulation

The public health activities under the heading of this essay focus on:

- Individuals engaged in public health relevant professions and businesses;
- Companies engaged in public health relevant industries and businesses;
- Products with potential impact on the public's health.

The *legal regulation of professions* in the realm of public health was first directed towards the regulation of health professionals (e. g., medical doctors, pharmacists, nurses, paramedics). Therefore, medical professions are subject to intensive statutory and administrative regulation. This includes not only ► licensing to access these professions but also stipulation of the education and training curricula to obtain the necessary qualifications. Some of these regulation elements will be discussed below. It is important to note that public health regulation of professions goes far beyond the health professions and encompasses several other professions with potential impact on the public's health. Among these professions, cooks, butchers, other food handling professions, retailers, constructors, truckers, restaurant operators, hairdressers, public health officers, and farmers may be identified, for example.

Corresponding to professionals, the *legal regulation of businesses and companies* engaged in public health relevant industries and businesses comprises companies with direct relevance to the public's health as well as companies with rather indirect public health reference. Again, the regulated businesses extend the scope of direct health-related businesses like pharmaceutical and medical device companies, hospitals, or drug stores. Moreover, the regulation includes, among others, the whole food and beverages industry, chemicals, construction (e. g., asbestos!), tobacco, clothes, toys (such as the worldwide product recalls in the year 2007 because of elevated lead concentrations in baby toys), electronic household equipment, rifles, and the waste industry. Substantively, the regulation of companies has two compartments:

- Regulation with respect to health risks to the general public; and
- Regulation with respect to health risks to company employees (occupational safety regulation).

The occupational safety laws will be subject to a separate essay. Therefore, in the following, the legal aspects of business regulation will be elucidated.

Finally, the *legal regulation of products* with potential impact on the public's health covers a variety of products that are hard to oversee. As with the regulated companies and businesses, the range of regulated products includes goods that are directly used in the health context (e. g., pharmaceuticals, medical devices, food) and other products with direct or indirect impact on the public's health (e. g., automotives, chemicals, toxic substances, construction materials, mobile phones, electrical equipment, clothes). The regulation of products also governs product-related information materials like package leaflets or instruction manuals.

Elements of Legal Regulation

To a considerable extent, the type of legal means applied within the regulation of professions, businesses, and products are similar and have similar starting points. Thus, for all three subjects, the regulation comprises the whole life-cycle of the respective product, business, or professional conduct. Therefore, life-cycle related regulation focuses on several distinct stages:

- Regulation of the access to a market for products, professionals, or companies (e. g., licenses, concessions, registrations, product marketing authorizations);
- Direct regulation and supervision of the business conduct or a product's marketing and use (e. g., inspections, sanctioning of legal non-compliance, regulation of advertising, setting compulsory safety standards, restrictions of product access by children

and adolescents, ban of materials for production and use);
- Indirect regulation of the business conduct (e. g., providing incentives through tax laws, indirect regulation by tort liability, criminal law prohibitions, and civil sanctions);
- Regulation of the continuation and end of the market presence (e. g., prohibition and closure of businesses; revocation of licenses and product marketing authorizations);
- Occupational safety regulation.

Accordingly, public health regulation is first relevant at the stage of access to a commercial market by a professional, a company, or a product. For professionals and businesses, public health agencies regularly require that a concession, license, registration, or other form of administrative permission is obtained. The licensures are a basic tool of public health practice and maybe the most important legal instrument of commercial regulation (*See* Gostin 2000). Similarly, products with public health relevance routinely need to fulfill particular requirements prior to entering the market. These requirements may consist of marketing authorizations (e. g., pharmaceuticals) with additional specific prerequisites like the conduct of clinical trials. Such product-related requirements commonly include technical and safety measures (*See* the technical safety requirements for automotives).

After having obtained market entry, regulation continues at the next stages. Public health agencies supervise the conduct of the business as well as a product's use and marketing and its safety findings. One particular element of this segment of regulation is the regulation of commercial speech (Gostin 2000; Gostin and Jacobson 2006). For a large number of products and businesses, public health authorities have imposed restraints on commercial speech; these consist of restrictions and prohibitions in advertising and public information (e. g., alcohol, tobacco, pharmaceuticals). Additionally, companies and manufacturers are forced to disclose safety-relevant information even if this disclosure is disadvantageous for the marketing of a product.

Regulation of business conduct and product marketing particularly includes regulatory surveillance, granting permission for the agencies to inspect the businesses, order inquiries, conduct hearings, and impose reporting duties. The agencies are entitled to impose legal restraints and limitations on the business conduct and product marketing, including trade restrictions. In case of emergencies, the agencies are entitled to inform the public about the health risks. This section of public health regulation may include manifold further obligations, which cannot be discussed in detail here.

Finally, for the regulation of business conduct and product marketing, the public health agencies need sufficient legal authorization. The powerful legal means in this realm include prohibition of businesses, closure of factories and businesses, ban from professions, revocation of licenses, and withdrawal of product marketing authorizations. The marketing of certain goods may be limited to certain people or (relevant for pharmaceuticals) to certain indications. Health departments and regulatory agencies may order the recall of products from the market and terminate their economic life-cycle.

Legal Regulation of the Pharmaceutical Industry

In conclusion, legal regulation in the interest of the population's health is attached to all steps of business conduct or product marketing so that public health agencies accompany the actors from their market entry up to the moment of market exit. A very good example for the regulation of businesses and products is the regulation of the pharmaceutical industry and the drugs as their products. In most jurisdictions, pharmaceutical companies must fulfill certain requirements prior to receiving a permit to conduct their business. They need to establish the personal and organizational infrastructure of the production process as well as undertaking pharmacovigilance duties. Prior to placing a drug on the market, the company must conduct clinical trials, which again have to follow strict rules. The clinical trials themselves need regulatory permission and an assessment by an institutional review board or ethics committee. Within the conduct of the studies, the Good Clinical Practice obligations expect attention. Based on the clinical trials, pharmaceuticals will be evaluated and, finally, receive a marketing authorization. After the receipt of this authorization, the product may enter the market. However, the production must observe Good Manufacturing Practice. During the whole marketing period, the pharmaceutical company must continuously review the safety profile of the drug. The company must establish a pharmacovigilance system in order to collect risk information in conjunction with the practical administration of the drug and take appropriate risk reduction

measures. The agencies must be informed about the obtained risk information. With increasing information, the marketing authorization regularly undergoes variations, which need to be coordinated with the regulatory agencies. In addition, the marketing authorization needs to be prolongated after certain periods of time. Within this review process, all information on the product's benefits and risks are collected and evaluated. Pharmaceutical companies must meet extensive reporting and notification obligations regarding safety information as well as (in many jurisdictions) mandatory insurances. During the marketing period, most jurisdictions prohibit extensive advertising and restrict product advertising accordingly. In Europe, public advertising for prescription drugs is not allowed. Finally, based on the pharmacovigilance information, the regulatory agencies decide whether the product should remain on the market or not. Further product-related regulations on pharmaceuticals cannot be elucidated at this point. In summary, pharmaceuticals and pharmaceutical companies are subject to closely meshed regulation throughout their whole lifecycle.

Legal Concerns

In accordance with comments of scholars, it must be noted that from a legal perspective the "public health regulation of commercial activity, like the regulation of professional behavior, is highly contested terrain" (Gostin 2000; *See* also Reynolds 1995). The regulation of professions, businesses, and products is associated with relevant ramifications on the rights and freedoms of the regulated individuals and companies even though it is necessary for public health and consumer protection purposes. In this realm, the economic liberty and property rights play important roles and limit the regulation. All individuals and companies have the right to choose and conduct a certain business. Therefore, regulation of access to a business or market is a far-reaching legal tool restraining the basic rights of individuals and companies. Similarly, the imposition of professional duties like mandatory reporting impacts the rights and freedoms of the regulated professional to conduct his business the way he feels most appropriate. Such obligations also have associated costs, which the professional or the company has to bear.

In addition to property rights, the business or product-related restrictions of commercial speech encroach the constitutional freedom of speech of professionals and companies. As another aspect, the legal regulation of products often impacts property rights and professional freedoms so that, prior to such decisions, careful legal balancing is necessary. In fact, the highly contested nature of the legal regulation of professions, businesses, and products calls for particular awareness of the conflicts between the public's right to health and safety and the economic rights, freedoms, and commercial interests of the professional market actors.

This area of public health practice has points of contact with a number of other public health practice fields. Among these, occupational safety regulation was already noted above. Additionally, information and communication in the scope of public health, infectious diseases law, environmental law, tort law, and criminal law as indirect public health regulation means are relevant in cases of misconduct. The right balance is necessary between the safeguarding and promotion of public health and the right to conduct business autonomously. Public health law does not intend to impede businesses and, therefore, has to navigate between enabling businesses and product marketing and controlling and, at the same time, mitigating the public health risks tied to these businesses and products.

Cross-References

- ▶ Criminal Law
- ▶ Environmental Law and Public Health
- ▶ Infectious Diseases Control Law
- ▶ Labor and Occupational Safety Law
- ▶ Public Health Law, Information and Communication
- ▶ Public Health Law, Legal Means
- ▶ Tort Law and Public Health

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Legal Tools of Public Health

► Public Health Law, Legal Means

Legionellosis

Synonyms

Infection with Legionella pneumophila; Legionnaire's disease

Cross-References

► Water Quality and Waterborne Infectious Diseases

Legionnaire's Disease

► Legionellosis

Leishmaniasis

Synonyms

Infection with Leishmania

Cross-References

► Tropical Diseases and Travel Medicine

Leishmaniasis, Cutaneous

Synonyms

Leishmaniasis of the skin; Oriental sore; Delhi boil; Baghdad boil; Balkan sore; Saldana

Definition

Cutaneous leishmaniasis primarily appears in South Europe, Asia and Africa. It is characterized by itching and papulous efflorescences of the skin, which later develop into sharply limited lesions (ulcers). One has to differentiate between two forms of cutaneous leishmaniasis, dry and wet. In the dry from, which is most frequently caused by *Leishmania tropica*, painless, dry ulcers develop. The moist form, which is most often caused by *Leishmania major*, is characterized by secreting ulcers, which sometimes enlarge. Within 3–18 months cutaneous leishmaniasis heals with scarring. Often, treatment is not necessary at all. Possible therapeutic measures are tissue injections with antimony preparations and the administration of dapsone, ketoconazole or amphotericin B.

Leishmaniasis, Mucocutaneous

Synonyms

Leishmaniasis of the mucous membranes; Uta; Espundia

Definition

Mucocutaneous leishmaniasis, which is caused by *Leishmania braziliensis*, is primarily found in South America. Infection starts with a reddening and swelling at the point of entrance, which later on ulcerates. During the course of the disease, the mucocutaneous membranes of the nose-throat-area can be involved. When spreading along the inner airways, the parasites can cause ulcerations and mutilations. Among other things, the nose septum can be involved; with the destruction of the septum the nose collapses, a so-called 'tapir's nose' results. Therapy consists of the administration of sodium antimony gluconate, meglumine antimoniate, pentamidine and allopurinol. Another effective substance for the treatment of mucocutaneous leishmaniasis is amphotericin B.

Leishmaniasis of the Mucous Membranes

► Leishmaniasis, Mucocutaneous

Leishmaniasis of the Skin

► Leishmaniasis, Cutaneous

Leishmaniasis, Visceral

Synonyms

Kala-Azar; Dum-Dum fever

Definition

Visceral leishmaniasis, which is also called "kala-azar" (Hindi for "black fever") or "Dum-Dum fever", belongs to the classic parasitoses. It is transmitted by the bite of the sand fly. Transmission is also possible by needle stick injury, transfusion, transplantation or as an intrauterine infection via the placenta. Kala-azar is characterized by an affection of inner organs; lymph nodes, spleen, liver and bone marrow are primarily involved. Visceral leishmaniasis starts with fever, stomach ache, diarrhea and loss of weight. As the disease progresses there are recurrent fever episodes, a reduced general condition, hepatosplenomegaly, edema, ascites and internal bleeding occur. Laboratory test results show anemia, low white blood cell count (leucopenia) and low platelet count (thrombopenia). Without therapy, kala-azar has a deadly outcome within 1–2 years; effective treatment can reduce lethality to 3–20%. Therapy consists of administration of intramuscular or intravenous pentavalent antimonial (Sb^v) compounds. For a couple of years, a new substance, miltefosin, has been available, which can be administered orally.

Leisure Time Physical Activity and Sedentariness

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Definition

Leisure time physical activity refers to all of the behavior connected with ► physical activity that people engage in in their freely disposable time. Hence, there is a distinction between it and physical activity which is engaged in as part of gainful employment or in the context of daily life. In particular, however, the boundaries between leisure time activities and everyday activities are blurred because of their situational and subjective nature. As specific forms of leisure-time behavior which consciously aim at improving physical fitness, ► sport and exercise constitute the core area of leisure time physical activity.

Describing the same problem from the opposite perspective, sedentariness is a concept or term which refers to a physically ► inactive lifestyle. It is embedded in social and mental behavioral patterns and caused by current developments in the work and leisure sector of our societies (Brettschneider and Naul 2004).

Basic Characteristics

► WHO estimates that physical inactivity is the cause of approximately 2 million deaths a year. The proportion of physically inactive or insufficiently active people is estimated at 17% and 41%, respectively. These average figures are even exceeded in the developed countries and particularly in the major cities with their environments that are less conducive to exercise (WHO 2004). In modern Western societies, daily energy consumption has fallen by approximately 800 Kcal over the past five decades, which is the equivalent of walking 16 km (Hardman and Stensel 2003), and in Europe, two thirds of adolescents do not follow the recommendation of engaging in moderate exercise for an hour a day (Brettschneider 2004).

Leisure Time as a Sphere of Physical Activity

Until late in the second half of last century, the bulk of physical activity was engaged in during gainful employment. However, technological developments and structural changes in the working world, combined with shorter working hours, and particularly a shorter total working life, have led to a situation where only 20% of the population in the European Union today still engages in fairly intensive physical activity (EU 2003) within the framework of gainful employment. A similar picture emerges with regard to physical demands in the area of housework and mobility. For instance, the spread of washing machines in Germany rose from just 9% to 89% between 1962 and 1993 (Heßler 2001) and the proportion of journeys made by bicycle in the EU is a mere 5% (WHO 2000).

Not only has the total energy balance decreased overall as a result of the smaller amount of physical activity but there have also been significant shifts in terms of the context in which physical activity is carried out and can be carried out today. As a result, the functional correlation between work and leisure time has also changed. Instead of primarily contributing to regeneration after heavy physical work, leisure time and the activities undertaken during leisure time perform the

opposite function today and are therefore intended to compensate for a lack of exercise and psycho-social stresses at work.

Leisure Patterns and Behavior

Almost all empirical surveys prove that the leisure activities most frequently engaged in are predominantly sedentary and physically inactive recreational activities such as reading, resting, talking on the phone or watching television, while active habits play a subordinate role. With regard to physically active leisure-time activities, extensive data is available on sports activities. Other physically active habits during leisure time have only been recorded and analyzed sporadically owing to their less structured nature and the associated systemic difficulties. With regard to the spread of a sedentary lifestyle during leisure time, it is mainly the use of the media that has been investigated to date.

Sport During Leisure Time

The percentage of the population that actually regularly engages in sporting activity is relatively small. A comparative study of European Union countries which was conducted in 2004 was able to show that only 38% of the EU population engage in sporting activity at least once a week and only 17% do so 3 times or more per week. In the EU however, 51% of people do not engage in any form of sport whatsoever (EU 2004). The by and large low level of participation in sport becomes even clearer if the assessment is based on time budget data instead of on the self-reported frequency of sporting activity. Here, data from European time budget surveys carried out during the period from 1998 to 2002 shows that on average 15–30 minutes a day is spent on sport and exercise in the broader sense (including activities such as going for a walk or picking mushrooms). In no European country do people spend more than a quarter of an hour a day on sporting activity in the narrower sense. In the less active countries of southern Europe, the figure is in some cases even less than 5 minutes (van Bottenburg 2005).

This is average data. However, all of the studies conducted on sporting habits indicate that, in spite of the successful opening up and ► democratization of sport on the lines of the Sport for All movement, there are also still major differences in respect of regional participation in sport and different prevalence based on socio-demographic characteristics. Thus, an international comparison shows up a clear North–South divide with higher participation in sport in the Scandinavian and central European countries (van Bottenburg 2005). Furthermore, it is evident that men by and large are more active in a sporting sense than women and that younger people are more active than older people. However, the influence of gender and age on individual sporting habits is progressively declining (ibid.); socio-economic status and the level of education, on the other hand, continue to influence the likelihood of participation in sport as strongly as ever.

Use of the Media and TV Consumption

Use of the media, especially television, dominates leisure-time behavior in all developed countries. In Germany, for instance, 98% of the population above the age of 14 watches television at least once a week. The average viewing duration is 110 minutes for adults (► HETUS), 108–109 minutes for children and adolescents and significantly more for the over 65s (143 minutes). The results of research on changes in viewing duration are contradictory (Brettschneider 2004). The growing number of permanent viewers should be highlighted. Approximately 15% of European children and adolescents between the ages of 11 and 15 watch four hours or more of television a day. In some European countries, the figure is even close to 40% (ib).

Computer use also plays a major role in leisure-time behavior. However, unlike television, computer-related activities have not yet caught on equally in all developed countries or in all social classes. In Germany, for instance, significantly more frequent computer use during leisure time is evident in cohorts born before 1976 (HETUS). Similarly to TV consumption, the percentage of heavy users is also important here: 13% of adolescent Europeans spend 3 hours a day at the computer; at weekends, the figure even rises to 24% (Brettschneider 2004).

Conclusion

Physical inactivity and the high prevalence of a sedentary, inactive lifestyle are a huge threat to general health, although the problem is no longer confined solely to the highly developed societies of Europe and North America but has also spread to the less developed

countries. Against the backdrop of structural and technological development, an increase in physical activity for the majority of the population can only be achieved by boosting physical activity in the area of daily activities and by changing leisure-time behavior. In this regard, it must in particular also be ensured that no two-tier society develops in which people with a lower socio-economic status and educational background are also disproportionately often inactive and are thus exposed to a higher health risk. Measures that help target groups who are particularly at risk to change their leisure-time behavior and that make it possible for broad social classes to gain preferably barrier-free access to physically active leisure-time activities therefore represent an important and cost-efficient contribution to public health.

Cross-References

- ► Physical Activity
- ► Public Health
- ► WHO

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Leprosy

Synonyms

Hansen's disease

Definition

Leprosy is chronic, mildly infectious illness that produces, if untreated, various deformities and disfigurements. It is caused by the rod-shaped bacterium *Mycobacterium leprae*. The mode of transmission is not fully understood. It is thought to be transmitted by nasal discharges and skin sores, possibly also by contaminated objects and arthropods. Only 5% of those exposed acquire the disease. The onset is intermittent and gradual; symptoms may not appear until years after exposure. It is seldom fatal, but its involvement of the peripheral nerves destroys sensation and makes the patient prone to inadvertent injury.

Lethality

- ► Mortality

Level of Measurement

Synonyms

Scale of measurement; Taxonomy of data/variables; Steven's classification system

Definition

The level of measurement of a variable is a classification proposed in order to describe the nature of information contained within numbers assigned to objects or subjects, therefore within the variable. It refers to the degree to which characteristics of the data may be modeled mathematically. The most frequently used classification of measurement scales in biostatistics is one defined by Stevens, who proposed four level of measurement: nominal, ordinal, interval, and ratio. Each involves different properties (relations and operations) of the numbers or symbols that constitute the measurements as well as a set of permissible transformations.

The nominal scale (or Level of Measurement) only classifies or categorizes values of the variable. The ordinal scale is used to order or rank values of variables in addition to naming variables. For the interval scale, equal differences between measures represent equal differences in the values of the variable, and there is not an arbitrary zero point. In the ratio scale, any two adjoining values are the same distance apart and there is a true zero point (the complete absence of any amount of the variable).

Liability of Public Authorities

► State Liability

Liability Without Fault

► Strict Liability

Liberalism

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Liberalism would stress human rights and individual opportunities and would protect the individual from some abuses which have taken place in the past in the name of the common good.

Liberalism and Libertarianism

Definition

Liberalism is a political philosophy that puts a high value on the liberty of each human being and rejects authoritarian control. So every person ought to do what s/he prefers to, as long as s/he treats other human beings with respect. Liberalism comes in two flavors: On the one hand, there are libertarians who hold the opinion that the state should guarantee complete individual freedom without infringement of personal choice. This means – in its extreme form – no government-provided social services, and only a bare minimum of taxes and trade regulation (e. g. merely a protection of ownership). Egalitarian liberals (► Egalitarianism), on the other hand, believe that the right of choice requires adequate resources. This implies a positive right to a minimum level of resources and services to ensure equal opportunities.

Lice

Synonyms

Pediculosis

Definition

Lice, wingless insects with six stout legs and claws, spend their whole life on their host and cling tightly to the host's hair. Eggs (0.5mm), the so-called nits, are laid near the proximal part of the hair shaft. They are attached with a specialized saliva, causing a bond which is difficult to separate. Eggs hatch into nymphs; following three nymphal stages, the adult stage is reached. The whole cycle of development (from the egg to the adult louse) lasts 30–41 days. The characteristic symptom of an infestation with lice is itching. One can distinguish between head lice (pediculosis capitis), body or clothing lice (pediculosis vestimentorum) and pubic lice (pediculosis pubis, ► sexually transmitted diseases, STD). As for children, the most common lice are head lice. Lice cannot jump; transmission from one individual to another takes place by direct contact. Away from their host lice can only survive for a short time, as they feed on blood and need specific surroundings (like a certain temperature). Nits can be scraped off the hair with a special nit comb, which is a comb with very fine and close teeth. The medical treatment consists of the application of malathion, pyrethrum or permethrin. The advantage of permethrin is that it has to be used only once. In cases of body or pubic lice, clothing and bedclothes should be washed at a temperature of at least 60°C. Lice at all their different stages (eggs, nymphs) can be killed by freezing or by keeping clothing, soft toys and other articles in plastic bags for a couple of days.

Licensing

Synonyms

Licensure

Definition

In administrative law, licensing means the regulatory legal tool to regulate professions, businesses, and products. The key instruments of licensing are licenses, permits, and other means of regulatory supervision of the entry and conduct of professions and businesses. The license stands for the regulatory permission to take on a regulated profession or a regulated business or to develop and market a product that is subject to governmental regulation (e. g., pharmaceuticals, medical devices). Governmental licenses are revocable. In contrast, under private law, licensing means agreements with which holders of intellectual property rights allow others to utilize these rights vis-à-vis a license fee.

Licensure

► Licensing

Life Expectancy

Synonyms

Survival; Years of life; Longevity

Definition

Life expectancy is a statistical measure defined as the expected (mean) survival of human beings based upon a number of criteria such as gender and geographic location. Popularly, it is most often construed to mean the life expectancy at birth for a given human population, which is the same as the expected age at death. However, technically life expectancy means the expected number of years remaining to live, and it can be calculated for any age.

Life expectancy is a summary measure of mortality and survival in a population, often used for comparisons across time and between countries. Using a demographic life table, life expectancy can be calculated from any exact age as the average number of years lived from a particular birthday. Life expectancy at birth is a statistical measure of the average length of life in a given population. For populations undergoing ► demographic transition, life expectancy can increase with age in the early years, reflecting high rates of infant and child morality and showing that those who survive the high-risk early period have better prospects of survival. After this early period, remaining life expectancy declines with age.

Life Skills

Definition

Life skills are defined as follows in the context of health promotion: Life skills are abilities for adaptive and positive behavior that enable individuals to deal effectively with the demands and challenges of everyday life.

Life skills are needed to maintain and use social contacts in cases of life crisis, disease, and disability. In addition, they include decision making and problem solving, creative thinking and critical thinking, self awareness and empathy, communication skills and interpersonal relationship skills, coping with emotions, and managing stress. Life skills encompass social and communicative abilities as well as personal, interpersonal, cognitive, and physical skills that enable people to control and direct their circumstances in life, and to develop the capacity to live with and produce change in their environment.

Lifestyle

Synonyms

Way of life

Definition

A lifestyle is based upon an individual organization and expressive arrangement of everyday life and it forms a synthesis of conscious intentions and unconsciously experienced behavior, attitudes and objectives, and contacts and interactions with other people.

Individual lifestyles can be found, in the same or similar manner, in other people. Lifestyles show correlation but also differences. Lifestyles are determined by gender, age, education, work income, ethnic groups and social ecological environment.

Lifestyle is a way of living characterized by identifiable patterns of behavior based on an individual's choice, influenced by the individual's personal characteristics,

their social interactions, and socioeconomic and environmental factors.

Cross-References

► Culture
► Ethics and Culture

Lifestyle and Health Determinants

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Introduction

Good health is the most valuable asset a person can ever own. Until the first half of the 20th century mortality and morbidity were mainly affected by communicable diseases such as infectious and deficiency diseases. In the last decades life expectancy has increased continuously and the transition from infectious to degenerative diseases has created new lifestyle-related health problems. Thus, the conditions have changed and chronic non-communicable diseases have become a major burden both in the developed and in the developing nations. There are many factors that influence an individual's health. Whether a person falls ill depends on various exogenous and endogenous reasons. Generally, the idea of health determinants includes the social, economic and physical environment and additionally the person's individual characteristics and behavior (WHO 2007a). Thus, individual lifestyle determinants have a strong effect on a person's well-being.

Determinants such as unbalanced diet, a lack of physical activity and substance abuse can be linked to a number of major health problems (European Commission 2007). There is ample evidence that these determinants cause for example diseases like certain cancers, obesity or cardiovascular diseases. Thus, many diseases are related to people's behavior (Koelen and van den Ban 2004). Especially deprived populations and children have a smaller chance to achieve a well established health status and are the population group with the highest prevalence of non-communicable diseases. These conditions are normally caused by poor nutrition, low physical activity levels, smoking or alcohol abuse. Combined with economic, social and cultural circumstances as well as gender aspects they interact and affect the individual's health status. Taking different living conditions into account it becomes clear that preventing the public's health is a challenging mission for the individual itself but first of all for policies, institutions, the global market and the community. For this reason campaigns and interventions that address health promotion should also focus on cultural and socioeconomic factors. Therefor, actions and interventions in various settings, such as kindergartens, schools, workplaces or local communities could be realized efficiently by practicing healthy behaviors and using preventive healthcare services.

But there is a great demand particularly for policymakers and public health institutions to interact, identify deficiencies in health systems, propose broad health targets and communicate to implement health policies on national and regional levels. Thereby the overall goal to promote the population's health can be achieved. On the other side public health policies should be transformed into action with respect to the individual responsibility of the population. People make different choices about the way they want to live and consequently affect directly their health and well-being. Accordingly, tobacco and alcohol consumption, high blood pressure and obesity are risk factors that cause at least one third of all diseases in developed countries like North America, Europe and the Asian Pacific (WHO 2002). It is obvious that these circumstances lead to a broader encouragement to the individual itself and certain population groups in their settings always in consideration with current scientific basis.

An individual's lifestyle consists of a broad range of determinants that have an impact on health and well-being. The underlying chapter provides an overview about relating determinants. It is divided in the following subtopics: nutrition, obesity, physical activity, leisure time physical activity and ► sedentariness (► leisure time physical activity and sedentariness), environmental health determinants, economical health determinants, social health determinants (► health determinants, social), psychological health determinants (► health determinants, psychological), alcohol consumption, drug abuse, substance abuse, tobacco consumption, reproductive health and the influence and

impact of health care systems according to health and lifestyle related aspects.

Nutrition

► Nutrition is a complex interaction that influences our daily life and is also influenced by various determinants. It covers not only human needs – for example absorption of liquid and solid foods to provide the body with essential nutrients – but effects significantly social issues. Different sensory characteristics eating and drinking can be seen as a pleasure. Cultural, economic and individual factors determine the quality of nutrition and nutrition habits as well as influencing factors like lifestyle and well-being. A healthy diet provides an adequate amount of each essential nutrient. Thus, a well-balanced nutrition is essential for promoting health and has a high impact on preventing nutrition related diseases.

Nutritional Recommendations like the Daily Reference Intakes (DRIs) provide fundamental information on basic nutrients needs for every population group and period of life to maintain the individual's health. DRIs incorporate current concepts regarding the role of nutrients and food components in reducing for example the risk of chronic diseases and are intended to plan and assess diets for healthy people (Dudek 2006).

What people are finally eat depends on their lifestyle, their preferences and dislikes. Often, consumed meals are too fat, too salty and do not consist of enough fresh components like vegetables, fruits or fresh herbs. The widespread overnutrition leads to problems such as overweight and obesity in the industrial countries. Consumers should be provided with information that is necessary to create a healthy and well-balanced diet with respect to aspects like dietary diversity or cultural differences in daily nutrition. This information needs to be scientific based and clearly described. Nutrition education should be intended to be an integral part of school curricula in order to let children of all age groups benefit early from prevention and health promotion.

Obesity

► Obesity is one of the greatest current public health challenges. The prevalence has tripled in many countries in the last two decades and is increasing at an alarming rate. A great prevalence of obesity in men and women as well as in children is recognized in populations living in the N and W of Europe, in Australia, Canada and the US (Crawford and Jeffery 2005). Children and additionally people in lower socio–economic groups are mostly affected. Overweight and obesity are strongly related to non-communicable diseases and contribute to a decrease in life expectancy (WHO 2006). According to this one's quality of life is influenced negatively and therefor obesity has a significant effect on economic costs and social development.

► Overweight and obesity are considered as a problem of energy balance. Inadequate diet with high energy intake and low physical activity result in a positive energy balance. Studies show that energy intake has risen in concert with the growing of obesity and is combined with a decrease in energy expenditure (Crawford and Jeffery 2005). Additional factors that have an influence on the course of overweight and obesity are for example the parental weight, genetic fundamentals as well as the preventive effect of exclusive breastfeeding during the first six month of life (European Commission 2004a). Excessive body weight often results in various diseases particularly cardiovascular diseases, diabetes mellitus type 2, high blood pressure, dyslipidaemia and certain form of cancer. Gastrointestinal, respiratory or psychological complications are due to both overweight and obesity.

In tackling and preventing overweight and obesity public health strategies and policy responses are very important key elements that may change the present situation. Especially children and their caregivers (family members and teachers) have to be addressed in public health programs and intervention because food habits occur in early childhood and have its implication up to adulthood. Behavior-oriented lifestyle programs should be preferred instead of pharmacotherapy. Public health approaches to obesity prevention have to address a broad range of influencing factors. Key elements that have to be focused on are nutrition and physical activity which have an important impact on energy balance and finally on the individual's health and well-being.

Physical Activity

Regular ► physical activity can be seen as one of the most influencing factors for quality of life and provides the basis for the maintenance of health and well-being. Being physically active regularly in a moderate-intensity helps to reduce various kinds of diseases and

almost all people of different ages benefit from regular (RKI 2005; Center for Disease Control and Prevention 2006). Children and their parents and even older people help to maintain their health by being physically active. It is recommended to be physically active at least 30 minutes each day (RKI 2005). Today, a large number of methodologically similar studies provide essential information on how, how often and what kind of physical activity the individual should aim at. Studies and questionnaires conclude their results in public recommendations. Furthermore, health education in public places, such as kindergartens, schools or companies may be useful to increase knowledge and competence of the whole population concerning an enhanced physical activity and so health-promoting environment. National policies have to aim at encouraging the population by providing more engagement in being physically active (WHO 2007a). Thus, a regular physical activity has numerous health benefits and reduces the risk for major chronic diseases.

Leisure Time Physical Activity and Sedentariness

During the past decades physical activity has declined in the daily life of most people living in industrial countries. Great distances to the workplace and modern life circumstances lead to a more inactive life. People tend to go by car or by public transport for short distances and working conditions in offices enhance the ► sedentary behavior (► leisure time physical activity and sedentariness) as well. Physical inactivity is characterized by a lack of sufficiently strong contractions of muscles. Furthermore, the metabolism is not adequately forced. Leisure time activity refers to all behaviors that are connected with being physically active in free time. Physical is believed to contribute to obesity and other diseases, such as type II diabetes, some kinds of cancer or heart diseases and thus, causes approximately 2 million deaths a year. According to this a predominantly sedentary lifestyle increases the risk for many non-communicable diseases.

Most people spend their free time by doing predominantly sedentary activities such as reading, or watching television instead of doing sports. Furthermore, time budget for additional physical activity is very limited when for instance working the whole day and caring of the family. Further impact on inactivity is given by socio-economic status and the level of education whereas gender does not have a dominant influence. Additionally, the use of the media, for instance television or computer, dominates leisure-time behavior in all developed countries. Regarding this present situation enhancing physical activity promoting to be one of the major objectives, especially for public heath policies from an evidence–based perspective. More studies are needed to develop an effective and applicable approach on how to best tackle people's physical inactivity. Efforts have to be multidisciplinary in order to encourage individuals and communities without disregarding environmental, transport community planning circumstances.

Environmental Health Determinants

Human health and environment are multi-causaly linked. Living conditions, workplace and individual lifestyle factors determine health and thus the quality of one's life. According to that, ► environment-related determinants of health (► health determinants, environmental) cover all physical, chemical, biological and psychological conditions that may have an effect both on the current as well as on future life (Kreisel 1998).

During the last decades environmental conditions have been improved, e. g. medical care has been well established, as well as hygienic circumstances, living and working conditions. This background leads to a high quality of life and an increased life expectancy. Nevertheless, there are various diseases that are attributable to environmental factors. Additionally, these differ between industrial and developing countries and between the East and the West of Europe and moreover, these are strongly depending on socio–economic aspects (EEA 2005).

While most of the people living in developing countries suffer from communicable diseases, caused by poverty and poor hygiene, the major burden of disease in industrialized countries are due to non-communicable diseases caused by changes in lifestyle through a modernized environment.

Currently, air pollution and climate change have the greatest impact on population health. As a result, diseases like respiratory illness and allergies have become a major problem and the relation of human health and environmental quality have become more precise and relevant due to ongoing research and policy activities. The public concern about the present situation demands

on science and research (EEA 2005). Moreover, the environmental influence on health-related quality of life is also linked to economy and health care system (e. g. increased illness and thus loss of working hours, high expenditures of health systems). Strategies that help to prevent and protect the environment and the population are urgently necessary since environment and human health as well as well-being interact from the beginning of life. Thus, prevention has to be aimed at identifying and reducing the risks.

Economical Health Determinants

A person's health status is additionally influenced by the environment. Health status and economical health determinants (► health determinants, economic) interact consistently, e. g. income affects the health status, well-being and quality of life in addition to social, psychological and individual characteristics. Within the framework of Public-Health-Issues health economics focus not only on economic analysis of health care and the financing of health systems but on the development of organization and financing of innovative profiles of health or medical care. In the present situation of well-established health systems it is of great importance how to analyze their costeffectiveness. The overall aim is to establish health services considering the needs of every person combined with acceptable cost and high-quality and to further go on in measuring the efficiencies of several programs or interventions in the field of public prevention and health promotion. Thereby important economical basics should be established by health policies to improve the population's health.

Social Health Determinants

Lifestyle and health are socio-culturally varying (► health determinants, social). Socio–economic position, social roles and circumstances or cultural factors are complex patterns also including sex and age. Thus, health status is influenced by socioeconomic development and vice versa. Lower socioeconomic status is the most powerful contributor affecting one's health: the lower one's socioeconomic status, the poorer one's health. Social inequalities in health are a key problem all over the world (Siegrist and Marmot 2006). Socio–economic factors greatly influence the health status. Level of education or occupational class can be seen as socio–economic indicators that have a big impact on health status. Mortality is between 28 and 53 per cent higher in the lower educational groups (Mackenbach 2006). Stable social networks and social support operate as protective determinants for coping with stressful situations in daily life. Thus, social capital is an individual resource that is fundamental for the social status, health and well-being. Another aspect of social health is employment. The absence of regular income and acceptance in society leads to higher morbidity and mortality. Unemployment is associated with adverse health outcomes. On the basis of the growing concern, evidenced-based strategies to reduce social health inequalities have to be focused on. Changes in lifestyle and modifications in the individual's environment should be first steps of an intervention to reduce social health inequalities on the population level.

Psychological Health Determinants

Health and its psychological processes contribute to an individual and productive life. Psychological determinants have a major focus on behaviors that contribute to health and illness (► health determinants, psychological). But unfortunately, in most parts of the world interest in mental health and related disorders is unsufficient especially if compared to physical health. According to the World Health Organization (WHO) mental health problems are increasing and today about 450 million people suffer from mental disorders that are responsible for 12% of burden of disease (more than on cancer) (WHO 2001).

Mental health itself is difficult to define and implicates more than the absence of mental disorders. The individual's behavior, social and economical circumstances have a high impact on mental health. Psychological well-being further is influenced by self-esteem, existence of life-tasks and goals, emotional well-being as well as the interaction of socio-economic lifestyle and psychological health.

Regarding public health issues it is essential to pay attention to the health of every individual. Primary prevention should be regarded as the first and most promising way to reduce the prevalence of mental disorders and is intended to address population groups at high risk. Policies should focus on the population's mental health by cost-effective services, mental health promotion programs, adequate care concepts or for example promoting a healthy lifestyle and therefor reduce the

risk for mental disorders and related conditions (WHO 2001).

Alcohol Consumption

According to the World Health Organization about 2 billion people worldwide consume alcohol beverages. The over-consumption and in connection with this alcohol dependency are related with high morbidity and mortality all over the world and implicates health and social consequences. People regard alcohol and its consumption as a part of culture, lifestyle and luxury. For most people alcohol is an integral part of daily life. Influencing factors are the socio–economic position, cultural factors but also social and political circumstances, like taxes and the availability of alcoholic beverages. ► Alcohol consumption can be divided in three main groups: moderate drinking, heavy drinking and excessive drinking (WHO 2004).

Particularly the number of young people who are seriously threatened by the use of alcohol is rising, especially by increased binge drinking. Young people drink in order to get drunk.

Heavy alcohol consumption is linked to numerous diseases. Depending on the period, the social circumstances, individual health and amount of alcohol a person drinks several health related problems can occur. Aggressiveness, physical disorders and alcohol poisoning are results of short-time alcohol consumption. Whereas liver cirrhosis, certain cancers, cardiovascular diseases or malnutrition reflect long–term heavy drinking. Additionally, the social network can collapse with loss of friends, family or job as major consequences.

Tackling the alcohol problems has to be an integral part of public health policies. Primary prevention throughout public programs or interventions should be already implemented in the surroundings of children and teenagers. This population group is at risk and premature alcohol problems may lead to further difficulties in adulthood. Policy initiatives should also aim at reducing the public availability of alcoholic beverages (WHO 2004).

Drug Abuse

► Drug abuse in this context is related to medication drug abuse, the consumption of a drug apart from a medical need. It covers psychological and physical symptoms and leads to behavioral changes. Drug abuse is one of the hardest ascertainable form of addictions. Women are more likely to abuse drugs than men and increased age is associated with higher prevalence of drug abuse. Analgesics, barbiturates, depressants but also anorectics are drugs often abused. Drug abuse may lead to drug dependence and increases the risk of physical, mental and social disorders (Faust 1996).

Furthermore, the use of drugs in daily life implicates hazards in road use and occupation and poor health is the consequence, too. Taking drugs is often combined with alcohol consumption and thus increases its effect on health. Another field of drug abuse covers doping, substances that positively influence muscular effort with adverse health effects.

Knowing that people who abuse drugs are often understated and harder to identify overall aims of public health strategies should focus on confirming the diagnosis of drug abuse in time for preventing further drug-abuse-related diseases. Prevention and health promotion may contribute to premature identification and education based on scientific evidence and with political encouragement.

Substance Abuse

Substance abuse (► substance related disorders) in this context describes the intake of substances with psychoactive properties that affect the central nervous system grouped according to their stimulating or hallucinogenic effect, such as alcohol, cannabis, nicotine or opioids. The regular use of psychoactive substances results in health threats on the basis of the addicting potential. Psychoactive substance do not only change mood for a short time. With regard to long-term intake of the mentioned substances health consequences of dependence or intoxication lead to higher risks for accidents, violence and mortality. These conditions result also in social problems as well as depression and physical dysfunctions.

People with poor social background like an adverse childhood combined with genetic susceptibility are vulnerable to substance abuse. Individual characteristics of a person may further interact.

Successful prevention of substances abuse may contribute to reduce costs for therapy and rehabilitation. Furthermore, preventive strategies should consider the need for primary prevention as well as efficiency of programs in the mentioned field.

Tobacco Consumption

► Tobacco consumption is the second leading cause of death and the fourth most common risk factor for diseases in the world (WHO 2007b). Smoking harms nearly every organ of the human body and causes many acute and chronic diseases, as the majority of cancers, particularly lung cancer though the existence of harmful and additive substances. In addition to this, smokers are high at risk for heart diseases, strokes or other fatal diseases. Especially maternal smoking during pregnancy is harmful to both the mother and the fetus. It causes low birth weight through inadequate supply of oxygen and nutrients via the umbilical cord and additionally results in long-term effects for the child after birth. This effect is also given if the mother is exposed to passive smoke from the environment (European Commission 2004b). Passive smoking endangers not only the own health but also the health of other people and this particularly vulnerable populations (e. g. infants, elderly etc.) (DHS 2003).

Regarding economical factors, public health costs of treating tobacco-caused diseases are enormous. Besides the above mentioned diseases smokers often are affected by chronic diseases that keep them away from work. Particularly poor, deprived individuals and families are influenced by the loss of money spend on tobacco, loss of income through illness and so forth. Furthermore, tobacco smoking and the exposure to tobacco smoke have social and environmental consequences.

For reducing the number of smokers, effective multilevel strategies on the national and global level have to be implemented in various settings. A high impact on combating the tobacco problem is known by public interventions, such as informing the population about the health risks of cigarette smoking or increasing prices on tobacco products. Additionally, prohibit smoking in public places, restaurants and work places have lead to reduced tobacco consumption. Only cost-effective and successful preventive strategies may bring long–lasting changes for a smoke-free environment in all public places. Although, smoking and its health effects are well-known, the problem of tobacco consumption and its serious consequences on public's health can only be solved with the aid and cooperation of all countries (DHS 2003). Early primary prevention can avoid that children and adolescents start smoking.

Reproductive Health

Reproduction needs a healthy population that has necessary resources, including individual decision-making and environmental basics. Sexual and ► reproductive health is a vital element of physical and emotional well-being. Complete physical, mental and social well-being lead to the ability that people are able to have a satisfying and safe sex life, that they have the competence to reproduce and the freedom to decide if, when and how often to do so and that men and woman have to be informed about safe, effective and acceptable methods of birth control. Furthermore, reproductive health focuses on techniques and services that contribute to reproductive health and well-being and prevents reproductive health problems (United Nations Fund for Population Activities 2007).

Safe reproduction is a part of existing knowledge about human sexuality and appropriate as well as good quality health information and services. Many people worldwide live in conditions of high-risk sexual behavior and face high risk of getting sexually transmitted diseases. In this regard the risk depends on a person's behavior. To ensure comprehensive and factual information for population, health care services, public health policies and programs should consider the needs and abilities of the whole population. All of them should be able to get the chance for own decision-making and be treated in the health-care systems. These circumstances are not only essential for family planning but first of all for preventing sexual transmitted diseases. As unsafe sex is the second most important risk factor for certain diseases and death effective interventions may help to make better reproductive health choices (WHO/RHR and CCP 2007c).

Health Care Systems

One's health is affected by ► health care systems, starting with care during pregnancy and delivery continuing over the whole life span. As an interdisciplinary field of research health care systems aim at promoting and maintaining the population's health. Thus, they have contributed to improve health. How they act and implement depends on which services are provided and how health care systems are organized. Institutional structures differ from nation to nation. Financing of these systems is guaranteed by both – public (taxes) and private funds (donations). As resources are limited a well-

established distributing system leads to the best possible dissemination of funds and services (WHO 2000).

Summary

Health as a substantial resource permits people to live in a well-established, socially, economically and productive life (von Lengerke 2001). There is no doubt that the individual's behavior influences certain lifestyle-related diseases such as cancer, overweight, cardiovascular diseases or suicides. Many of these diseases are linked to an unhealthy behavior, such as tobacco and alcohol consumption, poor dietary patterns and a lack of physical activity. Additionally, sexual transmitted diseases like AIDS or mental disorders are caused by unhealthy behavior. Therefor, most of the above-mentioned diseases could be prevented by a healthier lifestyle and behavior. This aim could be achieved by complementing prevention and health promotion effectively in all settings and at the international, national, regional and community level.

Cross-References

- ▶ Alcohol Consumption
- ▶ Drug Abuse
- ▶ Health Care Systems
- ▶ Health Determinants, Economic
- ▶ Health Determinants, Environmental
- ▶ Health Determinants, Psychological
- ▶ Health Determinants, Social
- ▶ Leisure Time Physical Activity and Sedentariness
- ▶ Nutrition
- ▶ Obesity
- ▶ Reproductive Health
- ▶ Substance Related Disorders
- ▶ Tobacco Consumption

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Life Table Analysis

Definition

Life table analysis involves stratifying patients by length of follow-up. Within each time stratum, a probability of failing is computed as the number at risk at the beginning of the interval. For each time stratum, the probability of surviving is one probability minus the probability of failing. The estimated probability of surviving to a particular time is the product of the probability of surviving each of the preceding time strata.

Life Threatening Illness

► End Stage Disease

Light

► Illumination

Lighting

Synonyms

Illumination

Definition

Almost 80% of sensations from humans immediate surroundings are received via the ocular system, but visible light is a key element because without light we can not see. Appropriate lighting has a positive influence on various aspects of human well being—visual capacity and perception, mood, and mental concentration and working ability. One of the most important tasks in designing our microenvironment is therefore to provide optimal lighting according to actual visual activities. In such lighting conditions, the level of fatigue may be significantly decreased or delayed; safety at work increased; and lower rates of traumatism and absenteeism ascertained. Lighting affects the comfort of occupants and/or workers, their health, work capacity, and company's productivity. Low illumination, excessive brightness (glare), flicker, 100-per-second modulation, or other lighting deficiencies may cause various adverse visual and/or nonvisual effects, and other consequences such as fatigue, eye strain, discomfort, visual impairments, headache, accidents, injuries, annoyance, etc. Daylight (or natural lighting), and electric (or artificial) lighting of interior spaces will be described here. The greatest source of daylight on Earth is the Sun, directly or indirectly entering working and/or nonworking interiors through properly designed windows, glazed doors, roof-lights, etc. Daylight is preferable in all of these spaces because of its good spectral composition, though its levels vary with time of day and time of year, and are highly related to climatic (lighting) characteristics of the region. On the other hand, electric light complements or replaces daylight, and two main groups of artificial light sources for indoor space illumination have been developed—incandescent sources (filament lamps or light bulbs), and fluorescent tubes. Artificial lighting may be designed as general uniform lighting (the whole space is illuminated to approximately the same illumination) or localized lighting (additional illumination for exacting visual tasks, e. g. overhead light in dentistry and in operating theaters and examination rooms in hospitals, microelectronic assembly, etc). The luxmeter is the most appropriate handy instrument for both daylight and electric lighting measurements.

Likelihood

Definition

In general use, the word likelihood is a synonym for probability but in statistics, it has a more specific meaning – it is the probability of the observed data given the probability model, which gave rise to the data. Like-

lihood is used to compare different possible candidate values for the parameters of the model. The one with the greatest likelihood is considered to be more likely. Parameter values for which the probability of the observed data is greatest are the most likely values, or maximum likelihood estimates. The ratio between likelihoods is used in hypothesis testing.

Likelihood Ratio

Definition

The likelihood ratio is the likelihood that a given test result would be expected in a patient with the target disorder compared to the likelihood that the same result would be expected in a patient without that disorder. A likelihood ratio test is a statistical test in which the ratio between the maximum likelihood under the null hypothesis and the maximum with that constraint relaxed is computed.

Limited Resources

► Scarcity

Linear Discriminant Function Analysis

► Discriminant Analysis

Linkage Analysis

Definition

Linkage analysis is a statistical technique which is widely used to identify markers (regions) on genes in the human ► genome with the aim of obtaining a crude chromosomal location of the gene or genes associated with a ► phenotype of interest. The analysis must be performed within families, because the specific marker allele associated with the disease generally varies from family to family, in accordance with the allelic distribution of the marker in the population.

Linkage Disequilibrium

Definition

Linkage disequilibrium is an excess or deficiency of certain combinations of ► alleles from genes or SNPs (► single nucleotide polymorphism) located on the same ► chromosome. Linkage disequilibrium has been observed in associations detected at the level of the gene product. For example, many of the associations between specific HLA alleles and various diseases may be due to linkage disequilibrium among alleles in the HLA region.

Linkage Group (in Some Species)

► Chromosome

Lipometabolism

Definition

Biochemical pathways to burn lipids.

Live Birth

Definition

Live birth is a birth in which the baby shows any sign of life, such as a heartbeat or involuntary muscle movement, irregardless of the duration of the pregnancy or the duration of the life of the child.

Cross-References

► Infertility

Living Conditions

Definition

Living conditions are defined as follows in the context of health promotion: Living conditions are the everyday environment of people; where they live, play, and work. These living conditions are a product of social and economic circumstances and the physical environment – all of which can impact upon health – and are largely outside of the immediate control of the individual.

Cross-References

► Health Setting

Local Health Departments

Definition

Local health departments are administrative or service units of local or state government concerned with health and carrying some responsibility for the health of a jurisdiction smaller than the state.

Local Health Effects

Definition

All or part of the body may be affected. A local effect occurs at the place where the hazardous agent contacts the body.

Local Knowledge

► Traditional Knowledge

Local Public Health Agency (LPHA)

Definition

Local public health agencies include the ► local health department, local board of health, and/or other local governmental entity designed to provide public health services to the jurisdiction. Local agencies are part of the state public health system.

Logistic Model

Definition

Logistic model is a statistical model of an individual's risk (probability of disease y) as a function of a risk factor x

$$P(y/x) = \frac{1}{1 + e^{-\alpha-\beta x}}$$

where e is the (natural) exponential function. This model has a desirable range, 0 to 1 and other attractive statistical features. In the multiple logistic model, the term β_x is replaced by a linear term involving several factors e. g., $\beta_1 x_1 + \beta_2 x_2$ if there are two factors x_1 and x_2.

Logistic Regression Analysis

Definition

Logistic regression analysis is a regression technique based on generalized linear models (► general and generalized linear model). The goal of logistic regression analysis is to find the best fitting biologically reasonable model to describe the relationship between a categorical, most usually binary or dichotomous, outcome (dependent or response variable) and a set of independent (predictor or explanatory) variables that could be categorical or continuous or both. For example, it is used to identify risk factors associated with disease occurrence. Logistic regression is also used to adjust statistically the estimated effects of each variable in the model for differences in the distributions of and associations between other independent variables. For example, it is used to assess interaction effects and to understand the impact of covariate control variables. The multiple logistic regression model is given by: $\log it(\pi) = \ln[\pi/(1\text{-}\pi)] = \beta_0 + \beta_1 x_1 + ... + \beta_k x_k$, where $X_1, X_2, \ldots, X_k$ are a collection of independent variables, π is a probability of success for binomial outcome variables and $\beta_0, \beta_1, \ldots, \beta_k$ are parameters of the model. Logistic regression applies the maximum likelihood estimation after transforming the dependent into a logit variable (the natural logarithm of the odds of the dependent occurring or not). In this way, logistic regression estimates the probability of a certain event occurring. A distinction can be made between binomial/binary (e. g., alive or dead), multinomial (e. g., several categories of prognosis) and ordinal logistic regression (when multiple classes of the dependent variable can be ranked), as well as between unconditional (no stratification variables) and conditional logistic regression (inclusion of stratification variables).

Loglinear Analysis

Synonyms

Loglinear modeling

Definition

Loglinear analysis is a multivariate statistical technique that can be applied to contingency tables (to explore the data or verify specific hypotheses) for analyzing the relationships and interpretation of qualitative, categorical data. Loglinear analysis, a type of multi-way frequency analysis, is an extension of the two-way contingency table, where the conditional relationship between two or more discrete, categorical variables is analyzed by taking the natural logarithm of the cell frequencies within a contingency table. For example, the frequency of different symptoms may be crossed by patient's age and gender or the number of suicides may be crossed by region and religion. Loglinear analysis may also be used as a regression method to predict the expected frequencies (table cell values) of a dependent variable, to understand the relative importance of different independent variables in predicting a dependent variable, and to confirm models using a goodness-of-fit test (the likelihood ratio). It is based on loglinear models (specialized cases of generalized linear models), with the assumption that a linear relationship exists between the logarithm of the dependent variable and the independent variables with a Poisson or multinomial distribution of data. The first distribution leads to Poisson regression, common in event history analysis. Like other forms of loglinear analysis, Poisson regression predicts the count or rate associated with each cell in the table formed by the factors. Logit and probit models extend the loglinear model to allow a mixture of categorical and continuous independent variables to predict one or more categorical dependent variables.

Loglinear Modelling

► Loglinear Analysis

Logopaedics

► Speech Therapy

Logrank Test

Definition

This method allows instant generalization to allow the comparison of several groups of patients with each other: for each group, the extent of exposure to risk of death on a particular day is still the proportion of patients who are in that group on that day multiplied by the number of deaths on that day. The total exposure in one group over an extended period is the sum of the separate exposures in that group on the separate days comprising the period. In any one period, the sum of all the Os (observations) will equal the sum of all the Es (extent of exposure). For example, if we were comparing four groups, A, B, C, and D, we would check that $O_A + O_B + O_C + O_D$ equals $E_A + E_B + E_C + E_D$ at the end of the analysis. Logrank significance levels or p-values may be estimated by comparing the sum of $\frac{(O-E)^2}{E}$ with an appropriate chi square distribution. $\frac{(O-E)^2}{E}$ can be calculated in each group and added up, one term from each group. The sum of all the $\frac{(O-E)^2}{E}$ calculations is termed $\chi 2$. If the symbol k denotes the number of groups being compared with each other, this has a $\chi 2$ distribution with $df = k - 1$.

Longevity

Synonyms

Years of life; Life Expectancy

Definition

Longevity is defined as the number of years of life that can be expected on average in a given population. It refers to the expected years of life at birth which is the calculated mean age of death, based on current mortality rates for all age groups. There are other indicators of longevity—life expectancy at age 1, 15, 45 and 65 (WHO's Health for All database) or 40, 60, 65 and 80 (OECD Health Data). Longevity is increased during the centuries due to improved sanitation, health care and prevention.

Longitudinal Study

Synonyms

Long-term observational trial

Definition

A longitudinal study is a research design in which subjects are followed over time with continuous or repeated monitoring of risk factors, health outcomes, or both. Such investigation can last months or years. Types of longitudinal studies include cohort studies (prospective and retrospective) and panel studies. While cohort studies sample a cohort (a group experiencing some event) in a selected time period and study subjects at intervals through time, panel studies sample a cross-section of the population and survey it at regular intervals. Because longitudinal studies are observational, they have less power to detect causal relationships than experimental studies. However, because of repeated observation at the individual level (at two different points in time at least, and often more) they have more power than cross-sectional observational studies. Longitudinal studies can be used for researching many topics.

Long-Term Care

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Definition

Long-term care comprises a variety of services provided to persons with a chronic illness or disability who cannot care for themselves for long periods of time and are therefore dependent on help with their basic ► activities of daily living. Demand for long-term care grows exponentially with age and is concentrated in persons aged 80 years and older. Long-term care usually involves provision of custodial and non-skilled care, such as assisting with normal daily tasks like dressing, bathing, and using the bathroom. This care component is often provided in combination with help with basic medical services such as help with wound dressing, pain management, medication, health monitoring, prevention, rehabilitation, or services of ► palliative care. Long-term care can be provided at home, in the community, in assisted living accommodation, or in nursing homes.

Basic Characteristics

Long-Term Care Settings

Long-term care is provided in different settings depending on the recipient's needs and preferences, the availability of informal support, and the source of reimbursement. Gerontological literature, therefore, often refers to a continuum of care. Among the different long-term care areas that have emerged, mainly driven by reimbursement policy, the ► nursing home is still the major institutional setting. Home and community-based care on the other hand refer to a wide variety of non-institutional long-term care settings, ranging from various types of congregate living arrangements to care recipients' own homes. The boundaries between institutional and non-institutional long-term care are blurred. Many ► assisted living facilities are large buildings that strongly resemble hotels or nursing homes in physical appearance and philosophy. Over the past decade, there has been considerable investment in home-care services among the Organisation for Economic Cooperation and Development (OECD) countries, driven by the goal to maintain disabled older people in their homes where possible rather than in care institutions; this also reflects the wishes expressed by older people themselves.

Providers of Long-Term Care

Long-term care provision can be differentiated into formal care and informal care. Formal care is long-term care services supplied by employees of any private or public organization; this includes care provided in institutions like nursing homes as well as care provided to persons living at home by professionally trained care assistants like nurses or untrained care assistants. A large proportion of the paid providers of long-term care are paraprofessional workers like certified nursing assistants in nursing homes or home care workers. The latter deliver the largest share of the primarily low-tech personal care and assistance with managing daily life. Informal care is the care provided by informal caregivers such as family members, relatives, friends, neighbors, and others, mostly those with a previously existing social relationship with the care recipient. Informal care is usually provided in the home and is typically unpaid. In several OECD countries, programs have been designed for persons who are cared for at home in order to allow a more individual choice among care options. Some of these programs incor-

porate payments to informal caregivers in the form of income support. They aim to increase flexibility and mobilize, or at least maintain, a broader carer potential that enables older persons to stay in the community longer and reduces the need for expensive institutional care.

Quality of Long-Term Care

Based on studies from several OECD countries, there is evidence that the quality of long-term care is variable and often does not meet the expectations of users. Quality issues are particularly reported for patients with dementia. Driven by concerns about poor quality of long-term care in many developed countries, several countries have initiated reforms, increased spending, and introduced or improved existing regulations for quality assessment and improvement. Usually, ► quality of care is classified into the dimensions of structure, process, and outcome. Quality regulations have developed in recent years from defining minimum requirements for structure and process of care towards complex assessment and improvement instructions that include instruments for outcomes measurement, strategies of continuous quality improvement, detailed documentation, and explicit requirements for protecting patients' rights, privacy, and participation. Yet, transparency about the quality of long-term care and the prevalence of ► adverse effects in most countries is still not made accessible to the public on a regular basis. Without combining improved measurement with transparency, the functioning of a market for long-term care services does not seem feasible. There is a growing consensus that reporting on quality in long-term care has to be on a more scientific basis and needs to become an integral part of the care process itself, including scientific collaboration at the national and international levels. For decisive improvements in quality, countries need to move on from setting standards of quality of infrastructure and process of care to measuring the quality of outcomes. One of the main challenges will be to back up administrative systems with better information, which ideally should be developed in an interactive way: data and indicators produced from administrative systems should be of a proven reliability and validity in order to have maximum potential for use in developing better policies and adjusting infrastructure.

Long-Term Care Financing

There are projections that public expenditure for long-term care as a proportion of Gross Domestic Product (GDP) in OECD countries could double by 2050. This leads to the question: to which degree may public systems be capable of compensating for increasing long-term care expenditures in the future? This also affects the private system, as it can be assumed that higher proportions of the costs will have to be born privately, which is already the case in a number of countries. Given the fact that policy-makers are concerned about the sustainability of their systems of long-term care financing, different strategies have been followed, often depending on the respective social protection systems. Some countries have raised additional contributions; while in others, concerns about rising expenditure have been seen as a reason to find ways to limit expenditure by increased targeting or raising user payments. Several OECD countries like Austria, Germany, Japan, and the Netherlands provide comprehensive coverage and therefore treat long-term care in more or less the same way as other health-related needs. Other OECD countries, like the US or the UK, provide a system for long-term care that depends in part or in whole on a means test of the recipient's income and/or assets, and therefore treats long-term care differently from the way other health-related needs are covered. Within the OECD countries, the share of GDP spent on publicly financed long-term care varies from 0.2% to 2.9%. Private long-term care insurance as primary cover has played a very limited role in most OECD countries. It is expected to play a stronger role in the future, especially in the market for voluntary complementary long-term care insurance to meet additional costs not covered by public programs.

Conclusion

Although there is no clear recipe for balancing public and private financing, several elements are essential to the design and implementation of a long-term care system for the future. The system should address the long-term care needs of people of all ages, recognizing that services and other accommodations must be tailored to people with varying degrees of physical and mental impairment. The long-term care system must be sensitive to the needs of the family of the person who requires long-term care. Although formal care should

not replace the efforts of family and friends, the repertoire of services should build the family into the process and ensure that the family is supported. The future long-term care system should also recognize all the options that can meet the residential and care needs of the individual, and recognize that these needs do not necessarily increase in neat, predictable steps. The system must be flexible enough to address the acute, chronic, and non-medical social needs—such as housekeeping and transportation—of the long-term care client, which may fluctuate over time. Clients who prefer more autonomy should have that option, although they should recognize the tradeoffs involved in managing their own care. Long-term care will be a major challenge of the twenty-first century, and therefore financing, delivery, and training strategies should be actively developed, integrating the lessons learned from the successes and failures in other countries and nations.

Cross-References

- ► Activities of Daily Living
- ► Adverse Effect
- ► Assisted Living Facilities
- ► Nursing Homes
- ► Quality of Care

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Long-Term Care Facility

► Hospice Care

Long-Term Observational Trial

► Longitudinal Study

The Love of Wisdom

► Philosophy

Low Birth Weight

Synonyms

Small for gestation age

Definition

Low birth weight infants are born less than 2500 gm measured within an hour of birth.

Low-Level Exposure

Synonyms

Threshold concentrations of hazardous substances

Definition

It is difficult to quantify precisely the effects of chronic low-level exposure to substances such as those which are released by textiles and furniture, ingested with food, or contained in household or personal cleaning agents. Establishing a causal connection between a recognized and defined form of exposure and a given disorder is often very difficult, if not downright impossible. From an ► environmental medicine perspective, however, this is especially important since particularly vulnerable population groups – those with a high individual susceptibility – can very well be exposed to substances either singly or in combination. Quantifying the effects of hazardous substances in the environment by

extrapolating from the uptake of allowable concentrations within the low dosage range is especially important for those substances which are present everywhere and so make it impossible to avoid exposure even when preventive measures (e. g., reducing immissions) are observed strictly.

Lues connata

► Congenital Syphilis

Lumad

► Indigenous Health, Asian

Lung Affection with Yersinia pestis

► Lung Plague

Lung to Body Ratio

Definition

The size of the lung compared to the size of his or her body affects the lung's ability to absorb oxygen. Children tend to have a larger lung to body ratio than adults, often making them more susceptible to airborne pollution and irritants.

Lung Plague

Synonyms

Lung affection with Yersinia pestis

Definition

On the one hand, lung plague is caused by hematogenic spread of *Yersinia pestis* in patients with bubonic plague; on the other hand, it can be transmitted by droplets when coming into contact with a person suffering from lung plague. Following an incubation period of 1–2 days, the infected persons develop painful cough, black-bloody sputum, cyanosis of the lips and difficulties in breathing; lung edema develops. Without treatment lung plague takes a lethal course within 2–5 days in about 95% of the patients.

Luther, Martin

Definition

Martin Luther lived from 1483 to 1546. He believed in the salvation of man through faith. He was the founder of reformation. As a professor of theology (divinity), he sought to correct the failures of the Catholic Church by his orientation to Jesus Christ as the overall word of God. He made new discoveries in God's mercy, his preaching, and writings, but in particular, the Lutheran Bible, which had and still has much recognition.

Lyme Borreliosis (LB)

Synonyms

Lyme disease; Infection with Borrelia burgdorferi

Definition

In 2–4% the bite of a tick infected with the bacterium *Borrelia burgdorferi* leads to clinical manifestations, which are called Lyme borreliosis. In 70–80% of the symptomatic courses, after 1–3 weeks, a rash develops at the site of the bite. The so-called erythema migrans is a reddening, which spreads centrifugally and becomes pale in the center. Between 1 and 5 weeks (up to 3 months) after the tick bite, 15% of people develop neurological symptoms (neuro borreliosis). The most frequent symptom is a facialis nerve paralysis, but other symptoms such as meningitis, encephalitis or an affection of the peripheral nervous system, with pain and disorders of sensibility, can appear as well. Moreover, an infection with *Borrelia burgdorferi* can affect the joints. In the so-called Lyme arthritis, most often the larger joints are involved, primarily the knee joint. While an oral antibiotic treatment is sufficient for erythema migrans, in neuro borreliosis and Lyme arthritis parenteral antibiotic therapy is necessary.

Cross-References

► Zoonotic and Parasitic Infections

Lyme Disease

► Lyme Borreliosis (LB)

Lymphadenopathy-Associated Virus

► Human Immunodeficiency Virus (HIV)/ Acquired Immune Deficiency Syndrome (AIDS)

Lymphogranuloma venereum (LGV)

Synonyms

Lymphopathia venerea; Climatic bubo; Duran-Nicolas-Favre disease

Definition

Lymphogranuloma venereum is primarily found in tropical regions. It is caused by various strains of the bacterium *Chlamydia trachomatis* (serotypes L1–L3); the incubation period varies between 2 and 30 days. In the primary stage, a painful vesicle develops in the genital region. This vesicle ruptures and heals within 2 weeks. During the second stage, which starts 3–4 weeks later, there are general symptoms of illness. Furthermore, a swelling of the lymph nodes of the groin appears, which is painful and can be as big as a fist, and which later ulcerates. When these ulcers heal, they leave scars and fistulas. Long-term complications and damage are granulomatous inflammations, an impairment of the lymphatic drainage as well as strictures and ulceration in the genital and anal region. Lymphogranuloma venereum is treated for three weeks with doxycycline, tetracycline or erythromycin.

Lymphopathia venerea

► Lymphogranuloma Venereum (LGV)

Maasai (Eastern Africa, Kenya, Tanzania)

► Indigenous Health – Africa

Macroelements

► Major Elements (Macronutrients)

Macrolide Antibiotics

Synonyms

Macrolides

Definition

Macrolide antibiotics have been used since 1952. The first substance available was erythromycin. In general, macrolides are given orally. Their effects are primarily on gram positive germs. Macrolides play a special role in the treatment of infections by chlamydia and mycoplasma. Due to their structure, these pathogens are classified between bacteria and viruses. As they do not have a proper cell wall, they are hardly sensitive to penicillin's and cephalosporins. Another infection, which can be treated well by macrolides, is legionnaires disease.

Macrominerals

► Major Elements (Macronutrients)

Mad Cow Disease

► BSE

Maintenance Therapy

Synonyms

Substitution therapy; Methadone maintenance

Definition

Maintenance therapy (MM) in the context of substance dependence stands for prescribing psychoactive substances to currently dependent patients, who are unable to stop their problematic drug use. The most relevant examples are methadone, buprenorphine and recently legal heroin prescription (controversially discussed) for heroin dependents and nicotine replacements (patches, gums, nasal spray) for smokers. The therapeutic target is to reduce the negative health and social consequences of continued problematic drug use ("harm reduction"). MM is often combined with behaviour therapy programmes in order to reach abstinence as long–term goal, but quitting rates are unsatisfactory.

Major Elements (Macronutrients)

Synonyms

Macrominerals; Macroelements; Bulk minerals

Definition

Macroelements are dietary minerals needed by the human body in high quantities, generally more than 100

mg/day (as opposed to microminerals, which are only required in very small amounts). Macroelement composition is modified by a variety of natural processes and/or deliberate and accidental human activities. Concentrations depend mostly on the base on which the soil is formed (bedrocks). Soil may lose some elements by leaching; and agricultural chemicals and pollutants may be added. The presence of major elements as constituents of the human body are: oxygen, 61% (also forms the highest proportion of the lithosphere, i. e. 50%); carbon, 23%; hydrogen, 10%; and nitrogen, 2.6%; the rest is taken up by calcium, magnesium, sodium, potassium, and phosphorus.

Malaria

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Synonyms

Infection with plasmodia

Definition

Malaria is an infectious disease of worldwide significance, which is transmitted by the *Anopheles* mosquito in warm climates. The disease is characterized by recurrent fever attacks.

Malaria is an infectious parasitic disease that is common in Africa, Central and South America, the Mediterranean countries, Asia, and many Pacific islands. It can be acute or chronic and is frequently recurrent. The causative microorganism is *Plasmodium falciparum* and for completion of its life cycle both mosquito and man are necessary.

Basic Characteristics

History

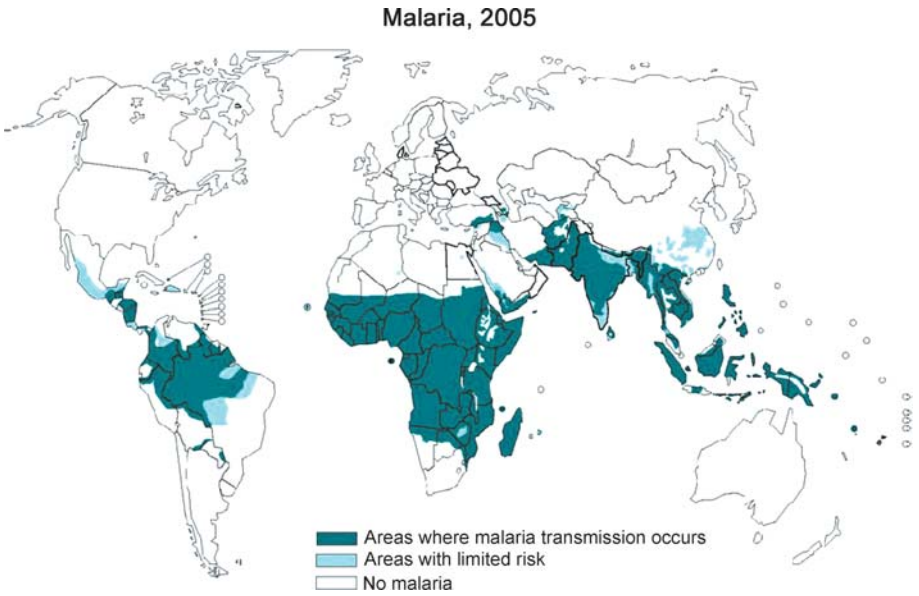
As early as in 400 BC, the Greek physician Hippocrates described a disease with the symptoms of malaria. A connection between fever attacks and climatic circumstances was assumed. Later reports of malaria, written by Roman physicians, are dated to the 2nd century AD. The relationship between fever and marsh areas gave malaria its name: malaria stems from Italian and means bad air. For hundreds of years, Peruvian Indians have been using cinchona bark to cure specific forms of malaria. Quinine, which is the effective alkaloid of the cinchona bark, was isolated at the beginning of the 1820s. It took another hundred years before further therapeutics against malaria were developed. At the end of the 19th century, ► plasmodia, the germs, which cause malaria, were detected in human blood; the ► *Anopheles* mosquito was found to be the transmitter of the disease. The step-by-step ► development of plasmodia was discovered in the first half of the 20th century. Malaria is still of significance today as 41% of the world's population lives in malaria-endemic regions. However, at present, 59% of the world's population lives in regions that have never had malaria or in which malaria has been wiped out – for example, by a draining of marsh areas, but, due to climatic changes (global warming), the WHO predicts that the incidence of malaria will spread as a result of an expansion of the climatic conditions favorable to *Anopheles* mosquitoes.

Transmission

Malaria is primarily transmitted in tropical or subtropical regions by the bite of an infected female *Anopheles* mosquito (Fig. 1). As the insects are night-active, in general, the bite takes place between sundown and sunrise, specifically inside houses or other kinds of living space. Plasmodia have been found in blood products, but, as plasmodia are sensitive to cold, cooling blood products makes them free of infection, they only become significantly infective in the case of a transfusion of untreated fresh blood. Other possible modes of transmission are through the re-use of contaminated needles or via the placenta to the unborn child, and, a rare situation, 'airport malaria' or 'luggage malaria', can be transmitted by the *Anopheles* mosquitoes being transported inside luggage from an endemic region; thus, not only travelers can be infected with malaria, but also airport staff or people who live in close proximity to airports.

Course of the Disease

According to the species of plasmodia, the incubation period varies between 7 and 24 days. Malaria



Malaria, Figure 1 Regions at risk of transmission of malaria according to the WHO, 2005 http://www.who.int/ith/maps/malaria2005_en.gif

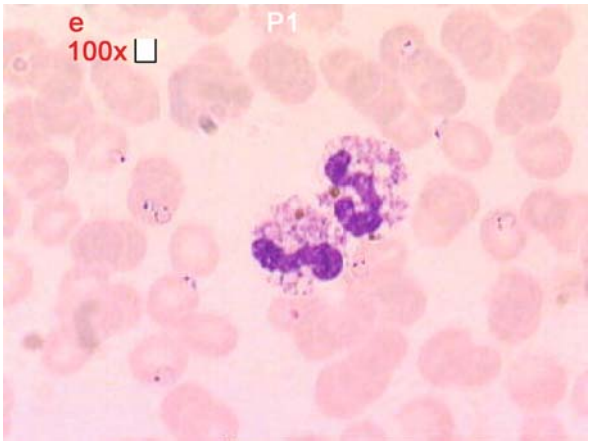
starts with fever and flu-like symptoms, as tiredness, headache and rheumatic pains. Additionally, abdominal symptoms, like nausea, vomiting or diarrhea, can appear. The further course of the infection is characterized by recurrent fever attacks (► fever attacks in malaria). During the fever-free intervals, plasmodia reproduce asexually; their release into the circulatory system leads to the next rise of temperature. Due to the destruction of red blood cells, anemia develops and there is a low platelet count (thrombocytopenia). The increased capture of erythrocytes in the spleen leads to an enlargement of the organ (splenomegaly). An affection of the kidneys and the liver may also be possible; frequently, there is a mild jaundice (icterus). Clumping of erythrocytes can impair blood circulation. The latter is extremely serious if the blood vessels of the brain are affected; in this case, cerebral malaria results, which leads to reduced consciousness, cerebral seizures, coma or even death. Malaria during pregnancy is dangerous as it often takes a more severe course than in nonpregnant women. Besides the transmission to the unborn child, possible complications are miscarriage, preterm birth and intrauterine growth retardation. A rare infection is blackwater fever (*Plasmodium falciparum*) in which hemolysis (destruction of the red blood cells) and acute renal failure occurs, causing high lethality. The name of the disease is derived from the urine, which is dark colored, nearly black.

Malaria in Children

Transplacental transmission of IgG-antibodies, produced by the mother who has been infected with malaria, protects the baby from those plasmodia. Moreover, the high percentage of fetal hemoglobin (HbF), which is present directly after birth, has a protective effect. HbF, like other structurally varied hemoglobin (as in case of sickle cell anemia), has a certain resistance against infections with plasmodia. As HbF is replaced by the adult form of hemoglobin, the protective effect declines within the first year of life. Due to the still immature immune system, the most serious courses of malaria are observed between the 1st and 4th–5th years of life. Every year, about a million children, primarily in this age-group, die of malaria, in most cases because of cerebral complications or multiorgan failure. Often, these children live in outlying villages where medical care is lacking.

Diagnostics

Anamnesis plays an important role in the diagnosis of malaria. While a connection between fever and malaria is quickly drawn in malaria-endemic regions, diagnosis is much more difficult in areas where *Anopheles* mosquitoes are not common. When the cause of fever is unclear, physicians should consider malaria as a possibility, especially if their patients have been travelers in tropical regions. A blood cell count will show that



Malaria, Figure 2 Malaria tropica, blood slide; *Plasmodium falciparum* infected erythrocytes (immature trophozoites, ring stage) and neutrophile leukocytes with toxic granulation, containing malaria pigment (homozoin); photo kindly provided by Dr. Christoph Borst, Neumünster

erythrocytes and thrombocytes are reduced. The parasites can be detected microscopically by the so-called ► thick drop method. The plasmodia species and the number of parasites can be determined (Fig. 2). Various malaria rapid tests are available, which provide a result within about 10 minutes. Other means of detection, like fluorescence stain or molecular biologic methods, are possible, but are not used in diagnosis because they are both time-consuming and expensive.

Malaria Prophylaxis

To prevent an infection with malaria, different strategies can be used. Due to the ecological consequences, an extensive killing of ► *Anopheles* mosquitoes by insecticides (DDT) is no longer carried out. Nowadays, they are only used locally for the inside of houses. Non-medicinal measures of protection aim at the avoidance of insect bites. In houses and in other living quarters, doors and windows should be equipped with insect screens and people should sleep under mosquito nets, the protective effect of which can be increased by an impregnation with 1% permethrin (effect of impregnation lasts for 6 months). It is important that the mosquito net does not have any tears and its entrance parts should overlap enough to prevent insect entry. As mosquitoes can also bite through the net, it must not rest directly on the skin, and the net should be carefully tucked under the mattress so that it does not slip out during sleep. Out of doors, covering clothing should be worn (long sleeves, long trousers, socks, closed shoes). Exposed parts of the body, including the skin at the edges of the clothing, should be treated with repellents (diethyltoluamid, DEET). For journeys to regions that are at high risk for malaria, ► malaria chemoprophylaxis should be carried out. Recommendations concerning protection against malaria in endemic regions are published by various organizations and updated regularly. A vaccination against malaria, which would be an effective prophylaxis for people living in endemic regions, is not available yet and is a current target of medical research.

Therapy of Malaria

Besides symptomatic measures to reduce fever and overcome nausea, drugs are available, used in accordance with the various species of plasmodia and their resistances. In infections that are not caused by *Plasmodium falciparum* (but by *P. vivax*, *P. ovale* or *P. malariae*), ► chloroquine (Resochin®, Aralen®) is an effective therapy. If resistances are suspected or treatment proves to be ineffective, ► mefloquine (Lariam®, Mephaquin®), ► atovaquon + proguanil (Malarone®) or ► artemether + lumefantrine (Riamet®) can be used. Following an infection with *Plasmodium ovale* or *P. vivax*, ► primaquine should be administered for recidivist prophylaxis.

During pregnancy, ► quinine (Quinora®, Quinerva®, QM-260®) can be given intravenously or orally, alternatively, mefloquine can be given after the onset of the second trimester. Due to the risk in pregnant women and the danger of hypoglycemia, close monitoring is necessary, particularly of blood sugar levels. Quinine + doxycycline or clindamycin is effective therapy for an infection with *Plasmodium falciparum*, or artemether + lumefantrine or atovaquon + proguanil can be used. In complicated cases, in-patient care is necessary, and even intensive care measures may become essential. In developing countries, the restricted availability of drugs and the lack of medical supplies limit therapeutic possibilities and are responsible for a great number of deaths from malarial infections. Travelers in these countries may resort to self treatment – standby- or ► self-therapy of malaria. Without medical treatment, the duration of a malarial infection varies depending upon the species of plasmodia involved; *Plasmodium*

falciparum 1–2 years, *Plasmodium vivax* or *P. ovale* 1.5–5 years and *Plasmodium malariae* can take up to 50 years.

In conclusion, malaria is an infectious disease that is caused by various plasmodia species that are found in tropical areas and which is transmitted by the bite of the *Anopheles* mosquito. The infection is of great significance in malaria-endemic regions. It is characterized by recurrent fever attacks and can take a serious or even deadly course. On the one hand, measures of protection aim at the avoidance of insect bites (use of insecticides, mosquito nets, suitable clothing), and on the other hand, medicinal prophylaxis can be performed, especially on travelers to malaria-endemic regions. Malaria can be treated with different effective drugs, the availability of which might be restricted in developing countries.

Cross-References

- ► Anopheles Mosquito
- ► Artemether/Lumefantrine (Riamet®)
- ► Atovaquon + Proguanil (Malarone®)
- ► Chloroquine (Resochin®, Aralen®)
- ► Development of Plasmodia
- ► Fever Attacks in Malaria
- ► Malaria Chemoprophylaxis
- ► Mefloquine (Lariam®, Mephaquin®)
- ► Plasmodia
- ► Primaquine
- ► Quinine (Quinora®, Quinerva®, QM-260®)
- ► Self-Therapy of Malaria
- ► Thick Drop Method

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http://www.who.int/topics/malaria/en/

Malaria Causing Parasites

- ► Malaria
- ► Plasmodia (P. ovale, P. falciparum, P. malariae, P. vivax)

Malaria Chemoprophylaxis

Synonyms

Medicinal prophylaxis of malaria; Prophylactic therapy of malaria; Malaria suppression; Suppressive therapy of malaria

Definition

Chemoprophylaxis of malaria aims at the destruction of plasmodia, which are transmitted by the bite of an infected mosquito, thus preventing an outbreak of malaria. Prophylactic therapy is recommended for journeys into endemic regions that are at high risk of malaria, but not for long-term stays. Chemoprophylaxis has to be started 1 to 3 weeks before the onset of the journey and has to be continued for at least 4 weeks after leaving the endemic region. For medicinal prophylaxis ► chloroquin (Resochin®, Aralen®), ► mefloquin (Lariam®, Mephaquin®), ► atovaquon + proguanil (Malarone®) and doxycycline can be used. Before prophylaxis is carried out, the pros and cons have to be considered. On the one hand, the regional risk of a malaria infection has to be judged, on the other hand, possible side effects and long-term toxicity have to be taken into account. Special problems arise during pregnancy, especially when resistances against chloroquine are present. If it can be avoided, a pregnant woman should not travel to regions with a high risk of malaria.

Malaria Suppression

- ► Malaria Chemoprophylaxis

M

Malaria Transmitting Mosquito

► Anopheles Mosquito

Male

► Sex/Gender

Male-Factor Infertility

Definition

Male-factor infertility is the kind of infertility in which the cause or causes can be attributed to the male partner. Most often male-factor infertility is a result of absent or low sperm count, defects of the testicular veins, or ductal blockages.

Cross-References

► Infertility

Male Health

► Men's Health

Malignant Tumors

► Cancer

Malnutrition

Synonyms

Improper nutrition; Undernutrition

Definition

Malnutrition is defined as deficiency of one or more of the essential diet ingredients. Primary malnutrition is caused by lack of essential nutrients such as vitamins, minerals or proteins. Secondary malnutrition is caused by failure of absorption or utilization of essential nutrients (as in disease of the gastrointestinal tract, thyroid, kidney, liver, or pancreas), by increased nutritional requirements (growth, injuries, burns, surgical procedures, pregnancy, lactation, fever), or by excessive excretion (diarrhea). In both cases a wide range of clinical abnormalities and metabolic effects may occur. In some regions of the world malnutrition may occur due to poor economy or climate conditions such as floods, drought or due to population size (e. g. overpopulation). Also malnutrition may result from poor eating habits.

Malta Fever

► Brucellosis

Mammography

Definition

Mammography is a procedure to detect diseases of the breast, particularly tumors of the breast by the use of X-rays. The radiographic examination of the breast is indicated to assist clinical detection of masses in the breast tissue, investigate secreting mamilla, follow-up of breast cancer treatment, and screening of the female population for preclinical – particularly precancerous – lesions in the breast. The guidelines for mammography screening (breast cancer screening) vary across countries as there is no consensus of the relation between benefits of breast cancer diagnosis at an earlier stage and the risk of radiographic examination and breast cancer treatment.

Managed Care

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Synonyms

Integrated health care delivery; Coordination of care

Definition

There is no generally admitted definition of Managed Care. The term Managed Care refers to a variety of structural and procedural issues that had a major impact

on the US health insurance system and health care structures and that were at least partly adopted by other health care systems in the aftermath. The principle of Managed Care is to manage and integrate the whole range of services that a patient needs with the theoretical aim of maximizing efficiency and effectiveness of health care delivery. A characteristic of Managed Care models is that the provider of health insurance steers and monitors the delivery of the respective health care services to a higher degree than usual. The strict separation between medical responsibility on the one hand and financing and administration on the other hand moves towards an integrated, cross-functional approach. Managed Care systems typically rely on a primary care physician who acts as a gatekeeper through whom the patient has to go to obtain other health services such as specialty medical care, surgery, or physical therapy.

The following elements summarize the key characteristics of Managed Care models:

- Diligent selection of the participating/approved health care providers (selective contracting)
- Limitation of utilization of health care services to selected providers, partially with a primary care physician assigned as "gatekeeper" and responsible for the overall care of members assigned to him/her
- Setting of financial incentives for the health care provider and insured person
- Development and review of ► treatment guidelines
- Ex ante evaluation of necessity and adequacy of specific services/procedures (e. g. ► preadmission reviews)
- Retrospective review in case of specific predefined incidents
- ► Cost-effectiveness analysis of new technologies

Basic Characteristics

Emergence and Evolution

The health delivery and management forms subsumed under the term Managed Care originated in the United States. First attempts can be traced back to the middle of the 19th century, yet it took until 1973 before Managed Care models gained increasing coverage when the US Congress enacted The Health Maintenance Organization Act as a cost-containment strategy. It offered loan guarantees and start up grants to encourage the development of alternative delivery systems. Managed Care plans, with utilization controls and preferred provider relationships, became an attractive alternative to ► indemnity insurance plans for many employers. In the 1980s, the Health Care Financing Administration (HCFA), also under severe pressure to contain cost increases, began a series of changes in ► medicare reimbursement policies. HCFA implemented revolutionary payment methods that prospectively paid providers an amount calculated on the basis of their past delivery of specific diagnosis-related services, and furthermore several states introduced selective contracting with health care providers which led to the emergence of another form of Managed Care, the Preferred Provider Organizations (PPO). As Managed Care in the US continued to respond to the changing market for health care coverage, new relationships were formed; hospitals merged to create health networks, physicians were affiliated through joint ventures with participating hospitals, Managed Care plans bought health networks to create integrated delivery systems, and employers joined together and assumed financial risk to create purchasing coalitions.

Managed Care Organizations

Although there are several forms of Managed Care, with partially smooth transitions between the different types, the following three categories can usually be differentiated:

- Health Maintenance Organizations (HMOs)
- Preferred Provider Organizations (PPOs)
- Point of Service Organizations (POS Organizations)

Health Maintenance Organizations Early in the 1970s, Paul Ellwood, MD, proposed a way out of the US Medicare budget crisis. He suggested that the federal government should turn to prepaid health plans to control costs. To do so, it would be necessary for the government to catapult these insurance plans from minor to major health care players. For the purpose of new legislation, these prepaid plans were renamed "health maintenance organizations" (or HMOs); the newly coined HMO term had (at that time) greater appeal. The HMO Act of 1973 was thus designed, debated, passed, and signed the face of US health care. As defined in the act, a federally qualified HMO would allow members access to a panel of employed physicians or a network of doctors and facilities including

hospitals in exchange for a subscriber fee (premium). In return, the HMO received mandated market access and could receive federal development funds. In practice, an HMO is an insurance plan under which an insurance company controls all major aspects of the health care of the insured. In the design of the plan, each member is assigned a "gatekeeper", a primary care physician (PCP), often a ► general practitioner, responsible for the overall care of members assigned to him/her. Specialty services require a specific referral from the PCP to the specialist. Non-emergency hospital admissions also require specific pre-authorization by the PCP. The conditions of the contracts between the HMO and the insured are usually the result of negotiations between the HMO and payers (employers, ► medicaid, Medicare). There are both "for-profit HMOs" and "not for profit HMOs", with the latter representing the minority.

Preferred Provider Organizations A preferred provider organization contracts with independent service providers to ensure health care delivery of its members. There are PPOs that cover the insurance risk and PPOs that transfer the risk to the buyer/financier of the PPO services, in general a conventional health insurer or self-insured company. The idea of a preferred provider organization is the provision of a substantial discount below the regularly charged rates to the insured members of the group without significant limitation of their choice of providers. Preferred provider organizations themselves earn money by charging an access fee to the insurance company for the use of their network. They negotiate with providers to set fee schedules, and handle disputes between insurers and providers. PPOs differ from health maintenance organizations (HMOs), in which insured persons who do not use participating health care providers receive little or no benefit from their health plan. PPO members are reimbursed for utilization of non-preferred providers, albeit at a reduced rate which may include higher deductibles, co-payments, lower reimbursement percentages, or a combination of these. Exclusive Provider Organizations (EPOs) are similar to PPOs but that they do not provide any benefit if the insured chooses a non-preferred provider, apart from some exceptions in emergencies. Another feature generally included in a PPO is utilization review, where representatives of the insurer or administrator review the records of treatments provided to verify that they are appropriate for the condition being treated rather than being performed largely or solely to increase the amount of reimbursement due, a procedure that many providers resent as second-guessing. A pre-certification requirement is also a near-universal feature, in which scheduled (non-emergency) hospital admissions and in some instances outpatient surgery as well must have prior approval of the insurer and often undergo utilization review in advance.

Point of Service Organizations Besides HMOs and PPOs, Point of Service (POS) Organizations have gained increasing importance. POS organizations combine the elements of HMOs and PPOs, as members can decide if they want to be served within the HMO or by an external provider at the moment of utilizing the health care service. When enrolling in a POS plan, the insured is required to choose a primary care physician for health care monitoring. This primary care physician must be chosen from within the health care network. The primary POS physician becomes the "point of service" and may then make referrals outside the network, although only some compensation will be offered by the health insurance company in such circumstances. For medical visits within the health care network, paperwork is completed for the insured. If the insured chooses to go outside the network, it is their own responsibility to fill out the forms, send bills in for payment, and keep an accurate account of health care receipts. The advantage for the insured is that they can on the one hand utilize the broad services offered within the HMO without or with only minor deductibles, but that on the other hand they are to a large extent reimbursed when using an external provider outside the HMO.

Adaptation of US Approach by Other Countries

Some elements of the US Managed Care system have been adopted by other countries. Switzerland was the first European country where HMOs characterized by capitation (per capita lump sum) and gatekeeping in form of the General Practitioner network systems were implemented. The development of managed health care in Switzerland relies on the belief that adequate economic incentives and competition result in cost reduction and high quality health care. While both of forms of Managed Care can reduce hospitalization rates, unlike US HMOs, Swiss HMOs cannot negotiate on price with hospitals by establishing preferred provider contracts.

The first elements of Managed Care have also been implemented in Germany, primarily in the context of introducing integrated service delivery offerings, which nevertheless, as of today, only play a minor role in the German health care system. Further Managed Care elements introduced in Germany were Disease Management Programs for specific chronic diseases, as well as Diagnosis Related Groups and a hospital reimbursement system. Other European countries like France, the UK, and the Netherlands have also introduced Managed Care elements.

Conclusion

In general, it can be shown in several studies that the Managed Care models in the US have led to a shift in health care delivery from the inpatient to the outpatient sector. Although the lower costs of Managed Care Organizations for inpatient care are partially outbalanced by higher costs for outpatient care and medication, the overall costs for health care delivery of a Managed Care Organization (MCO) are still lower than for traditional health insurers. With regard to quality differences between MCOs and traditional models, there is no clear-cut picture when analyzing the different studies. It can, however, be concluded that the quality of health care delivery within MCOs is not worse than within other delivery systems, which results in MCOs being a more efficient delivery model. The successful transferability of the US Managed Care approach to other countries strongly depends on the local regulatory environment, which is often not open to more competitive elements in health care delivery.

Cross-References

- ► Cost-Effectiveness Analysis
- ► General Practitioner
- ► Indemnity Insurance Plan
- ► Managed Care Health Insurance
- ► Medicaid
- ► Medicare
- ► Preadmission Review
- ► Treatment Guidelines

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Managed Care Health Insurance

Synonyms

Managed care

Definition

Managed care health insurance refers to payment and delivery arrangements between health insurers and health care providers that are supposed to control and to coordinate the use of health care services in order to contain costs and to improve the quality of the provision of services.

Managed Competition

- ► Competition, Health Care
- ► Regulated Competition

Managed Health Care Plans (U.S.)

Definition

Managed health care plans in the United States are ► health insurances covering the risk of illness or injury of an individual by applying ► disease management programs (DM programs). Generally, managed health care plans have developed several DM programs to meet the needs of the insured suffering from differ-

ent ► chronic diseases. To provide health care services within a DM program, managed health care plans employ health professionals of their own or contract with ► disease management organizations. Managed health care plans may be privately financed and administered through insurance premiums and private insurance companies or publicly administered by the state and financed through public funds such as ► medicare and ► medicaid.

Management Damage Reduction

► Disaster Response

Management of Occupational Diseases

Synonyms

Administration

Definition

Management means the art, science, and technique of getting things done by deployment of material and human resources in systematic manner, and monitoring how, and how well, they are done. Management of ► occupational diseases deals with implementation of strategies and tactics that reflect objectives and goals in ► occupational health and safety. New management methods are aimed at putting people closer to the center of the processes. Co-workers are being more actively involved. Information, communication and cooperation are integral parts of management of occupational diseases.

Management of Oral Diseases

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Synonyms

Dental treatment; Treatment options

Definition

Management of oral diseases is concerned with the treatment of all oral disorders and syndromes by pharmacological, dental and maxillofacial/oral surgical or orthodontic means. The management of dental and oral diseases is aimed at restoring oral health or restoring a condition that enables an individual to lead a "socially and economically productive life in a state of complete physical, mental and social well-being" (World Health Organization 2001).

Basic Characteristics

Oral Disease – Management and Disciplines

Oral diseases can affect all oral and dentofacial structures. Thus, the management of oral disorders includes all steps from the examination to the diagnosis and treatment of such illnesses. Oral diseases can affect all oral and dentofacial tissues; the hard tissues including bone and teeth as well as mucosal, pulpal, periodontal and glandular soft tissues.

Traditionally, the treatment of different types of diseases has been organized into a number of different (specialty) disciplines. Examples for each of the disciplines are listed in Table 1. Conditions within the discipline of *oral (and maxillofacial) surgery* include infections, trauma to maxillofacial structures and neoplastic diseases. *Operative (or conservative) dentistry* focuses on the treatment of caries and dental trauma including diseases of the dental pulp (endodontics). *Prosthodontics* is involved with the replacement of missing teeth as well as the treatment of functional structures such as the temporomandibular joint and jaw muscles. It is common to summarize all efforts to restore or replace teeth under the term restorative dentistry. *Periodontology or periodontics* is the specialty concerned with the diagnosis and treatment of illness of the gingival and periodontal tissues. *Orthodontics* or dentofacial orthopedics focuses on the diagnosis and treatment of defects in tooth position and the treatment of dentofacial deformities, mostly with regard to the alignment of the maxillo-mandibular relationship. Crossing these disciplines is *general (or family) dentistry*, which includes all treatments that can be provided in a primary care setting. *Pediatric dentistry* deals with the provision of dental services to children, and *geriatric dentistry* is focused on specialized treatment for the elderly and infirm patients.

Management of Oral Diseases, Table 1 Disciplines and their respective field within oral disease management

Discipline	Typical diseases	Typical treatments
Oral (maxillofacial) surgery	Oral cancer Maxillofacial trauma Infections of the salivary glands Mucosal lesions	Pharmacological treatment (infections) Surgical removal of teeth Surgical excision (mucosal irregularities, tumors) Surgical reconstruction Orthognathic surgery Bone grafting Placement of dental implants
Operative dentistry (including endodontics)	Caries Pulpitis	Anterior and posterior fillings Root canal treatment Esthetic corrections (tooth whitening, bleaching)
Prosthodontics	Partial edentulism Complete edentulism Myofascial pain Arthropathies Facial defects	Fixed restorations (crowns, partial crowns) Fixed partial dentures (bridges) Removable partial and complete dentures Dental implant restorations Maxillofacial prostheses Bite splints
Periodontics	Gingivitis Periodontitis	Closed debridement Open debridement (flap surgery)
Orthodontics	Skeletal dysgnathia Dental malalignment	Orthodontic positioning and alignment of teeth

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Treatment of Oral Diseases

Surgical Treatments Oral cancer is among the conditions treated by surgical intervention (Howaldt 2000). Curative treatment is usually initiated by radical surgical removal of the tumor. Radical in this case means that all cancerous tissue can be removed. Surgical treatment can be supplemented by radiotherapy and chemotherapy. However, in some cases a curative approach is not possible without destruction of vital organs, thus palliative treatment with partial tumor removal (size reduction) followed by chemo- or radiotherapy can be carried out. The ultimate goal in the latter case is to restore the quality of life of the patient. Depending on the amount of oral and maxillofacial structures that are destroyed by cancer or ablative surgery, many such patients require reconstruction. Surgical reconstruction may also be required after maxillofacial trauma due to accidents. Bony structures can often be repositioned after trauma, however in some cases and after removal of parts of the jawbone due to tumor surgery, bone grafts can be used to replace missing bone. Other procedures are various types of flap surgeries or skin grafting to repair soft tissue lesions. In some cases, maxillofacial prostheses are required and delivered by prosthodontists. Other procedures provided by oral surgeons include the surgical removal of teeth including wisdom teeth. For these procedures, a surgical incision is made to lift a mucosal flap to enable access to the jawbone. Variable amounts of bone are then removed by osteotomy to get access to the structure to be removed. Wisdom teeth or residual roots can then be removed and the wound is closed by sutures. ▶ Dental implants are another treatment often provided by oral surgeons. These artificial tooth roots are usually made from titanium and used to replace missing teeth or to stabilize dentures.

Operative Dentistry Dental caries often results in large primary structural defects of one or multiple teeth. High and low speed motors are used to excavate the decayed enamel and dentine together with diamond and round burs. The resulting defects can be restored either by direct or indirect restorations. For anterior teeth (incisors and canines), direct restorations are made from tooth-colored resin composite materials. These can also be used for smaller fillings of posterior teeth (premolars and molars). ▶ Composite fillings are bonded to the remaining enamel and dentin using

an etching and bonding technique. For posterior teeth, amalgam has been used as a standard filling material; it as been used less in the past years due to controversies about its biocompatibility. Instead, gold ► inlays or ► onlays (partial crowns) can be made. If a more esthetically pleasing restoration is desired, inlays or onlays can be made from ceramic. If caries leads to an inflammation of the dental pulp, an *endodontic* or ► root canal treatment is carried out. The dental pulp is removed completely and the space is filled with a root filling material (Kidd et al. 2003).

Dental trauma is often caused by accidents in road traffic or households. Fractured tooth fragments can either be reattached using the bonding technique. If fragments are lost, the tooth can be restored with a resin composite filling. Larger defects may require a crown restoration. Traumatized teeth which have been partially or fully avulsed can often be splinted to adjacent teeth if the alveolus is intact. Primary healing of the traumatized periodontal and gingival tissues is often achieved, however, an endodontic treatment may be necessary. The prognosis of avulsed teeth is uncertain. If the integrity of the tooth as a whole is compromised beyond the loss of the clinical crown it usually cannot be replanted and the resulting gap will have to be closed using prosthetic restorations.

Prosthodontics If larger portions of dental hard tissues are missing they need to be replaced by prosthodontic means. Fixed prosthodontic (Shillingburg 1997) rehabilitations include full ► crowns. For posterior teeth, metal crowns are common whereas for anterior teeth, mainly tooth-colored crowns are used (porcelain fused to metal, all-ceramic) so that tooth shape and color are mimicked.

Small numbers of missing teeth can be replaced using ► fixed dental prostheses (fixed partial dentures; FPDs). As long as the gap is enclosed by teeth, these can be used as abutment teeth for fixed bridgework. The missing tooth itself is replaced by a pontic. Multiple gaps can be restored with multiple pontics, however, as a general rule, no more than three adjacent missing teeth should be restored using FPDs. Single or multiple missing units can also be replaced using ► dental implants. After the surgical placement of the jaw-anchored titanium screw and a healing phase, the final prosthodontic restoration is made and attached to the implant using a screw or cement joint. In most cases, fixed restorations will not only restore chewing and speech function but also restore the esthetic appearance so that the rehabilitation will not be detected by the untrained eye.

Multiple missing teeth often cannot be restored by fixed restorations anymore, unless multiple implants are placed. Thus, ► partial removable dental prostheses (removable partial dentures; RPD) (Jepson 2004) are required to rehabilitate patients suffering from partial edentulism. Such partial dentures consist of a base which is usually made from denture base resin (polymethylmethacrylate). The base is completed with industrially prefabricated denture teeth, the actual replacements for the missing natural teeth. Final RPDs often have a reinforcing metal substructure. The metal base extends to the attachments which are used to retain the denture in the patient's mouth. Attachments can be clasps which partially circumvent the remaining teeth; in addition, so called ► precision attachments or ► telescopic crowns (telescopic copings, double crowns) are used as attachments. Removable dentures can be worn at all times, but have to be removed by the patient for cleaning.

If all teeth are missing, ► complete removable dental prostheses (complete dentures; Geering et al. 1993; Zarb et al. 2004) are used to replace all of the missing teeth. Similar to partial dentures, a denture base made of pink acrylic resin is combined with denture teeth to make a complete denture. These dentures rely on the anatomy of the jawbone and the mucosal tissues for retention. Jawbone will be reduced by resorption over time, thus denture retention will decrease over time. Dental implants (Lindhe et al. 2003) can be used to improve retention and regain support of partial and complete dentures.

Periodontics ► Gingivitis and ► periodontitis make up for the second large entity of bacterial oral disease. Treatments for gingivitis and periodontitis include closed and open debridement of the root surfaces of the affected teeth. Surgical treatments comprise but are not limited to open flap surgery to gain access to cleaning sites and guided tissue regeneration to recreate periodontal attachment of the tooth to the jawbone (Lindhe et al. 2003).

Orthodontics Orthodontic diagnosis and treatments are mostly provided in specialist settings. Rotated,

inclined or malpositioned teeth are moved using minimal forces applied by removable or fixed orthodontic devices. Skeletal dysgnathy is mostly treated surgically through repositioning of the mandible and/or maxilla within the skull bone.

Delivery of Care and Goals of Dental Disease Management

The management of oral disease is mostly provided through individual treatment providers in ambulatory settings. Treatment providers are mostly general dentists, while orthodontic services are almost exclusively offered by specialists. Oral surgical procedures are mostly performed on an outpatient basis while extensive maxillofacial interventions are carried out in specialized hospitals.

The ultimate goal of managing dental disease is the 'restitutio ad integrum'. This may be achieved for some infectious diseases and low-grade trauma to soft and hard tissues and functional illnesses such as myofascial pain. However, for the restorative disciplines a complete restoration of the initial state is impossible, thus the goal mostly has been reduced to a disease free state of hard and soft tissues. In addition, for most restorative and prosthodontic (including periodontal and implant) treatment, goals can be expressed in terms of survival of the treated tooth or the restoration. However, survival does not reflect the patient perspective. This is achieved using patient based ratings of satisfaction, chewing ability (or function), oral comfort, ability to speak and of esthetics (Heydecke et al. 2003a). Furthermore, oral health related quality of life can be measured using specific questionnaires (Heydecke et al. 2003b).

Cross-References

- ▶ Complete Removable Dental Prosthesis
- ▶ Composite Filling
- ▶ Crown
- ▶ Dental Implants
- ▶ Fixed Dental Prosthesis
- ▶ Gingivitis
- ▶ Inlay, Onlay
- ▶ Onlay
- ▶ Partial Removable Dental Prosthesis
- ▶ Periodontitis
- ▶ Precision Attachment
- ▶ Root Canal Treatment
- ▶ Telescopic Crown, Double Crown

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Mangyan

- ▶ Indigenous Health, Asian

Mania

Definition

Mania is characterized by an elevated mood out of keeping with the patient's circumstances. It may vary from carefree joviality to almost uncontrollable excitement. Elation is accompanied by increased energy, resulting in overactivity, pressure of speech, and a decreased need for sleep. Attention cannot be sustained, and there is often marked distractibility. Self-esteem is often inflated with grandiose ideas and overconfidence. Loss of normal social inhibitions may result in behavior that is reckless, foolhardy, or inappropriate to the circumstances, and out of character. Individuals can suffer from mania with or without psychotic symptoms. Manic patients with psychotic symptoms

also experience delusions (usually grandiose) or hallucinations (usually of voices speaking directly to the patient) or the excitement, excessive motor activity, and flight of ideas are so extreme that the subject is incomprehensible or inaccessible to ordinary communication.

Manic-Depressive Illness

► Bipolar Affective Disorder

Manic-Depressive Psychosis

► Bipolar Affective Disorder

Manic-Depressive Reaction

► Bipolar Affective Disorder

Man-Machine System

Definition

► Human-factors engineers regard humans as an element in a "man-machine" system. A "man-machine system" means that the man and his machine have a reciprocal relationship with each other. A man is effectively a single channel device, although one that time shares. An ergonomically sound system provides optimum performance because it takes advantage of the strengths and weaknesses of both its human and machine components. This has always been done intuitively by good designers, but systems ergonomics aims to ensure that this is done systematically.

Mann Whitney (U) Test

Definition

A non-parametric test for comparing the distribution of a continuous variable between two independent groups. It is analogous to the paired-sample t-test, and can be used when the data are ordinal or not normally distributed.

Mantel-Haenszel χ^2 Test

Definition

Test for a null hypothesis of no overall relationship in a series of 2×2 tables for stratified data derived either from a cohort or a case-control study. It allows analysis of confounding and gives an adjusted odds ratio or relative risk. It can be used on categorical or categorized continuous data.

Maori Health Strategy

Definition

Maori ► health strategy sets the direction for Maori health development in the health and disability sector for the next five to 10 years. It is accompanied by the Health Action Plan that contains the governmental action plan for strategy implementation. This includes public policies that actively promote: whānau well being, quality education, employment opportunities, suitable housing, safe working conditions, improvements in income and wealth, and addressing systemic barriers including institutional racism.

Maori (New Zealand)

► Indigenous Health – Australooceaninan

Marburg Disease

► Marburg Fever

Marburg Fever

Synonyms

Marburg disease; Marburg virus disease

Definition

Marburg fever, which appeared first in Marburg (Germany) in 1967, is an Ebola-like hemorrhagic fever. The course is less severe than Ebola. The disease was transmitted by African green monkeys, which had been

imported from Uganda for medical trials. A vaccine is not available.

Marburg Virus Disease

► Marburg Fever

Marital Quality

Definition

Perceived and objective characteristics of a marital union. These characteristics may include self-evaluated assessments of satisfaction, fullfillment, and happiness of union partners. They may also involve self- or externally-evaluated aspects of marital interactions, such as conflict, communication, problem solving, sharing, and physical and/or emotional closeness. In addition to interpersonal dynamics, it involves structural aspects of a union, such as the cohabitation and separation history. Marital quality addresses the history and dynamics of social, economic, psychological and even sexual rights and reciprocity within the couple.

Market Research

Definition

Market research is the systematic collection and analysis of data about the consumers (or target individuals) and their preferences, the competitors and potential allies, appropriate methods of distributing messages and reaching ► target groups, and the effectiveness of marketing programs. Techniques in market research include telephone polling and focus group interviews. Using a social marketing approach, market research can also be applied in public health in the context of designing public health programs. It helps to answer questions such as: How does the target group think and behave as related to a health goal or health problem? How can the target audience be reached best? Which messages and materials work best?

Masculinity

► Sex/Gender

Mass Media

Synonyms

Mass communication

Definition

Mass media like print media, television, and radio, as well as the internet, refers to those media that are designed to be consumed by large audiences through the agencies of technology. In the context of health education, mass media is a tool for the transfer of information, concepts, and ideas to both general and specific audiences. They are important tools in advancing public health goals of health promotion campaigns.

Mass media is a term describing the form of communication designed to reach a vast audience, such as the population of a state or nation, without any personal contact between the senders and receivers. Examples would include newspapers, magazines, billboards, radio and television, as well as the internet. Mass media are tools for the transfer of information, concepts, and ideas to both general and specific audiences. They are important tools in advancing public health goals, e. g. through awareness raising campaigns.

Using mass media can be counterproductive if the channels used are not audience-appropriate, or if the message being delivered is too emotional, fear arousing, or controversial. Therefore, proper formative research is necessary, including questions on the choice of channels, attitudes of the priority audience, and message testing.

Matching

Definition

Matching is the process of making a study group and a comparison group comparable with respect to extraneous factors. It is a selection of study subjects so that major known confounders are evenly distributed across the study groups.

Matching is often done in case-control studies in which controls are selected to match the cases in some way, e. g., by age and sex. It can be used in some way in cohort studies, but this is uncommon. Matching can be done on an individual basis, with one or more controls

matched to each case so that for instance, each control is matched by year of birth to a specific case. Alternatively, frequency matching aims to select controls to match the general distribution of the confounding variables in cases. For example controls would be selected to ensure the same male to female ratio as cases.

Material Safety Data Sheets

Synonyms

Chemical safety data sheet

Definition

Material safety data sheets (MSDS) are the foundation of a successful safety and health program. They provide information that can be used during employee training and chemical exposure emergencies; they also give vital information to medical professionals caring for the affected employee. Their purpose is to communicate critical facts about the working safety with regard to the material. MSDS is a standardized document that serves to alert both the worker and the occupational safety and health professional about the relevant hazards at the workplace, as well as means of prevention of harm from a specific chemical substance. The information presented could then serve as a basis for the development of informational and instructional materials (such as curricula, guidelines, checklists, codes of practice, and warning notes), and for the selection of appropriate measures to either abate or reduce the risk of exposure.

The MSDS contains detailed information about the properties of hazardous material and the precautions to be followed for its use. Where prescribed by law, employers must maintain an inventory of chemical and biological agents.

Maternal Mortality

Definition

Maternal mortality is defined as probability of dying at giving birth expressed per 1000 deliveries.

Maternal Mortality Rate

Definition

The maternal mortality rate is the number of pregnancy-related deaths per 100,000 live births during the same year. According to the World Health Organization (WHO) "maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy", but sometimes deaths up to one year after birth are included. The maternal mortality rate is a measure of the likelihood that a pregnant woman will die from maternal causes. This measure reflects not only the adequacy of pregnancy-related health care, but also the general level of socioeconomic development. Maternal mortality rates are very low in industrial countries.

Maternity

► Pregnancy

Maturation

► Child Health and Development

McNemar's Test

Definition

A special form of the Chi-squared test used in the analysis of paired (not independent) proportions. This non-parametric test compares two correlated dichotomous responses and is most frequently used in situations where the same sample is used, to find out the agreement (concordance) of two diagnostic tests or difference (discordance) between two treatments.

Mean

Definition

The mean is the most commonly used ► measure of central tendency. When used without any qualification, mean refers to the arithmetic mean. The sample mean is usually denoted by the symbol $\bar{x}$. The mean

of a set of observations $x_1, x_2, \ldots, x_n$ is defined as $\bar{x} = (x_1 + x_2 + \cdots + x_n)/n$, where n is the number of observations. Mean is based on all observations of the data set and consequentially is influenced by extreme values, either high or low. It is most useful when the data distribution is symmetric. Mean is not a good measure of central tendency if the data distribution is skewed or contains extreme values. One way to obtain a mean that does not depend on the extreme values is the trimmed mean. It can be calculated by removing a certain percentage of the lowest and the highest values of the distribution and then calculating the mean by using the remaining data. For example, a mean trimmed 10% is calculated by removing the lowest and highest 5% of the values. Two other means used in statistics are the geometric mean and harmonic mean.

Meaning

► Ethics and Religious Aspects

Measles

Synonyms

Rubeola; Morbilli

Definition

Measles, first described in the 10th century, is a viral infectious disease, which is spread by droplets. Humans are the only reservoir of the virus. Widespread epidemics caused a great number of deaths in the Middle Ages, and not without cause measles has been called the greatest killer of children in history. According to the World Health Organization, even in 2003 about 500 000 people, mostly children, died from measles. After an incubation period of 10–14 days the prodromal stage appears, which is characterized by fever and inflammatory reactions of the respiratory tract and the eyes. One can speak of the typical three Cs, which are cough, coryza (running nose) and conjunctivitis (red eyes). The second stage of the infection starts after 12–13 days with a reddening of the palate and the mucous membrane of the cheeks. Two to three days later the typical maculopapular rash delvelops, starting behind the ears and then spreading over the whole body. Possible complications are a swelling of the larynx (croup), pneumonia, corneal and retinal damage and inflammation of the brain (encephalomyelitis). A rare, but extremely feared complication is subacute sclerosing panencephalits (SSPE). SSPE is an inflammation of the whole brain, which appears months or years after infection with measles. The disease, which cannot be treated, is progressive and always leads to death. The most important measure to prevent an infection with measles is the active measles-vaccination (► immunization, active).

Cross-References

► Infectious Diseases in Pediatrics

Measles Vaccination

Synonyms

Measles immunization; Rubeola vaccination; Rubeola immunization

Definition

Living ► vaccines against measles have been available since the 1960s. Antibodies transferred to the unborn child through the mother's placenta may inhibit the success of the vaccine by neutralizing the vaccine's viruses. For this reason, the first measles vaccination should not take place before 11 months of age. A second vaccination is recommended at an interval of at least 4 weeks following the first vaccination, in order to provide immunity even when primary vaccination has failed. In the majority of cases, the combination vaccination against measles, mumps and rubella (MMR) is used. The protection rate of the vaccination is 99%, and probably lasts a lifetime. Measles vaccination leads to immunity quickly. An infection from the wild-type measles virus can be prevented by vaccination up to 48 hours after the measles' incubation. At 6 to 10 days after vaccination, 5% of cases show a mild course of the disease without any risk of contagiousness. Contraindications for measles vaccinations are immune deficiency, acute diseases with fever, pregnancy and a known severe allergic reaction to components of the vaccines or the carrier protein.

Measurement

Synonyms

Assessment; Judgment; Mensuration; Rating; Quantification

Definition

Measurement is the process in which numbers or other symbols are assigned to the characteristics of the units that are observed, in such a way that the relation between numbers or symbols reflects the relation between characteristics that are the subject of the research. In medicine various characteristics of individuals and indicators of health may be the object of measurements: e. g. clinical (presence of signs and symptoms, diagnosis, performance of a diagnostic procedure), physiologic-biochemical, physical, mental, psychosocial, epidemiologic (frequency of disease, rates), vital statistics, various aspects of health care, health related quality of life and patient perception and satisfaction.

An inherent property of every measurement procedure is ► error in measurement.

The most common bases for biochemical and physiologic measures are International System of Units (SI) which is a metric system based on multiples of ten (decimal system).

Measurement: Accuracy and Precision, Reliability and Validity

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Synonyms

Assessment; Judgment; Mensuration; Metage; Rating; Quantification

Definition

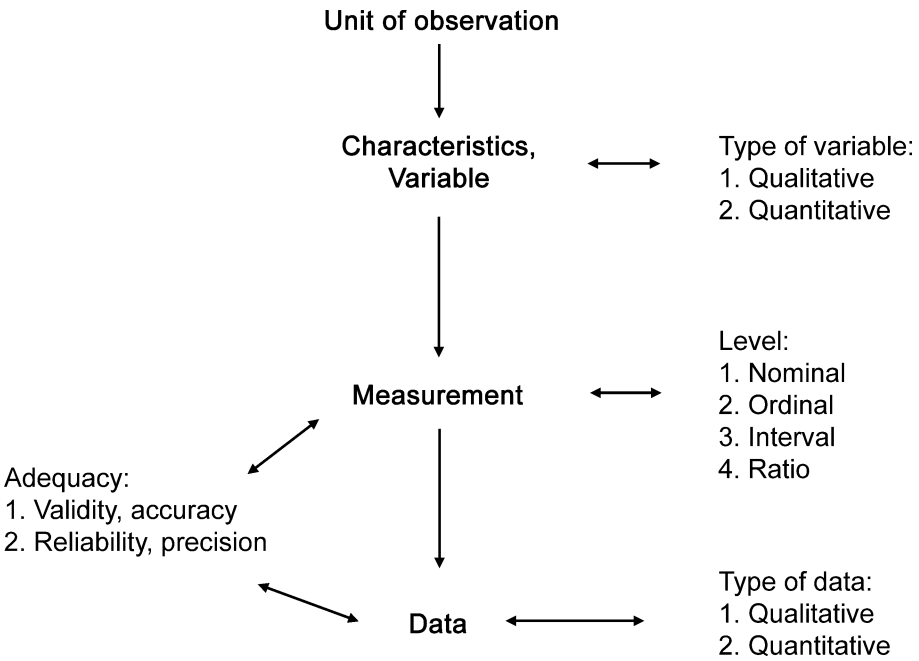
► Measurement is the process in which numbers or other symbols are assigned to the characteristics that are being observed.

Basic Characteristics

Measurement is the process in which numbers or other symbols are assigned to the characteristics of the units that are observed, in such a way that the relation between numbers or symbols reflects the relation between characteristics that are the subject of the research. Measurement is the process in which the numbers or other symbols are assigned to the characteristics of the units that are observed, in a way where the relation between numbers or symbols refelcts the realtion between characteristics that are the subject of the research. Figure 1 shows relation of measurement to unit of observation, variable and data, some of key terms in biostatistics (see synopsis Biostatistics).

In all measurements some degree of uncertainty is present, and it can be expressed as ► error in measurement. This means that, beside measured values (estimate of true value), each measuring has two other components: error limits and probability that the true value is within error limits. The errors that occur in the measurement process are inherent, and can be reduced only by more adequate measuring. The errors can be classified into two categories: systematic and random errors. Systematic error (bias) is the cause of predictable systematic overestimated or underestimated values. On the other hand, random errors are not predictable, and in a given measurement process they can result either in overestimated values or underestimated values.

The errors in the measurement process can originate from various factors such as poor instrument calibration, inaccurate response time within the instrument in relation to the changes in the measured variables, loading errors – influence of the instrument on the measured ► variable, conditions of the surroundings, human factors – inter-observer and intra-observer variability. Sometimes random errors occur because of 'noise' – small and quick changes in the environment or in the instrument itself. The measurement can be made more adequate by identifying and minimizing any error. Measurement adequacy subsumes various concepts such as ► accuracy, ► agreement, ► precision, ► reliability, validity (► validity, measurement) and repeatability and reproducibility are necessary concomitants associated with these concepts. Repeatability signifies the closeness of results of successive measurements obtained under near identical conditions while reproducibility signifies the closeness of results of successive measure-



Measurement: Accuracy and Precision, Reliability and Validity, Figure 1 Relation of measurement, unit of observation, variable and data

ments obtained under changed conditions, e. g. changes in techniques, technicians, instruments and/or laboratories.

► Accuracy refers to the closeness of the measured value to the correct value (marked as "reference", "criterion" or "gold standard"). In laboratory measurements the gold standard is defined by the referent laboratory. The gold standard is the method or procedure that is widely recognized as the best available, e. g. a diagnostic test that will reflect the true disease status (Feinstein 2002). When a test is carried out for diagnostic purposes it is called an index test (Webb et al. 2005). The index test results are then compared to defined gold standards as shown in Table 1, where the examinees are classified as positive or negative according to the gold standard and index test (Chernick and Friis 2003).

Measurement: Accuracy and Precision, Reliability and Validity, Table 1 Comparison of test results and final diagnosis

		True disease status		
		Diseased	Nondiseased	Total
Test result	Positive	*TP*	*FP*	*TP* + *FP*
	Negative	*FN*	*TN*	*FN* + *TN*
	Total	*TP* + *FN*	*FP* + *TN*	*N*

TP – true positive, *FN* – false negative, *FP* – false positive, *TN* – true negative, *N* – sample size

An estimate of diagnostic accuracy for the index test, as well as predictive values can be calculated:

1. Overall accuracy $= (TP + TN)/N$
2. Sensitivity $= TP/(TP + FN)$
3. Specificity $= TN/(FP + TN)$
4. Positive predictive value $= TP/(TP + FP)$
5. Negative predictive value $= TN/(FN + TN)$.

Unlike accuracy, agreement is examined in the absence of gold standards, and it refers to the closeness of two measured values, not to whether those values are correct or not (Feinstein 2002). When the measurement results are given as binary ► data, the agreement is estimated by ► proportion of agreement or ► kappa coefficient, and when given as continuous ► data agreement is estimated with ► Pearson's correlation coefficient (Pearson's r) or with intraclass correlation coefficient. In binary ► data the comparison between two raters or two measurement methods can be shown if a 2×2 table is used (Table 2).

The frequencies a and b represent the agreement of two raters, while the frequencies c and d disagreement. The ► proportion of agreement (percent of agreement) is the proportion of frequencies in cells a and d of total frequency: $(a + d)/N$ (Katz 1997).

When ► kappa coefficient approaches one, the possibility that two raters having the same results is a random phenomenon has to be considered (Feinstein

Measurement: Accuracy and Precision, Reliability and Validity, Table 2 Comparison of the results obtained by two raters

		Rater A		
		Yes	No	Total
Rater B	Yes	a	b	$a+b$
	No	c	d	$c+d$
	Total	$a+c$	$b+d$	N

2002). It is calculated through following formula: $\kappa = \frac{2(ad-bc)}{(b+c)N+2(ad-bc)}$. ► Kappa coefficient value less than 0.4 can be considered as poor, from 0.4 to 0.75 fair to good, and over 0.75 excellent (Fleiss 1981).

► Precision refers to the consistency of repeated results. The less the differences among repeated measures the larger the measurement precision. Precision is quantified by measures of variability (variance, standard deviation, coefficient of variation) and confidence intervals. These measures are called imprecision measures, as the higher the variation the less the precision.

Precision should not be confused with resolution (the smallest change of the measurement value that an instrument can show). In digital instruments resolution depends on the number of digits in the measurement result, and in analogous instruments it depends on the relation between the width of the measurement grade on the scale and the indicator width (Harlow et al. 2002). Generally, resolution is higher than accuracy on the instruments, thus the resolution does not limit the minimal changes of the measurement value that the instrument can detect.

Example 1:

A new automated analyzer for reticulocyte counting was to be evaluated in a study. Seventy blood samples were collected, and used to compare results obtained by the automated analyzer and those by manual (visual) counting, as well as to estimate the imprecision of these two methods.

The correlation coefficient between the results of these two methods was 0.96. Intra-assay imprecision was presented in the form of coefficient of variation (CV), and it was 19% for the automatized system, and 26% for the manual method. It was concluded that there is excellent concordance between these two methods and that the imprecision was less in the case of the automated analyzer (less CV) that was the subject of the evaluation.

Measurement: Accuracy and Precision, Reliability and Validity, Table 3 Arthroscopic and ultrasound findings of medial meniscus examination

		Arthroscopic findings of medial meniscus injury (gold standard)		
		Positive	Negative	Total
Ultrasound findings of medial meniscus injury	Positive	75	1	76
	Negative	1	11	12
	Total	76	12	88

Example 2:

The research goal was to estimate the diagnostic accuracy of medial meniscus ultrasound examination. Arthroscopic findings confirming the diagnosis of medial meniscus injury was taken as the gold standard. The findings, obtained in the course of arthroscopic and ultrasound examination are shown in Table 3.

These data resulted in the evaluation of diagnostic accuracy and predictive values for ultrasound examination:

- overall accuracy $= (75+11)/88 = 0.98$,
- sensitivity $= 75/76 = 0.99$,
- specificity $= 11/12 = 0.92$,
- positive predictive value $= 75/76 = 0.99$, and
- negative predictive value $= 11/12 = 0.92$.

In the same research the agreement between two doctors, who used ultrasound examination of medial meniscus, was tested. Comparison of the findings obtained by two doctors is shown in Table 4.

The proportion of agreement was $(73+10)/88 = 0.94$ (i. e. percentage of agreement 94%). Kappa coefficient was $\kappa = \frac{2(73\cdot10-3\cdot2)}{(3+2)\cdot88+2(73\cdot10-3\cdot2)} = 0.77$, which is in the region of excellent.

Measurement: Accuracy and Precision, Reliability and Validity, Table 4 Ultrasound findings of medial meniscus injury given by two examiners

		Rater B – findings of medial meniscus injury		
		Yes	No	Total
Rater A – findings of medial meniscus injury	Yes	73	3	76
	No	2	10	12
	Total	75	13	88

Many measurement in medicine is based on the results of questionnaires or scales. The measurement value is obtained as answers to several questions or items within the particular measurement instrument, questionnaire or scale. The measurement adequacy evaluation of such instruments depends on their ► reliability and validity. The concept of ► reliability is akin to the concept of ► precision, and the concept of validity is akin to the concept of ► accuracy (Krishnamurty et al. 1995). ► Reliability indicates the degree to which the measurement instrument is consistent, and validity is the relation between what is assumed to being measured by the instrument and what it is actually measuring (Nunnally and Bernstein 1994).

There are three ways to analyze reliability: internal consistency reliability, test-retest reliability and inter-rater reliability.

Applying the evaluation of the internal consistency we estimate the congruence of individual items on the scale. Each item is observed as a separate instrument for the measurement of an examined construct, so that coherence between them suggests that all items measure the same thing as the instrument as a whole. Applying alpha coefficient (Cronbach's alpha) and Kuder–Richardson formula – KR20 is the most frequent way to calculate internal consistency evaluation. Inter-rater reliability measures agreement of two or more raters that use the same information on the same analyzing unit. Inter-rater reliability is mostly evaluated by the application of intraclass correlation coefficient, ► Pearson's correlation coefficient, ► kappa coefficient, and rank correlation coefficient. Test-retest reliability is an estimation of the stability of scale over time that is a measure of the congruence of results obtained by repeated measurement on the same objects, under the proviso that there is no change in the condition of those objects.

Validity can be considered as the extent to which a measurement, test, or study measures what it purports to measure. Three major types of validity are content, criterion and construct validity. Content validity indicates whether the measuring instrument covers all areas under investigation. Criterion validity is empirically based, and relates to the correlation of the instrument with external criteria. Construct validity is applied when there is no adequate gold standard, existing instruments, criteria or other ► data against which results can be compared. It is possible to improve construct validity by developing a more fitting definition of the construct, derived from a set of related ideas, by finding a better way to measure that construct, and by giving an accurate explanation of the effects it has in clinical practice and research (Blacker 2000).

Example 3:

The research goal was to estimate the reliability and validity of the questionnaire on children's health status. The questionnaire is a parent-report instrument, and it consists of 30 questions that parents answered about their children's health status. The research was carried out on the representative sample of 1572 parents. The questionnaire showed good reliability of internal consistency (alpha coefficient $= 0.93$), and good test-retest reliability (Pearson's $r = 0.91$). Content and construct validity was estimated by correlation between questionnaire scores and data on health service use, presence of illness, disability and functioning, where the Pearson's r was above 0.82. It was concluded that estimating children's health status, through the administration of the questionnaire, is reliable and valid.

M

Cross-References

► Accuracy
► Agreement
► Data
► Error in Measurement
► Kappa Coefficient
► Measurement
► Precision
► Proportion of Agreement
► Reliability
► Variable

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Measurement Error

► Error in Measurement

Measures of Association

Definition

Measures of association show the degree of ► relationship between two or more variables. These measures usually show the direction and strength of the ► relationship. The first step in discovering an association between variables can be a ► graphical representation of data pairs, using the scatter diagram, which allows a visual inspection for the possible association. Numerical assessment of association includes various measures. For two continuous variables the most commonly used measure of association is ► Pearson's correlation coefficient. Nonparametric counterparts for correlation between two sets of ranks are Kendall's tau, Spearman's rank correlation coefficient, Goodman–Kruskal gamma, and Somer's *D*.

For data in a ► contingency table, a measure of association shows the degree of association between categories of variables in rows and columns. For these data, measures of association include the phi coefficient, contingency coefficient, Cramer's V, Yule's *Q*, Goodman–Kruskal lambda, Tschuprov coefficient, and Sakoda coefficient.

For epidemiologic data, measures of association show the degree of association between exposure to risk factor and event occurrence (disease, injury, ...). Data measures of association, also called measures of risk, include measures such as ► relative risk, ► odds ratio and risk difference.

Measures in Case of Outbreak of Communicable Diseases

► Outbreak Management and Surveillance of Infectious Diseases

Measures of Central Tendency

Definition

Measures of central tendency describe the distribution of a set of values around a value or values at or near the middle of the set. The measures of central tendency that are most commonly used are ► mean, ► median and mode. ► Mean is computed by dividing the sum of all values by the number of values. ► Median is equal to the numerical value of the central data in the sequence of data ordered from the smallest to the largest. Mode is the value with the highest frequency of occurrence in a set of data. Which of these measures is used depends on the characteristics of the data. Mode can be applied with all levels of measurement, but is not useful with a set of data that has many values. Median can be applied with ordinal, interval and ratio levels of measurement, but is not useful with a set of data that has few values. Mean can be applied with interval and ratio levels of measurement, but is not useful when the data distribution is skewed or contains extreme values. For moderate asymmetric unimodal distributions an empirical relationship between the mean, median, and mode is given by mean – mode $\approx$ 3(mean – median).

Measures of Dispersion

Definition

Measures of dispersion show a degree of variation or dispersion of values of the observed variable around the measures of the central tendency. If the values tend to be grouped around the measures of central tendency, then these measures will be small, while if the values tend to be spread more around the measures of central tendency, then the measures will be large. The measures of dispersion can be divided into the measures based on quantiles and measures based on the deviation of observations from the mean. Measures of dispersion based on quantiles are (a) range – difference between

the largest and the smallest value, (b) interquartile range – difference between the first and the third quartile), and (c) interdecile range – difference between the first and the ninth decile (see essay Descriptive statistics). Measures of dispersion based on the deviation of observations from the mean are (a) variance – mean square deviation from the mean, (b) standard deviation – square root of the variance, and (c) coefficient of variation – relative measure of variation obtained by dividing the standard deviation by the mean and expressing this ratio in percentage (see essay Descriptive statistics).

Cross-References

► Descriptive Statistics

Median

Definition

Median is a ► measure of central tendency which is equal to the numerical value of the middle data in the sequence of data ordered from the smallest to the largest. When the number of data is odd, the median is equal to the middle data. It can be found in location $(n+1)/2$ of the set of values, where n is the number of values. When the number of data is even, the median is equal to the mean of the two middle data. The median divides the data into two parts of equal size and it is equal to the second quartile, fifth decile, fiftieth percentile (see quantiles), and nearly equal to the cumulative relative frequency of 50% on a cumulative frequency graph. The median is the best measure of central tendency if the data distribution is skewed or contains extreme values.

Median Survival Time

Definition

The median survival time is the time at which 50% of cases are resolved. Median survival is very often reported in survival analysis. The median survival time can be derived from a ► Kaplan–Meier survival plot.

Median Test

Definition

Assesses the difference in samples in terms of a contingency table. The number of cases in each sample that fall above or below the common median is counted and the Chi-square value for the resulting $2 \times k$ samples contingency table is calculated. The median test is particularly useful when the scale contains artificial limits, and many cases fall at either extreme of the scale.

Mediate

Synonyms

Mediation

Definition

The pre-requisites and prospects for health cannot be ensured by the health sector alone. More importantly, health promotion demands coordinated action by all concerned: by governments, by health and other social and economic sectors, by non governmental and voluntary organizations, by local authorities, by industry and by the media. People in all walks of life are involved as individuals, families and communities. Professional and social groups and health personnel have a major responsibility to mediate between differing interests in society for the pursuit of health. Health promotion strategies and programs should be adapted to the local needs and possibilities of individual countries and regions to take into account differing social, cultural and economic systems.

Mediation

Synonyms

Reconciliation

Definition

In ► health promotion, the process of negotiation and reconciliation of the different interests (personal, social, economic) of individuals and groups and of different sectors (public and private) in ways that promote health

and quality of life. This is one of the three health promotion action strategies of the ► Ottawa charter (WHO 1986). The strategy is based on the insight that producing change in people's lifestyles and living conditions inevitably produces conflicts between the different sectors and interests in a population. Such conflicts may arise, for example, from concerns about access to, use and distribution of resources, or constraints on individuals or organizational practices. Health professionals have a special responsibility for participation in this reconciliation process.

Cross-References

► Mediate

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Medicaid

Definition

Medicaid is a US Government program providing medical care for certain individuals and families with low incomes. It is administered by the states and financed jointly by the federal government and the states. The program is covered under Title XIX of the Social Security Act of 1965. Within federally determined guidelines, the states define the individuals who qualify for the program and the duration, amount and scope of health care services covered. Eligible persons for Medicaid are in general children and their caretakers, pregnant women, disabled persons, blind persons or persons aged over 65 who demonstrate a need according to set income and asset standards. Medicaid is the largest source of funding for medical services in the United States for people whose resources and income are insufficient to pay for health care.

Medical Anthropology

► Health Research and Indigenous Health

Medical Building

► Health Care Facility

Medical Care

Definition

Professional services administered by a physician or another professional provider for the treatment of an illness or accidental injury.

Medical Care Services

► Health Care Services

Medical Cover

► Health Insurance

Medical Data

Definition

Medical data describes the state of health of a person and contains no personally identifiable information. Medical data are stored under a pseudonym, which is different than the user ID or other personal information. This prevents unauthorized association of this information. Medical data are stored exactly as entered by the record owner or by authorized individuals.

Medical Decision Analysis

Definition

Medical decision analysis is the scientific approach to health care decision-making under ► uncertainty. All relevant parameters potentially influencing the decision making process, such as alternative actions, events by chance including their probabilities of occurrence, and final consequences, are clearly stated and included in a model.

Medical Devices

Synonyms

Medical products

Definition

Medical devices are all kinds of instruments, appliances or substances that are used to diagnose, relieve or cure diseases. Medical devices are used in hospitals as well as in physicians' practices. They can also directly be used at the patient's home, as for example hearing aids or other devices specifically designed for several kinds of handicaps. The production and dispensation of medical devices is regulated by law in each country. Medical devices are, as ► drugs, subject to ► reimbursement by the health insurance. The reimbursement of medical devices may include a small part of ► co-payment by the patient depending on the specific contract of the health insurance.

Medical Documentation

► Health Record

Medical Economics

► Health Economics in Dentistry

Medical Education Information System

Definition

The medical education information system is a branch of ► health information system that provides easier learning and assimilation of knowledge from various fields of medicine and health care. It includes both paper publications (encyclopedias, dictionaries, handbooks, textbooks, journals) and electronic media (the Internet).

Medical Ethics

Definition

The branch of medicine that deals with the incorporation of an individual's interests, societal values, legal issues, and moral arguments into medical practice. It includes for example consent to treatment, confidentiality, research on human subjects, contraception and abortion, rationing of health care, and the prolonging of life in the event of serious irreversible brain damage.
Medical ethics is a discipline that evaluates the risks and merits of medical activities such as medical research and the delivery of medical services with regard to the protection of the interests of the patient, the provider and other health care institutions. According to medical ethical standards, all medical activities must be in conformity with current law and ethical standards.

Medical Geology

► Geomedicine

Medical Guideline

► Clinical Guideline
► Treatment Protocol

Medical Informatics

Synonyms

Health informatics; Health care informatics

Definition

Medical informatics is the systematic study of the identification, collection, storage, commutation, retrieval and analysis of information, data and knowledge about medical care services that can be used to improve decisions made by physicians and managers of health care organizations. The methods of medical informatics are used to aid information management in medical practice, education and research. This definition strongly supports the process of information management, rather than the use of information technology. Branches of medical informatics include bioinformatics, ► clinical informatics, ► consumer health informatics and ► public health informatics.

Medical Information

Synonyms

Clinical information; Patient-specific information

Definition

Clinical information is organized ► patient data and ► medical knowledge used to make clinical decisions. Both clinical and public health activities entail the organization of such data into useable information. For example, incidence of important cases of disease from surveillance programs and summary evidence from cohort studies or clinical trials are expressed as odds ratios for certain harmful and beneficial outcomes.

Medical Information System

► Health Information System

Medical Insurance

► Health Insurance

Medical Knowledge

Synonyms

Clinical knowledge

Definition

Medical knowledge is the collection of information about diseases, therapies, interpretation of lab tests etc, which is potentially applicable to decisions about multiple patients and public health policies. Medical knowledge should be based on sound evidence from clinical and epidemiological studies, using valid and reliable methods.

Medical Knowledge, Modern

► Health Knowledge, Western

Medically Unexplained Physical Symptoms (MUPS)

Definition

Term referring to a situation where no physical causes for observed physical symptoms can be found.

Medical Management

► Health Care

Medical Management Information System

Definition

The medical management information system is a branch of health ► information system that allows payers and purchasers to track health care expenditure and utilization patterns.

Medical Outcomes

► Health Determinants, Economic

Medical Products

► Medical Devices

Medical Progress

Definition

Medical progress covers all kinds of technical and scientific innovations made in the medical area. New inventions in the field of pharmaceutical products (drugs and medical devices), in the field of diagnosis as well as disease therapy are considered to be part of the medical progress. In general, medical progress is associated with high research and development costs and new expensive medical equipment, drugs etc. In this case medical progress is the reason for an upward spiral of health care costs. But there are examples of medical progress enabling patients to live in healthier conditions

and preventing the need for hospital care due to the early detection of diseases and appropriate treatment with new drugs.

Medical Record

► Health Record

Medical Rehabilitation

Definition

Medical rehabilitation aims at developing and restoring the functional and psychological abilities of the individual to enable self-dependence and the leading of an active life. This includes developing methods of compensating for the loss or absence of a function or for a functional limitation. Medical rehabilitation measures derive from an medical scientific background and are usually carried out by physicians supported by nurses and therapists. In recent years, there has been a shift towards a more comprehensive model of rehabilitation including social rehabilitation and vocational rehabilitation. Unlike medical rehabilitation, with the physician having a leading role, the contemporary comprehensive rehabilitation approach is usually delivered by multidisciplinary ► rehabilitation teams.

Medical Research

► Clinical Studies
► Clinical Trials
► Health Research
► Health Research and Indigenous Health

Medical Research Information System

Definition

The medical research information system is a branch of ► health information system that enables health professionals to stay up to date with current medical investigations. One of the well known databases with over 600 000 biomedical papers a year is Medline, updated by the National Medical Library of the USA.

Medical School

Synonyms

Faculty of medicine

Definition

The primary objective of a medical school is teaching medicine to their students. It is a tertiary educational institution or part of it. The teaching years of medical schools are typically divided into a preclinical phase and a clinical phase. Besides enabling the students to become medical doctors, many medical schools also offer PhD or similar educational programs. Medical schools often do medical research and some of them also operate hospitals. The subjects taught at medical schools comprise human anatomy, biochemistry, immunology, neurobiology, genetics, and human biology. The entry criteria and structure of the programs at medical schools differ significantly around the world. In many countries, a doctor needs, in addition to the title conferred by the medical school, a license by a government authority.

Medical Services

► Health Care

Medical Specializations

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Synonyms

Medical specialties

Definition

Medical specializations are those specific fields of medicine where additional training and internship beyond medical school is required. They can be differentiated into non-surgical and surgical specialties. The medical specializations are reflected in the different

wards of an inpatient setting or in specialized outpatient practices. In many health care systems, the patient first has to attend an appointment with a general practitioner who acts as a gatekeeper and – if necessary – refers the patient to the corresponding specialist.

Basic Characteristics

Background

According to the Organisation for Economic Co-operation and Development (OECD), the number of physicians in OECD countries has increased by 35% between 1990 and 2005, to 2.8 million. This increase was driven largely by a 50% growth of specialists in the same period, and they now make up more than 50% of all physicians in most of the OECD countries. This increase is amongst other factors driven by the – in some OECD countries significant – higher income levels of medical specialists.

Education

Medical education in general and the training for becoming a medical specialist both differ significantly throughout the world. Entry-level education takes place at ► medical school and includes preclinical and clinical aspects. The preclinical part covers the basic sciences like anatomy, physiology, biochemistry, pharmacology, and pathology, whereas the clinical part teaches specific fields like internal medicine, pediatrics, obstetrics and gynecology, psychiatry, and surgery. Postgraduate education is usually undertaken as supervised practice in the form of an internship or provisional registration of around a year prior to full registration being granted. After that, further multi-year training is required to become specialist. In some countries, this period starts with a generalist training of some years before specialization may commence.

Non-surgical Specialties

There are numerous non-surgical specialties that are offered in general or specialized hospital settings and partly by outpatient physician practices. The specialties include ► anesthesiology, ► dermatology, ► internal medicine, ► neurology, ► nuclear medicine, ► obstetrics and gynecology, oncology (► cancer), ophthalmology (eye medicine), ► pathology, ► pediatrics, preventive medicine, ► psychiatry, ► radiation oncology, ► radiology, and ► urology. Each of these specializations includes several subspecialties.

Surgical Specialties

The surgical specialties are primarily offered in hospital settings, either ► inpatient or ► outpatient. Amongst the surgical specialties are the fields of ► cardiac surgery, ► hand surgery, ► neurosurgery, ► oral and maxillofacial surgery, ► orthopedic surgery, ► otolaryngology, ► plastic surgery, surgical oncology, ► thoracic surgery, and ► transplant surgery.

Conclusion

Considering the ageing society and the progress in treatment methods and technical devices in the health care sector in many countries of the world, it seems realistic to predict that the trends towards increased specialization amongst physicians will continue, although several countries are promoting an enhanced ► primary care model.

Cross-References

► Anesthesiology
► Cancer
► Cardiac Surgery
► Dermatology
► Hand Surgery
► Internal Medicine
► Medical School
► Neurology
► Neurosurgery
► Nuclear Medicine
► Obstetrics and Gynecology
► Oral and Maxillofacial Surgery
► Orthopedic Surgery
► Otolaryngology
► Pathology
► Pediatrics
► Plastic Surgery
► Psychiatry
► Radiation Oncology
► Radiology
► Thoracic Surgery
► Transplant Surgery
► Urology

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Medical Specialties

► Medical Specializations

Medical Staff

► Health Care Professionals

Medical Surveillance

► Health Surveillance

Medical Wastes

Definition

Medical waste is often described as any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals. It means human organs, tissues, body parts other than teeth, products of conception, and fluids removed by trauma or during surgery or autopsy or other medical procedure, and not fixed in formaldehyde. Medical waste may contain infectious agents. Incineration at high temperatures destroys many of the toxins and pathogens in medical waste and other hazardous wastes, in addition to reducing the volume. Medical waste shall be stored in rigid, leakproof containers with tight-fitting lids which have been labeled with a label which is marked with the international biohazard symbol and the word "Biohazard." Medical waste shall be transported from the point of generation to the storage area in rigid, covered containers.

Medicament

► Drug

Medicare

Definition

In the United States, Medicare is a federal health insurance program for the elderly (people over age 65) and for some individuals with disabilities. The program was enacted as Title XVIII under the Social Security Act in 1965 and consists of two parts: Part A covers inpatient care services and some long-term care arrangements, part B covers outpatient medical services. Part B requires usually a ► co-payment of 20%. The program is administered by the Health Care Financing Administration of the US Department of Health and Human Services. Eligible persons are people over 65, people entitled to Social Security disability payments for 24 months or more and people with end-stage renal disease.

Medication

► Drug

Medication Abuse

► Drug Abuse

Medicide

► Euthanasia

Medicinal Prevention of Tuberculosis

► Chemoprophylaxis of Tuberculosis

Medicinal Prophylaxis of Malaria

► Malaria Chemoprophylaxis

Medicinal Prophylaxis of Tuberculosis

► Chemoprophylaxis of Tuberculosis

Medicinal Treatment of Multiresistant Tuberculosis

Synonyms

Medicinal treatment of tuberculosis caused by multiresistant bacteria; Drug therapy in multiresistant tuberculosis

Definition

With a time scale of 21–24 months, the medicinal treatment of multiresistant tubercle bacilli is very long-lasting. The chances of healing depend on the number of drugs against which the germ is resistant; 75% in 3 drug resistance, 25% in 5 drug resistance. Different agents are used for therapy with a combination of at least 4 drugs being recommended. Drugs are chosen that are known to still be effective against the multiresistant germs. Other possible therapeutics are aminoglycosides (capreomycin, kanamycin), fluoroquinolones (ofloxacin, ciprofloxacin, levofloxacin) and thionamides (ethionamide, prothinamide). Moreover, the bacteriostatic substances PAS (para-aminosalicylic acid) and cycloserin can be used. As the treatment of multiresistant germs is very expensive, it is frequently not available in developing countries or other poor regions.

Medicinal Treatment of Uncomplicated Tuberculosis

Synonyms

Drug treatment of uncomplicated tuberculosis

Definition

Medicinal treatment of uncomplicated tuberculosis is carried out for a period of 6 months. During the initial phase, which lasts 2 months, a 3- to 4- fold combination is used. The 3-fold combination contains isoniazid (INH), rifampin (RIF) and pyrazinamide (PZA). In the 4-fold combination ethambutol (EMB) or streptomycin (STM) is additionally used. In the following stabilizing phase INH and RIF are given for 4 months. Side effects of INH, RIF and PZA primarily concern the liver, EMB can damage the nerves of the eye, and STM can impair hearing and renal function. Thiazetazon is only used in poorer countries in the absence of a HIV-infection; this substance also shows liver toxicity.

Medicinal Treatment of Worm Infections

► Anthelminthic Therapy

Medicine

► Drug Administration

Medicine People

► Indigenous Health Care Services

Medina Worm Infection

► Dracunculiasis
► Guinea Worm Infection

Mefloquine (Lariam®, Mephaquin®)

Definition

Mefloquine is derived from the alkaloids of the bark of the South American cinchona tree (quinine and quinidine). Its effect results from the impairment of the metabolic processes in plasmodia. Mefloquine is effective against all kinds of malaria. After the initial administration of the drug, further doses are given after 6 and 12 hours. Besides gastrointestinal symptoms, possible side effects are cerebral seizures, neuropsychological symptoms (halluzinations, states of panic), cardiac arrhythmias and a toxic epidermolysis.

Meiosis

Synonyms

Meiotic cell division

Definition

Meiosis is a process of nuclear division accompanying cell division that produces four separate nuclei for four new daughter cells which are haploid, that is, carry half the number of chromosomes of the parent cell's full diploid chromosomal complement. Meiosis bear many similarities to ► mitosis in terms of the phases of its cell-division, which are: 1) prophase I, 2) metaphase I, 3) anaphase I, 4) telophase I, 5) prophase II, 6) metaphase II, 7) anaphase II, and 8) telophase II. However, during meiosis there is an exchange of genetic information between homologous chromosomes, which does not occur during mitosis. During prophase I, as the duplicated chromosomes condense into bar-like bodies, joined at the centromere, they are aligned laterally with their duplicated homologous chromosome, called synapsis. This alignment is called a bivalent. During late prophase, the ends of the aligned homologous chromosomes are often exchanged at a point called a cross-over, of which there can be many between any set of homologous chromosomal arms. This process is called ► recombination. There can be many recombinations along a chromosome, although in general, there are fewer recombinations near the centromere than there are towards the ends of the chromosomal arms. At the end of prophase, crossover points called chiasmata still exist. During metaphase I, the bivalents are bound to the mitotic spindle, and in anaphase, the chiasmata disappear as the homologous chromosomes are pulled apart to their respective poles, taking along recombinant chromosomal arms. In telophase I, a nuclear envelope may or may not form, as a second round of division is about to be initiated. At this point in the division, each daughter cell has 46 chromosomes, all of which are non-identical, homologous chromosomes joined at their similar centromeres. Prophase II is short, and it occurs before the chromosomes have had a chance to replicated or enter an additional cell cycle. In metaphase II the chromosomes align on the metaphase plate, and the two homologous chromosomes, looking much like sister chromatids, are pulled apart to their respective poles in anaphase II.

In metaphase II, nuclear envelopes form around the cells, each with a haploid complement of 23 chromosomes. From one diploid parent cell, four haploid daughter cells have arisen.

Meiotic Cell Division

► Meiosis

Menarche

Synonyms

Menophenia; Initiation of the menstrual function; Establishment of the menses

Definition

Menarche is the first menstrual period, or first menstrual bleeding. Timing of menarche is influenced by both genetic and environmental factors, especially nutritional status, but it generally occurs about two years after onset of breast development (thelarche) and when growth in height slows after reaching its peak. Menarche occurs within a wide range, with most girls starting their periods at 12 or 13 years. Average age of menarche has declined in modern societies. It is one of the main signifiers of the onset of puberty.

(Mendelian) Models of Inheritance

► Mendelian Modes of Inheritance

Mendelian Modes of Inheritance

Synonyms

Modes of inheritance; (Mendelian) models of inheritance

Definition

In organisms which reproduce by the union of male and female reproductive cells (or, gametes), the expression of physical characteristics in offspring inherited from their parents through transmitted genetic information are governed by the principle of segregation and the rules of gene expression. The principle of segregation states that, in general, each copy of a gene present in the parental genomes has an equal probability of being transmitted to offspring to its homologue – a parent who possesses the variants *A* and *a* of one gene is equally likely to transmit either *A* or *a* to their offspring. However, the characteristics expressed by the offspring once its genome is set are governed by Mendelian modes of trait inheritance. Some gene variants may be preferentially expressed to others, and these variants are called 'dominant' while the less preferred variants are labelled 'recessive'. For example, at a fictional gene GZ1, there are two possible genetic variants, or 'alleles', B and b. A family has a father with a GZ1 genotype, the identity of both homologues at the site, or Bb; the mother also has genotype Bb, and their three children 1, 2 and 3 each have genotypes of BB, Bb and bb respectively. Accordingly, different manifestations of the trait influence by GZ1 are observed depending on the mode of inheritance:

1) If the allele B is dominant to the recessive allele b, and we are interested in the trait governed by B, we say that the trait follows a *dominant* Mendelian mode of inheritance. That is, the trait expressed by B will be expressed by any individual carrying even one copy of B. In the family described, the mother, father and children 1 and 2 all express the trait associated with B.
2) If the allele B is dominant to the recessive allele b, and we are interested in the trait governed by b, we say that the trait follows a *recessive* mode of inheritance. The trait expressed by b will be expressed in individuals carrying no copies of B. In the family described, only child 3 expresses the trait associated with b.
3) If alleles B and b do not compete, but are equally and/or differently expressed, we say that we observe a *codominant* mode of inheritance. The expression of the trait varies by genotype. In the family described, the mother, father and child 2 will express similar traits; child 1 and child 3 will express traits different from each other and their other family members.
4) If the allele B is dominant to the recessive allele b, and the variation in the level of trait is based on the number of copies of B which they possess, then we say that we observed mode of inheritance is *additive*. In the family described, child 1 would have the highest level of the additively-inherited trait; the mother, father and child 2 would have a similar level of the trait; and child 3 would have the lowest level of the trait.

Mendelian patterns of inheritance are similarly applied to sex chromosomes as they are to autosomes. In females, the above Mendelian patterns of inheritance are applicable to genes present on the two X chromosomes, while in males, whatever gene variant is present at a particular site on the X chromosome is automatically the variant which is expressed, as there is only one homologue of X in males. All variants at all genes on the Y chromosome are likewise expressed in males.

Mendelian Traits

Definition

Traits which are inherited from the transmission of genes in families following Mendel's laws of heredity.

Cross-References

► Genetic Epidemiology

Menigococcal Vaccination

Synonyms

Meningococcal immunization

Definition

The first monovalent (group C) meningococcal polysaccharide ► vaccine was licensed in 1974, further vaccines followed: in 1978 there was authorized another monovalent group C vaccine as well as a group A and a bivalent vaccine for both groups A and C; a quadrivalent vaccine (groups A, C, Y and W-135, MPSV4) was licensed in 1981. The meningococcal conjugate vaccine MCV4, which also protects against the subtypes A,C,Y and W-135, was introduced in 2005 and can be used for persons 11–55 years of age. The protection rate achieved by MPSV4 is 85–100 %, MCV4 is believed to have the same efficacy and most probably induces a longer-lasting protection than the polysaccharide vaccine. In general, vaccination is carried through in individuals two years of age or older as a single dose. If indicated, also younger children – from three months of age – can receive MPSV4. In these cases, a second dose should be given three months apart. In many countries meningococcal vaccination is not recommended in general but for people at high risk for infection, such as splenectomized persons, patients with terminal component complement deficiency (a kind of immune system disorder) or travelers to certain countries (e. g. the areas in sub-Saharan Africa known as the meningitis belt, which extends from Mauritania in the west to Ethiopia in the east). Contraindications for meningococcal vaccination are acute severe illness, a known allergy to any component of the vaccine or an allergic reaction to a previous dose of meningococcal vaccine.

Meningitis

Synonyms

Infection of the meninges; Inflammation of the meninges

Cross-References

► Acute Life-Threatening Infections

Meningococcal Septicaemia

► Waterhouse–Friederichsen Syndrome

Menopause

Synonyms

Pausimenia; Climacteric period; Climacterium

Definition

Menopause is the physiological or iatrogenic cessation of menstrual cycles (amenorrhea) due to decreasing ovarian function (consumption of all viable follicles). Average onset of menopause in women is 50.5 years. The physiologic menopause is established when menses have been absent for one year. Menopausal symptoms can range from nonexistent to severe and last from a few months up to ten years or more. Major symptoms of the perimenopause are hot flushes (vasomotor origin), vaginal discomfort and bladder symptoms.

Menophenia

► Menarche

Men's Health

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Synonyms

Male health; Men's health and well-being; The health of boys and men; The health of men and boys

Definition

Men's health entails both the systematic exploration of the multi-dimensional factors (e. g., biomedical, psychosocial, structural, cultural historical) influencing the health of men and boys and the systematic elaboration of multi-level actions undertaken to engage these influences so as to improve or maintain the health of men and boys within their physical, social and spiritual contexts.

Basic Characteristics

Overview

While a concern for the health of men has no doubt always existed in some form in all cultures, men's health as a distinct area of critical intellectual and practical concern in the domain of public health is relatively recent in the West (Hayes 2003). In terms of research, government policy, and practical programmes and projects, men's health *per se* remains a relatively minor area of concern (Schofield et al. 2000; Macdonald, Crawford 2002). Where there is a focus, it tends to be on such issues as men's reproductive health or men's engagement in anti-social behavior. Additionally, such research continues to be fragmented by salient differences of political, social, and intellectual perspective (White 2005).

Historically, the social codes of most peoples have made distinctions between what constituted a virile man in contrast to a fecund woman, or between a pure or impure man and woman. However, these distinctions were more in the order of *phronesis*, or of wisdom concerning the processes constituting best practice for relating well with other persons, people groups, or cosmic powers. Increasingly, the distinctions are now found in the order of *techne*, or of knowledge concerning the processes constituting best practice for working well with 'things', such as the 'male body' or the 'male psyche'. However, there is a transition towards reintroducing salient aspects of *phronesis* again.

Late 20th Century Background

It is widely held that where once all people were measured on the basis of male experiences of disease and illness women began to question this basis of knowledge and practice with respect to their reproductive health in the middle years of the last century. During the political and cultural upheavals of the 1960s and 1970s in the West, women increasing demanded and received limited funds for and credibility from research that privileged women's health more broadly. 'Progressive' men engaged in commensurate reflections with regard to the psychological origins and manifestations of the 'oppression' of women by men generally, and by the medicalized professions specifically. Both men and women undertook somewhat more critical sociological analyses during the 1980s and 1990s. Concepts such as ► hegemonic masculinities' and ► expert dominance' were developed as devices for explaining the oppression of women and at least certain types of men, as well as the relatively negative health outcomes obtained by the oppressed (Rowan 1997).

Throughout this period, the dissemination of both quasi-scientific and mytho-poetically (see Rowan 1997) oriented paradigms through various media ensured that the general public would be 'educated' into the essential physiological and, hence, psycho-social differences between men and women. Ironically, these 'expert' sanctioned proposals of how people should deal with each other have been extremely popular with the larger public (e. g., Gray's *Men are from Mars, Women are from Venus*). However, these distinctions are not always equally valued by this public or by many health professionals.

For instance, the female psyche has become, paradoxically, the privileged template of the human 'soul' for many. Ostensibly because of the depredations of 'hegemonic' or 'demanding and commanding' masculinities, men are frequently both deemed to be and portrayed as sub-standard in this regard. In other words they are considered, for the most part, to be incapable of experiencing and expressing emotions adequately (*alexythimia*) or of engaging in appropriate self-care. Furthermore, as a result of the perceived unwillingness of western males to redeem their deficient 'souls', their bodies are considered to be doomed first to suffer a variety of typical diseases and, then, a premature (hence, meaningless) death.

Early 21st Century Transitions

Careful research into the histories, literatures and lives of working class, gay, and aboriginal men reveals a much more richly nuanced and variegated 'tissue' of ► embodied manhood than is typically acknowledged (Luck et al. 2000; Hayes 2003). This is also true of men who have fought in wars or worked in emergency services, who have endured experiences of mental ill-health, or who are under and unemployed. Instead of ► pathologising men, these stories support the growing impetus to take a more positive, primary health care approach to supporting the way that various men seek to live their lives personally and communally (Macdonald, Crawford 2002). Such an approach focuses on helping them to identify the knowledge, skills and attitudes that they wish to use or gain to achieve their aspirations both as individuals and members of groups.

For instance, while including stories of selfish ambition and hatred, the prisoner of war stories from the Pacific that emerged following World War 2 include recurring themes of tenderness, self-sacrifice and compassion collectively organized for the benefit of comrades (Nelson 1985). Additionally, it is well documented that the traumas of those who returned from the wars of the last century have negatively influenced their families for generations. Governments have conveniently suggested to these people that it is 'best you forget'. Western societies typically ignore the economic and political significance of the processes of socialization that prepare men to fight in wars or to work in hazardous industries. Little regard is collectively given to their contribution to the ill-health of men. Disaggregation of men's health statistics indicates that negative health outcomes for men, when compared to women, tend to be more salient for such men than for those socialized for other life outcomes (Luck et al. 2000).

Just as women's experiences of health and illness cannot be measured on the basis of male experiences, policy and practical programs aimed at improving men's health do not necessarily work well just because they have worked well for women. The lack of research into men's health in the West has resulted in less evidence calling for resources to be allocated to this area. For instance, even though the mortality rates are roughly equivalent in industrialized nations, research funding for the diagnosis and treatment of prostate cancer significant lags that of breast cancer in women.

The Emerging New Public Health Paradigm and Practice

Within the field of men's health, there is a growing call for a new approach in terms of public health practice. Rather than working within the negative paradigm of ► pathologising men's health, leading academics within the field, such as Professor John Macdonald at the University of Western Sydney (Australia), are advocating for a more ► *salutogenic* (health generating) approach. Following the medical sociologist, Aaron Antonovsky, Macdonald and Crawford (2002) urge health professionals and policy makers to focus on what generates or promotes health for men and that acknowledges and fosters their positive social value.

Important research in Australia indicates that men in "safe [non-shaming], well-facilitated groups [good group processes and dynamics] associated with their networks" (Hayes 2002, p. 83) can and will discuss and act upon their health concerns. Growing numbers of agencies and communities are recognizing the need to create opportunities for men to maintain their social connections in the face of growing rates of workforce redundancy for men over 50 years of age and decreased opportunities for non-consumerist leisure options for males of all ages. These opportunities for social connectedness benefit men in terms of both mental and physical health by providing for instrumental, affective and inspirational support. Additionally, research indicates that agencies that adopt policies, plans, procedures and protocols that work with men on their own "terms and turf" are more attractive and, therefore, beneficial to men than those which are heavily professionalized or feminized.

In terms of both the men and those who work with them effectively, social change is currently occurring through innovative, opportunistic, localized approaches rather than top down and whole of system approaches. As a movement, men's health is only beginning to gain momentum and it remains largely 'western' in ethos. This momentum is largely the result of voluntary efforts and "grass roots" initiatives. Linkages and networks are only recently beginning to be formed across multiple sectors and disciplines. National and international conferences on men's health are being held on a recurring basis. A number of peer-reviewed journals or newsletters are now being published to provide support for these endeavors: *Harvard Men's Health Watch, Journal of Men's Health and Gender, Journal of Men's Studies*, and the *International Journal of Men's Health*.

It is incumbent on those working with men to apprise themselves of the wide range of resources increasingly available to shed light on the complex biomedical, psycho-social, structural and cultural historical issues relating to men's health. (Luck et al. 2000) This can help to generate a more comprehensive, and less naïve, understanding of what engenders or endangers the health of men and the ones with whom they live, learn, work, worship and play.

Global Mortality Statistics

Variations in mortality between regions reveal substantive differences. For instance, in 2003 the World Health Organization (WHO) estimated that the life expectan-

cy for males at birth compared to women [x] in the various regions was: African 46[48], Americas 71[77], SE Asia 61[64], Europe 68[77], Eastern Mediterranean 61[64], Western Pacific 70[74]. (WHO 2005) In 2001, the leading cause of death for all males was related to non-communicable diseases (57%) such as cardiovascular diseases (27%), malignant neoplasms or cancers (13%), respiratory diseases (6%) and digestive diseases (4%); this was followed by communicable diseases (32%) such as non-respiratory infections and parasitic diseases (20%) and respiratory infections (7%); and, finally, injuries (12%) whether unintentional (8%) or intentional (4%) [n.b., percentages approximate] (WHO 2002).

Cross-References

- ► Alexithymia
- ► Embodied, Embodiment
- ► Expert Dominance
- ► Hegemonic Masculinity
- ► Mythopoetic
- ► Pathologising
- ► Salutogenic

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Men's Health and Well-Being

► Men's Health

Menstrual Cycle

Definition

The average length of the menstrual cycle is 28 days. Day one is by convention the first day of vaginal bleeding. The mean duration of the menstrual flow is between 2–6 days with an average blood loss of 20–60 ml. Ovulation generally occurs on day 14 (14 days before the first day of the next vaginal bleeding). The normal menstrual cycle is divided into two segments. The follicular phase (variable length: 10–14 days) and the luteal phase (14 days). During the follicular phase hormonal feedback promotes the development of a single dominant follicle which is prepared for ovulation. The luteal phase is the duration of time from ovulation to onset of menses in which the endometrium is prepared for the implantation of an embryo. If implantation with production of HCG does not occur, menstrual flow begins as a result of the shrinking of the corpus luteum resulting in a fall of progesterone, the gestational hormone.

Mensuration

► Measurement
► Measurement: Accuracy and Precision, Reliability and Validity

Mental and Behavioral Disorders Due to Psychoactive Substances

► Substance Use Disorders

Mental Health in Children and Adolescents

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Definitions

Individuals < 18 years of age are divided into infants (1 month to 1 year of age), children (1–12 years of age), and adolescents (13–18 years of age).

Basic Characteristics

Introduction

Mental health and illness in children, and the measurement of mental health and illness, are somewhat different from that in adults. Overall, most mental diseases can strike a person at any age (e. g., depression, anxiety, ► conduct disorders). ► Attention deficit hyperactivity disorders show an early onset, usually in the first five years of life. For understanding the mental health of children, age, developmental stage, and timing factors are of high importance. A behavior that might be quite normal at one age (e. g., fear of darkness in young children) can be an indicator of a mental disorder at another age (► separation anxiety disorder of childhood, ► phobic anxiety disorder of childhood, ► social anxiety disorder of childhood). Developmental continuities have to be considered as well as developmental discontinuities (► speech and language developmental disorder, ► reading and/or spelling disorder, ► arithmetical skills disorder, ► motor function developmental disorder, ► childhood autism). The environment and adaptation of the child to the environment is another relevant factor in understanding mental health and illness in children (► elective mutism).

Epidemiology

The prevalence of mental disorders in children and adolescents is not as well documented as it is for the adult population. According to previous research and depending on diagnostic criteria, 10–20 percent of children and adolescents are estimated to have clinically significant mental disorders with at least mild functional impairment (e. g., Shaffer et al. 2000). In most studies, the conceptual definition of the "clinical significance" is taken into consideration. Barkmann and Schulte-Markwort (2005) distinguished three levels of hierarchy:

1. existence of psychological complaints
2. fulfillment of the diagnostic criteria for the determination of a mental disorder (e. g., according to ICD-10)
3. fulfillment of a severity or impairment criterion.

Federal regulations in the USA define a sub-group of mental disorders as "serious emotional disturbance" in reference to children under the age of 18 with a diagnosable mental disorder that severely disrupts the ability to function socially, academically, and emotionally. Finally, some studies use the classification "severe psychopathology" (defined as the presence of multiple mental disorders, i. e. ≥ 3). Different study designs and measurements make comparisons of studies difficult. The threshold of mental disorders may vary from culture to culture.

The MECA Study (Methodology for Epidemiology of Mental Disorders in Children and Adolescents) estimated that > 20% of U.S. children aged 9 to 17 had a diagnosable mental disorder. Preliminary results of the representative German child and adolescent mental health survey indicate that almost 22% of children show at least psychological disturbances (Table 1).

The frequency of mental illnesses symptoms is negatively associated with socioeconomic status. Parental mental disorders, parental conflicts, and single parenthood are risk factors for mental disorders in children (www.kiggs.de).

Mental Health in Children and Adolescents, Table 1 Prevalence rates of mental disorders in Germany and the USA

Mental disorders	German prevalence estimates*	U.S. prevalence estimates**
Anxiety disorders	10%	13.0%
Mood disorders	5.4%	6.2%
Disruptive disorders	7.6%	10.3%
Attention deficit hyperactivity disorder	2.2%	–

*Children and adolescents aged 7 to 17 years, Ravens-Sieberer et al. 2006. www.kiggs.de
**Children and adolescents aged 9 to 17 years, combined MECA sample. www.surgeongeneral.gov/library/mentalhealth

M

Consequences

Recent longitudinal studies suggest that a mental disorder in childhood or adolescence increases the risk of recurrence of this mental disorder as well as the incidence of another mental disorder in later life. For example, depressed adolescents with special risk factors (i. e., female gender, multiple depressive disorder episodes, elevated borderline personality disorder symptoms) are at elevated risk for recurrence of depressive disorders during young adulthood (Lewinsohn et al. 2000). Lieb et al. (2000) showed that somatoform disorders in adolescents and young adults were often associated with the development of other mental disorders in the following four years. Another result of the Early Developmental Stages of Psychopathology Study (EDSP) was that panic attacks were associated with high levels of comorbidity and multimorbidity across the diagnostic spectrum among adolescents and young adults in the community (Goodwin et al. 2004). The EDSP study is a prospective, longitudinal study designed to collect data on the prevalence, risk factors, comorbidity, and course of mental and substance use disorders in a representative community sample in Munich, Germany, which consisted of 3021 subjects aged 14–24 years at baseline. The study consists of a baseline (time 0) survey, two follow-up surveys (first follow-up survey was 14–25 months after baseline; second follow-up survey was 34–50 months after baseline), and a family history component (Wittchen et al. 2004).

Treatment

Treatment of mental disorders in children is not different from adult treatment, i. e., medication, cognitive-behavioral psychotherapy, family psychotherapy, psychoanalytic psychotherapy, and functional training (e. g., dyslexia) are relevant treatments. An additional and necessary special aspect of therapy for children is the work with parents, teachers and/or other important persons.

Future Research

Not all psychological disturbances or mental disorders existing in childhood and adolescence persist into adulthood. A substantial fraction of children and adolescents recover and do not suffer from recurrence or comorbidity of mental disorders. However, those children suffering from psychological disorders, and especially those with risk factors, need access to treatment as soon as possible. To optimize the recognition rate of mental health problems, the use of simple diagnostic screening instruments in general practice could be helpful, as well as special training of mental health professionals. Resources available to the affected children and their families (e. g., individual, family-related, and social) have to be supported. There is a strong need for more longitudinal epidemiological studies in Europe and worldwide in order to determine the prevalence rates of mental disorders, risk and protective factors, and therapy and service utilization. However, it is noteworthy that valid measures of need are absent since prevalence rates of mental disorders in epidemiological surveys are only an imperfect proxy for the need for treatment. Further, taking developmental aspects into consideration, there might be windows of opportunity during children's development when preventive or treatment interventions may be especially effective. Those windows of opportunity have to be identified.

Cross-References

- ► Arithmetical Skills Disorder
- ► Attention Deficit Hyperactivity Disorder (ADHD)
- ► Childhood Autism
- ► Conduct Disorders
- ► Elective Mutism
- ► Hyperkinetic Disorder
- ► Motor Function Developmental Disorder
- ► Phobic Anxiety Disorder of Childhood
- ► Reading and/or Spelling Disorder
- ► Separation Anxiety Disorder of Childhood
- ► Social Anxiety Disorder of Childhood
- ► Speech and Language Developmental Disorders

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Mental Health Economics

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Definitions

Economics is the science that studies the production, distribution, and consumption of resources. The word "economics" is from the Greek words "οἶκος", meaning "household, estate", and "νόμος", meaning "custom, law", and thus literally means "household management" or "management of the state". Health economics examines the supply of and demand for health and health care, and the economic analysis of health care systems and health care reforms. It also examines the economic evaluation of health care technologies and the measurement and valuation of health. Mental health economics is health economics in relation to mental health.

Basic Characteristics

Introduction

Health – not merely health care – has high economic importance. In mental health care, the uncertainty and variation in treatments are greater than in health care; the assumption of patient self-interested behavior is more dubious and less predictable than in mainly physically ill patients; the social consequences and external costs of mental illness are formidable. The European Brain Council (EBC) showed that the burden of brain disorders constitutes 35% of the total burden of all diseases in Europe (calculated in terms of DALYs, i. e. ► disability adjusted life years, for details s. http://www.europeanbraincouncil.org). Mental disorders account for about 25% of all DALYs lost in Europe, followed by cardiovascular diseases (17.1% of all DALYs lost, Kaplan and Laing 2004). Worlwide, mental disorders account for 15.4% of the burden of disease in established market economies. Major depressive disorder, schizophrenia, and obsessive-compulsive disorder are among the top 10 leading causes of disability (see Table 1). Morbidity costs comprise the major part of the ► indirect costs of all mental disorders. This indicates an important characteristic of mental disorders: Mortality is relatively low, onset is often in (young) adulthood, and most of the indirect costs are derived from lost or reduced productivity at the workplace, school, and home.

Mental Health Economics, Table 1 Disease burden by selected illness categories in established market economies, 1990 (Murray and Lopez 1996)

	Percent of Total DALYs*
All cardiovascular conditions	18.6
Ischemic heart disease	9.0
All mental illness	**15.4**
Unipolar major depression	**6.8**
All malignant diseases (cancer)	15.0
All respiratory conditions	4.8
All alcohol use	**4.7**
All infectious and parasitic diseases	2.8
All drug use	**1.5**

Costs of Mental Disorders in Europe and the U.S.A.

Andlin-Sobocki et al. (2005) developed a model to combine epidemiological and economic data on brain disorders in Europe (i. e., EU member countries, Iceland, Norway, and Switzerland). The epidemiological data are based on a systematic literature review of published European epidemiology data (Wittchen and Jacobi 2005). The economic costs were estimated using a ► bottom-up approach, i. e., the cost data were collected per patient and disease and aggregated to nation-

€ million	Healthcare costs	Direct non-medical costs	Indirect costs	Total costs
Mental disorders	**97221**	**9336**	**132985**	**239542**
Addiction	16655	3962	36657	57274
Affective disorders	28639	**	77027	105666
Anxiety disorders	22072	**	19301	41373
Psychotic disorders	29855	5374	**	35229
All brain disorders*	**135445**	**72200**	**178530**	**386175**

* All brain disorders include: Brain tumor, Trauma, Epilepsy, Migraine and other headaches, Multiple sclerosis, Parkinson's disease, Stroke and Dementia;
** Direct non-medical costs are missing for affective and anxiety disorders; indirect costs are missing for psychotic disorders

Mental Health Economics, Table 2 Costs of mental disorders in Europe (Andlin-Sobocki et al. 2005)

al levels with the help of prevalence data (in contrast to a ► top-down approach). The inherent problem of the bottom-up approach is double-counting due to comorbidity. This problem stems mainly of the epidemiological data (e. g., patients suffering from depression probably also suffer from comorbid anxiety disorders).

Mental disorders (i. e., addiction, ► affective disorders, ► anxiety disorders, ► psychotic disorders) made up 62% (i. e. 240 billion €) of the total costs of brain disorders in Europe (for details see Table 2).

About 50% of the costs of mental disorders are indirect costs and almost 40% direct healthcare costs. It should be noted, however, that direct medical (► direct medical costs) and non medical costs (► direct non medical costs) were not included in the costs of affective and anxiety disorders. Moreover, the ► indirect costs due to anxiety disorders only comprised lost work days due to sick leave. The authors conclude that their study probably underestimates the full economic burden of mental disorders in Europe.

In 1996, the United States spent more than $99 billion for the direct treatment of mental disorders, as well as substance abuse, and Alzheimer's disease and other dementias (the National health accounts was $943 billion total). More than two-thirds of this mental health amount ($69 billion) was for mental health services. Spending for direct treatment of substance abuse was almost $13 billion (more than 1 percent of total health spending), and that for Alzheimer's disease and other dementias was almost $18 billion (Mark et al. 1998).

Consequences

The costs of brain disorders will increase dramatically during the next two decades (Andlin-Sobocki et al. 2005). It is important to find out which systems of care are most effective (for details of the U.S. mental health service system see www.surgeongeneral.gov/library/mentalhealth/chapter6/); existing evaluation studies could not demonstrate a conclusive effectiveness because of missing control groups. Carrying out prospective field studies and increased research efforts (i. e., better prevention, better diagnostic assessment, better treatment, better health care systems) might be the only way to counteract this cost increase not only in European countries.

Cross-References

► Bottom-Up Approach (For Cost-Estimation)
► Direct Medical Costs
► Direct Non Medical Costs
► Disability Adjusted Life Years (DALYs)
► Indirect Costs
► Top-Down Approach (For Cost-Estimation)

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Mental Health in Older Adults

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Synonyms

Elderly

Definition

Specific chronological markers for old age are defined in different ways by different authors. The definition of "older adults" varies, depending on different perspectives and purposes. Whereas gerontologists traditionally focus on individuals aged 60 years and older, the federal government of the U.S.A. uses age 65 as a marker for full Social Security and Medicare benefits. Researchers identify subgroups of "older adults" as "younger old" (ages 65–75), "older-old" (ages 75–85), and "oldest old" (ages 85+). Age ranges vary across studies.

Basic Characteristics

Introduction

The demographics of the industrial world are well known. It is important to understand the needs of older adults suffering from (and living with) mental disorders. There are age-dependent and treatment-relevant changes that have to be considered in the elderly. For example, ► pharmacokinetic and ► pharmacodynamic variables can influence the effect of a pharmacological therapy (those changes may occur in the ► absorption, ► distribution, ► metabolism, and excretion of psychotropic medications (► elimination)) as well as medical comorbidities, concomitant medication, cognition of older adults, hyperopia, and less available resources than younger people have.

Prevalence and Costs of Brain Disorders in Older Adults

Depression and hopelessness are not natural conditions of older age. Many older adults and, unfortunately, health care professionals as well mistakenly assume that depression is a normal consequence of physical, social, and economic difficulties in later life. Older people suffering from chronic or stressful physical conditions (e. g. hearing loss, mobility impairment) are a high risk population for depression. Depressive disorders in the elderly are both underdiagnosed and undertreated. Depression is one of the most frequent conditions associated with suicide in older adults (Conwell and Brent 1995). There is much misunderstanding about thoughts of death in later life. Depression, serious loss (e. g., death of a spouse, loss of a friend), and (terminal) illness trigger the sense of mortality, regardless of age. Periodic thoughts of death do occur. However, when actual dread of death does occur, it should not be dismissed as accompanying aging, but rather as a signal of underlying distress or depressive disorder. As compared to older persons whose depression began earlier in life, those whose depression first appears in late life are likely to have a more chronic course of illness. There is growing evidence that depression beginning in late life is associated with vascular changes in the brain. According to Narrow, about 6% of the U.S. population age 65 and older suffer from depressive disorders (i. e., major depressive disorder, dysthymic disorder, or bipolar disorder; http://www.nimh.nih.gov). Beekmann et al. (1999) found in a worldwide review an average prevalence of major depressive disorders of 1.8% in the elderly. The experience of depressive symptoms and subclinical depression, respectively, is much more prevalent. The symptoms of depressive disorders and ► dementias in an early state are very similar and often not to distinguish.

Some mild degree of memory decline can be normal with aging. Those normal changes usually mean a slower pace of learning and the need for new information to be repeated. However, more severe memory problems may indicate dementia or other serious cognitive illnesses. Dementia involves a loss of cognitive (memory and attention) abilities due to brain damage secondary to illness. Symptoms of dementia can include memory impairment, and difficulties with language, movement, object or face or word recognition, and difficulty making judgments, regulating emotions or shifting attention from one subject to another. Noteworthingly, dementia is not a part of regular aging – it is a physical disease of the brain. The prevalence rate of dementia dramatically increases with increasing age. The degree of care that an elder may require due to dementia will be variable, depending on whether dementia is due to

Alzheimer's disease (or similar progressive disease) or stroke, and how affected the elder is by the condition. Older adults' mild early memory problems may not require much care at all. While vascular (stroke) dementia will not necessarily get worse (e. g., if blood pressure is kept stable and low), Alzheimer's dementia is by nature a progressive disorder, which will result in more and more impairment over time. The costs of vascular dementia might be, especially in the beginning of the disease, somewhat higher than in AD due to the costs of cardiovascular medication. In the European member states (including the new member states) it is estimated that about 5.1 million people suffer from dementia (about two thirds of people with dementia have Alzheimer's disease). Wancata et al. (2003) have reported a dramatic increase of the dementia cases in Europe in the next 50 years (to approximately 11.9 million people). There is consistent evidence that costs of care for patients suffering from dementia are very high across European countries (e. g. National Dementia Economic Study NADES in Belgium: Total annual costs of a patient with dementia living et home: € 5,346; total annual costs of an institutionalized patient with dementia: € 27,620) (Scuvee-Moreau et al. 2002). ► Parkinson's disease is also a relevant illness, especially in older age. High-quality studies (i. e., use of established diagnostic criteria, inclusion of the entire age range of the population, and screening by an experienced neurologist) estimated prevalence rates of approximately 108 to 257/100,000 (Campenhausen et al. 2005). The mean total direct costs (e. g., drugs, outpatient visits, inpatient care) per patient per year are reported between 3360 € (UK; Findley 2003) and 8160 € (Germany; Spottke 2005).

Ageing Mentally Healthy

Different types of interventions have been successful in improving the mental health of elder people. Examples of universal strategies are: exercise interventions (e. g. aerobic, t'ai chi, other physical exercises) and improving social support through befriending (especially older women seem to profit from friendships and social support). Promising preventive interventions for selective and indicated elder populations include the use of patient education methods among chronically ill elderly (e. g. patients suffering from chronic pain) and their caregivers (e. g. psycho-educational programmes for caregivers of patients with ► dementia), early screening and interventions in primary care (e. g. screening of high systolic blood pressure and anti-hypertensive medication for prevention of vascular dementia and stroke). Early detection of depressive disorders in primary care can reduce the risk of suicide in older individuals. Because of the ► pharmacokinetic and ► pharmacodynamic concerns in older age, it is often recommended that clinicians "start low and go slow" when prescribing new psychoactive medications for older adults. Efficacy is great and side effects are minimized when initial doses are small and the rate of increase is slow. Better compliance with a pharmacological treatment regime may be achieved by giving simple instructions and by asking specific questions to make sure that the patient understands directions. An effective pharmacotherapy can also avoid premature institutionalization. Last, the avoidance of excessive disability is of high importance. For example, a co-occurring depressive disorder can contribute to excess disability by hastening functional impairment in patients with Alzheimer's disease or another severe and persistent mental illness. Hence, attention to comorbid mental disorders may reduce the functional limitations associated with mental and somatic impairments.

Cross-References

► Absorption
► Dementia
► Distribution
► Elimination
► Metabolism
► Parkinson's Disease (PD)
► Pharmacodynamics
► Pharmacokinetics

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Mental Health Promotion

Synonyms

Mental illness prevention

Definition

Mental health promotion comprises efforts to enhance positive mental health and prevent mental illness through the overlapping spheres of health education, prevention and health protection. Such a pro-active wide-ranging campaign with mobilization of the community, professions and decision-makers, significant progress can be made in the containment if not elimination of mental disorder.

Mental Illness Prevention

► Mental Health Promotion

Mentoring

► Social/Emotional Support

Meta-Analysis

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Synonyms

Quantitative synthesis; Quantitative research synthesis

Definition

The term meta-analysis will be used here to describe the quantitative procedures that the research synthesist uses to statistically combine the results of studies.

Basic Characteristics

Synthesizing Main Effects and Interactions

► Quantitative research synthesis is an extension of the same rules of inference required for rigorous data analysis in primary research. If primary researchers must specify quantitatively the relation of the data to their conclusions, the next users of data should be required to do the same. Before considering quantitative synthesis, it is important to take a closer look at some of the unique features off accumulated research results. In research synthesis, the most obvious feature of both main effects and interactions is that the results of separate tests of the same comparison or relationship will vary from one testing to the next.

Variability in Main Effect Test Differences in outcomes of tests of main effects can be caused by two classes of influence. One source of variance in the results of studies can be chance fluctuations due to the inexactness of sampled estimates-sampling error. The second source is variance in results created by differences in how studies are conducted or, who participates in them or, both.

Variability in Interaction Tests The factors that create variability in main effects can also affect variability in tests of interactions. Interaction effects are as susceptible to sampling error and procedural variation as main effects. The benefit of research synthesis underscores the importance of primary researchers presenting detailed information about the levels of variables used in their studies. Without specific information, research synthesists may not be able to conduct an across-study analysis.

Interactions in Meta-Analysis

There are two different ways that interactions could be statistically combined across a study.

Techniques for Combining Significance Levels of Independent Findings The separate p levels and re-

lationship strengths associated with each study's interaction test could be aggregated. The techniques for combining significance levels of independent findings allow the synthetists to cumulate the results of numerous tests so that overall conclusions can be drawn. In these techniques three assumptions are important. First, the individual findings that go into cumulative analyses should all test the same comparison or estimate the same relationship. Second, the separate tests that go into the cumulative analysis must be independent of one other. Third, the synthetist must believe that the primary researchers made valid assumptions when they computed the results of the tests.

1. Vote-counting methods can take into account the statistical significance of findings or focus only on direction of the findings. The most popular way to perform vote counts in research synthesis involves tallying the number of positive and negative findings regardless of their statistical significance. In these analyses, the synthesist categorizes findings based solely on their direction. If the null hypothesis is true – that is, if no relationships exist between the variables in the sampled population – it would be excepted that the number of findings in each direction will be equal. Once the number of results in each direction are counted, the meta-analyst performs a sign test (estimate Z score, for the overall series of findings) to discover the statistically significant frequency between findings in different directions:

$$Z_{vc} = \frac{(N_p) - (1/2N)}{1/2\sqrt{N}}$$

N_p = the number of positive findings
N = the total number of findings (positive + negative)
Vote counts should be described only when there is a large number of studies, and always be accompanied by more sensitive meta-analysis procedures.

2. Combined significance levels, by using the exact probabilities, the results of the combined analysis, take into account the different sample sizes and relationship strengths found in each comparison. The most frequently applied is called method of adding Z's (Z_{st} = z score for the overall series of findings):

$$Z_{st} = \frac{\sum_{i=1}^{N} Z_i}{\sqrt{N}}$$

Z_i = the standard normal deviation for the ith finding
N = the total number of findings in the series.
The method of adding Z's (Z_w the z score for the weighted combination of findings) can be modified to allow the meta-analyst to differently weight the results of different statistical tests. The meta-analyst might want to give added weight to findings based on larger sample sizes (because sample sizes affected significance levels):

$$Z_w = \frac{\sum_{i=1}^{N} W_i Z_i}{\sqrt{\sum_{i=1}^{N} W_i^2}}$$

W_i = the weighing factor associated with each finding

3. Fail-safe N answers the question "How many findings totalling to a null hypothesis confirmation (Z_{st}) would have to be added to the results of retrieved findings in order to change the conclusion that a relation exists"? The formula for calculating this number, when the chosen significance level is $p < 0.05$, is:

$$N_{FS.05} = \left(\frac{\sum_{i=1}^{N} Z_i}{1.645} \right) - N$$

$N_{FS.05}$ = the number of additional null-summing findings needed to raise the combined probability to just above $p < 0.05$

4. Combined significance levels and study-generated evidence are combined significance level techniques and results of vote-count.

Measuring Relationship Strength The primary function of the meta-analysis procedures described so far is to help the synthetist accept or reject the null hypothesis. Before a meta-analysis can be performed we must decide what statistics or effect measure will be used to describe the treatment effect. Each ▶ effect size index is associated with a particular research design in a manner similar to t-test being associated with two-group comparisons, F test associated with multiple group designs, and chi squares associated with frequency tables.

1. The ▶ *d* index measure of an effect size is appropriate when the means of two groups are being compared. The *d* index is typically used in association with *t*-test. Formula for calculating the *d* index is:

$$d = \frac{X_1 - X_2}{(SD_1 + SD_2)/2}$$

X_1 and X_2 = the two group means
SD_1 and SD_2 the average standard deviation of the two groups.
This formula assumes that the two groups have approximately equal sample sizes and standard deviation. If primary research does not report the means and standard deviation we can use the next formula for *d* index:

$$d = \frac{2t}{\sqrt{df_{\text{error}}}}$$

t = the value of the *t*-test associated comparison
df_{error} = the error degrees of freedom associated with *t*-test.

2. The ▶ *r* index is the most appropriate metric for expressing an effect size when the researcher is interested in describing the relationship between two continuous variables. Very often we do not have presented variances and covariances in primary research. Because of that, if only the value of the *t*-test associated with *r* index is given, the formula for its calculation is:

$$r = \sqrt{\frac{t^2}{t^2 + df_{\text{error}}}}$$

3. In the medical sciences, the ▶ odds ratio is most used. The researcher is often interested in the effect of a treatment on mortality or the appearance or disappearance of disease. Odds ratios are one way of expressing the size of the effect of a treatment on an even rate. The odds of an event are given as a ratio of the probability of occurring to the probability of it not occurring. The odds ratio is the ratio of the odds of an event in the treatment (or exposed) group compared to the odds in the control (or unexposed) group.

	With disease	Without disease
With treatment	*a*	*b*
Without treatment	*c*	*d*
Total	$a + c$	$b + d$

$$\text{OR} = \frac{a/c}{b/d} = \frac{ad}{bc}$$

$$95\%\text{CI}_{\text{OR}} = \exp[\ln \text{OR} \pm 1,96\text{SE}_{(\ln \text{OR})}]$$

When the event rate is very low or very high, the odds ratio is very similar to the ▶ relative risk. *Relative risk, relative rate or relative differences* of an event is the risk of the outcome in the treatment group divided by the risk in the control group.
▶ Number needed to treat (NNT) is a way of expressing the size of a treatment effect which is easier to interpret clinically. The NNT is the number of patients with a particular condition who must receive a treatment for a prescribed period in order to prevent the occurrence of specified adverse outcomes of that condition. This number is the reciprocal of the absolute risk reduction.

$$\text{NNT} = 1/\text{ARR}$$

$$\text{ARR} = \text{CER (control even rate)} - \text{EER (experimental even rate)}$$

$$95\%\text{CI} = 1/(\text{CER} - \text{EER}) \pm 1.96 \times \sqrt{\left[\frac{\text{CER}(1-\text{CER})}{Nc} + \frac{\text{EER}(1-\text{EER})}{Ne}\right]}$$

Nc = number of patients in the control group
Ne = number of patients in the experimental group

Combining Effect Sizes Across Studies

Once each ▶ effect size has been calculated, the meta-analyst averages the effects that estimate the same comparison or relationship. It is generally accepted that these averages should weight the individual effect sizes based on the number of participants in their respective samples.

1. *The d index.* For the *d* index, this procedures first requires the meta-analyst to calculate a weighting factor w_i, which is the inverse of the variance associated with each *d* index estimate:

$$w_i = \frac{2(n_{i1} + n_{i2})n_{i1}n_{i2}}{2(n_{i1} + n_{i2})^2 + n_{i1}n_{i2}d_i^2} \qquad d. = \frac{\sum_{i=1}^{N} d_i w_i}{\sum_{i=1}^{N} w_i}$$

n_{i1} and n_{i2} = the number of data points in Group 1 and Group 2 of the comparison

M

d_i = the d index of the comparison under consideration

$$95\%CI_{d.} = d. \pm 1.96 \sqrt{1 \Big/ \sum_{i=1}^{N} w_i}$$

2. *The r index.* Firstly, each r index is transformed into its corresponding z score, $z_{,i}$ and then the following formula is applied:

$$z. = \frac{\sum_{i=1}^{N} (n_i - 3) z_i}{\sum_{i=1}^{N} (n_i - 3)}$$

n_i = the total sample size for the ith comparison

$$95\%CI_{z.} = z. \pm 1.96 \Big/ \sqrt{\sum_{i=1}^{N} (n_i - 3)}$$

Analyzing Variance in Effect Sizes Across Findings

Another set of statistical techniques helps us discover why ► effect sizes vary from one study to another. In these analyses, the effect sizes found in the separate studies are the "dependent" or predicted variables, and characteristics of the studies are the predictor variables. For analyzing variance in effect sizes across findings we can use traditional inferential statistics, compared observed to expected variance and homogeneity analyses.

Traditional Inferential Statistics One way to analyze the variance in effect sizes is to apply the traditional inference procedures that are employed by primary research. There are problems. Traditional inference procedures do not test the hypothesis that the variability in effect size is due solely to sampling error. Therefore, the traditional inference procedures can reveal associations between design characteristics and effect sizes without determining first whether the overall variance is greater than expected by chance. Because effect sizes can be based on different sample sizes, they can have different sampling variances associated with them, that is, they are measured with different amounts of error.

Comparing Observed to Expected Variance In this method, the variation in the observed effect sizes is compared with the variation expected if only sampling error were causing differences in effect size estimates. This approach involves calculating the observed variance in the effect sizes from the known findings and the expected variance in these effect sizes given that all are estimating the same underlying population value.

Homogeneity Analyses Homogeneity analyses also compares the observed variance to that expected from sampling error. It includes a calculation of how probable it is that the variance exhibited by the effect sizes would be observed if only sampling error was making them different. Statistical models can be classified as "fixed effect" or "random effect models". A "fixed effect" model (► homogeneity analyses: "fixed effect" model) ignores between study heterogeneity and estimates the treatment effect as if it were a single true value underlying all the study results. "Random effect" models (► homogeneity analyses: "random effect models") take into account the possibility that other factors may modify treatment effects, and assume that the studies include in review a random sample taken from a distribution of the possible treatment effects. Both models express the uncertainty due to sampling in their estimates using ► confidence intervals. Usually the estimate of average treatment effects reported by both methods are very similar, but random effect models weight smaller studies proportionally higher than fixed effect models, which in some circumstance may lead to different estimates. This may be of particular concern if the identification of the smaller studies is affected by publication bias.

Here it is important to state explicitly, however, some circumstances in which the use of quantitative procedures in synthesis is not appropriate. First, quantitative procedures are applicable only to research syntheses and not to syntheses with other focuses or goals. Second, the basic premise behind the use of statistics in research syntheses is that a series of studies address an identical conceptual hypothesis.

Example In a meta-analysis the effect of selective decontamination of the digestive tract (SDD) on the rate of nosocomial infections was examined. Odds ratios (OR) together with their 95%CI were used for assessing the effect of treatment. OR for any study with this outcome is estimated, and then pooled OR. Information from 25 trials with 5964 enrolled patients was the base for aggregate data meta-analysis. Information

about nosocomial infection was obtained from 15 trials. In one study, 40/130 patients in the control group had infection and 21/147 in the group with SDD had nosocomial infection. OR for nosocomial infection, for this study is:

	With disease	Without disease	Total
With treatment	21(a)	126(b)	147(N_{1i})
Without treatment	40(c)	90(d)	130(N_{2i})
Total	61(M_{1i})	216(M_{2i})	277(Ti)

$\mathrm{OR} = 21 \times 90/126 \times 40 = 0.375$

$O - E$	V	OR	95%CI
21–32=-11	12	0.375	0.2–0.7

$$
\begin{aligned}
E &= (M_{1i}) \times (N_{1i})/T_i \\
V &= N_{1i} \times N_{2i} \times M_{1i} \times M_{2i}/T_i^2 \times (T_i - 1) \\
X^2 &= (O - E)^2/V = 10,08 \\
\mathrm{SE}_{(\ln \mathrm{OR})} &= 1/\sqrt{V} \\
95\%\mathrm{CI} &= \exp[\ln \mathrm{OR} + 1.96\mathrm{SE}_{(\ln \mathrm{OR})}] \\
&= \exp[-0.98 + 1,96 \times 1/3.46]
\end{aligned}
$$

For any study all these parameters must be examined and then pooled OR calculated:

$$\text{Pooled OR} = \exp\left(\frac{\sum (O - E)}{\sum V}\right) \quad \text{and}$$

$$95\%\mathrm{CI} = \exp\left(\frac{\sum (O - E) \pm 1.96\sqrt{\sum V}}{\sum V}\right)$$

OR equal 1 means no effect of treatment. An OR of less than 1.0 suggests that SDD results in a reduction in the relative odds of developing a nosocomial infection.

Cross-References

- ▶ Confidence Interval
- ▶ *d* Index
- ▶ Effect Size
- ▶ Homogeneity Analyses: "Fixed Effect" Model
- ▶ Homogeneity Analyses: "Random Effect Models"
- ▶ Number Needed to Treat (NNT)
- ▶ Odds Ratio (OR)
- ▶ Quantitative Research Synthesis
- ▶ Relative Risk
- ▶ *r* Index

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Metabolic Equivalents (METS)

Definition

Unit to characterize physical performance and the intensity of different types of exercise.

Metabolism

Definition

Metabolism is the transformation of (pharmacological) substances and their metabolites.

Metabolomics

Synonyms

Metabonomics

Definition

Metabolomics is the aggregate study of metabolites; a systematic study of the unique chemical fingerprints that are a result of specific cellular processes. Quantitative analytical approaches have been developed to identify metabolites that are modulated in response to treatment with toxic agents. Nuclear magnetic resonance (NMR) based fingerprinting has been applied to high-abundance metabolites. The metabolome represents the

collection of all metabolites in a biological organism, which are the end products of its gene expression.

Metabonomics

► Metabolomics

Metadata

Definition

Since ► information retrieval alone cannot identify all relevant words in documentation text, all documents are provided with so-called metadata. Metadata are "data about data", meaning that they include basic bibliographic information as well as key words to the content and context of the document.

Metage

► Measurement: Accuracy and Precision, Reliability and Validity

Methadone Maintenance

► Maintenance Therapy

Methicillin

Definition

Methicillin is a beta-lactamase antibiotic related to penicillin, which is no longer in use. In the 1960s methicillin was the first antibiotic drug against which staphylococci developed resistance. Nowadays, it is used as a test antibiotic, as resistances against methicillin can be assumed to be valid for other beta-lactamase-antibiotics.

Métis (Canada)

► Indigenous Health, North America

Microbiology

Definition

Microbiology is the study of micro-organisms which are living organisms that are too small to be seen with the naked eye, such as bacteria, viruses, fungi, algae, etc. As a branch of biology it examines the effects of such organisms on humans.

Microclimate

Definition

The term microclimate describes the condition of air in a certain closed space, usually referring to an occupational setting. The principle parameters of microclimate are air temperature, air pressure, air velocity, air humidity, and heat radiation, and their interactions.

Microenvironments

► Setting

Microminerals

► Trace Elements

Microsatellite DNA

► Short Tandem Repeat (STR)

Microsimulation

► Modelling

Microwaves

Synonyms

MW

Definition

Electromagnetic ► radiation with a longer wavelength than infrared radiation but shorter than the radiation used in commercial radio broadcasting (radiofrequencies, RF) is called microwaves (MW). Wavelengths of MW are in the range from 1 mm to 1 m, and as the wavelength increases, the frequency decreases. The frequencies of the whole microwave region are about 300 GHz to 0.3 GHz (1 GHz equals 1 billion Hz), divided into extra high frequencies (EHG), super high frequencies (SHF), and ultra high frequencies (UHF), in decreasing order. The term radiofrequencies is restricted to frequencies below 300 MHz (0.3 GHz). Though natural sources of MW are the Sun and stars, man-made emitters far exceed natural sources, and are now likely to produce electromagnetic pollution. There are numerous useful applications of MW, such as radar (cloud detection meteorological radar, and shipborne navigational radar), satellite communications, microwave medical diathermal therapy, surgical diathermy, microwave ovens and heaters, television systems, altimeters, amateur radio, telemetry, etc. However, the fact that there are some dangers in MW device use must be emphasized because most people are exposed to low-level MW radiation and some of them, in certain occupations, may be exposed to higher levels. Most of the absorbed MW energy is converted into heat.

Midstream Urine

Synonyms

Clean-catch urine specimen

Definition

For proper urine analysis it is important to avoid bacterial contamination of the urine. After cleansing the urethral meatus a small amount of urine is passed into the toilet. The following amount – the midstream – is collected in a clean (sterile) container.

Migrant Children

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Synonyms

Young migrants; Children and adolescents from migrant families

Definition

The term "migrant children" comprises children and adolescents (► adolescence) whose life situation is shaped by their own experience of migration, by that of their families or by the status of belonging to an (ethnic) minority. Thus the children and young people have either migrated themselves or belong to the following generations. Their position in the life-cycle and the migration process is associated with special challenges and coping strategies that can have an impact on their health and health care behavior.

Basic Characteristics

Migration: A Cross-Generational Process

Migration may place its own particular imprint on the life-worlds of children and adolescents, both when they themselves are migrants or born into following generations. Seldom the decision to migrate is taken by one single individual; generally it is a project embraced by the whole family, a collective decision affecting it and future family generations. However, there are not just the expectations of the parents about the future prospects of their children that turn migration into a cross-generational process. Uncertainty about residence status, segregation tendencies, social disadvantage, and discrimination are some of the factors in the country of migration that can affect the life situations of migrant children and following generations in a different manner as they might affect lives of non-immigrant children and young people. Furthermore, the process of migration is associated with particular challenges to children and adolescents which are not shared by adult generations. In terms of rapid feats of assimilation such as learning the language and building social contacts, migrant children frequently adopt the role of mediators between parents and the host society, taking on adult functions whilst still minors. One of the most significant disruptions young migrants may experience is the disconnection between traditional modes of thought and perception in their families and the norms and values of the host society, a disconnection which they live out in a highly contradictory manner as travelers poised

between disparate cultural worlds. There is as yet no reliable body of research on whether and what impact such general conditions have on the health of children and young people from migrant families. Current studies suggest that migrant children – or sub-groups of children from migrant families – run greater health risks in certain areas of health than children from non-migrant backgrounds.

Health Risks or Benefits? Selected Findings

- Children who migrate from countries with a high prevalence of infectious diseases are a vulnerable group. In 2003 the risk of acquiring tuberculosis was 10.8 times as high among non-German children and adolescents than for their German counterparts. Children of migrants run a greater risk of infection at birth or from breastfeeding than children from non-migrants. In France, nearly 75% of newly reported cases of HIV are amongst women of foreign nationality, thus increasing the risk of perinatally transmitted HIV (► migrants, infectious diseases).
- Various research projects of ► unintentional injuries point at a connection between a migrant background and the risk of injuries. In Germany and Switzerland the rate of injuries was twice as high among migrant children as among their German and Swiss peers (Limbourg et al. 2003). Studies from other countries also indicate a higher propensity among ethnic minorities to be involved in accidents (Dowswell 2002). In the USA and Canada children of colored parents are a vulnerable group. Moreover, a study monitoring unintentional injuries in a German municipality showed an increased rate of unintentional injuries in migrant children compared to non-immigrant children. This elevation of the injury rate was most pronounced among boys aged 5–15 (Böhmann et al. 2004). Possible reasons for the higher incidence of accidents among migrant children include language barriers, social status and their provenance from regions with much less traffic.
- Genetic metabolic disorders are a form of hereditary impairment frequently noted not only in children of Turkish origin but in those from the Middle East and North Africa (Morocco). One explanation for the higher prevalence of such hereditary disorders among migrant children is seen in traditional ► consanguineal marriages (Stöckler-Ipsiroglu et al. 2005).
- In the USA, the Third National Health and Nutrition Examination Survey found clear ethnic differences in terms of cardiovascular risk factors (BMI, blood pressure, HbA1c, smoking and the fatty part of energy intake) among children and young people aged 6–24 years (Winkleby 1999). In Germany, surveys of first-year school children found a higher prevalence of overweight and obese children among the migrant group (Kuepper-Nybelen et al. 2005; Will et al. 2005).
- Ethnic origin has proved to be a further risk factor alongside socio-economic status for the prevalence of caries and the overall poor dental condition of children and young people. Such a connection has been demonstrated not just in developed industrialized countries like Norway, Sweden and Denmark, but also by studies in Arab and Latin American countries (Irigoyen 1999; Sundby 2003; Rajab 2002).
- Girls from migrant families from the Mediterranean area appear to have a high risk of suicide. For example, the suicide rate of Turkish girls and young women in the age group 10–17 years is almost twice as high as that for their German peers (Razum and Zeeb 2004). One possible explanation for this higher risk factor is that this age group has a particularly acute perception of the contradictions between the traditional gender expectations of the family and the cultural practices of mainstream society and that such contradictions can be perceived as irreconcilable.

However, it would be wrong to conclude that all children and young people from migrant families have a worse state of health or display more risk-prone behavior in terms of health care. Studies from Austria show, for instance, that the incidence of Sudden Infant Death (SID) is lower in the Turkish-speaking population than in the German-speaking population whilst in the Netherlands the incidence of SID among families of Moroccan origin was significantly lower than that among families originating from Turkey (Kytir et al. 1997; van Sleuwen et al. 2003). The causes of such a low level of SID risk were attributed to lower exposure to smoking and the nurturing structures of the (extended) family association. Migrant children from ethnic population with traditional lifestyles have lower prevalences of atopic disorders (bronchial asthma,

hay fever, skin affections) than populations with Western lifestyles, even after moving to a richer industrialized country (ISAAC 1998; Grüber 2005). Even so, as acculturation becomes more advanced, atopic risk factors also increase, among migrant children too. Studies into SID risk have showed similarly findings. It was noted that with increasing length of residence migrant groups tended to acquire the typical risk factor profiles found in the host country.

Challenges for Public Health

Such observations draw a diverse and patchwork picture. Compared to their peers with no migrant history, children and adolescents from migrant families appear more risk-prone in some health-related areas and less risk-prone in others. The migrant population itself continues to show significant differences in terms of their health and risk behavior. Migrant children can be differentiated by various factors including country of origin, the generation of immigrants to which they belong, gender and social status. In terms of the health care consequences arising from life situations of persons with migrant histories, a wide variety of factors are at work - of which the cultural background, the health care and social situation in the country of origin and the length of residence in the host country are only a few. Our current knowledge of the processes and mechanisms leading to health-related disparities between children and adolescents is still fragmentary. Furthermore, previous studies have put the focus very much on migration-induced risks to the detriment of resources like health-promoting habits or family cohesion. To date there are still no international studies which would allow us to analyze whether – and if so to what extent – the respective social conditions underpinning migration in their host countries impact on the health of children and young people of immigrant origin. It is the task of future research to address the migration process as a cross-generational experience in all its complex interplay of social class, gender, age and ethnicity.

Cross-References

- ► Adolescence
- ► Consanguineal Marriage
- ► Migrants, Infectious Diseases
- ► Unintentional Injuries

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Migrant Health

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Definition

Migrant health in the context of Public Health comprises policies and practices in relation to mobile populations. Migrant health not only addresses the needs of migrant populations, but also those of communities hosting migrants.

Introduction

The number of migrants worldwide is increasing. Moreover, migrants are traveling faster and to more destinations than ever before. Migration can have effects on the health of those migrating, both in positive and negative ways. For example, migrants face particular health risks at different stages of the migration process. At the same time, they may bring along resources that have a protective effect on their health. Immigration can also have health effects on the majority population of the host country. Increasing awareness of these risks and potentially positive effects has led to the emergence of migration health as a major public health concern (Wiedl and Marschalck 2001; IOM 2004a).

Definition of Migrants, Trends and Types of Migration

Definition of Migrants

In the World Migration Report 2005, the IOM defines migration as "a process of moving, either across an international border, or within a state. It includes migration of refugees, displaced persons, uprooted people and economic migrants" (IOM 2005). However, there is considerable ambiguity involved in the definition of migrants, and there is no definition that is universally agreed upon. Many countries are using their own definitions in their classification of travelers and migrants. International law distinguishes between nationals and non-nationals, for example, or between citizens, aliens, and immigrants. It also recognizes other categories such as refugees, asylum seekers and migrant workers (UNAIDS/IOM 2001). Migrants may be defined by their ethnicity or legal status and migration can be categorized using parameters of duration, motivation and distance. Labor migration, refugee migration, resettlement migration, internal migration and commuting are common and important categories (UNFMPA/IMP 2004). Often, migration does not occur directly between two places but involves one or several places of transit. Some of the reasons why people migrate are to join family members, for economic reasons or to continue their education in other countries. A considerable number are displaced persons, refugees or uprooted people (► refugees and internally displaced people). This Synopsis deals primarily with international migration; for health aspects of internal migration see ► migration, internal.

Migration can be voluntary or forced. In voluntary migration, a person or group of persons decide of their own accord to move. The decision could, however, have been brought about by economic or other pressures. In forced migration, on the other hand, the movement is due to external factors such as war, persecution or disaster. Often, push and pull factors, which can be economic, political, cultural, and environmentally based are simultaneously at work, making such classification only theoretical. An overview of different forms of migration is shown in Table 1.

Heterogeneity of Migrant Populations

The categorizations provided above do not fully reflect the heterogeneity of migrant populations. Migrants may differ considerably in socio-economic and cultural terms, even if they originate from the same country or region. In addition, the reasons and mode of migration, their legal status with respect to how long they can stay in the host country and under what conditions, especially the implications for their access to services and work, can all be different; and all these different factors can affect the health of migrants (Braunschweig and Carballo 2001).

Numbers of Migrants, Receiving Countries

The number of international migrants is increasing rapidly. In 2000, there were an estimated 175 million international migrants, more than double the 82 million from 1970 (IOM 2005). The UN estimates that by 2005, this figure had risen to 191 million, mean-

Voluntary migration	Involuntary/forced migration
Labor migration (including temporary contract workers)	Refugees/asylum seekers
Reunification of family members	Internally displaced persons (not always counted as migrants or refugees, ► Refugees and Internally Displaced People)
Educational purposes (students)	Environmental migrants
Persons returning to their countries of origin (return migration)	Trafficked persons
"Reintegration" – e. g. return of 'Aussiedler' (ethnic Germans) to Germany, of Jews to Israel	
Undocumented (irregular) migration	

Migrant Health, Table 1
Classification of types of migration

ing that 1 in 35 persons in the world is an international migrant; 95 million of them (almost 50%) are women (UN 2006). Table 2 shows the countries hosting the largest numbers of international migrants. There have recently been significant shifts in international migration. While traditional countries of immigration such Canada and the US continue to be attractive destinations, Russia, Germany and Ukraine are among the countries with the largest number of immigrants.

Most international organizations dealing with migrant issues base estimates of migrant numbers on data provided by the International Organization for Migration (IOM). Up-to-date figures by country can be found under http://www.migrationinformation.org/GlobalData/countrydata/country.cfm.

Country	Number of migrants in the country (in million, 2005)
USA	38.4
Russia	12.1
Germany	10.1
Ukraine	6.8
France	6.5
Saudi-Arabia	6.4
Canada	6.1
India	5.7
UK	5.4
Spain	4.8

Migrant Health, Table 2
Estimated number of international migrants in 2005, by country (UN 2006)

Changing Trends and Motives of Migration

Throughout history, humans have been moving from one place to another, internally as well as across borders. Contemporary migration, however, greatly differs from that of past times. The process of globalization has transformed the world. Due to modern technology capital, goods, service, information and ideas are rapidly being transferred from one country and continent to another. The benefits of the expanding global economy, however, are not evenly distributed. Growing social inequalities (► migrants, ► social inequalities), disparities in the standard of living as well as in levels of human security, are evident in different parts of the world. These rising differences have been associated with an increase in the scale and scope of international migration. Modern means of transportation as well as the opening up of borders between countries and regions have made it possible for people to travel further, faster and more easily than ever before. Migration is now a global issue, with all states of the world functioning as either points of origin, of transit or of destination, or at times as all three simultaneously (UNFPA/IMP 2004; IOM 2005; GCIM 2005).

Health in the Context of Migration

Role of Migrant Health

When related to the context of migration, the definition of health as given by the WHO translates into the physical, mental and social well-being of mobile populations as well as the communities affected by migration. Well-managed migrant health, including public health, not only promotes the well-being of everyone involved. The International Organization for Migration (IOM) argues

that it can also promote inclusion and understanding, thus facilitating the integration of migrants within communities, which, in turn, contributes to stable societies and enhanced development (IOM 2004b).

Historical Dimension of Migrant Health

The scope and patterns of migratory movements have never been static, and neither have the links and interdependencies between migration and health. They are evolving with the same complexity that characterizes migration (IOM 2003). Core issues relating to migration and health/illness today have a historic dimension and show a distinct continuity. An example of a concern that is centuries old and still causes worries today is the alleged importation of disease by migrants. During the plague epidemic in Europe in the 14th century, it was already acknowledged that human health and disease could be affected by migration. Formal systems of quarantine to hinder the flow of infectious disease through travel have existed for a long time and predate immigration laws (IOM 2003). Today, the general populations in target countries of immigration still worry about health problems such as epidemics being imported by migrants. Numerically, this is a small problem; furthermore, transmission is often restricted to the migrant populations (► migrants, infectious diseases). International travel for the purpose of business and tourism is far more common, and it carries a risk of disease spread, as the example of SARS shows.

In many industrialized countries of Western Europe, migrant health was for a long time restricted to keeping migrant workers sufficiently healthy so they could continue to work. It was expected that they would return to their countries of origin when ill or growing old. It is a relatively recent insight that migrant workers stay longer than initially expected. For example, they raise families in the host countries and in consequence often decide to remain there when getting old or chronically ill (► migrants, aging). Health services in many countries took a long time to improve access to health services for migrants, and a lot remains to be done (► migrants, access to health care). Concern has been raised that unless more attention is paid to the health and health care of migrants, they will remain socially secluded in many settings and not be able to benefit from the right to health due to every human being (the human rights perspective to migrant health).

As a consequence of the insights described above, a number of international and national legal instruments have been developed that set out the operational guidelines and structures for bodies concerned with health aspects of migration management. Some of these instruments (listed below) apply to people or workers in general, but it is important that they apply to mobile populations as well.

List of legal instruments setting out guidelines for bodies concerned with health aspects of migration: (IOM 2003)

- Since its formation in 1919, the International Labour Organization (ILO) recognizes the need to improve working conditions for both national and foreign workers.
- WHO constitution (1948): the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion and political belief, economic or social condition.
- 1948: The United Nations Universal Declaration of Human Rights put forth all elementary human rights, including the right to health.
- The International Covenant on Economic Social and Cultural Rights of 1966 recognizes “the highest attainable standard of physical and mental health” for every human being and specifies steps to be taken to achieve this.
- In its 1977 Convention on the Legal Status of Migrant Workers, the Council of Europe refers to medical assistance for migrant workers.
- 1994: Programme of Action of International Conference on Population and Development (Cairo Conference or ICPD) urged governments to provide migrants and refugees with access to adequate health services.
- 1999: Final document proposing key actions for further implementation of Programme of Action of Cairo Conference urged governments in both countries of origin and of destination to provide effective protection for migrants and basic health and social services. Adequate international support to meet the basic needs of refugee populations including adequate accommodation, education, protection from violence, health services and basic social services such as clean water, sanitation and nutrition was also called for.

- 2002: The Second United Nations World Assembly on Aging in Madrid adopted an international plan of action calling for the integration of older migrants with their new communities by assisting them to sustain economic and health security.

Health Implications of Migration

Under normal circumstances, migration itself should not pose a risk to the health of those undertaking it. It is rather the conditions surrounding the process that can increase vulnerability to ill health. The risks concerned are related to the conditions before departure, during travel or in transit, on arrival or when settling in a situation of socio-economical disadvantage. For example, migrants who do physical work have a higher risk of injury and health sequelae leading to early retirement than the majority population of an industrialized country. In addition to physical stress, migrants experience a higher risk of psychosocial health problems. They may have to cope with temporary or permanent loss of contact to family and friends, disconnection with language, culture, homeland, loss of status, and loss of contact with their ethnic group. Psychological problems may be accentuated when migration is accomplished under adverse conditions (Carta et al. 2005). Irregular migrants are, in addition, exposed to considerable physical risks (see below).

Communicable Diseases in Migrants

Infectious diseases continue to be major causes of mortality and morbidity in certain parts of the world. This poses a challenge for health care providers and for national disease control strategies in countries receiving immigrants/refugees from areas where infections persist. The examples of tuberculosis and HIV are discussed below; for more general information see ► migrants, infectious diseases.

Tuberculosis is a disease that has been unevenly controlled globally. Consequently, a number of migrant-receiving countries are seeing changes in their TB profiles. For example, the incidence of new tuberculosis cases in Denmark increased in the early 1990s, with the proportion of foreign-born cases rising from 18% in 1986 to 60% in 1996. The Netherlands experienced a 45% rise in the number of reported TB cases between 1987 and 1995; at least 50% of these cases involved migrants. In Germany and France, migrants are three and six times, respectively, more likely to be diagnosed with TB than non-migrants are. Many migrants move into living conditions that are crowded and poorly maintained, a fact that plays a role in the spread of tuberculosis within migrant communities (Carballo et al. 1998).

The link between HIV and migration poses a challenge to governments and health care providers. Migrants who are prone to human rights abuses, economic deprivation, social inequalities (► migrants, ► social inequalities) and socio-economic instability are also particularly vulnerable to HIV. In many industrialized countries, migrants from high-prevalence countries were found to be disproportionally affected by HIV and AIDS. Many of these migrants discover their status late and fail to receive timely treatment. It is difficult to establish whether these persons were already infected when they arrived, or became infected in the destination countries. To avoid the double stigma of disease and foreignness, prevention efforts for migrants should be within the context of the overall national prevention strategy (IOM 2005).

Migration and Chronic, Non-Communicable Diseases

Migrants moving from one area to another, or from one country to another, ultimately "adopt" the health profile and risk factors for disease of the local population. This can happen at various speeds, depending on disease entity and country of origin. Migrants who "take along" a low risk of disease can maintain it for a long time, depending on their lifestyle (Razum and Twardella 2002). For example, the incidence of breast cancer and colon cancer in 'developing' countries is lower than in industrialized countries, and migrants benefit from this advantage. People migrating from countries with low mortality from coronary heart diseases (CHD) to countries with higher CHD mortality rates initially experience a mortality advantage. This advantage can be short-lived, however, as in the case of South Asian migrants to the UK.

It has frequently been observed that migrants experience a lower overall mortality than the majority population, in spite of being socio-economically disadvantaged. This phenomenon is discussed in the Essay ► migrant mortality, healthy migrant effect. Initially advantageous cause-specific mortality rates of immi-

grants may turn into a mortality disadvantage, however, when socio-economic conditions are unfavorable and access to health care is difficult. The duration of stay in the host country plays an important role in the modification of health status. There is substantial evidence for this 'acculturation' hypothesis. For example, South Asians in the UK originating from India, Pakistan or Bangladesh show higher rates of lung cancer and breast cancer than populations on the Indian subcontinent. In Canada, obesity among immigrants was found to increase with length of stay (Gatrell 2002).

Psychological Health of Migrants

Sluzki (2001) has identified five stages of the migration process shown in Table 3. Each of these stages may be associated with particular forms of stress or negative feelings for the migrants, which may in turn lead to psychological and physical health problems. Yet, the psychological burden of migration does not usually manifest itself soon after arrival in the host country. It is during the decompensation stage that problems, which may have been suppressed in earlier stages, present as somatic complaints. Exacerbations of chronic conditions for which care was not sought on time, because other concerns (such as basic survival) were more pressing, will also surface.

Migrant Health, Table 3 Stages of migration (Sluzki 2001)

Stage	Description
Planning	Characterized by excitement, anxiety, and tension. It may last hours, days or months
Migration	Duration may be only a few hours or up to years if living in a refugee camp
Over-compensation	Characterized by novelty and task-oriented adaptation. Usually lasts 6 months to 1 year after arrival
Decompensation	Characterized by acculturation and/or culture shock, loss, and mourning. Usually lasts 6 months to 1 year after arrival and may recur
Resolution, or stage of intergenerational support	Characterized by being occupied with rearing bicultural children or establishing a personal social network

Migrant Groups with Particular Health Risks or Poor Access to Health Services

A number of reports have documented the particular health risks, the reduced access to health care and the health consequences for migrants in many parts of the world. The unfavorable health outcomes observed have been linked to the lower entitlements for migrants in the receiving countries (Braunschweig and Carballo 2001; UNFPA/IMP 2004; IOM 2005). Migrants are not only exposed to poor working and living conditions, factors which are in themselves determinants of poor health. They also have reduced access to health care due to a number of political, administrative and cultural reasons not necessarily present for the native population. Different concepts of health and disease, language difficulties or the presence of racism are examples of barriers that migrants face (► migrants, access to health care; ► migrants, diversity management).

The risk of negative health outcomes is not equally distributed within the migrant population. For example, women may have a higher risk than men, due to poorer access to care or lack of empowerment. Migrants who do physical work experience a higher risk of industrial accidents compared to highly skilled computer programmers. In the following, selected risk groups are presented. More details are provided in dedicated essays.

Women

The increasing number of women migrants has led to more attention being paid to the particular problems they face during the migration process. As noted in the report "Meeting the Challenges of Migration" by UNFPA/IMP, migration can further female empowerment, e. g. by providing women with the opportunity to earn money as labor migrants, thereby becoming economically independent. However, there is also concern that migration of women can lead to an increase in their discrimination, exploitation, abuse and in their being at risk of being infected with sexually transmitted diseases such as HIV (UNFPA/IMP 2004). This issue is further discussed in the Essay ► migrants, sexual exploitation.

Migrating Adolescents and Children

Political turmoil, war and other social upheavals have led to a significant increase in the number of child and

adolescent migrants globally. In situations of forced migration, they face severe psychological repercussions, having to leave their homes and communities, schools and at times being separated from, or losing, their families. They also run the risk of being forced into childhood labor or trafficked for sexual purposes (UNFPA/IMP 2004). Also see ► migrants, sexual exploitation as well as ► migrant children.

Elderly Migrants

Elderly migrants have received scarce attention in public health debate and policy making up to date. Their numbers in host countries are, however, steadily rising as more and more migrants do no return to their countries of origin after retirement. The problems they face are not adequately dealt with by health and social services. Elderly migrants are vulnerable to discrimination not only based on age or gender, but also on race, ethnicity, religion, culture and language (Dietzel-Papakyriakou and Olbermann 2001). For more information see ► migrants, aging.

Victims of Forced Migration

Although the issues for the health of refugees are similar to those for other migrants, the basic problems are usually exacerbated. Forced migration has health consequences of a magnitude far greater than those associated with voluntary migration. Civil war, political persecution and the "ethnic cleansing" of the late twentieth century have led to the death of millions of people globally and to the detriment of the physical, mental and emotional health of many others. The displacement of refugees disrupt livelihoods, the production of food and the operation of health services (Gatrell 2002; UNAIDS/IOM 2001). The overcrowding in refugee camps, sexual violence, trauma of watching people, often family members, being killed and mutilated has far-reaching consequences for long-term mental health. Also see ► refugees and internally displaced people.

Asylum Seekers

Between the mid 1980s and the 1990s, the number of refugees and asylum seekers in industrialized countries increased substantially, with economic reasons gaining in importance. In consequence, many receiving countries revised their former openness to these population groups. Refugees and asylum seekers were not admitted into the country or confined in detention centers with only temporary forms of asylum. Asylum seekers living in the community in several countries face restricted access to work, education, housing, welfare and at times even to basic health care services. It can be assumed that post-migration stress adds to the effect of previous trauma and increases the risk of posttraumatic stress disorders and other psychiatric symptoms (Silove et al. 2000; Keller et al. 2003; Norredan et al. 2005).

Irregular Migrants

The mode of migration is also of importance for the health outcomes of the individuals concerned. Persons whose entry, residence and where applicable, employment in a host or transit country has been recognized and authorized by the State authorities are termed regular migrants. Of these, those who are able to plan their journeys, book a flight and make basic arrangements for their stay in the host country will be in a better position to take care of themselves than those fleeing persecution or war, with no resources of their own. Irregular migrants are those who enter, or remain in, a country of which they are not citizens without authorization. This category includes unsuccessful asylum seekers who do not observe a deportation order, smuggled or trafficked persons or persons who remain in the host country without renewing their stay permits when their official term of stay has expired. The risk of negative health consequences is substantial, starting with the often hazardous journeys they undertake to the intended host or transit country and consummating in the clandestine lifestyle they are forced to lead. Irregular migrants are also particularly vulnerable to racism, discrimination and xenophobia (Carballo and Nerukar 2001; ILO/IOM/OHCHR 2001; IOM 2005).

Health Opportunities of Migration

Unfortunately, discussions on migrant health are often focussing on health risks and adverse outcomes alone. This ignores that migrants tend to come from healthier and better-trained segments of sending communities. At the time of arrival, they are often in better health than the average of the host community. As migrant workers, they often expose themselves to higher risks in the workplace, in the agricultural and industrial sec-

tors as well as in domestic environments. However, relative to their countries of origin, they often have better access to health care and enjoy the benefits of the developed public health care system of industrialized countries (Razum and Twardella 2002). Thus, positive health effects may be considerable when compared to the situation before migration. In addition, there can be an indirect positive effect on the health of the population of origin: Remittances sent back home contribute towards improving the economic status of families, and thereby to improving their health (UNFPA/IMP 2004; IOM 2005). It is estimated that remittances from migrants to their home communities in developing countries exceed official development assistance and are only second to the foreign direct investment (IOM 2005).

Data on Migration and Migrant Health

Migration Data

Migration data form a vital part of the basis for formulating, implementing and evaluating migration related policies. Such data also assist in protecting migrants, in integrating migration issues into national development planning and in formulating target policies to reduce migration pressures (UNFPA/IMP 2004). The lack of migration data poses a major obstacle to developing effective migration policy and legislation and to sharing information amongst countries. The UNSD has issued guidelines and recommendations on concepts and methods to help countries in the collection and dissemination of their data. These recommendations are meant to improve the quality of data and promote the application of common definitions and concepts by countries to enhance the comparability of data internationally. Some of the obstacles to collecting comprehensive, accurate and timely migration data are associated with: (UN 2002)

- lack of specific and compatible definitions and poor comparability of data sources
- operational problems of how data are retrieved including the incompleteness of information over time, and
- political motivations that may influence how statistics are reported within and among governments.

In addition, some categories of migration data are particularly difficult to calculate or estimate. These include numbers relating to irregular migration, temporary/return migration and the gender dimension of migration. The fact that there is no single source of data to provide comprehensive figures on migration serves to make the situation more difficult. Administrative registers such as population registers, register of foreigners, residence permits, work permits, application for asylum and exit permits as well as border collection, census data and household surveys have been recommended as data sources. Most of these methods, however, have shortcomings. For instance, although residency permits constitute an effective way of counting the number of non-citizens at a given time, they often reflect the number of newcomers rather than the totality of persons with a migration background living in the country. Additionally, residency permits often no longer apply within free-trade areas and may therefore not be useful for data collection on particular nationalities in certain regions (UN 2002; UNFPA/IMP 2004).

Health Information Relating to Migrants

Health information relating to migrants comprises of representative and timely data on health, health behavior and health care uptake of migrants. Ideally, cost aspects should also be covered. Such data should form a vital part of the basis for formulating, implementing and evaluating policies related to the health of migrants. The data should be routinely collected, but often are not, or are collected but not routinely available or analyzed. A standard definition of the target group "migrants" should be used so that data are comparable within all administrative units of a country and over time. Even neighboring countries should use compatible definitions so that the effectiveness of different national policies towards the health of migrants can be compared. Improving availability and use of health information on migrants thus is one of the challenges facing Public Health policy literally everywhere.

Research on Migration and Migrant Health

The number of research centers around the world addressing migration related issues has increased in the past few years. This is particularly evident in developed countries, where governments are channeling more resources to migration research. Still, universities and private research bodies conduct much of the work. Countries such as Canada and Australia, which have 'in-house' research programmes linked to their

migration departments, are an exception. In developing countries, resources are rarely devoted to setting up migrant research programmes. This regional imbalance is accompanied by a difference in research priorities. For developed countries, topics such as asylum, irregular migration and migrant trafficking have priority. Developing countries, on the other hand, are interested in the whereabouts of their citizens and in strengthening collaboration between origin and destination countries (UNFPA/IMP 2004).

Research on migrant health takes two broad directions, one dealing with questions of equity in health and health care provision, the other investigating the role of nature vs. nurture in disease causation. Both encounter similar problems as those faced when collecting health information on migrants, such as finding an appropriate and operationalizable way of defining the group under study. Few countries such as Switzerland have conducted large-scale surveys on migrant health (► migrant health surveys). Epidemiological studies on disease causation compare the risks of populations of similar ethnic origin in different environments, i. e., in the country of origin and the host country. By analyzing variations e. g. in risk of coronary heart disease, the respective contributions of genetic traits and environment can be investigated.

Summary

The number of migrants (national and international) is constantly increasing. Governments and Public Health actors are continually faced with complex challenges when dealing with the various aspects of migration. Not only the health and welfare of the migrants should be considered, but also those of the communities they come in contact with during the process. In public debates, in policymaking and in research, migrants are often perceived as a homogeneous group. Migrants' gendered identities and cultural practices are often ignored. There is also little recognition of the gendered nature of refugee groups and the specific needs of female migrants. The heterogeneity of migrant groups and the varying definitions or classifications of the subgroups used make research and international co-operation difficult. The problem of reaching migrants, the lack of reliable migrant data, their isolation and the high mobility of certain migrant groups also pose challenges for health services and researchers alike.

Cross-References

- ► Migrant Children
- ► Migrant Health Surveys
- ► Migrant Mortality, Healthy Migrant Effect
- ► Migrants, Access to Health Care
- ► Migrants, Ageing
- ► Migrants, Diversity Management
- ► Migrants, Infectious Diseases
- ► Migrants, Sexual Exploitation
- ► Migrants, Social Inequalities
- ► Migration and Brain Drain
- ► Migration, Internal
- ► Refugees and Internally Displaced People

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Migrant Health Surveys

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Definition

Migrant Health Surveys are research projects designed to measure the health status and health behaviour of migrants through standardised interview questions and sometimes medical examinations. The corresponding questionnaires are used by interviewers in telephone or face-to-face interviews or have to be completed by the respondents themselves (self-administered questionnaires). In many cases, a Migrant Health Survey is part of a general health survey systematically considering migrants as a sub-group of the general population. According to scientific standards, a survey should be representative for a given population at national or regional level. If this sampled population comprises migrant groups, special efforts are needed to ensure their adequate representation in the study. In this respect, Migrant Health Surveys are characterised by migrant-oriented approaches at all stages of the study design (that is sampling, questionnaire construction, field work, contents and analysis).

Basic Characteristics

Sampling

The challenge of an adequate sampling procedure for Migrant Health Surveys starts with the *definition* of the term *migrant* as it shall be used in the study. The sampled migrant population of a survey can comprise the partially intersecting sub-sets of foreign nationals, naturalised immigrants, 2nd or 3rd generation immigrants, return migrants, asylum seekers, refugees and ethnic or minority groups. Facing this heterogeneity, researchers may decide to focus only on a few migrant sub-groups. Such deliberations particularly arise if the migrant sample is a sub-sample of the general population. Considering the fact that in most countries the migrant population is divided into groups of quite different sizes, a sample from the general population would represent only the largest of these groups in quantities that would allow stratified analyses. Consequently, in order to mirror the social and health related heterogeneity of the migrant sample population, it is recommendable to over-sample at least some migrant sub-groups. However, the issue of *over-sampling* involves the problem of identifying migrants in the general population. This task can be met using population register information like nationality or status of residence (Rommel et al. 2006) or by over-sampling and screening communities with high proportions of specific migrant populations (National Center for Health Statistics 1999; Erens et al. 2001).

Translation

The dataset of a Migrant Health Survey can only be said to be representative if all individuals of the sampled population had the same chance to be included in the study. As many migrants even of the 2nd or 3rd generation lack sufficient linguistic proficien-

cy of the national language of their host countries (*source language*), they would fail to understand many of the contents of the questionnaires mostly designed by host country nationals. To ensure the representative participation of migrants, one of the main tasks for Migrant Health Surveys is thus an adequate translation of the questionnaires into the migrants' mother tongues (*target language*) (Pennell et al. 2004; Schenk and Neuhauser 2005; Rommel et al. 2006). Otherwise the migrants, especially those less integrated, will refuse to participate in the study and the resulting migrant subsample will be biased. To critically evaluate questionnaires that have been translated in a language other than the mother tongue of the researcher, *forward/backward translations* independently done by various professional translators have proven to be useful (for procedures and problems cp. Small et al. 1999; Acquadro et al. 2004; Ponce et al. 2004; Rommel et al. 2006). For economic and pragmatic reasons, only a restricted number of languages can be covered. Consequently, predefined sub-samples for selected migrant groups may be favoured over a general population sample (see above).

Cross-Cultural Equivalence/Linguistic Validation

The adaptation of questionnaires to the needs of migrant groups is not confined to the translation act. During or after the translation process, it can be helpful to request the assistance of *bi-lingual experts* – at best migrants themselves – who are familiar with the characteristics of a determined migrant community as well as migrant specific health concerns (Pennell et al. 2004; Rommel et al. 2006). Their revision of the translated questionnaires is one possible step to ensure not only the *content validity* but also the *construct validity* of the translated instruments. While content validity only indicates the linguistically correct translation of contents, construct validity is achieved if an instrument in the target language measures the same scientific concepts as the corresponding items in the source language (Harkness et al. 2003; Bhopal et al. 2004; Ponce et al. 2004). This includes that expressions are not only translated correctly, but are also commonly understandable and verbalise comparable contents. In this respect, a further procedure established to scrutinise the comprehensibility of survey questions and the accuracy of underlying concepts is ► cognitive pre-testing through qualitative interviews or focus groups (Campanelli 1997; Acquadro et al. 2004; Bhopal et al. 2005). This procedure should be conducted by bi-lingual collaborators; its aim is to include linguistically less integrated migrants as the main target group of the translated questionnaires.

To definitely ensure construct validity before field work, extensive standard pre-testing under field conditions and subsequent statistical analysis would be necessary. Many statistical methods to assess construct validity are available (Harkness et al. 2003) and especially the preparation of standard indices for the employment in various languages and cultures underlies quite strict scientific rules (psychometric testing). However, for economic reasons, these procedures are frequently not included in the *standard pre-testing* of comparatively large questionnaires of multilingual population surveys. As a result, the final assessment of construct validity is postponed to data analysis after field work and researchers have to take the risk of partially suboptimal data quality. Nevertheless, even if the budget is restricted, standard pre-testing should not be given up completely. Even a few interviews in each language can provide information on how the questionnaires work in the field and interviewer debriefing can be applied to achieve final improvements before field work starts (Pennell et al. 2004; Rommel et al. 2006).

Field Work

The field work of Migrant Health Surveys should be announced well in advance by a bi-lingual letter which explains the aims of the study, clarifies issues of data protection and tries to dispel migrant-specific reservations against the quest for information on behalf of a public institution or research institute (Erens et al. 2001; Schenk and Neuhauser 2005; Rommel et al. 2006). The latter applies especially to migrant groups with mainly foreign nationalities which may fear for their status of residence or expect other supposed negative consequences. As a result of the translation and validation procedure, it is a characteristic of Migrant Health Surveys that *bi-lingual interviewers* familiar with the contents of the study and potential linguistic problems are at the disposal of the interviewees (Small et al. 1999; Erens et al. 2001; Rommel et al. 2006). In telephone or face-to-face interviews, either the whole field work has to be done by those interviewers or it must be indicated before and at the

beginning of the interview that the questionnaire can be alternatively completed in the mother tongue of the interviewee. In any case, the rate of interviews in languages other than the source language will increase considerably if the first contact is made by compatriots of the interviewees. In postal or ► examination surveys which use self-administered questionnaires, different language versions can be provided. It is then up to the respondents to choose the version they want to complete or to change languages depending on their comprehension of the individual questions.

Contents and Analysis

In addition to the well-established social, health and behaviour indicators of general health surveys, Migrant Health Surveys are characterised by *migrant specific topics*. As a minimum standard, indicators for the definition of the respondents' social and migrant status should be among the contents of the questionnaire. This comprises *education and vocational training abroad* (to measure correctly the social status), *place of birth* and *nationality* of the respondents and their parents (to identify naturalised migrants and to derive the generation after migration), *year of migration* (to derive length of stay) and *status of residence* or *motivation of migration* (to identify migrant groups, e. g. asylum seekers, students, immigrant workers, refugees, return migrants etc.) (Schenk and Neuhauser 2005). Moreover, depending on the research interest aspects of *integration* (e. g. language skills, language spoken at home, social networks, cultural practices), perceived *discrimination*, self-ascribed *ethnicity, religion* and *religiousness* or specific aspects of *service utilisation* (e. g. communication problems, culturally adequate care) can be taken into account (Rommel et al. 2006).

Regarding *analytical strategies* (► stratified analysis) for Migrant Health Surveys, two approaches can be distinguished. On the one hand, the analysis can focus on the comparison between host population and migrant groups. Simple content analyses of cross-tabulations give first insights into the differences and similarities between groups. In multivariate models the significance and intensity of differences in health and behaviour can be estimated, controlling simultaneously for general confounding effects like sex, age, social status etc. On the other hand, migrant-specific indicators cannot be compared with the host population. Instead, they provide a deeper understanding of specific living conditions and typical biographical configurations. Such data thus allow assessing the heterogeneity within the migrant population beyond ethnicity or nationality, and the corresponding effects on health and health behaviour.

Cross-References

► Cognitive Pre-testing
► Examination Survey
► Stratified Analysis

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Migrant Mortality, Healthy Migrant Effect

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Definition

The "Healthy Migrant Effect" describes an empirically observed mortality advantage of migrants from certain countries of origin, relative to the majority population in the host countries, usually in the industrialized world. Occasionally, it relates to a relatively lower morbidity of immigrants as well. The Healthy Migrant Effect also serves as an *ad hoc* explanation when migrants are found to have a better health status in spite of being socioeconomically disadvantaged. The Healthy Migrant Effect is not theoretically founded; it is often reduced to a presumed selection of healthy individuals at the time of migration (which is an insufficient explanation).

Basic Characteristics

Migrant Mortality: A Paradox

Socioeconomic status is known to be strongly and inversely associated with mortality: Those who are poor, unemployed or have a low educational attainment experience higher mortality than the rich, employed, and well-educated. In many destination countries, migrants have, on average, a lower socioeconomic status than the majority population. Their mortality, however, overall as well as for certain specific causes, is often lower in comparison – a paradox (Razum and Twardella 2002). This has been observed in the US, in Germany, in the UK, and in Canada (see Table 1). The mortality advantage of migrants has been called "Healthy Migrant Effect", thereby alluding to the "Healthy Worker Effect", the mortality advantage of workers in employment, relative to the general population (which also comprises diseased, non-working individuals with a higher risk of mortality).

What is the "Healthy Migrant Effect"?

Firstly, the question has to be resolved whether the observed mortality advantage of migrants is real or due to bias. One possible explanation is the "salmon bias". Its underlying claim is that gravely ill migrants tend to return to their countries of origin. This leads to a numerator-denominator (▶ numerator-denominator bias) mismatch and thus to an underestimation of mortality. Study designs that are based on repeated cross-sectional analyses are prone to this type of bias. For example, a considerably lower all-cause mortality was observed among male Turkish migrants in Germany than among German men (Razum et al. 1998). In a longitudinal design, however, their peers in the Netherlands had a higher mortality than Dutch men (Bos et al. 2004). Still, this observation cannot be generalized: Table 1 shows other large studies that found similar mortality advantages (Singh and Hiatt 2006; Ronellenfitsch et al. 2006; Sheth et al. 1999). Moreover, cohort studies which could rule out return migration confirmed that there are real and sometimes quite large mortality advantages of migrants (Swerdlow 1991; Abraido-

Migrant Mortality, Healthy Migrant Effect, Table 1 Mortality risk of migrants relative to the population of the host country

Origin	Host country	Data source	Measure	Relative Risk		Reference
				Men	Women	
China	Canada	Canadian Mortality Database	RR	0,55	0,63	(Sheth et al. 1999)
Mexico	USA	National Longitudinal Mortality Study	HR	0,57	0,60	(Abraido-Lanza et al. 1999)
Vietnam	England	National Health Service Register	SMR	0,64	0,56	(Swerdlow 1991)
Former USSR§	Germany	Population and Cause of Death Statistics	SMR	0,89	0,81	(Ronellenfitsch et al. 2006)
Mainly Latin America, Asia	USA	National Mortality Data	RR	0,77	0,84	(Singh & Hiatt 2006)

* Former "Guestworker" from Mediterranean countries (Turkey, Yugoslavia, Italy, Spain, Portugal); men and women combined
§ "Aussiedler" (return migrants of German origin). RR: *Relative Risk*; HR: *Hazard Ratio*; SMR: *Standardized Mortality Ratio*

Lanza et al. 1999). More studies based on individual follow-up are needed to analyze the size and direction of observed mortality differentials.

The data sets used for many of the studies listed above have an additional limitation: the association between socioeconomic indicators such as unemployment on the one hand, and health outcomes on the other, is merely ecological (► ecological association). Thus it remains unclear whether migrants with a low socioeconomic status have a higher or lower mortality than those of high socioeconomic status, and how social mobility of migrants affects their mortality. Only measurements at individual level can help to further clarify the determinants of trends in disparity. They should be complemented by measurements of community attributes such as the extent of discrimination. Clearly, present studies examine only selected aspects of the association between migration and health (Davey Smith 2000).

Explanatory Models

Given the many studies reporting a mortality advantage of migrants, this advantage may be real, rather than due to bias. Various explanations for an actually lower mortality of migrants, relative to the populations of origin and of the host country, have been proposed. The most common one is mainly healthy and active individuals migrate. Immigrants would thus have a mortality advantage. However, it is important to note that this advantage would be relative to the population from which the migrants originate – not necessarily relative to the population of the host country, as is usually implied (Razum and Twardella 2002). To better understand this effect, future migrant studies have to include the populations of origin of immigrants as well.

Another explanatory model interprets migration from low-income to industrialized countries as a speeded-up progression along the continuum of the ► health transition, thus in effect picturing migrants as time travelers. Relative to the situation in industrialized countries, these migrants come from a "past" stage of the health transition (Razum and Twardella 2002). They have been exposed to fewer or lower doses of risk factors for cardiovascular and other non-communicable diseases. They will experience a mortality advantage for such diseases even years after migration and the adaptation of a "Western" lifestyle because of the long lag-times between exposure and death. At the same time, they will immediately benefit from better access to medical care for infectious diseases and emergencies, further increasing their mortality advantage. To investigate the dynamics of these effects, duration of stay in the destination country needs to be measured. In addition, a detailed breakdown of ethnic and geographic origin is required because some disease risks are brought from the countries of origin.

Can the Paradox be Resolved?

To better understand mortality differentials and their change over time, three additional requirements would have to be fulfilled. The first one is to base future studies on an explicit model of migrant health and its determinants (Razum and Zeeb 2004), taking into consideration the complexity of the association between migration and health (Davey Smith 2000). Secondly, these determinants would have to be measured longitudinally and at individual level. Such a migrant cohort would, of course, also be useful to investigate the respective roles of nature and of nurture in disease aetiology.

A migrant cohort measuring behavioral and socioeconomic variables at individual level would require considerable resources, which many a migrant researcher has failed to obtain so far. Epidemiological migrant studies appear to have come to a dead stop for another reason, however (and this is the third requirement): An "ideal" prospective migrant study which could help to understand the mortality paradox would have to enroll individuals *before* they migrate (these individuals would be the very ones that are usually categorized as "lost to follow-up" in cohort studies because of moving abroad). Follow-up would need to continue in the country of destination and, in case of return migration, again in the country of origin. Achieving sufficiently large sample sizes, however, would be a challenge (Razum 2006).

Migrant Mortality and Public Health

Given the unexplained nature of observed mortality differentials, the mortality of migrants cannot be considered a good indicator for their socioeconomic and general health status. It is well conceivable that migrants from Mediterranean countries are disadvantaged in many respects in an industrialized host country of the north, and yet their cardiovascular mortality remains lower than that of the majority population for

many decades. This observation would merely reflect the mortality advantage of their country of origin relative to that of the host country. Some particular causes of death, however, are more informative with regard to equity in health care. Among these are infant mortality and maternal mortality. These should decline to levels close to those experienced by the majority population within a short time after migration if care is equitable (Razum and Zeeb 2004). Remaining differentials usually have to be interpreted as an indication of barriers that migrants face when accessing and utilizing health services in the host country.

Cross-References

- ► Ecological Association
- ► Health Transition
- ► Numerator-Denominator Bias

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Migrants, Access to Health Care

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Definition

Most health care services are insufficiently adapted to the socio-cultural diversity of the clientele they are trying to serve. Problems of access, the lack of cultural competence in health care providers, lack of special provisions (such as interpreter services, translated health education material) may all be structural barriers to access and to quality care. Differential impact of health care services may be linked to discriminatory practices in the health care system, inadequate health care concepts and structures dealing with diversity but also to a lack of skills of the health professionals. Such obstacles need to be overcome to improve access of migrants to health care services.

Basic Characteristics

Cultural Background or Socioeconomic Status?

Health care institutions and providers are increasingly challenged to understand and address the needs of an ethnically diverse clientele appropriately. The international interest in 'culturally responsive care' parallels recent developments in medicine such as patient-centered care, the enactment of charters of patients' rights, and the growing importance attached to the outcome of health care interventions and to patient satisfaction. Cultural differences, however, might be less of a barrier to equitable health and equitable access to health care services, than socio-economic factors, migration factors, discrimination and the selective impact of health care. As ethnic health patterns broadly reflect socio-economic differences between migrants/ethnic minorities and the majority population, it is essential to

develop policies to improve the socio-economic status and the general participation chances of these groups.

Because of legal, financial, linguistic or cultural reasons, it may be impossible or some difficult for migrants and ethnic minorities to access the health care system, or to receive the same quality of care as the majority population. Discrimination and racism have been observed in the domain of health care, and this at a systemic level as well as at the level of individual institutions and/or health care providers.

Some migrant groups (e. g. undocumented immigrant) have only very limited access to the health care system (e. g. limited to emergency care). Access to the health insurance system may not be possible without legal status and/or working permit, etc. Although most ethnic minorities are included in compulsory insurance systems, disparities in access to health care are not limited to direct access. Once they are patients in health care services, the quality of care they receive may be lower than that received by patients of the majority population.

Perceived Quality of Care

Migrant patients have shown to be less satisfied with, and less informed about, the treatment received in the hospital (Borde et al. 2002). Deficiencies in mental health care for migrants lead to a high rate of premature abandonment of treatments. Health professionals seemed to agree with their patients on the fact that the quality of care they delivered was below standards. Unresolved language barriers have been proved to dramatically affect the quality of care received by migrant patients (Bowen 2001; Jacobs et al. 2003). As such, access issues should be viewed as quality issues. Smedley, Stith and Nelson (2003) have added that substandard care for some groups, be it related to problems of access or of quality of services delivered, should raise the concern that the provision of care may be inconsistently and subjectively administered.

Language and Information

Linguistic barriers, combined with low socio-economic status, may also reduce access to information on the functioning and possible benefits of health care services. A lack of knowledge of the health care system and how to use it may hamper access and lead to inadequate use of health care services. As a result of language barriers, health care providers may fail to meet ethical standards in providing health care. Language barriers may result in failure to protect patient confidentiality, or to obtain meaningful informed consent (Kaufert and Putsch 1997). Consensus exists that the provision of professional health care interpreters is an important prerequisite to guarantee equitable access to, and quality of care to many ethnic minorities. Professional interpreters may have an important impact on the acceptability of health care services and patient satisfaction in ethnic minority groups.

Cultural Differences and Expectations

Partly culturally determined beliefs, concepts, types of behavior, traditions and religious convictions may have a profound impact on the expectations and interactions of ethnic minorities with the health care system. Cultural diversity may affect the cross-cultural health care encounter. Examples include views on nutrition/diet, explanatory models, different types of traditional healing systems, views on surgery and transplantation, autopsy, on communication with the diseased (e. g. the communication of bad news), visiting ill persons, the process of dying and death, religious rituals to be executed at birth/death, gender relationships (acceptability of a health care provider of the opposite sex to the patient), etc. (Henley and Schott 1999). When cultural differences are insufficiently taken into account (e. g. lack of respect for the values and convictions of ethnic minority patients), this may make health care services culturally unacceptable for these groups, leading to cultural barriers to care. When health care institutions lack cultural competence, this may affect the accessibility of the health care system.

Structural Discrimination

Cultural differences may only account for a small portion of the health problems experienced by ethnic minorities. Structural discrimination in the health care system, the experience of racist and discriminatory practices inside and outside the health care system, do seriously affect the expectations of ethnic minority patients and their interaction with the health care system. Health professionals and institutions need to gain awareness of these processes, learn to detect them, understand their possible impact on the outcome on

access, quality of care and treatment. The development of culture competence or cultural responsiveness would add to the efficiency and effectiveness of health care provision to ethnic minorities (Bischoff 2003; also ► migrants, diversity management).

Information, Education, Empowerment

Patient education, participation, activation and empowerment (► patient empowerment) have to be given more attention. Some populations may lack the knowledge and skills to use the health care system appropriately and to live a healthy lifestyle. Low 'health literacy', as this phenomenon has recently been labeled, may lead to health problems and to an inadequate use of health services. Undocumented migrants and refugees are often insufficiently aware of their (limited) rights to health care, and as such may not seek medical attention for their health problems. Ethnic minorities and migrants are often poorly reached by health education and promotion programs that are oriented towards middle class population. Culturally sensitive health/patient education programs are needed to give migrants more control over actions and decisions that influence their health. Of special importance are programs that inform on how to access and use the health care system in an effective way. Health information materials and programs, health promotion campaigns and interventions have to be tailored to the needs and characteristics of migrants and ethnic minorities considering their specific sociocultural life circumstances: it may be necessary to translate material, provide audio- or video-taped material for (semi)illiterate groups and groups with low educational status.

Research makes clear that it is important to involve members of the target groups in the preparation and implementation of health promotion initiatives for ethnic minorities. These can provide access, valuable information on strategies and self-organizations that can help to improve the impact of health promotion activities. At a systemic level, the quality of care could be improved through the active participation of ethnic minorities in needs assessment, program development, implementation and evaluation. In order to improve access of migrants to health care they need to be considered in the development of an integrated social/health policy and corresponding policies in health care institutions as a constitutive part of the population.

Cross-References

► Migrants, Diversity Management
► Patient Empowerment

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Migrants, Ageing

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Definition

► Elderly persons are defined as those over 50 years of age in some European surveys (Weber et al. 2004). However, most international organizations and surveys refer to the ageing population as those over 60 years of age and to very old persons as being 80 years and older (United Nations 2002; Mette 2005).

Basic Characteristics

Significance for Public Health

Migrants are found to be a population group with specific health risks. Their access to health and social care facilities is often limited compared to that of the indigenous population (International Organisation for Migration 2003). These now well-known facts were explored and discussed in health sciences for several decades. More recently, the impact of these facts on the ageing migrant population has become apparent. Several discourses reflecting global and regional developments contributed to this attention: The fact that global ageing will be pervasive and enduring (United Nations 2002) and that this development will be accompanied by an epidemiological transition boosting chronic and old-age-related diseases led to new priorities in health care planning and delivery. Gerontological and geriatric aspects of care are now a major issue. This includes a growing awareness of the most vulnerable groups among the ageing population. The growing significance of migrants is also stressed by the sheer number of migrants world wide, and the expected increase in this number.

As a consequence, health planning and delivery have to take the constantly growing population group of elderly migrants into account on a regional scale. This is experienced as an unprecedented challenge, especially by countries which recruited migrant workers in the 1960s and 1970s in large numbers (in Europe: Germany, Netherlands, Belgium, Austria). Elderly migrants are a rapidly growing population group in these countries, as the available data of the European Union show (Eurostat 2005). European countries with a colonial past like France and United Kingdom had different immigration patterns which lead to a slightly less pointed population distribution with regard to the ageing population (Eurostat 2005). Nevertheless, ageing minorities pose also in these countries a specific challenge for planning of care. In addition, a broader diversity of ethnic and language groups among the ageing migrant population has to be considered. Thus, in many countries, specific demands of a rapidly growing ageing migrant population group have to be identified and new structures and resources for adequate care need to be created within a short period of time.

Health Determinants of Ageing Migrants

Migration is regarded as a potentially stressful event. Yet, the ability to cope with a new environment and to adapt to a new socio-cultural sign system is unequally distributed in the migration population. It is important to recognize this heterogeneity when assessing potential health care problems of ageing migrants and when establishing health and social care programmes for these migrants. Varieties are associated with the migrants' socio-cultural background (urban areas/remote areas/religion) and with the reasons for migration (Mette 2005; also ► migrant health). The following social and health-related risks in the intersection of old age (► socio-cultural definitions of old age) and migration are of special relevance for this population group:

- Low average incomes and high dependency rates on welfare
- Objective and subjective health problems and early ageing due to the effects of dirty and heavy work
- Health risks related to unfavorable housing areas
- Mental and psychological health problems resulting from migration-related experiences and hardships
- Psychosocial stress due to experiences of discrimination, maladaptation to the host country and an experience of having failed original objectives of the migration
- Experience of being stereotyped and lack of interculturally adequate institutional support in age- and health-related questions (also ► migrants, diversity management)
- Intergenerational conflicts as the second and third generation tend to cultivate life styles similar to the indigenous population. Yet, family networks as well as interethnic networks tend to be more reliable and supportive than those of the indigenous population
- Isolation in ethnic groups and tendencies of enhancing ethnicity and culture.

Social and Health Services for Ageing Migrants

A variety of social and health care services has been established in the last decades in countries of high income to support the elderly and very old and their families. Many of these services are criticized for being insufficient and insensitive to the specific demands of ageing migrants. Thus, ► socio-cultural barriers are hindering ageing migrants to use existing services and to

obtain adequate support for their needs. Lack of sufficient information dissemination about available services for ageing migrants is another aspect which seems to have a severe impact on their health and social care seeking behavior. Pressurized by the rapid population growth of ageing migrants and in acknowledging an increasing acceptance of (im)migration as a social fact and supported by anti-discrimination and patient rights regulations, welfare and health care organization committed themselves to a greater extent to an interculturally sensitive work. The following aspects are seen as central for this endeavor (also see Essay Improving Access of Migrants to Health Care):

- Enabling communication between migrants and service deliverer
- Dissemination of information in native languages for ethnic groups
- Changes in structure and processes of services to support an interculturally adequate outcome.

Putting intercultural aspects on the agenda fills a long documented gap in health and social care settings. However, evidence from health research is showing that the socio-economic status is the most important determinant in patterns and causes of disparities in health and health seeking behavior. In the long run, prevention of inequalities in the care of ageing migrants must be sought in policies supporting education and acculturation of migrants. Participation in economic and social life constitutes the main route for supporting the integration of migrants.

Cross-References

► Elderly Persons
► Socio-Cultural Barriers
► Socio-Cultural Definitions of Old Age

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Migrants, Diversity Management

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Definition

The term "diversity" refers to a social and cultural variety or heterogeneity in a specific context, especially on a national, local, organizational level, and even in kinships. Diversity is created by a range of components. The most important components are migration, racial or ethnic origin, nationality, mother tongue, religion or belief. These are combined with gender, sexual orientation, age, physical challenges and disability (cf. the EU Equality Directives 2000). Diversity is not a stable state; it is an ongoing process. International migration contributes in a very dynamic way to diversity. Public health professionals have to develop sensibility towards diversity and its management because diversity is strongly associated with the risk of unequal treatment.

Basic Characteristics

Driving Forces

Diversity is an emerging theme of the Public Health agenda (WHO 2003). The driving forces of diversity in Public Health are

- the ongoing globalization, the enlargement of the European Union,
- international migration (including refugees and asylum seekers) (GCIM 2005; IOM 2005) and labor mobility (including highly skilled health professionals),
- different stages of migrant integration on national and local levels,
- an evolving positive self-image of minorities and colored people,
- a rising awareness regarding health disparities between nations and groups.

Public Health is especially responsible for managing diversity in an appropriate way in order to reduce health disparities. Thereby, all functions of Public Health are challenged:

- Public Health as a professional service system with a social setting approach,
- Public Health as an employer responsible for both the diversity competence of management and staff and the agility and responsiveness of the organization,
- Public Health as a provider of training programs for health professionals,
- Public Health as a population related interdisciplinary science.

The European Union promotes the awareness regarding diversity and equality in order to reduce discrimination and to realize equal opportunities for all (EU Equality Directives 2000).

Old and New Patterns of Diversity

Diversity is context-bound. This means that the specific profile of a population is coined by national and local history as well as by political decisions. Some examples of particular population groups illustrate this: In Germany, so-called 'Aussiedler' are the largest immigrant group. They have a German background and immigrated from different countries and regions of the former 'Eastern bloc'. In Great Britain, the composition of the population is influenced by minorities and migrants from the former colonial empire. In the United States, autochthonous Indians contribute to the map of diversity (► autochthonous population). Furthermore, each country has developed an own system to classify and quantify diversity (European Kommission 2004).

Old patterns of national and local diversity are changing. Ongoing international migration and mobility, the processes of local inclusion or seclusion, relations between groups and an emerging self-confidence of minorities (e. g., black and colored people in predominantly white societies) are forces with an impact on the social construction of diversity and equality. The emerging new patterns of diversity are complex, ambiguous, and dynamic. In addition, the new diversity is not easy to quantify in statistical terms, because it is much more a social quality. Public Health professionals are forced to rethink the paradigm and concept of diversity in use. This is inevitable for monitoring the equal treatment of people from different backgrounds in an appropriate and non-discriminatory way.

Diversity and Equality

Diversity is not only a term for describing the manifold differences in a social context. In many cases, diversity is stereotyped and valued in a negative way. Migrants, refugees, and asylum seekers in particular are victims of ignorance and exclusion. In consequence, the term diversity is strongly coupled with the term equality. It is a social-political term which covers the potential discrimination of individuals and groups on grounds of diversity criteria. This means that diversity needs to be interpreted as a multi-dimensional approach of observing, analyzing, and promoting equality in Public Health. This implies a change in perspective: Diversity should not be conceptualized as a deficit and risk; it should be seen as an important resource, too.

Direct and Indirect Discrimination

It is important to take into account two types of discrimination: direct and indirect discrimination (EU Equality Directives 2000; Geiger 2006). Direct discrimination occurs where a person is treated less favorably than another in a comparable situation on grounds of diversity criteria. In comparison to indirect discrimination, direct discrimination is much more explicit.

Indirect discrimination can be subtle and occurs where an apparently neutral provision, criterion or practice would put persons from different background at a particular disadvantage compared with other persons. For example, migrants are not explicitly excluded from health services. Still, migrants face considerable barriers (e. g., lack of information, insufficient knowledge of

the foreign language, different cultural concepts) that hinder the access to relevant health services (WHO 2003; also ► migrants, access to health care). In everyday life, subtle and multiple forms of discrimination are predominant. Multiple discrimination is based on a combination of two or more stereotypes regarding diversity (e. g. elderly colored migrants) (WHO 2003).

Managing Diversity in Public Health

Managing Diversity – Internally and Externally Diversity is a challenge to Public Health organizations and professionals and requires a proactive management. Diversity management in Public Health covers both an outward-oriented and an inward-oriented strategy. The outward-oriented strategy promotes and favors services that are appropriate for, and responsive to, diversity by ensuring access for all; while the inward-oriented strategy seeks to increase diversity competence in the workforce in order to improve the services that have to meet diverse needs. Thereby, the so called '► demographic imperative' becomes a driving force of Public Health development. It is important to highlight that the implementation of diversity/equality policies and practices involve the entire Public Health system and the success strongly depends on the commitment of both management and staff.

Approaching Diversity – Options In the contemporary landscape of Public Health system one can find many different approaches to managing diversity. The most important are (Geiger, Razum 2006; compare Adler 2002):

- The diversity-free approach. This approach is based on ► parochialism or ► ethnocentrism. This means that the existing procedures are considered as the only or best way. Diversity is ignored or conceptualized as disturbance; potential biases are not reflected.
- The trans-diversity approach. The basic assumption of the trans-diversity approach is that it is possible to develop a Public Health standard and service for all groups irrespective their different backgrounds.
- The diversity-specific approach. This approach suggests that equality will be reached by health services exclusively conceptualized for specific groups. 'Positive action' could be seen as a synonym.
- The diversity-sensitive approach. The diversity-sensitive approach takes into account the complex processes of social diversity. The basic idea is that Public Health has to display a new dimension of reflexivity, flexibility, and quality respecting the divers and changing needs of the population. This approach is comparable to 'diversity mainstreaming'.

The diversity-specific approach and diversity-sensitive approach are the pillars of mainstreaming diversity – the preferred strategy of the European Union.

Mainstreaming Diversity – a Dual Strategy The European Union recommends a dual diversity/equality strategy: so-called 'diversity mainstreaming' as the dominant strategy combined with so-called 'positive actions' if required. Diversity mainstreaming is a continuous process. This means that each decision is coupled with considerations regarding the impact of and on diversity/equality (Commission der Europäischen Gemeinschaften 2005). Therefore, Diversity mainstreaming covers policies, provisions, processes, and practices in Public Health organizations. Positive actions are seen as additional specific programs. They are required to provide equality of access and equality of participation for the most disadvantaged groups.

Main Challenges The diversity/equality frame of reference is challenging the Public Health system. The most important aspects are:

- rethinking the concepts of diversity and the coupled strategies of managing diversity,
- matching the workforce and the workflow in Public Health organizations to the diversity profile of the population,
- developing performance indicators for monitoring the success of diversity management in Public Health.

Managing Diversity in Public Health can be seen as a professional and organizational strategy valuing diversity as a health resource, aiming to fight discrimination, and promoting equal health opportunities for all.

Cross-References

► Autochthonous Population
► Demographic Imperative
► Ethnocentrism
► Migrants, Access to Health Care
► Parochialism

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Migrants, Infectious Diseases

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Definition

► Infectious diseases are caused by a variety of biological agents such as viruses, bacteria, fungi, parasites and their toxic products. They arise through transmission of the agent from an infected person, animal, or reservoir to a susceptible host where they trigger a pathological reaction. In contrast to non-communicable diseases, the population dynamics for infectious diseases are particularly influenced by the transmission patterns between infected persons or animals and exposed susceptible individuals.

Basic Characteristics

Background

In developed countries, a higher prevalence of infectious diseases can be observed among migrant populations compared to the native population. This is due to the fact that migrants often come from developing countries where infectious diseases are still rampant. There, infectious disease accounts for approximately 44% of overall mortality and substantial morbidity, a finding that has remained almost constant over the last decades (World Health Report 2004). This burden of disease includes also the sequelae of chronic infectious diseases such as cancer (e. g. hepatocellular carcinoma as a consequence of chronic hepatitis B or hepatitis C infection). In addition to sick individuals, healthy persons are also of great importance for the transmission dynamics in populations. They sometimes carry the infection without knowing (carriers) and may thus transmit it to susceptible individuals. Infections also represent an underestimated threat for people who travel from the Northern hemisphere to the developing world, be they migrants or tourists.

Examples of infectious diseases which contribute significantly to the burden of disease in migrant populations include tuberculosis, diarrhoeal diseases of various origin as well as hepatitis A, B and C. Further examples are vector-borne diseases such as malaria and dengue, sexually transmitted infections (HIV/Aids, syphilis, *Chlamydia* infections, hepatitis B, human papilloma virus infection) and *Helicobacter pylori*-associated diseases (Prüfer-Krämer and Krämer 2004, Rothenbacher et al. 1998, Van de Laar et al. 2003, Migliori and Centis 2002, Marschall et al. 2005, MMWR 2006).

Population Dynamics

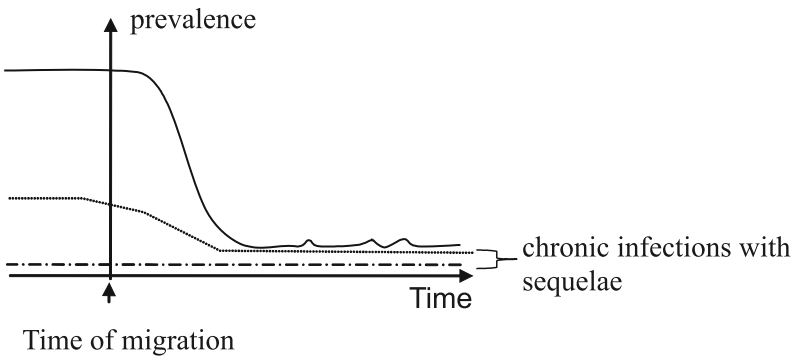
Migration from developing to developed countries bears opportunities as well as risks (epidemiological transition) for persons. Better management and treatment of infectious diseases in developed countries make it possible for known or newly diagnosed infections to be effectively treated. Where this occurs, the incidence and prevalence of acute infectious diseases such as malaria and hepatitis A in migrant populations may reach levels similar to those in the native population. However, it is possible that during visits to the country of origin, individuals again become exposed to infectious agents with a high local prevalence. They may thus acquire the infection and import it to the country of destination. We then observe an increase of incident cases and possibly outbreaks in the migrant population. In the case of chronic infections, a substantially high level of endemicity will remain even after long periods of residence in the country of destination. This may be the case for several chronic infections like tuberculosis, HIV/Aids, and hepatitis B and C (Fig. 1). Possible reasons are: 1. the infection is not diagnosed and therefore not treated. 2. The infection is treated, but insufficiently so. 3. Effective treatment for the infection is not available in spite of a correct diagnosis. 4. Social disparities prevent access to adequate health care.

Underutilization of Health Services

From a public health perspective, migrants are generally underserved or inadequately treated in their host countries, e. g. with regard to the management of infectious diseases. This has several reasons: 1. the patient's (migrant's) poor knowledge about the disease. 2. The physician's or health care worker's poor knowledge of rare tropical diseases. 3. The patient's limited access to health care facilities due to information deficits and language barriers (► migrants, access to health care). This mismanagement does not only relate to the medical treatment *per se*. More importantly, it also includes preventive activities such as the provision of vaccination to migrant children (► migrant children) or effective advice on the prevention of sexually transmitted diseases.

Public Health Recommendations

Public health programs are needed that address these issues and lead to a better health service for migrant populations. To start with, it has to be realized that migrant groups differ (► migrants, diversity management). In order to provide an effective service the origin of the migrant has to be considered, because the local endemic situation defines the *a priori* probability for a specific infection. Due to rising global migra-



Migrants, Infectious Diseases, Figure 1 Diagram showing the development of acute and chronic infections among migrants in relation to time of migration

tion rates it is necessary that public health programs in destination countries include continuing education of health care personnel regarding the changes in migration waves. This knowledge is necessary not only for specialists such as tropical diseases physicians but also for general practitioners, community doctors, nurses, and the migrant community itself. The training and/or establishment of specialists for migration medicine and public health are a further option for the future. Despite the high impact of infections on the burden of disease in migrants, these subpopulations lack adequate awareness and information. The distribution of information linked to campaigns against hepatitis B, sexually transmitted infections and tuberculosis through community-based participatory actions provides a promising option for creative and effective public health interventions. Finally, the improvement of infectious disease control in developing countries through effective vaccination programs, vector control, education and adequate treatment will possibly lead to extensive reductions in the burden of infectious disease there.

The increasing irregular migration requires special attention due to several reasons: 1. their often low socio-economic status is linked to higher prevalence rates and risky behavior (e. g. commercial sex, drug use). 2. Screening programs fail to reach irregular migrants. 3. Irregular migrants have very limited access to health care and treatment.

Need for Research

For Europe and other parts of the world, indicators for a monitoring system for infectious diseases in migrants and minorities has to be developed, using existing health-related data bases and surveys. Currently, there is very limited evidence-based research on migration and infectious diseases. There is a need for new epidemiological and public health studies in these subpopulations (► infectious disease epidemiology). The establishment of a European network of epidemiological observatories for the health of minorities will be helpful to generate an evidence base for public health policy. Such a network can produce comparable data on socio-demographic and health profiles of ethnic minorities with respect to infectious diseases.

Cross-References

► Infectious Disease Epidemiology
► Infectious Diseases
► Migrant Children
► Migrants, Access to Health Care
► Migrants, Diversity Management

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Migrants, Sexual Exploitation

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Definition

Globalization with its increasing cross-border movement of capital, goods and people facilitates human trafficking in its various manifestations such as forced labor (including sexual exploitation), organ trade and child adoption trade. As a consequence, there has been a world-wide increase in commercial sexual exploitation in recent years, in particular so of children. Children are most vulnerable to sexual exploitation. Their case will be presented as exemplary for a wider problem.

Sexual exploitation of children and young people encompasses a broad range of sexual acts including touching with sexual intent, sexual intercourse and display of pornographic material or sexual organs. *Commercial* sexual exploitation of children (CSEC) includes child prostitution, child pornography and child trafficking for the purpose of sexual exploitation.

Basic Characteristics

Legal and Human Rights Framework

According to international law, all forms of sexual exploitation of underage girls and boys constitute human rights violations. The most important international document is the *Optional Protocol on the Sale of Children, Child Prostitution and Child Pornography* which came into force in 2002 with the aim of combating sexual exploitation. It supplements the 1989 *UN Convention on the Rights of the Child*. The 1989 Convention states that all persons below 18 years are "underage", i. e. children, and hence need special legal protection.

The Scale of the Problem

Despite the marked increase of human trafficking and CSEC observed in recent years, there is no reliable, evidence-based estimate on the overall scale of the phenomenon, a weakness that stems from the nature of the problem of trafficking and CSEC: It happens illegally and is often linked to organized crime, and available data are often not disaggregated according to age (adults/children), sex and type of exploitation.

Recording and analysis of the phenomenon has not been standardized within (federal) states and internationally. Thus, one of the main crucial tasks in the combat against CSEC is to significantly improve and standardize data collection and analysis.

Where Does Commercial Sexual Exploitation of Minors Predominantly Occur?

A significant proportion of CSEC, especially child prostitution, is carried out by local perpetrators within their home countries. However, it is increasingly an international phenomenon, whereby the increase in *international* trafficking is associated with two political developments in particular: the opening of the borders between East and West, and economic globalization, whose logic implies the search for sites that allow the most profitable utilization of goods and people worldwide.

Currently, central regions of CSEC are (South) Eastern Europe, the Mekong Region (e. g. Thailand, Vietnam, and Cambodia), Eastern and Southern Africa, Brazil, Central America and the Caribbean. Sexual exploitation of minors within the tourist industry accounts for part of the problem in these regions. Central European countries are important destinations and transit countries for girls being forced into prostitution (May-Chahal and Herczog 2003; ILO-IPEC 2001, 2003; IOM 2001).

Causes and Background

The causes and contexts of CSEC are diverse and complex and underscore the inequalities between those who prostitute themselves or are forced into prostitution on the one side (supply), and those who pay for sexual services on the other (demand).

Gender-Specific and Cultural Aspects Females account for the major proportion of the victims whereas more than 90% of the perpetrators are male. One reason for this striking gender ratio is gender-specific violence and discrimination. In many societies, females are not only discriminated in terms of their reproductive, sexual and physical self-determination, but also suffer legal disadvantages. However, even if females do enjoy equal rights according to the respective national law, societies do not necessarily treat women as legal subjects, which may be attributed to cultural norms and practices.

Poverty and Transformation Processes Almost all country-specific surveys on CSEC state a lack of income sources as the most important driving force behind the fact that minors prostitute themselves (ILO-IPEC 2001). Sudden collapse of family structures and intra-familial violence can exacerbate the problem. In some parts of Africa and Asia, AIDS-orphans face a dramatic risk (ILO-IPEC 2002).

Major transformation processes, which are often accompanied by growing poverty, can lead to erosion of values and norms. Females are particularly affected by this, putting them at higher risk of becoming victims of sexual exploitation. This has for example been the case in countries of the former Soviet Union.

In regions of armed conflict as well as in post-war situations, destruction of the basic necessities of life and the

accompanying lack of opportunities to generate income make women and children vulnerable to commercial sexual exploitation and trafficking.

Paedo-Sexual "Demand" and the Growing Global Sex Industry The prerequisite for CSEC is the existence of a "market". Demand from adults for sex with children and for child pornography is on the increase throughout the world (► paedo-sexual behavior). This is evident in the global sex industry, which helps to create a profitable market for child prostitution. Sexual exploitation of women including minors – alongside trading in drugs and arms – is one of the most lucrative illegal businesses worldwide. Growing demand is also observed in the tourist sector.

Lack of Law Enforcement In many countries legal action against CSEC is inadequately pursued. Protecting women and children from sexual exploitation is often denied high political or legal priority. Inappropriate criminal prosecution signals a low risk to the perpetrators.

How Does CSEC Affect the Victims' Health?

The impacts of sexual violence on the victims' health are considered significant (Busza et al. 2004; WHO 2003). Effects can be short and/or long term and – depending on gender, age, and personal history – can vary considerably. To date there have been few investigations into the global public health problems resulting from the large numbers of children forced into prostitution (Willis and Levy 2002). It is known, however, that disorders resulting from sexual exploitation affect the personal health of victims and have implications for public health (Zimmermann et al. 2003; WHO 2003). They include:

- physical impact (injuries, particularly to internal and external sexual organs);
- psychosomatic impact;
- psychological impact (► post-traumatic stress disorders, loss of self-respect, depression);
- health-endangering behavior such as drug abuse, high-risk sexual practices;
- impact related to ► sexual and reproductive health (sexually transmitted diseases, HIV/AIDS, unwanted pregnancies and unsafe abortions);
- self-harm and suicide.

Trafficked women and girls are particularly seriously affected because their often illegal status forces them to avoid making use of public services. The fear of being handed over to the police, as well as the fear of being shunned and discriminated against by their families and peer group, complete the vicious circle.

Preventing and Combating CSEC

Intervention strategies involve developing and strengthening criminal law and its enforcement. They also include primary and secondary prevention and the protection and rehabilitation of victims. Since, in many cases, sexual exploitation takes place in connection with trafficking, cross-border networking between institutions in all sectors is crucial. In addition, the involvement of communities in particularly affected regions in identifying and solving problems has proven successful: Child traffickers and job brokers find it more difficult to commit their crimes in circumstances where there is social responsibility and respective control mechanisms. Strengthening the victims' life skills to develop self-protection mechanisms and self-confidence is considered to be another essential feature of primary and secondary prevention. Among the most important strategies however, are interventions to reduce poverty.

The Health Sector's Response

The health sector has so far responded weakly to the challenge with little involvement in the debate or interventions aimed at combating CSEC and rehabilitating its victims (Beyrer 2004; Busza et al. 2004). There are numerous fields of action, for example:

- The existing data base should be improved by epidemiological and qualitative investigation. Evidence-based results should then be used to develop public health interventions.
- Access to health care services must be adapted to suit the particular life situation of victims. This may include: treatment of injuries, diagnosis and treatment of sexually transmitted diseases, HIV/AIDS testing, antiretroviral treatment, ► emergency contraception ("morning-after pill"), post abortion care and safe abortions, psycho-social and trauma counseling, and the development of standardized examination protocols incorporating reference systems from child and youth protection organizations. To

tackle these challenges, inter-sectoral co-operation needs to be strengthened and personnel in the health sector needs to receive respective training.

Cross-References

- ► Emergency Contraception
- ► Paedo-Sexual Behavior
- ► Post-traumatic Stress Disorder (PTSD)
- ► Sexual and Reproductive Health

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Migrants, Social Inequalities

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Definition

In the context of migrants, social inequalities refer to disadvantages, e. g. in education, in working and living conditions and in economic resources, experienced by groups for whom their extra-territorial origins serve as identity marker in their host communities. In most countries, a considerable proportion of migrants lives in socially deprived conditions and therefore experiences social inequalities relative to the majority population. Such inequalities usually, but not necessarily, result in visible and measurable health disadvantages.

Basic Characteristics

Socioeconomic Status and Health

Most known societies are heterogeneous in socioeconomic terms; different parts of the population live under different socioeconomic conditions, have different levels of education, etc. Such differences often provide the basis for social stratification, e. g. in social classes. Socioeconomic status or social class is in general associated with health status. Frequently, a pronounced gradient is visible: The socially most advantaged groups have the best health status while the socially most disadvantaged groups tend to have the poorest health status (Townsend 1982; Wilkinson 1996; Helmert et al. 1997; Hart et al. 1998; Adler and Ostrove 1999). The pathways through which this association operates are complex; they include macroeconomic, social, environmental, and behavioral factors. These factors, together with genetic background and life course factors, act on the health status of an individual.

Being migrant increases the probability of living in socially deprived conditions or of being a member of the lower social classes. Such class membership is usually associated with a disadvantaged health situation. However, migrants differ from indigenous populations in many other aspects that are also relevant to health. The differences range from genetic background to lifestyle and nutrition (► migrant health). Thus, not all health differences of migrants are the result of social inequalities. It follows therefore that a disparity in risk is not necessarily an indication of inequity; equal risks, on the other hand, do not necessarily imply equity in health (► migrant mortality, healthy migrant effect).

In addition, migrants often face disadvantages in access to health care (► migrants, access to health care). To

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some extent, this limited access may be explained by the social deprivation of migrants, although socially deprived non-migrants also encounter barriers to access. Deprived population groups, whether with or without a migration background, tend to have fewer health-related resources, e. g. a lower health literacy. In consequence, both groups have lower participation rates in prevention programs. There are, however, additional factors affecting access that are specific to the circumstances of migrants: discrimination, racism, language barriers, etc. Thus the question arises as to the degree to which inequalities in health risk among migrants are an expression of social inequalities, or of inequity in health care. Identifying and quantifying the contributing factors in a particular setting could help to develop appropriate strategies towards improving the health of migrants – as well as that of other disadvantaged groups.

Unfortunately, differences or similarities in the risk of specific diseases do not lend themselves as an adequate measure of equity. In a hypothetical example, similar mortality rates from cardiovascular disease (CVD) could be the result of rather different conditions that are not necessarily all a result of inequity. Consider the following scenarios:

- Migrants and indigenous populations have the same mortality from CVD and equal access to prevention and health care resources. This would obviously be an equitable situation.
- Migrants have a lower mortality from CVD (due to nature or nurture factors), but the potential benefit in risk is reduced by lower access to health care. This would be an inequitable situation, because the relative increase in risk among migrants would be avoided if migrants had equal access to health care, thus it would be unnecessary and unfair.
- Migrants have a naturally lower mortality from CVD, but the migration process increases their risk. Due to changes in their lifestyle or living conditions, rather than lower access to health care, migrants may experience a significant increase in risk up to the level of the indigenous population. If the increase is the result of unhealthy living or working conditions caused by social deprivation, and the effects of this deprivation could be avoided, this would constitute an inequitable situation. However, the increase could also be the result of deliberate changes in lifestyle that are not forced by social deprivation, e. g. a change in food habits. The increase in risk might then be indeed avoidable, but not necessarily unfair and so not an expression of inequity.

When morbidity or quality of life is considered, the picture is equally complex and findings are sometimes contradictory. For example, disadvantages in health status among migrants, compared to the majority population of the host country, sometimes become visible only in middle age. In order to assess for equity and fairness, it is therefore not sufficient to consider only risks. The objective of migrant-sensitive health care systems and research must be to analyze and consider the different needs, risks and their causes in different social groups (► migrants, diversity management).

Equitable Health Care for Migrants

There is no agreement in Public Health as to whether a health care system based on a libertarian (► liberalism and libertarianism), egalitarian (► egalitarianism) or utilitarian (► utilitarianism) framework is the best or the most fair (see Culyer 1993; Frankfurt 1997; Rawls 1999; Roberts and Reich 2002). From the point of view of migrants' needs, the objective of health care systems cannot be to produce equality in risk, but to care for individuals' needs in a fair way while respecting their differences (see Frankfurt 1997). A person will feel respected if his or her individual characteristics and needs as an individual are recognised and attended to. Respect, like equity, cannot be achieved by aiming merely at equality: Treating all persons the same way is not necessarily an indication of respect; it may simply be a consequence of not knowing the specific needs and wishes of specific groups (such as migrants). Equality would then merely be the lowest common denominator and an ideal "which must be implemented in the absence of considerations showing that an alternative is required" (Frankfurt 1997). In order to avoid the trap of the lowest common denominator, more research is needed on how migrants' needs differ from those of the majority population, and how these differing needs can best be met within the constraints of an existing health care system. The more knowledge there is about the specific risks and needs of migrants and other social groups, the more attention a health care system can pay to these differences.

There are various, partly overlapping strategies to overcome social inequalities that migrants are facing; if

successful, such strategies would contribute towards improving migrants' health. General social and economic measures such as transfers will not be discussed here. Examples of strategies with a strong focus on health and health care for migrants include:

- Diversity management; this is an approach on the side of the health care providers; it takes advantage of knowledge about differences between population groups to establish just, fair *and* respectful health services (► migrants, diversity management).
- Improving health literacy among migrants; this approach requires active contributions from both providers of services and from migrants themselves. Its objective is to help migrants to increase their understanding of all aspects of health and health care, including body functions, preventive measures, access routes to health care etc.
- Empowerment, which takes the idea of improving health literacy a step further. The empowerment of migrants seeks to enable them to identify the conditions that determine their health status and to find out how to change them. Attractive in theory, this approach poses many practical problems; it may suffer from low acceptability, especially among older and "traditional" migrants.

Social inequalities among migrants usually, but not always, show a negative impact on their health. Equity in health risks and outcomes among migrants, relative to the majority population, is a goal that may be difficult to achieve. Health care services need to be more responsive towards the needs of an increasingly diverse population. This will help to ensure that migrants and other minority groups are treated more fairly and respectfully. Social and economic measures seeking to improve the situation of disadvantaged groups in general should be designed in such a way that they also reach migrants, thereby contributing to better health of this group.

CrossReferences

► Egalitarianism
► Liberalism and Libertarianism
► Migrant Health
► Migrant Mortality, Healthy Migrant Effect
► Migrants, Access to Health Care
► Migrants, Diversity Management
► Utilitarianism

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Migration and Brain Drain

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Definition

"Brain Drain" describes the emigration flows of highly skilled professionals. The term implies a loss of valuable competences to the migrants' place of origin. This loss may become a barrier to human and economic development. Brain drain occurs within and across national boundaries, but also between different sectors of the economy. Most commonly, the term is applied for international migration towards wealthier, industrialized countries. As for the health sector, nurses and medical doctors are at the focus of interest. Their emigration is regarded as having considerable impact on the health care systems in their home countries.

Basic Characteristics

Growing Demand for Health Professionals Worldwide

Demographic and epidemiological trends in both industrialized and developing countries have led to an

increasing demand for skilled health workers and will continue to do so. While countries in the North have to deal with an aging population and a greater share of chronic diseases, countries in the South are carrying a large ► burden of disease stemming from poverty and epidemics. HIV/AIDS in particular is a threat to health systems in developing countries as it is increasing the workload and at the same time diminishing the workforce (WHO 2006). Worldwide gaps in human resources for health result of a history of under-investment and deficient ► workforce planning. Not only is there a shortage of workers in total; their geographical distribution and the skill mix within professional teams is often inadequate as well. While migrant professionals help to reduce disparities between rural and urban areas within industrialized countries, their movement increases the disparities between countries (Geiger, Razum 2006). For example, 33% of doctors and 10% of nurses working in the United Kingdom trained abroad. In Germany, this accounts for 17,318 doctors and 26,284 nurses, equivalent to 6% and 3% of the respective total workforce (WHO 2006) (p. 98). While the importance of workforce planning in the health sector is increasingly recognized, it is hampered by a weak knowledge base. This is concerning the scale of the phenomenon as well as the effectiveness and efficiency of planning tools and policies (Chen et al. 2004; Diallo 2004).

Push Factors – Unfavorable Working Conditions

Low wages and an unsatisfactory work environment are the two major forces that drive health professionals to look for other employment opportunities. Surveys among nurses in Southern countries reveal that the wish to migrate is widespread. Besides the payment, they mention insurmountable workloads, unsupportive management and colleagues, and a lack of promotion opportunities as underlying reasons. Moreover, the situation and work morale is aggravated by the ongoing outflow of professionals (UNFPA 2006). Psychological exhaustion may also stem from working in a situation of violent conflict and disaster, or from being confronted with a growing demand for terminal care of AIDS patients. These conditions put health workers at an increased risk for their personal health and safety, which is often inadequately addressed (WHO 2006). Consequently, a number of health professionals resign from the health services in their place of origin, either to migrate or find work in other economic sectors. Table 1 illustrates the gaps that doctors from sub-Saharan Africa leave behind when they migrate to ► OECD countries. The number of those who have registered abroad constitute up to 29% of the home country workforce, as in the case of Ghana. Regarding nurses, this percentage even amounts to 34% in Zimbabwe. The largest total number of 13,496 migrant nurses from a single sub-Saharan country comes from South Africa (WHO 2006) (p. 100).

Pull Factors in a Globalized Labor Market

The increasing number of vacancies in the health sectors of many industrialized countries together with a much higher wage level and standard of living, is per se an attractive factor for health professionals from a resource-poor background. If the country of origin provides poor general living conditions, even taking up an unskilled job in an industrialized country might be an acceptable alternative. Information technology such as the World Wide Web helps to communicate vacancies around the globe easily. In addition, during recent years labor markets have been opened through ► trade agreements and the mutual recognition of diplomas. Agencies from countries such as Great Britain and the United States have even developed active overseas recruitment mechanisms to meet the shortages of nurses and doctors in their domestic health systems (Stilwell et al. 2004). This momentum is reinforced by growing communities of migrant health professionals who are already established in the respective host countries – some of them even having received their training there. They serve as links for others who are considering to migrate. Networks of such migrant workers often transfer considerable amounts of money – so called remittances – to their family members who remained back home, thereby increasing the attraction of work migration (IOM 2005).

How to Manage Migration of Health Professionals

Effective management of health workers' migration has to consider both sides: the push and the pull factors. The World Health Report 2006 proposes strategies for source countries and receiving countries of international migration. Most importantly, it emphasizes that the migration of health professionals has to be rec-

Source country	Total doctors in home country	Doctors working in eight OECD recipient countries[a]	
		Number	Percentage of home country workforce
Angola	881	168	19
Cameroon	3,124	109	3
Ethiopia	1,936	335	17
Ghana	3,240	926	29
Mozambique	514	22	4
Nigeria	34,923	4,261	12
South Africa	32,973	12,136	37
Uganda	1,918	316	16
United Republic of Tanzania	822	46	6
Zimbabwe	2,086	237	11
Total	82,417	18,556	Average 23

[a] Recipient countries: Australia, Canada, Finland, France, Germany, Portugal, United Kingdom, United States of America Source: WHO (2006), p. 100; data compiled by WHO from various sources

Migration and Brain Drain, Table 1 Doctors trained in Sub-Saharan Africa working in OECD countries

ognized as a concern of the international community similar to any other emerging health crisis that single countries cannot deal alone with, such as natural disasters or infectious disease epidemics. The focus is on national leadership as governments are usually carrying the responsibility for public services, educational and financial policies (Chen et al. 2004). Strategies have to be adapted to national and professional particularities such as disease profiles, mechanisms of resource distribution, or the power of professional bodies.

As for source countries, the focus should be on training schemes that meet the actual needs, and on the improvement of local working conditions – which usually requires the support of receiving countries. The latter should also develop responsible recruitment policies and ensure that migrant workers are treated fairly (WHO 2006). ► Recruitment and retention schemes are of importance on both sides to move towards self-sufficiency and avoid the loss of professionals for the health sector.

There are examples of bilateral agreements to regulate the issuance and duration of work permissions, e.g. between South Africa and the United Kingdom. The Philippines encourage citizens who work abroad to send remittances through official channels and support the return of migrant workers by offering them scholarships and loans at preferential conditions (WHO 2006). A number of guidelines, tools and codes of practice have also emerged. However, such measures need to be evaluated to strengthen the foundation for future policy making and migration management (Chen et al. 2004; Stilwell et al. 2004).

Balancing Values: Ethics in Global Workforce Planning

The United Nations' ► millennium development goals are aiming to reduce worldwide childhood mortality by two thirds, and maternal mortality by three quarters until the year 2015. In the fight against HIV/AIDS, Malaria and other major diseases, unfavorable trends in incidence are to be reversed. These goals can only be achieved with a massive investment in the health workforce, particularly in countries most affected by these health problems. It seems to lie at hand to propose restrictions to the migration of health personnel. However, it is not only considered a breach of human rights to obstruct the movement of people, but it is basically impossible to stop migration from taking place (Chen et al. 2004). Even more, it is desirable to increase the number of highly qualified professionals from Southern countries who are working for international organizations and assume leadership in health. Thus ways have to be found – including both financial and non-finan-

cial incentives – to positively motivate health workers to remain where they are needed most, or to return after having gained experiences elsewhere (Stilwell et al. 2004).

Cross-References

- ► Burden of Disease
- ► Millennium Development Goals
- ► OECD
- ► Recruitment and Retention Schemes
- ► Trade Agreements
- ► Workforce Planning

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Migration, Internal

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Definition

Internal migration is the process of moving within a state. As with international migration, internal migration includes economic migrants as well as migration of uprooted people or displaced persons (IOM 2005).

Basic Characteristics

The number of internal migrants is assumed to be even higher than that of international migrants (► migration health). Still, internal migration receives little attention from the international community. Internal migration is often voluntary or economically based, but it can also be involuntary due to environmental degradation, developmental projects such as dam-building and conflict or unrest (UNFPA/IMP 2004). Some driving forces and associated consequences for health are described below.

Urbanization

Movements from rural to urban areas can have dramatic impacts on all aspects of life. The world's urban population has increased from one billion in 1960 to two billion in 1985. By 2003, almost half of the world's population was living in urban areas. There were 46 cities with 5 million inhabitants or more, among them 20 mega-cities with populations of 10 million or more. Thirty-three of the cities were in less developed countries. ► Urbanization is expected to continue in coming years. By 2007, the urban population is expected to be greater than the rural population for the first time ever (UN 2004).

The rapid growth of cities due to migration or natural population increase has outpaced governments' capabilities to provide basic services and economic opportunities to the expanding urban populations. Often migrants have to settle in shanty towns and slums where they are experiencing extreme poverty as well as lack of access to decent housing, sanitation, health-care and education (UNCHS 2003; UNFPA/IMP 2004).

Environment and Migration

In the past, attention was focused on persons displaced by conflict. However, an increasingly important cause of internal migration is ► environmental degradation resulting from natural disasters, the effects of war or of over-exploitation. According to the World Bank, an estimated 25 million people were displaced by envi-

ronmental degradation in 1998 (UNFPA 2001). Future research should also focus on other forms of displacement. Issues relating to land degradation and unsustainable agricultural practices are of particular importance. According to the United Nations Environment Programme (UNEP), over 300 million hectares of land have been degraded in Latin America and the Caribbean region. The main reasons are erosion caused by non-sustainable land use, nutrient depletion, chemical pollution, overgrazing and deforestation (UNEP 2002). As a consequence, rural populations will be unable to make a living off the land, which in turn prompts migration to the cities (UNFPA/IMP 2004).

Development-Induced Migration

Development projects such as the building of dams, roads, power lines, mines, pipelines and other infrastructure projects can force people to move off their land, thus leading to population redistribution. Between 1987 and 1997, an estimated 80 to 90 million persons worldwide are supposed to have been displaced due to infrastructure programs for the construction of dams, and for urban and transport development (Cernea 1997). As a consequence of some development projects, access to arable land is reduced, forcing people to migrate to cities. Government resettlement policies have not always been successful, even when they attempted to resettle populations close to their former homes so they could continue their traditional farming practices.

Conflict-Induced Migration

Migration induced by war and other conflicts is uncontrolled: when settlements are destroyed or have to be abandoned, urban pressure increases. Persons forced to leave their homes due to violence, internally or internationally, are particularly vulnerable (► refugees and internally displaced people). They lose traditional forms of living, rarely have access to economic opportunities or to basic services and tend to live in conditions of physical insecurity. Women, children and the elderly constitute the majority of the world's internally displaced people (IDPs). Women and girls are at risk of becoming victims of sexual violence and displaced children have been recruited as child soldiers (UNHCR 1994; Taipale et al. 2002; UNFPA/IMP 2004; OHCHR 2006).

The ► displacement of populations in conflict situations often means that health personnel are also displaced. As a consequence, health services are disrupted and vital access to care interrupted. Hence previously controlled diseases may re-emerge as epidemics, as the following examples demonstrate. During the 1980–1992 war in Mozambique, out of a population of roughly 16 million people, 3–6 million were internally displaced and about 1.5 million became refugees in neighboring countries. The number of children who were abandoned, orphaned or separated from their parents was estimated at about 250,000. Thirty to fifty percent of 1000 health posts and 200 health centres existing in the early 1980s were destroyed or forced to close. There were high rates of childhood malnutrition and epidemics of diseases such as cholera and measles. In Angola, trypanosomiasis, which had decreased from 2500 to 3 cases between 1949 and 1974, re-emerged during the conflict, with one in three Angolans being at risk (Taipale et al. 2002).

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Cross-References

► Displacement of Populations
► Environmental Degradation
► Migrant Health
► Refugees and Internally Displaced People
► Urbanization

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Mild Course of Black Death

► Abortive Plague

Mild Course of Plague

► Abortive Plague

Milieu

► Environment

Millennium Development Goals

Definition

All 191 United Nations Members States made a commitment to the MDGs in 2000, with an aim to achieve them by 2015. The Millennium Development Goals are intended to promote human development in order to improve living conditions and address key global imbalances in poverty, hunger and disease. They are:

1. Eradicate extreme poverty and hunger.
2. Achieve universal primary education.
3. Promote gender equality and empower women.
4. Reduce child mortality. Improve maternal health.
5. Combat HIV and AIDS, malaria and other diseases.
6. Ensure environmental sustainability.
7. Develop a global partnership for development.

The Millennium Development Goals (MDGs) address major issues in worldwide human development, setting up measurable and time-bound targets. They have been agreed upon at the United Nations Millennium Summit in 2000. The eight MDGs cover the reduction of extreme poverty and hunger, universal primary education, equality between women and men, reduction of childhood mortality and maternal mortality, reversing trends in major diseases, environmental sustainability, and the establishment of a global partnership for development. Achievements in these areas are meant to be monitored through country-level and global reports and statistics.

Minimum Principle

Synonyms

Efficiency postulate; Economic principle

Definition

The minimum principle states that a given result must be obtained with the minimum possible expenditure of resources. For this reason it is also known as the economic principle. In accordance with the minimum principle, the goal to be achieved (which, in dentistry, is the desired treatment outcome or medical outcome) is specified and the resources used for its achievement are to be kept to a minimum. Under the maximum principle, on the other hand, a fixed volume of resources is provided and the aim is to obtain the best possible – i. e. the maximum – outcome from them. Both principles are forms of the economic efficiency postulate, which embodies an ideal in the sphere of welfare economics. Departures from this ideal state are indicative of uneconomic functioning and wastage of resources.

Minority-Status Effect

Definition

The minority status (concerning race, gender, religion, sexual orientation, etc.) exerts an influence independent of economic, social, and demographic disparities. This fact is described by minority-status effect.

Miscarriage

► Abortion

Missing Data

Synonyms

Missing values

Definition

Missing data occurs when data are planned but are not present in the database for a variety of reasons, such as the death of a patient or experimental animal, resettlement of the patient, non-response on a question in a survey, and an erasing or losing of the data. When a large proportion of ► data of some ► variable or some case is missing, it greatly complicates the statistical analysis. According to the ► probability model of occurrence, missing values can be missing completely at random, missing at random, and non–ignorable missing data (► data preparation). Several methods for treatment of missing data have been developed, such as mean substitution (► data preparation) and casewise or pairwise deletion. In casewise (listwise) deletion, cases will be excluded from analysis if they contain any missing data for any variables planned for the entire set of statistical procedures. In pairwise deletion, cases will be excluded from analysis if they are missing data for any variables chosen for the one particular statistical procedure.

Missing Values

► Missing Data

Mitigation Strategies

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Synonyms

Risk reduction strategies

Definition

Disaster mitigation is a complex of activities taken in advance of a hazardous event, which aim at preventing disasters from occurring (i. e. preventing hazards from developing into disasters), or reducing the adverse effects of disasters on society and the environment.

Basic Characteristics

Mitigation, focusing on long-term measures for reducing or eliminating risk, is the most cost-efficient method for reducing the impact of hazards (► hazards, natural; ► hazards, technological). Disaster mitigation can be achieved by reducing the hazard or the vulnerability of communities to the hazard, or by changing the environment in which hazards and communities interact.

A precursor activity to disaster mitigation is the identification and evaluation of risk of disasters (e. g. floods, landslides, earthquakes) that pose a risk to the population in an area of interest. The higher the risk (understood as a product of probability and impact of adverse events), the more urgent the undertaking of mitigation and preparedness efforts addressed to hazard-specific vulnerabilities. If vulnerability is low (e. g. no one is living in the area, like a desert), there is no risk (e. g. an earthquake occurring in a desert).

A rigorous and systematic ► risk management process helps communities to identify the most cost-effective disaster mitigation strategy – a combination of measures for the range of risks that they face. The plan of action for disaster mitigation reflects priorities determined by the community and stakeholders.

In some countries, a national framework for mitigation exists for the whole country, with the goals of improving the disaster mitigation system and reducing adverse personal, social, economic, and environmental impacts of disasters. The process of building the disaster mitigation strategy may include establishing rules of land-use planning (zoning), accounting for hazards in building codes, development of emergency preparedness systems, preparing and disseminating guidelines for natural hazards, and awareness building. Also important are cost-effect considerations, i. e. examining the costs of natural disasters and the benefits of disaster mitigation.

If the occurrence of natural disasters is spatially restricted (e. g. in flood-prone areas), three mitigation strategies are feasible: protect, accommodate, or retreat. Pro-

tection may be attempted as far as feasible in the cost-benefit sense. It may not be financially feasible to offer very expensive protection to a small community with low damage potential. Accommodating disasters means living with disasters rather than hopelessly trying to avoid them at very high cost. Finally, retreat can be interpreted as a permanent relocation of inhabitants of unsafe areas.

Important discussion of flood protection strategies dates back to the mid-19th century in the USA, when the Congress decided to embank the Mississippi river in a single channel isolated from its floodplain. This decision has largely influenced flood protection policy in the USA and elsewhere, leading to transformation of rivers and reduction of wetlands. In 1936, the US federal government assumed primary responsibility for flood damage reduction across the nation and over the next decades embarked on a multi-billion dollar program of structural defenses. Yet, despite dedicated long-term effort and high investments, the flood risk has not been eradicated, and never will be.

The process of building a flood preparedness system may include some, or all, of the following components:

- Flood risk assessment and mapping, conveying a valuable spatial message
- Rigorous implementation of zoning – land use management to limit the use of floodplains for the site of vulnerable elements (including human settlements, industrial infrastructure, etc.)
- Relocation of riparian inhabitants and structures out of the floodplain
- Raising flood awareness of the floodplain communities, and creating a flood preparedness culture
- Building an effective and reliable flood forecasting and warning system, and preparing plans for reaction to warning (e. g. evacuation, see below)
- Development of preparedness system for the case when the existing protection measures are not able to restrain the flood waters – flood evacuation preparedness includes identifying shelters and rescue equipment, and making emergency plans with clear division of competencies and responsibilities of agencies
- Engineering of structures in the floodplain to withstand flood forces (dikes, flood walls with opening barriers, dams, storm water drainage systems)
- Adaptation of building codes to flood hazard, e. g., building designs with elevated floor levels, use of flood-resistant building materials (water resistant materials, waterproof seals, strong foundations), placement of storage and sleeping areas high off the ground, and building houses on poles (like in southern Asia)
- Development of system of flood insurance
- Watershed management – storing as much water as possible (according to the "catch water where it falls" principle).

The mitigative measures listed above fall into categories of structural or non-structural means. The former are technological solutions, like flood dikes, dams, flood control reservoirs, and relief channels. The latter include legislation, insurance, and land-use planning (e. g. the designation of areas with low damage potential like parks or playgrounds to be used as flood zones).

Mitigation of (preparedness system for) other natural disasters include essentially similar types of components as in the flood preparedness example above, aimed at weakening the load and strengthening the system resistance.

In an earthquake preparedness system, it is necessary to improve the resistance of the system by seismic zoning. Land-use management should reduce development in geological areas known to amplify ground vibrations e. g. alluvial soils, reclaimed land. Upgrading structural design is needed, which can be achieved by engineering of structures to withstand vibration forces; compliance with seismic building codes; enforcement of generally higher standards of construction; adequately high design standards for important buildings; and strengthening of existing buildings (retrofitting) and items inside the building (securing of furniture, fridges, etc. to the walls). Earthquake forecasting is possible, albeit for an extremely short advance time, and it therefore makes sense to install automatic systems reacting to a forecast in a fraction of a second, by triggering power switches off (hence averting fires).

In a gale-wind preparedness system, land-use management can improve protection from wind, e. g. by planting of windbreaks. System resistance can be considerably improved by engineering structures to withstand wind forces; siting buildings on the leeward side of hillsides; adapting the wind-load parameter in building codes; good quality construction of wind-resistant buildings; adequately securing elements that could be blown away or cause damage; and trimming tree branches and cleaning gutters. It is necessary to develop severe-weather forecasting and warning systems, to

raise community risk awareness, and to provide safety shelters and evacuation plans.

A system for wild fire mitigation includes measures to constrain the wild fire (planting of fire-resistant vegetation and wild fire breaks) and to improve the system resistance. The latter category includes zoning (land use management to limit development in high wild fire risk areas); appropriate siting of structures (away from the top of slopes/ridges); building codes for fire hazards; using fire resistant building materials; removing wild fire 'fuel' (rubbish, branches, leaf litter) from around houses and gutters; and storing flammable materials (fuel, wood, paint) securely. Development of fire weather warning systems and improvement of community awareness of wild-fire risk is also necessary. A fire evacuation plan should be in place and sufficient water supply, hoses, and protective clothing should be available.

The raising of awareness leads to improved knowledge and the chance of avoiding risks. This includes avoiding buying property that is exposed to hazards (in a subsidence, flood plain, or landslide risk area). Many homeowners may not be aware that their home is located in a risk area until hazard strikes, and real-estate agents do not provide such information. Even if flood risk maps are commissioned by authorities, sometimes they are not disseminated, as the ruling powers want to avoid the likely disruptive consequences for the property market. It is worth noting that the EU Floods Directive requests that information on flood risk be openly available to the public.

Natural and man-made disasters (► hazards, natural; ► hazards, technological) can be considered in the sustainability context. On the one hand, they destroy human heritage and jeopardize ► sustainable development (the definition of sustainable development refers to "non-decreasing quality of life"). On the other hand, following the most common interpretation of sustainable development, disaster protection policies that could be considered inappropriate options of defense by future generations should be avoided. This is how several large structural flood defenses are often regarded. Changes leading to aggravating flood risk are perceived as negative. In some locations, people regret that levees (which do not guarantee perfect protection) have been built and low-lying areas developed. Now, the issue of river renaturalization may come about. Structural mitigation (e. g. large dams) may have adverse environmental impacts. Some large reservoirs, whose construction required breaking the continuity of the river, inundation of large areas, and/or displacement of a high number of people, do not match the principles of sustainable development. When considering past developments, there were often one-sided arguments supporting a decision on a flood protection strategy, with important aspects ignored. However, this was due to lack of knowledge and understanding and the fact that value judgments have changed with time.

Cross-References

► Hazards, Natural
► Hazards, Technological
► Sustainable Development

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Mitosis

Synonyms

Mitotic cell division

Definition

Mitosis is a process of nuclear division accompanying cell division that produces two separate nuclei for two new daughter cells that carry the same diploid complement of chromosomes as the parent cell's diploid chromosomal complement. Mitosis is most common in somatic (non-reproductive) cells, and is the fourth phase of the cell cycle: G_1, S, G_2, and *M*. After G_1, S, and G_2 phases of the cell cycle (collectively called interphase), mitosis begins by the cell's entry

into the first of four phases: 1) prophase, 2) metaphase, 3) anaphase and 4) telophase. Whereas in interphase, chromosomes are unwound and are long filaments of DNA spread throughout the nucleus, prophase begins with the condensation of each chromosomes into a tightly bound bar-like structure. As the DNA has been replicated in the S phase, the two identical copies of the chromosome, called chromatids, are bound together tightly at a knot shaped structure near the center of the chromosome, called the centromere, so that each bar-like structure appears X-shaped. In late prophase, the nuclear envelope disintegrates. During metaphase, the mitotic spindle forms, which is a structure with two poles centered at the site of the new nuclei of the daughter cells. Spindle fibers consisting of long microtubules attach to the centromere of each chromosome. While attached to these fibers, the chromosomes align along the equidistant plane perpendicular to the two poles, called the metaphase plate. In the next phase, anaphase, the microtubules attached to the centromeres pull one chromatid each out of each chromosome to their respective poles; this ensures a diploid complement for the new nuclei of each newly arising cell. In the final phase, telophase, a nuclear envelope forms around the collection of chromatids, which unwind from their bar-like bodies into the elongated strands present during interphase.

Mitotic Cell Division

► Mitosis

Model Building

Definition

Because health care systems involve the coordination of interacting resources and human activities, it is natural that they generate a range of organizational problems that are ripe for tackling with the scientific approaches of simulation modeling. It was found that even proper attention to such technical matters did not always prevent worthwhile models being ignored by those they were intended to assist. Concern has therefore turned to the aim of creating simulation models that are both technically accurate and actually used as decision aids. One possibility to assist in reaching this goal is direct client involvement in the building of and experimentation with the model. Effective model building requires strong systems analysis skills. The health systems engineer must also be able to initiate resolutions to strategic problems using knowledge of how organizational decisions are made.

Modelling

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Synonyms

Economic modeling; Simulation; Microsimulation

Definition

A model is a simplified analytic representation of a real situation. Health economic modeling involves the simulation of events across populations and over time, where a mathematical framework permits the integration of facts and values for which real data are not available.

Basic Characteristics

Modeling is an analytic technique used to describe complete health care scenarios or components where no real data are available or where there is some doubt regarding the validity of the data. Health economic modeling is also applied in analyses where only part of the data are generated and not all data for a full analysis are available.

The underlying purpose of health economic modeling is to structure the available evidence on clinical processes and the related clinical and economic outcomes in order to support decisions about clinical treatment strategies and allocation of resources in health care. Therefore, economic models are very often developed for health care decision-making purposes (Weinstein et al. 1980).

Models are used in situations of ► uncertainty, where assumptions have to be made. The results are not subject to confirmatory testing, but are estimated in the best possible way. Assumptions might be necessary for unit costs, quantitative parameters such as incident case or prevalence rates, treatment efficacy or effectiveness such as survival rates and health state utilities, and structural issues like causal relationships between variables used (► cost effectiveness) (Drummond et al. 2005; Hunink et al. 2005; CADTH 2006).

Hence, models apply evidence on cost and consequences from many different sources. As it is not usually possible to base the complete calculation on primary data collected individually from the target population included, models are based on data from clinical trials, observational studies, insurance databases, case registries, and public health statistics. Usually, the primary data of randomized controlled trials or epidemiological analyses are combined with data from a number of different additional data sources such as administrative data from sickness funds (► claim's data analysis), routine data sets from official statistics, and reimbursement catalogs such as DRGs or fee-for-service schemes.

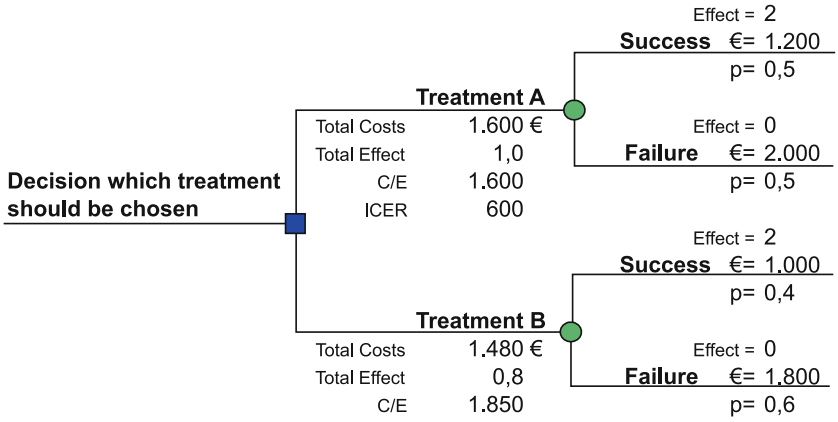
Health economic models could be applied for several purposes:

- Simplifying complex situations
- Outlining the progression of a chronic disease
- Extrapolating available efficacy data over a longer time frame
- Estimating the benefits of a technology that was analyzed under controlled conditions in patients receiving this treatment under real life conditions
- Amending missing elements of trial information by model components

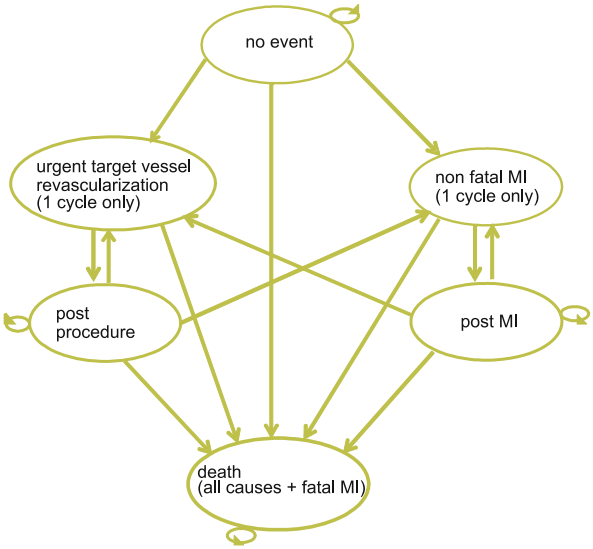
Models may be used in their simple form as a decision-tree analysis, which is particularly appropriate in acute event situations. However, when multiple alternatives arise and changes occur over time, this technology has to be amended – or alternative approaches have to be used. In this context, Markov Models are frequently applied for evaluating health care technologies (Weinstein et al. 2003; Gold et al. 1996; Bootman et al. 1996).

In decision analysis, a so-called decision-tree is generated, which helps to disaggregate a complex problem into smaller problems and elements for better understanding. A decision tree is a graphical structure in which decision and event nodes are used to represent different kinds of events, including decisions and uncertainties. Building the model comprises the following major steps:

1. The alternatives that are the subjects for decisions have to be clearly stated.
2. The consequences induced by the initial decision have to be identified and described, including all potential pathways that might occur. This step should also involve a decision on the time frame of the analysis.
3. Probabilities have to be attached to all consequences.
4. The target outcome parameter has to be identified.
5. The cost and outcomes alongside the different consequences have to be calculated.
6. Finally, a decision can be taken considering the underlying uncertainties reflected in a sensitivity analysis.



Modelling, Figure 1 Example Decision Tree



Modelling, Figure 2 Example Markov Model

The example provided outlines a simple decision situation: treatment A is an innovative treatment approach, which is more successful at higher costs. However, if the treatment option is failing, a second treatment is needed, which generates additional costs. Treatment B is the conventional treatment, with lower cost when comparing success and failure directly. By multiplying the probabilities with the costs and summing up the accrued cost for each decision alternative, a decision based on costs could finally be taken. Accordingly, this approach could be applied when identifying the potential benefits of alternative treatment approaches. Here, there is a hypothetical effect of two, e. g. life-year-gained (LYG), achieved with success and none with failure. Hence, treatment A generates a higher benefit compared with treatment B, which is the less costly alternative. The additional effect of treatment A could be obtained at an incremental cost of €120, which results in an ► incremental cost/effectiveness ratio of €600.

Markov models are more appropriate in modeling repeated events over time or progression of a disease where disease states could be experienced at more than one time. In a Markov model, the disease is represented as a restricted set of states (e. g. perfect health, impaired health, and death). Subjects move between the different states over time; these discrete time periods are so-called "Markov cycles". The chance of moving between states is calculated via transition probabilities.

The example provided outlines the treatment setting for patients after a coronary vascularization had been performed. The following states might arise in the example: revascularization with essential post-procedure activities in a follow-up cycle, a non-fatal myocardial infarction (MI) with a changed disease state after MI, and death. A transition from one state to another takes place with a certain probability after a pre-defined cycle length. By attaching estimates of resource use and health outcomes to the different states and transitions for an appropriate number of cycles, mid- to long-term costs and outcomes for patient cohorts could be generated.

One criticism of this modeling method, however, is that Markov models always assume constant transition probabilities between individual disease states over the course of time (Markovanian assumption) (Briggs et al. 1998). In reality, this probability is of course also influenced by specific corresponding factors. For example, the length of time spent by a patient in a particular disease state has an effect on the probability of transition to another state. It might be possible to account for this limitation by applying the so-called Markov processes, in which variable transition probabilities are inferred. This in turn requires substantial additional information that might not always be available.

Health economic models face different concerns and limitations. As they are based on assumptions, they are subject to bias. Extrapolation might become difficult for the time exceeding the follow-up period of randomized clinical trials or epidemiological studies. Taking these aspects of ► uncertainty into consideration, such models do not usually aim to achieve statistical confirmation of hypotheses made; they aim to describe the amount of uncertainty of different aspects of the model e. g. using ► sensitivity analyses. To deal with the uncertainty in the assumptions and the data used, techniques from Bayesian statistics and ► discrete-event simulations are implemented.

In addition, models are often perceived as "black boxes" when complicated mathematical models are calculated and validation is not performed. In order to solve these issues, models should be evaluated and carefully tested for computation errors in order to obtain optimal internal validity; results should be reviewed and it should be ensured that they are consistent with available data (face validity). If different models are available for the same problem, a cross-validation should be under-

taken, covering the discussion of differences in structure and underlying data.

All modeling activities have to include different levels of ► sensitivity analysis. At least a one-way sensitivity analysis should be performed, with a univariate variation of one variable at a time. The range of variation is a crucial issue and plausible ranges should be taken into account. Multivariate sensitivity analysis is considered the current state of the art, particularly for C/E ratios, as uncertainty pertains on both sides of the equation. This might be done with worst- or best-case scenarios. Other techniques in this context are bootstrapped estimates (► bootstrapping) and ► Monte Carlo simulation.

In health care settings, illustration of the course of diseases and patient pathways might sometimes be too complex to be modeled completely. This is due to the fact that, in addition to the wide range of different treatment strategies, the patient might also make different choices and flow differently through the system. Hence, a key step in modeling is to define the boundaries of the system to be modeled. A trade-off has to be made between including all environmental factors affecting the system and selecting only a few or no impacting factors at all. These decisions have to be guided by both availability of data or hypotheses and the feasibility of handling complexity.

Nevertheless, health economic models currently provide the best estimates relevant to decision-makers, particularly when trying to understand the future impact of newly implemented technologies (Buxton et al. 1998; Hunink et al. 2005).

Cross-References

► Bootstrapping
► Claims Data Analysis
► Cost-Effectiveness
► Disability Adjusted Life Years (DALYs)
► Discrete Event Simulation (DES)
► Incremental Cost-Effectiveness Ratio
► Medical Decision Analysis
► Monte Carlo Simulation
► Sensitivity Analysis

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Models of Behavior Change

► Health Behavior, Theories

Models of Finance

Synonyms

Health care funding

Definition

In a context of increasing international competition and falling public revenues, the issue of health care funding is central to health policy. The fundamental distinction to be made is between systems financed from general taxation and contribution-funded systems. With contribution-funded health benefits, the contributions are a charge mainly on labor. In view of the falling trend of the wage share, this form of funding is considered to be relatively unsustainable, so that more funds from taxation are called for to broaden the funding basis. As a rule, actual funding models are composites of three

sources – the state, employers and private households – whose proportions vary from country to country. In all systems a trend is now emerging for private households to be required to shoulder an increasing proportion of the funding burden by means of direct co-payments.

Moderators of Effect Size

► Effect Modifiers

Modes of Inheritance

► Mendelian Modes of Inheritance

Mode of Transmission

Definition

Transmission of an agent is its spread from a reservoir or source to a new host by one or more possible routes (direct or indirect). Direct transmission is the immediate transfer of an infectious agent from an infected host to a receptive portal of entry through which human or animal infection may take place. This may be by direct contact (such as touching, kissing, or sexual intercourse) or by direct spread of droplets by sneezing or coughing. Indirect transmission may be vehicle-borne, vector-borne, or air-borne.

Moisture

► Humidity

Molar

Definition

Molars are teeth in the back of the mouth used for mastication. Adult humans have 12 molars, three on both ends of the dental arch per jaw. The rearmost (third) molar in each group is called a wisdom tooth. Beside molars permanent dentition contains incisor teeth, canine teeth and ► premolars.

Molds

Definition

To grow, molds need oxygen, that means, they are aerobic. For their metabolism they depend on organic substances. The main part of the mold grows inside the foodstuff; the visible components, the hyphs, serve to reproduce and spread the spores through the air or by contact with objects. While the mold itself is not toxic at all, many species can produce poisonous substances, the mycotoxins. A moldy product should not be eaten, unless the mold is harmless and belongs to the characteristics of the product (like blue cheese).

Molecular Technologies to Detect Genetic Variations

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Definition

Molecular technologies are used to characterize, isolate, and manipulate the molecular components of cells and organisms. Thus, molecular technologies are the basic tools to study genetic information. Polymerase chain reaction is the most basic molecular technology. It is used to produce multiple identical copies of DNA (► deoxyribonucleic acid) fragments. Other key technologies include gel electrophoresis, ► allele-specific hybridization, DNA sequencing, and DNA chip technology.

Basic Characteristics

Polymerase Chain Reaction

Determination of DNA variations can be performed by polymerase chain reaction (PCR), a selective amplification of a well defined DNA sequence (target sequence) up to billions of copies. Initially high-molecular, genomic DNA (DNA template) is extracted from a blood sample or oral mucosa by affinity chromatography. PCR requires the following basic components: DNA template, sequence-specific and complementary

oligo-nucleotides (sense and antisense primer), a mix of four deoxynucleotides-triphosphate (dATP, dTTP, dGTP and dCTP) and a thermally stable DNA polymerase (e. g. Taq DNA polymerase), which incorporates the nucleotides complementary to the target DNA. A PCR buffer with Mg^{++} assures a suitable chemical environment for the DNA polymerase. Primers are short, artificial DNA strands (about 16–24 base pair long nucleotides) which determine the beginning and the end of the region to be amplified. A standard PCR reaction consists of 30–45 repetitive cycles comprised by the following three steps: denaturation, annealing and extension. PCR is carried out in a thermal cycler, a special equipment providing rapid and accurate changes in temperature required for each step of the reaction. At 95°C double stranded DNA, which includes the region of interest, is separated into its single strands by reversible melting of the hydrogen bonds that connect the two DNA strands (denatruation). Decreasing temperature to 50–60°C permits binding of the primers to the complementary, denaturated DNA or already amplificated fragments (annealing). Finally at a temperature of 72°C (temperature optimum of Taq-DNA-polymerase) each primer acts as a starting point for the replication by the DNA polymerase along the DNA template to a new strand (extension). As a result of duplication of the DNA region of interest, ideally in every cycle, the DNA amount increases exponential. However the real value is below the theoretical value of billions of copies. This is due to the inefficiency of PCR with increasing numbers of cycles. Complete reaction time is about one to two hours. Advantages of this easy and universal applicable method are robustness, specificity and sensitivity. Slightest traces of DNA can be detected and made available to diagnostic purposes. This benefit also recovers the greatest disadvantage: the risk of contamination. Thus it should be regarded not to contaminate the DNA sample with external DNA and therefore a control for contamination is arranged in every assay.

RFLP and Gel Electrophoresis

There are several possibilities to analyze amplificated DNA. The most common technical mode is *R*estriction *F*ragment *L*ength *P*olymorphism (RFLP). This technique may differentiate by analysis of patterns derived from cleavage of DNA by digestion with a restriction enzyme. Restriction enzymes are DNA cutting enzymes. They are able to recognize and cut DNA only at a particular sequence of nucleotides. As a result of point mutations additional restriction sites can emerge but then other restriction sites can be dropped out, by what the length of the fragments produced will differ from the wild type (normal sequence). By gel electrophoresis the fragments are separated from each other. After loading on a agarose gel the negatively charged DNA migrates according to fragment size in the electric field towards the positive charged electrode. Thereby different DNA patterns will be generated. The fragments are visualized by ethidiumbromide and UV-light. Applications for RFLP are the detection of known SNPs (► single nucleotide polymorphism) or mutations and affirmation of newly identified mutations.

Allele-Specific Hybridization of Probes

Synonyms Hybridization fluorescent-based mutation detection

5′nuclease Assay The application of probes specific to certain mutations allows beside detection also an allelic differentiation. The hybridization with allele-specific, fluorogenic probes is part of the routine diagnostics of SNPs or mutations. The *Taq*Man™ technology or 5′nuclease assay exploits the 5′endonucloeolytic activity of *Taq* polymerase to cleave an oligonucleotide probe during PCR amplification thereby generating a detectable signal. Therefore PCR is carried out with two primers and two allele specific DNA probes. Each probe is complimentary to one of the alleles of a SNP (normal or wildtype and mutant) and each is labeled with a different fluorophore. The probes are fluorescently labeled at their 5′ end and are non-extendable at their 3′ end by chemical modification (quencher molecule). During PCR the probe binds to the target sequence downstream from one of the primers and is displaced with cleavage by the 5′endonucleoytic activity of *Taq* polymerase during primer extension. Cleavage of the probe generates a signal, by dissociating the 5′fluorophore from the quencher molecule with an increase in fluorescence. The 5′endonucleolytic activity of the *Taq* polymerase is only enabled in presence of complementarity between target sequence and probe. The probe complementary to the wild type allele releases the fluorescence signal only in presence of the wild

type allele. In case of a heterozygous genotype the signal is decreased by half. In presence of a homozygous mutant no signal is emitted. The probe complementary to the mutant allele acts analogous. This amenable to automation assay offers the advantage of the allele being distinguished during or immediately after amplification without opening the amplification tube or processing the amplification product. This reduces time and erratic results due to post-PCR contamination.

Melting Curve Analysis Another method to analyze SNP or known polymorphisms is the detection by melting curve analysis using LightCycler™. Therefore PCR is carried out with two primers and two DNA probes representing either the wildtype- or the mutation-sequence. The two outer primer ensure amplification, the two interior probes permit differentiation of the alleles. The probes are labeled with two different fluorophore dyes: Probe 1 carries a fluorescein at its 3′ end whereas probe 2 carries a different label (LC Red 640 or LC Red 705) at its 5′ end. The underlying principle is the FRET (*f*luorescence *r*esonance *e*nergy *t*ransfer). When the two probes are brought into close contact by hybridization to the target sequence, FRET results between the two fluorophores. The first dye (donor-fluorophore) is excited by the LightCycler's Diode and emits green fluorescent light, which excites the LC Red dye (acceptor-fluorophore) attached to the second hybridization probe that subsequently emits red fluorescent light. The amount of measured fluorescence is proportional to the increasing amount of DNA generated during the ongoing PCR process. At the end of the PCR the samples are subsequently heated from a low temperature (e. g. 40°C) in small steps by continuous measurement of fluorescence. As the temperature increases, the probes are melting from its target, decreasing FRET. The melting temperature (T_m) of a probe is not only dependent on GC-content and length but also on the degree of homology to the target DNA-strand. When the probe is perfectly matched to the target, the the T_m is higher than with a mismatch. So each SNP can be distinguished by the characteristic $T_m$of each allele. Multiplex PCR is possible by using different fluorophores and/or different T_m's on each SNP.

DNA Sequencing

The search and the detection of unknown mutations requires elaborated methods. Gold standard is dideoxy sequencing. The basic principle is sequencing DNA after amplification by PCR. The technique utilizes DNA polymerase, the four deoxynucleotide-triphosphates (dNTPs) and with different fluorescent dyes labeled dideoxynucleotide-triphospates (ddNTPs) in low concentrations. The ddNTPs compete with dNTP for placement and terminate the DNA chain elongation base specifically. As a result all theoretically possible DNA fragments are generated. Electrophoresis is carried out by loading all four reaction products into one lane of a gel. After size-separation of the fragments by electrophoresis the particular base can be differentiated by laser light stimulation. The sequence is then determined by combinating the fragment sizes. The Editing is performed digital and verified by skillful technicians. In the meantime a higher automation rate is available by capillary electrophoresis in narrow glass capillaries filled with a viscous polymer. With this technique a mix of samples by 'lane tracking' is practically excluded.

DNA Chip Technology

DNA micro arrays are miniaturized devices which provide a format for the simultaneous analysis of many polymorphisms. For identification and systematization of SNPs high density oligonucleotide arrays like GeneChip™ are applicated. This array relies on the hybridization of biotin-tagged fragments of SNP-containing DNA to complementary DNA 25-mer oligonucleotide probes chemically tiled on a silicon wafer in an ordered array. Fragment selection by PCR is carried out on the DNA sample of interest to label the PCR products with biotin and to hybridize them then to the array. Successful hybridizations are detected fluorescently using a streptavidin-phycoerythrin conjugated molecule and an antibody-mediated signal amplification technique. Each oligonucleotide in the high-density array acts as an allele specific probe. To increase specifity, mismatch (MM) control oligonucleotides are used to recognize unspecific hybridization. These are identical to their perfect match (PM) partners except for a single base in a central position. Perfectly matched sequences hybridize more efficiently to their corresponding on the array and give stronger fluorescent signals over mismatched probe-target combinations. The hybridization signals are quantified by high-resolution fluorescent scanning and analyzed by computer software. DNA alterations such as heterozygote base-pair

polymorphisms or mutations, insertions and deletions can be identified.

Cross-References

► Allele
► Deoxyribonucleic Acid (DNA)
► Single Nucleotide Polymorphism (SNP)

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Monition About Health Hazard

► Health Warning Systems

Monitoring

Definition

According to the *Merriam Webster Online Dictionary*, monitoring means "to watch, observe, or check esp. for a special purpose."

As defined by Last in the famous *Dictionary of Epidemiology*, "monitoring is the intermittent performance and analysis of routine measurements, aimed at detecting changes in the environment or health status of populations". It is distinct from surveillance, which is a continuous and ongoing process.

Monotheism

Definition

In the monotheistic view, there is only one god because religion is essentially a relationship with one god who is conceived as the only divine being.

Monte Carlo Simulation

Definition

Monte Carlo Simulation can be described as an advanced form of ► sensitivity analysis in health economic ► modeling, and is used to describe the uncertainty and to evaluate the model repeatedly. The deterministic analysis is repeated for a large number of parameters in the model. The values of the parameters are randomly drawn from realistic probability distributions and then statistically analyzed. By this means, a large number of artificial "individuals" are randomly put into the model.

Monthly Chance of Pregnancy

► Fecundability

Moral

Definition

In order that a free society could exist in a friendly manner, it requires standards of behavior that could be accepted as a norm. The basis of those norms can be found in earlier writings by interested groups of men who sought to regulate the conduct of the individual. Some of these rules have been readily adopted and others taken as guidelines. A good Christian would put them into everyday practice, all in good faith.

Moral Hazard

Definition

Moral hazard refers to disincentives that are created by the existence of health insurance, and implies inefficient overspending for medical care.

Moral Hazard, ex ante

Definition

Ex ante moral hazard refers to the effect that being insured has on behavior – e. g. by utilizing less prevention.

Moral Hazard, ex post

Definition

Ex post moral hazard leads to an increase in demand because the price of medical services covered by health insurance is lower than it would be if the beneficiaries of health insurance paid for these medical services themselves.

Morality

► Ethics and Religious Aspects

Morbidity

Synonyms

Disease incidence and prevalence

Definition

Morbidity refers to illness or injury. On an individual level, it describes the state of being diseased or having unhealthy complications from a medical treatment. On a population level, morbidity measures the rate of disease incidence and prevalence, i. e. how many new cases of diseases occur in a population and the number of people who suffer from a disease or injury.
In ► epidemiology, the morbidity rate defines within the framework of a given time period the number of people who will probably suffer from that disease. The ► morbidity rate describes potential or expected rates rather than actual rates.

Morbidity Rate

Synonyms

Percentage rate of ill people within a time period

Definition

The morbidity rate is the proportion of individuals who become ill with a particular disease within a susceptible population during a specified time period, e. g. a given year. It is usually expressed as a number of people afflicted per 1,000, 10,000, or 100,000 people. It can also refer to the percentage of people who have complications after a procedure or treatment.

Morbus Koch (Koch's Disease)

Synonyms

Tuberculosis; Tbc; Mycobacterium tuberculosis complex; Consumption; Phtisis ($\tau\iota\sigma\iota\sigma$); King's evil; White plague; Wasting disease; Scrofula; Pott's disease

Cross-References

► Tuberculosis and Other Mycobacterioses

"Morning-After-Pill" (Colloquial)

► Emergency Contraception

Mortality

Synonyms

Frequency of death; Lethality

Definition

Mortality rate, a measure of the number of deaths in some population.
Mortality rate is a measure of the number of deaths (in general, or due to a specific cause) in some population, scaled to the size of that population, per unit time. Mortality rate is typically expressed in units of deaths per 1000 individuals per year; thus, a mortality rate of 10000.5 in a population of 100,000 would mean 1,000,500 deaths per year in the entire population. It is distinct from ► morbidity rate, which refers to the number of individuals who have contracted a disease during a given time period (the ► incidence rate) or the number who currently have that disease (the ► prevalence rate), scaled to the size of the population.

Mortality Rate

Synonyms

Death rate; Fatality rate

Definition

The mortality or mortality rate is the ratio of the total number of deaths in an area to the population of that area to the total population. It can refer to deaths in general, or deaths due to a specific cause. The mortality is typically expressed in number of deaths per 1000 individuals per year. However, there are a number of different types of mortality rates as, for example, the fetal mortality rate, which expresses the ratio of fetal deaths to the sum of the births in that year.

Mortality rates are an important measure of the level of mortality within a ► population. Mortality rates are usually age-specific rates of deaths during a time period. The numerator is the total number of deaths to people in an age group during that period. The denominator is the total amount of exposure of people in that age group to the risk of dying during that time-period. The denominator is usually a measure of the person-years lived during the period by people in that age group, and is often estimated by the mid-year population size. Mortality rates are used to produce estimates of survivorship and of life expectancy in a population.

Cross-References

► Disease Frequency, Measures

Morula

► Pre-implantory Blastocysts

Most Economical Way of Achieving a Task

► Efficiency

Motivation

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Synonyms

Willingness; Readiness; Needs

Definition

Motivation describes the situation of an organism in human and social science as well as in ethology that influences the direction, extent and kind of changing patterns of human behavior and action.

Basics Characteristics

Different roles have been assigned to motivational factors in the causation of behavior. Some have defined motivation as a non-specific energizing of all behavior. Others define it as recruiting and directing behavior, selecting which of many possible actions the organism will perform. According to Geen (1995), motivation refers to the initiation, direction, intensity and persistence of human behavior.

In psychology, motivation has been defined as the sum of separate ► motives that arouse, sustain and regulate certain behavior in an individual. A motive is characterized as behavior that is instigated by conscious or unconscious emotion or is a creation of the personality with the purpose of reaching a specific goal (Kehr 2004).

The word "motivation" is derived from the Latin term "motivus", which suggests the activating properties of the processes involved in psychological motivation.

One is motivated, by various means, to satisfy a need. For instance, if there is a need to influence other human beings an individual will be motivated to behave in a powerful and strong way towards others, or if there is a need to have contacts an individual will be motivated to socialize. The term motive is often used as a synonym for "need." Primary motives are based on physiological processes, e. g. the need to avoid hunger and coldness. Secondary motives are based on psychological processes, e. g. the need for achievement, or the need to demonstrate power and strength, or the need to secure contacts.

Motivation can also be classified as ► intrinsic motivation and ► extrinsic motivation. According to the theory of learning, motivation depends on internal and exter-

nal stimuli. Social conditions or characteristics of inorganic/inanimate objects are considered external stimuli.

Theories that explain and define the character of motivation have their roots in behavioral psychology. They provide a way to examine and understand human behavior in a variety of situations. Motivation theories are divided according to theories of needs (need theory) and processes (process theory). A range of theories schematize the development, in a formal way, the influence of the character of needs and the contents of these needs on human behavior.

The hierarchy of needs was notably promoted and defined by Abraham Maslow in his hierarchy of needs theory. He identified a set of needs that he prioritized into a hierarchy based on two conclusions:

- Human needs are either of an attraction/desire nature or of an avoidance nature.
- Because humans are "wanting" beings, once a desire is satisfied another desire will take its place.

The five levels of Maslow's needs, listed from basic (lowest, earliest) to most complex (highest, latest), are the following:

- Physiological needs like food, drink, and sleep.
- Security/safety: people want to feel safe, secure, and free from fear. They need stability, structure, and order.
- Social: this is a need for friends, family, and intimacy – for social acceptance and affection from one's peers. There is a need for social networks (e. g. ► social network).
- Self esteem: people want the respect of others and they want to be regarded as useful, competent, and important. People also desire self-esteem and need a good self image.
- Self-actualization: this highest motivation level involves people striving to actualize their full potential, to become more of what they are capable of being. They seek to attain self-fulfillment.

Some theories expand and modify the hierarchical theory of Maslow's needs: Alderfer proposed the ERG theory in which needs are divided into the categories of existence, relatedness and growth. The following theories were developed by various experts in the field of psychology:

- Motivation-hygiene theory developed by Frederick Herzberg.
- Theory X and Y established by Douglas McGregor.
- Acquired needs theory developed by David McClelland (Petri 1996, McClelland 1985).

According to Maslow, the most basic needs must be satisfied before successively higher needs can emerge. Cognitive psychologists such as Albert Bandura have suggested that individual mental processes, such as beliefs, play an important role in motivation, through the expectation of certain reinforcements for certain behaviors (Bandura 1992). Further theories explain how individuals select particular behaviors and how individuals determine if these behaviors meet their needs (process theories). Such theories are the Expectancy theory developed by Victor Vroom, the Equity theory established by J. Stacy Adams and the Rubikon model created by Heinz Heckhausen (Heckhausen 1989).

Motivation in Health Promotion and Disease Prevention

Motivation in relation to health promotion and disease prevention relates to the willingness of individuals to participate in health promotion interventions and to implement the recommendations for a healthy life style or the coping with disease in daily life. The motivation of individuals is essential if the suggestions of health promotion campaigns are to be followed. Motivation to participate in and implement health promotion issues through health education generates individual health behavior. Numerous concepts and models try to explain how individuals are motivated to participation in health promotion campaigns and interventions (for example ► the precede–proceed model, ► health belief model, (Rosenstock 1974) ► social learning theory, ► trans–theoretical model, ► theory of reasoned action, theory of planned action (Conner and Norman 1998). These theories and the theories of health behavior (► health behavior theories) contribute answers to the question of why people are motivated to change their behavior on health related issues (Schwarzer 1996). These models on health behavior explain an individual's readiness to change un-healthful behaviors (Sanders 1982). The basic premise is that behavior change is a process and not an event, and that individuals are at varying levels of motivation, or readiness, to change. This means that people at different points in the process of change can benefit from different programs for change, and the programs work best if matched to their stage of readiness.

Furthermore, models of health promotion (► health promotion models) try to explain behavior to help systematically plan, conduct and evaluate health promotion interventions or programs and to motivate individuals in participating health promotion. In modern public health practice today, usually a mix of concepts from different models is employed, and all major theories are examined for their applicability to a given intervention.

Cross-References

► Extrinsic Motivation
► Health Behavior, Theories
► Health Belief Model
► Health Promotion Models
► Intrinsic Motivation
► Motive
► Precede–Proceed Model
► Reasoned Action Theory
► Social Learning Theory
► Social Networks
► Transtheoretical Model

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Motive

Definition

Motives are congenital psychological dispositions that enable an individual to perceive things and to sample, through this perception, emotions, to act in a certain manner and to have impulses for action. The psychology of motivation differentiates various kinds of motives.

Motor Function Developmental Disorder

Definition

The main symptom of the specific developmental disorder of motor function is a serious impairment in the development of coordination. General intellectual retardation or other important neurological disorders are excluded. In most cases, a careful clinical examination shows marked neurodevelopmental immaturities such as choreiform movements of unsupported limbs or mirror movements and other associated motor features, as well as signs of impaired fine and gross motor coordination.

Motor Neuron Diseases

Synonyms

Anterior horn cell disease; Familial motor neuron disease; Lateral sclerosis

Definition

Motor neuron diseases (MND) represent a group of neurological diseases characterized by a progressive deterioration of the motor neurons in the brain, brainstem, and spinal cord resulting in muscle weakness and wasting. Usually, arms and legs are affected first, often followed by shoulders and other muscles. In most cases, the intellectual capacity remains unchanged. MND usually develops in people over the age of 40, with the highest incidence in the 50–70 years age group. The clinical subtypes of MND are differentiated by the major site of degeneration of the motor neurons. They include amyotrophic lateral sclerosis (Lou Gehrig's disease), progressive spinal muscular atrophy, progressive bulbar palsy, and primary lateral sclerosis.

MOTT (Mycobacteria Other than Tuberculosis)

Synonyms

Atypical mycobacteria; Mycobacterioses

Definition

Mycobacteria of the MOTT-complex contain a great number of species, for example *Mycobacterium avium*, *M. fortuitum*, *M. intracellulare*, *M. kansanii*, *M. marinum* or *M. ulcerans* (germ, which causes Buruli ulcus). They can be found in nature (in water, in the soil or in foodstuffs) as well as in installations (water pipes). Mycobacterial infections are not transmitted from one individual to another. In general, the pathogens are taken up orally or small skin injuries act as portals of entry. Mycobacteriosis can lead to a positive tuberculin skin test result. The detection of mycobacteria does not necessarily indicate the presence of disease. A MOTT-infection with therapeutic consequences – a mycobacteriosis – is present in cases of fistulae, when the germ is isolated from tissue that should be sterile (lymph nodes, bones), when mycobacteria are isolated in skin granulomas or following the repeated isolation of the same germ. Due to resistances it may be difficult to treat mycobacterial infections.

Mountain Sickness

► Altitude Sickness

mRNA Translation

► Translation

Multi-Centric Study

Definition

A multi-centric study is a study that is conducted at more than one research or medical center. The benefits of such studies include a large number of subjects from different geographic places and the ability to compare results from all of them. The most common weakness of randomized controlled clinical trials is that they are very expensive. Because of the high costs, multi-centric trials that utilize cooperation between many research centers are becoming more common.

Multidisciplinary

Definition

The involvement of two or more disciplines or professions in the provision of integrated and coordinated services including evaluation and assessment activities.

Multifactorial

Definition

Due to many causes with small effects.

Multifactorial Disease

Synonyms

Disease with multiple etiology

Definition

Multifactorial disease such as ► work-related diseases, for example hypertension, coronary heart disease, chronic non-specific respiratory disease, low back syndrome, upper limb disorders, cancer, etc., are thought to be caused by complex interactions between genetic factors (polygenic basis) and various environmental factors. The term multifactorial means that there are many different influences acting together to cause the appearance of the disease. These include effects from a combination of genetic factors, none of which on its own would be likely to cause the disease, and environmental factors, which again would not cause the disease by themselves. It is believed that a particular combination of genetic and environmental factors act together in concert and trigger the development of multifactorial disease.

Different environmental factors will influence the development of different multifactorial diseases. Besides environmental and workplace factors (chemical, physical, ergonomic, or psychosocial stressors), non-occupational life-style factors (diet, weight, type and amount of exercise, and smoking and drinking) also place genetically susceptible individuals at risk of developing multifactorial diseases.

Cross-References

► Diseases with Multiple Etiology

Multilevel Statistical Analysis

Synonyms

Hierarchical linear modelling; Multilevel statistical modelling

Definition

Multilevel statistical analysis comprises a broad spectrum of statistical techniques capable of statistical modeling and analysis of hierarchically structured data. For example, in population surveys, sample design typically mirrors the hierarchical population structure in terms of geography and household membership; for repeated measures data, time can be considered as another level that occurs within participants; for event history data, time spent in various states or situations is important; in studying mortality rates in a population, it is often of great concern to try to understand the factors associated with variations from area to area or community to community; in ecologic studies, a combination of direct observations of individuals (e. g. age and sex) – individual level variables, and observations of groups, organizations, or places (e. g. social organizations and air pollution) – and ecologic variables is usually present. Multilevel statistical analysis is usually a more advanced form of simple linear regression and multiple linear regression. Multilevel analysis allows variance in outcome variables to be analyzed at multiple hierarchical levels, whereas in simple linear and multiple linear regression, all effects are modeled to occur at a single level. Multilevel analysis has been extended to include multilevel structural equation modeling, multilevel latent class modeling, and other more general models.

Multilevel Statistical Modelling

► Multilevel Statistical Analysis

Multilineage Potential

► Plasticity

Multimodality Hospice Approach

► Health Care Teams in Palliative Care

Multiple Comparisons

Definition

Multiple comparisons is a term concerned with the interpretation of the multitude of hypothesis tests that might be undertaken on one set of data. The major sources of multiple comparisons are: multiple outcome measures, multiple treatment groups, multiple items in a questionnaire measuring an exposure variable, repeated measurements over time of a specific outcome measure and comparisons of outcome over subpopulations of subjects. Statistical analysis will give rise to many statistical tests with a high likelihood of finding many statistically significant test results purely by chance. The problem centers on the error rate that should be controlled either by multivariate global tests, adjusted marginal tests or by using summary measures.

Cross-References

► Fisher LSD

Multiple Linear Regression

► Multiple Regression

Multiple Regression

Synonyms

Multiple linear regression; Multivariate regression modeling

Definition

Multiple regression is a multivariate regression method for analyzing the relationships between several independent or predictor variables and a dependent variable. It is used to model relationships between variables (exactly the conditional expected value of dependent variable given the values of independent variables) and determine the magnitude of those relationships. The models can be used to make predictions. In

general, multiple regression allows the general question "what is the best predictor of …" For example, what are the best predictors of success in high-school? Which personality variable best predicts social adjustment? Which of the multiple social indicators best predicts whether a new immigrant group will adapt and be absorbed into society or not, etc. Multiple linear regression assumes the best estimate of the response is a linear function of some parameters (though not necessarily linear on the predictors). If the relationships between the variables being analyzed are not linear in parameters, a number of nonlinear regression techniques may be used to obtain more accurate regression (for example, a multi-layer ► artificial neural network). If the response variable is not continuous, specific regression techniques are available, e. g., ► logistic or Poisson regression (► logistic regression analysis). A distinction can also be made between parametric (requires choice of the regression equation with one or a greater number of unknown parameters) and non-parametric regression methods (without specifying the form of the relationship between variables *a priori*, e. g., ► Cox's proportional hazards regression). Some authors prefer to use the term multiple regression analysis exclusively in the sense that it can also handle all analysis of variance problems (but the reverse is not true).

Multiple Sclerosis

Definition

Multiple sclerosis (MS) is a disease of the central nervous system characterized by numbness, weakness, loss of muscle coordination, and problems with vision, speech, and bladder control. It is an autoimmune disease meaning that the body's immune system attacks myelin, which is an important substance that serves as a nerve insulator and helps in the transmission of nerve signals. MS is progressive and often fluctuates with exacerbations and remissions often occurring over several decades. "Multiple" refers to the multiple places affected in the central nervous system and to the multiple relapses and remissions. Ultimately, in most patients, permanent disability and sometimes death occurs. The cause of MS is still rather unclear. Possible factors include genetic susceptibility, environmental factors, viruses, or a combination of these factors.

Multiple Sequence Alignment

Definition

For a group of related sequences, the determination of relatedness by aligning identical or highly similar amino acid or nucleotide residues at the same position. This problem is usually performed with successive pairwise alignment.

Multipotency

Synonyms

Pluripotency

Definition

By definition, multipotency is the capacity of stem cells to give rise to cells of the three embryonic germ layers. Hence, any cell type derived from the embryoblast but not from the trophoblast can be generated. Although the term pluripotency is a synonym for multipotency, it is generally used to point out a limited multilineage potential restricted to one or two embryonic cell lineages. A general consensus whether adult stem cells can cross lineage boundaries or not has not yet been found.

Multivariable Statistics

► Multivariate Statistics

Multivariate Data Analysis

► Multivariate Statistics

Multivariate Regression Modelling

► Multiple Regression

Multivariate Statistical Analysis

► Multivariate Statistics

Multivariate Statistical Methods

► Multivariate Statistics

Multivariate Statistics

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Synonyms

Multivariable statistics; Multivariate statistical methods; Multivariate statistical analysis; Multivariate data analysis; Classification and prediction statistical methods

Definition

Multivariate statistics refers to methods that examine the simultaneous effect of multiple variables. Traditional classification of multivariate statistical methods suggested by Kendall is based on the concept of dependency between variables (Kendall 1957). If an interest centers on the association between two sets of variables, where one set is the realization of a dependent variable (or variables) and the other set is the realization of a number of independent variables, then the appropriate class of techniques would be those designated as dependence multivariate methods. If interest centers on the mutual association across all variables with no distinction made between variable types, interdependence multivariate methods are used (Dillon 1984).

Basic Characteristics

In the past 30 years, there has been an explosion of work in the theory and methods of multivariate analysis. This is partly due to an enormous increase in the use of these methods by biomedical, social, behavioral, and other researchers who analyze the simultaneous relationships of more than two variables. Beside that, mathematical tools (matrix algebra, vector geometry, probability distributions, and powerful types of analyzes for analyzing linear and nonlinear models such as general linear models or generalized linear models) that were needed as a theoretical basis for these methods have emerged. Another explanation of this explosion could be the easy access to computers and ► statistical packages that are capable of handling very sophisticated multivariate techniques; increasing statistical knowledge by researchers; increased collaboration with statisticians in different studies; and the growing concern of journal editors that poorly designed and analyzed studies would be published in their journals (Dawson-Saunders 1994).

Multivariate techniques differ from univariate and bivariate analyzes in that they direct attention away from the analysis of the mean and variance of a single variable, or from the pairwise relationships between two variables, and involve the analysis of covariances or correlations that reflect the extent of relationship between three or more variables, and analysis of distances which reflect similarity among variables. For example, a public health researcher/worker attempting to understand the role health determinants play in shaping the health status of a population might operationalize the concept of health determinants in terms of at least eight variables, relating to personal behavior and lifestyles, influences within communities which can sustain or damage health, living and working conditions, access to health services, and general socioeconomic, cultural, and environmental conditions. Similarly, if a public health researcher/worker is concerned with developing taxonomy for classifying individuals of a certain population on the basis of their socioeconomic position, information on education, social class, occupation, income, housing characteristics, and wealth may be collected, for example. Alternatively, a public health researcher/worker might prefer to measure socioeconomic status with as few variables as it is possible, only infant mortality in developing countries, for example.

Dependence multivariate methods usually seek to explain or predict one or more dependent variable (response, outcome variable(s)) based upon the set of predictor variables (independent, covariate, explanatory variables). Thus, there are two uses of dependence multivariate methods, prediction and description (explanation, classification). Interdependence mul-

tivariate methods, on the other hand, are less predictive in nature and attempt to provide insight into the underlying structure of the data by simplifying complexities, primarily through data reduction and through developing taxonomies and systems of classification. Some caution should be taken regarding the terminology concerning "dependent" and "independent variables" that is very common in statistical literature. This choice of terminology is unfortunate in that independent variables do not have to be statistically independent of each other. Indeed, these independent variables are usually interrelated in a complex way. Another disadvantage of this terminology is that a common connotation of the words implies a causal model, an assumption not needed for the multivariate methods described below (Afifi 1984).

Proper use of all multivariate methods requires that attention should also be paid to the type of measurement collected (measured on a nominal, ordinal, interval, or ratio scale) and the distributional form of the data analyzed. For example, several multivariate methods (e. g. ► multiple regression) require that the ► level of measurement be at the interval or ratio level, and that the distribution of the variables be multivariate normal. The classification of independent or dependent may differ from analysis to analysis, but the classification into Steven's system should remain constant throughout the analysis phase. Once these classifications are determined, it is possible to refer to Table 1 and decide what analysis should be considered.

Dependence Multivariate Methods

These methods are generally classed as regression type methods. This means that data can be partitioned into a response variable (y) and a set of possible predictor variables ($x_1, x_2, \ldots, x_k$). It is assumed that the value of the response variable is some function of the independent variables $\boldsymbol{x}$, i. e. in a generalized format: $y = f(\boldsymbol{x})$. Beside this deterministic part, the model has a probabilistic part – random error (ε). Together they form a statistical regression model (usually based on ► general or generalized linear models). This model (of dependence) is in fact the mathematical record of how one or several variables depend on other characteristics.

The basic steps used for dependence model building are model selection, model fitting, and model validation. In the model selection step, plots of the data, process knowledge, and assumptions about the process are used to determine the form of the model to be fitted to the data. Then, using the selected model and information about the data, an appropriate model-fitting method is used to estimate the unknown parameters in the model and to evaluate how effectively the calculated model fits the actual data for estimating the outcome variable. Models that fit the sample data well may not be successful predictors of response variables when applied to new data. Model validation involves an assessment of how the fitted regression model will perform in practice – that is, how successful it will be when applied to new or future data. If the model validation identifies problems with the current model, however, then the modeling process is repeated using information from the model validation step to select and/or fit an improved model. The model, if properly fitted and validated, can be used for prediction and/or classification.

Depending on the nature and the number of variables in the model, there are a great number of multivariate techniques that can be used to analyze dependence structure. These are ► multiple regression, ► discriminant analysis, ► logistic regression, ► proportional hazards regression (Cox regression), ► loglinear analysis, ► canonical correlation analysis, multivariate analysis of variance and covariance, path analysis, and structural equation modeling.

Interdependence Multivariate Methods

These methods look at the relationships between variables, with the primary aim of dimension reduction. Based on a typical data table that has n rows (e. g. units, cases, or objects) and k columns (variables), reduction can be seen as compression in one of two directions or both directions at the same time. This is a basis for three general categories of interdependence methods: geometrical or projection methods (reduction of columns leading to a small number of derived, new, variables which relate to more abstract features), classification methods (reduction of rows in order to group cases on the basis of their similarity over a range of variables), and hybrid methods, i. e. a combination of the previous two (reduction of the table in two directions simultaneously). The choice of multivariate method also depends on the nature of the data input.

The most frequently used interdependence methods are: ► principal component analysis, ► factor analysis,

Multivariate Statistics, Table 1 A Taxonomy of Multivariate Statistical Techniques under Steven's Classification (Adapted from Afifi 1984)

	Independent Variable(s)			
	Nominal or Ordinal		Interval or Ratio	
Dependent Variable(s)	1 Variable	>1 Variable	1 Variable	> 1 Variable
No dependent variables	Refer to statistical tests	Measures of association Log-linear models Chi-square test for independence Multidimensional scaling Correspondence analysis	Refer to statistical tests	Correlation analysis Principal component analysis Factor analysis Cluster analysis Multidimensional scaling
Nominal or Ordinal				
1 Variable	Refer to statistical tests	Log-linear models Logistic regression Classification tree CART Mantel-Haenszel test (1 variable with confounding factors)	Refer to statistical tests	Discriminant analysis Logistic regression Classification tree CART K-th nearest neighbor KNN
>1 Variable	Log-linear models	Log-linear models	Discriminant analysis K-th nearest neighbor KNN	Discriminant analysis K-th nearest neighbor KNN
Interval or Ratio				
1 Variable	Refer to statistical tests	Analysis of variance Multiple-classification analysis ANCOVA (1 variable with confounding factors)	Refer to statistical tests	Multiple regression Nonlinear regression
1 Variable censored	Refer to statistical tests	Cox regression	Refer to statistical tests	Cox regression
>1 Variable	Multivariate analysis of variance Analysis of variance on principal components Hotteling's T-square Profile analysis	Multivariate analysis of variance – MANOVA Multivariate analysis of covariance – MANCOVA (1 variable with confounding factors) Analysis of variance on principal components Canonical correlation analysis	Canonical correlation analysis	Canonical correlation analysis Multivariate multiple regression Path analysis Structural equations modeling

► cluster analysis, multidimensional scaling, and correspondence analysis.

Extensions of Multivariate Statistics

► Meta-analysis is a way to combine the results of several independent studies on a specific topic. It can be viewed as an extension of multivariate analysis because of the idea of summarizing evidences (variables), keeping in mind that units of measurement are studies. More on this topic can be found in a separate essay – Meta Analysis.

Longitudinal studies are studies in which individuals are measured repeatedly through time, allowing the direct study of change. The sequential nature of the measures implies that certain types of correlation structures are likely to arise. Methods for longitudinal analysis can be seen as a special case of more general regression methods for clustered data (Fitzmaurice et al. 2004).

Multilevel models are statistical models applied to data collected at more than one level in order to elucidate relationships at more than one level. They include a hierarchy of nested (clustering of units into hierarchy)

effects to disentangle the influences of different levels (Goldstein 2003). For example, a multilevel study of the effects of schooling on academic achievement could study the effects of a particular classroom teacher (level 1), who is located in a given school (level 2), which is influenced by the policies of the district (level 3) within which the school is located. In ecologic studies, a combination of direct observations of individuals (e. g. age and sex) – individual level variables, and observations of groups, organizations, or places (e. g. social organizations and air pollution) – ecologic variables, is usually present. ► Multilevel statistical analysis combines analysis conducted at those two (or more) levels.

A time series is a sequence of observations made over time; for example, annual infant mortality rate, weekly admissions to an emergency center, or daily carbon monoxide concentration. Time series models are used to describe the dependence of the outcome at each time on predictor variables including covariates and possibly previous values in the series. The observations in the time series cannot be assumed to be independent as is the case in most multivariate statistical methods. Time series methods are therefore necessary to account for the correlation between repeated responses over time. The goals of ► time series analysis include description, explanation, prediction, and control (Diggle 1990).

An ► artificial neural network is a nonlinear statistical data modeling tool. It can be used to model complex relationships between inputs and outputs or to find patterns in data. Neural networks extend regression methods to nonlinear multivariate models (Hastie et al. 2001).

Conclusions

In conclusion, multivariate statistics is an important area of biostatistics and is of particular value in public health, keeping in mind that contemporary public health research has been becoming increasingly interested in attempting to explain complex rather than simple phenomena. The appearance of new multivariate statistical methods creates further challenges for modern public health.

Cross-References

- ► Artificial Neural Network
- ► Canonical Correlation Analysis
- ► Cluster Analysis
- ► Cox Proportional Hazards Regression
- ► Discriminant Analysis
- ► Factor Analysis
- ► General and Generalized Linear Model
- ► Level of Measurement
- ► Logistic Regression Analysis
- ► Loglinear Analysis
- ► Meta-Analysis
- ► Multilevel Statistical Analysis
- ► Multiple Regression
- ► Principal Component Analysis
- ► Statistical Packages
- ► Time Series Analysis

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Mumps

Synonyms

Parotitis epidemica

Definition

Mumps is a viral infection with an incubation period of 12–35 days, which is spread by droplets and direct contact. Humans are the only reservoir of the virus. Besides fever, headache, muscular pain and malaise, the onset of the disease is usually characterized by pain and swelling of the parotic gland. In most cases the swellings starts on one side, but in 70–80% the other side is affected just a little later. Complications that may occur are: inflammation of other salivary glands or

the pancreas and infection of the central nervous system which is expressed by meningitis or encephalitis. In men or boys who have passed puberty there is a danger of developing orchiditis which might cause infertility. The most important measure in preventing parotitis epidemica is active mumps-vaccination (► immunization, active).

Mumps Vaccination

Synonyms

Mumps immunization

Definition

The mumps ► vaccine was developed in 1967. Nowadays, it is generally applied in combination with the vaccination against measles and rubella (MMR). The patient receives the first inoculation at a minimum of 11 months of age and a second vaccination at an interval of at least 4 weeks later. The protection rate is 97–99%. The mumps vaccination is recommended in view of the complications that can arise from infection with the wild-type virus, especially in boys – orchitis and meningitis. Contraindications for mumps or MMR vaccination are immunodeficiency, acute illness with fever, pregnancy and a known severe allergic reaction to components of the vaccines or the carrier protein.

Murri (Queensland)

► Indigenous Health – Australooceaninan

Musculoskeletal Health

Synonyms

Health of muscles and skeletal system

Definition

► Physical activity contributes to the development of bone mass during childhood and adolescence and to the maintenance of skeletal mass during adulthood. Increased bone mineral density during adulthood is positively associated with aerobic exercise. Through its load bearing effect on the skeleton, physical activity influences bone density and bone architecture, – the higher the load, the greater the bone mass. Higher calcium intake has linked to increased bone density in short-term studies, but high protein intake and high dairy calcium intake are both related to increased risk of fractures in long-term prospective studies of men and women. Because ideal calcium intake for development of peak bone mass has not been determined, it has not been established to what extent increased calcium intake will prevent osteoporosis.

Mutation

Synonyms

Genetic mutation; Chromosomal mutation

Definition

Mutations are changes to the genetic material (usually DNA or RNA) that predispose the occurrence of a clinical ► phenotype (disease), i. e. pathogenic alterations. Mutations can be caused by copying errors during cell division or by the exposure to a multiplicity of endogenous or exogenous mutagens (radiation, chemicals, viruses). The mutational spectrum includes single base substitutions (point mutations), frameshift mutations (small insertions or deletions), microdeletions, and large-scale chromosomal alterations (deletions, duplications, rearrangements). If germ cells (sperms, oocytes) are affected by a mutation (germline mutation), this can be passed on to the next generation (hereditary disorders). In contrast, somatic mutations usually occur during lifetime *de novo* in somatic (non-germline) cells of an organism; they are not transmitted to descendants, but may lead to cancer and other age-related diseases.

Mutually Exclusive Categories Tests

Synonyms

Analysis of frequencies

Definition

Mutually exclusive categories tests are applied to data obtained from individuals categorized into mutually

exclusive categories according to one or more variable. Analysis of frequencies includes several statistical tests. ► Goodness-of-fit tests are applied in the analysis of data from one-way tables. The chi-square ► test of homogeneity and chi-square ► test of independence are applied in the analysis of two-way ► contingency tables. When frequencies in ► contingency table analysis are too small to apply a chi-square test, ► Fisher's exact test is more appropriate (see essay Analysis of frequencies). The McNemar test is appropriate in the analysis of data from matched pairs for dichotomous variables.

MW

► Microwaves

Mycobacterioses

► MOTT (Mycobacteria Other than Tuberculosis)

Mycobacterium tuberculosis

Synonyms

Pathogens that cause tuberculosis; Typical mycobacteria, tubercle bacilli

Definition

Mycobacterium tuberculosis, the germ that causes tuberculosis, is a rod bacterium. Due to the structure of its cell wall, it has to be classified as gram-positive although it only shows a poor uptake of stain. The ability of mycobacteria to resist decoloration by ethanol and acids is called "acid-fastness". In Ziel–Neelsen staining tubercle bacilli appear as red rods on a blue background. The pathogens can remain dormant in macrophages (human cells of defense) for years or even decades without causing any symptoms.

Mycobacterium tuberculosis Complex

► Morbus Koch (Koch's Disease)
► Tuberculosis
► Tuberculosis and Other Mycobacterioses

Mycotoxins

Definition

Mycotoxins are toxic metabolites of moulds present on raw or processed food or feed. Moulds grow in a humid atmosphere, so either the humidity of the space where products are kept or the quantity of water in the product (so called 'water activity') enhance mould growth. Moulds which are frequently present on food are *Aspergillus*, *Penicillium*, *Fusarium*, Alternaria, *Claviceps* and they produce Aflatoxins B1, B2, G1, G2, M1, M2. *Aspergillus flavus* produce Ochratoxin A and Cyclopiazonic acid. These toxins, along with patulin, zearalenone, fumonisins and others, produce acute and chronic hepatic lesions and could be carcinogenic. Mycotoxins are destroyed only on temperatures above 220°C, so conventional cooking temperatures are ineffective in lowering the levels of mycotoxins. Peanuts, corn, nuts, figs, coffee, beans are always tested for the presence of mycotoxins since they grow in humid regions where conditions for growth of moulds are optimal.

Myofascial Pain

Definition

Myofascial pain is characterized by discomfort or pain in the muscles that control jaw function and the neck and shoulder muscles.

Mythopoetic

Synonyms

Myth-making; Mythologizing

Definition

The term mythopoetic refers to a tendency to reduce the *mythoi* or cosmic stories of a people or culture into paradigms of human psychological functioning. Myths were once used by societies to relate experiences to the functioning of the whole and often hierarchical world order of a created world but mythopoeia is now used as a tool for individuals to gain personal insight into

their own psychological functioning. This is often done without due reference to or regard for the larger societal or cultural epoch. For instance, some enthusiasts of this approach to men's health assert that the archetypes of the priest, king, warrior and lover are to be found within each man and that healthy masculine functioning requires the adequate exploration, expression and integration of these archetypes within the male psyche. Unfortunately, anachronistic images and understandings of these archetypes are very often converted into self-help strategies and practices that lack suitable explanatory power or therapeutic value.

Naga (India), (South Asia)

► Indigenous Health, Asian

Narcotic Analgesics

► Opiods

Narrative Synthesis

► Qualitative Overview

Nation

Synonyms

People; Population; Tribe; Society

Definition

A nation is a group of humans who share the same characteristics: common ► ethnic identity, as well as common language, religion, ideology, culture, and/or history. They are usually assumed to have a common origin. Therefore, the national population also has a degree of uniformity and homogeneity. A group of people with nothing in common, can not be defined as a nation. At least some of the characteristics must be exclusive to distinguish the nation from neighboring nations. It is possible that people with the same ethnic origin live in different nation-states and for that reason may be treated as members of separate nations.

Cross-References

► Ethnic Group

National

► Ethnic

National Health Service (NHS), United Kingdom

Definition

Since 1948 the National Health Service (NHS) has functioned as a national medical service in the United Kingdom. It is publicly funded by means of taxation. The NHS provides the majority of health care in the United Kingdom including primary health services, hospital and specialist services. Primary health services include general medical services provided by general practitioners, general dental services, pharmaceutical and ophthalmic services as well as ancillary services such as school medical service, care for mothers and young children, and midwifery. Hospital and specialist services comprise also research, pathological services, emergency services and long-term health care.

National Health Services

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Definition

National Health Services are systems of health institutions that provide ► health services to people of a given nation, province, or state. A national health service has

responsibility for addressing resource issues relating to access, equity, and quality of health care. It assures the delivery of healthcare services on the three levels of intervention: primary, secondary, and tertiary prevention. Specific services delivered through national health systems are maternal and child health services, health services, health services for the elderly and disabled, occupational health services, etc. A national health service stimulates the education of qualified health professionals and stimulates the community to invest in the health sector in order to meet the health needs of the nation. Furthermore, it supports states and communities in their effort to plan, organize, and deliver health care, as well as strengthen the overall public health system.

Basic Characteristics

Health services provided by national health systems include a wide range of services that can be didactically divided into several groups. First of all, most health services are provided for an individual in the community, but some are aimed at the population (► population-based services). Furthermore, health services can be divided by the place where they are provided: ► institutional health services (provided in a health care setting), home care services (provided at home or in the community, ► home- and community-based services), or ► occupational health services (provided at the workplace). Finally, all health services can be grouped as ► preventive services, where services effective in promoting health and preventing the occurrence of disease = primary prevention (► prevention, primary), clinical services provided for detection of disease or risk factors at early, treatable stages = secondary prevention (► prevention, secondary), and long-term care and rehabilitative services = tertiary prevention (► prevention, tertiary).

1. *Primary prevention* refers to health services conducted before the onset of disease and includes health promotion, protection, and prevention of disease. This group of activities is sometimes referred to as non-specific prevention, because they are conducted in order to improve health status, i. e. to make healthy people healthier and less susceptible to diseases. This is why these activities go beyond strictly clinical services; they expand to the social, economic, and even political sphere of life. Primary prevention services include:
   a. Stimulation of physical activity, promotion of healthy eating habits, and promotion of healthy lifestyles – avoidance of risk behavior, such as use of tobacco, alcoholic beverages, drugs, or risky sexual behavior.
   b. Support to governmental and global actions for environmental protection – improvement of food and water supply, prevention of air, water and soil pollution, and prevention of climate changes.
   c. Support to ensure access to general and health education, and coverage for all. Health education is of prime importance for the establishment of attitudes related to health promotion, thereby influencing health-related behavior.
   d. Stimulation of professional education and employment, leading to financial security, and higher socio-economic standards.
   e. Primary prevention includes some medical activities and measures that are more disease-oriented and more specific than those mentioned above. National health services are obliged to direct and manage the immunization process. The coverage rate of immunization should be more than 80% of the population in order to achieve an epidemiological barrier to the diseases in a population. Obligatory immunization is provided in infancy and childhood, as well as in adulthood, according to specific indications.
   f. Genetic counseling is a preventive service provided for women of reproductive age and during pregnancy, aiming to control the occurrence of genetic malformations in the population.
   g. In order to control the transmission of infective diseases, national health services must provide measures for disinfection, and pest (insects and rodents) eradication, as well as sanitary improvement of the urban and rural settings by various technical measures (soil decontamination, regulation of waste disposal, controlling emission of hazardous substances, etc.).
2. *Secondary prevention* refers to services conducted in order to detect and treat diseases early, aiming to prevent further complications and disabilities. National health systems are providing populations with various services, including:
   a. Obligatory examinations from pregnancy and childbirth, through infancy and childhood (at regular intervals), and school age (every two years),

up to examination of the employed population (every year). Obligatory examinations are being criticized as unnecessary and financially devastating for society. However, the activities undertaken expand the level of early diagnosis of disease and they include measures of health promotion and protection as well, giving health education and stimulation of a healthy lifestyle.

b. Screening is the application of a test on the population in order to estimate the risk for the onset of disease. By screening, a healthy population is divided into two subgroups – those with low risk and those with high risk. It is in the latter group that diagnostic tests are performed in order to determine the occurrence of disease at an early stage. Screening tests performed in infancy include screening for genetic malformations (Down's syndrome), genetic conditions (cystic fibrosis), inborn errors of metabolism, congenital hypothyroidism and adrenal hyperplasy, hearing loss, and hip dysplasia. In adulthood, screenings are undertaken for breast, cervical, prostate, and bowel cancer, with many more suggested – for mental disorders, infectious diseases, etc.

c. The treatment of diseases is the most expensive service within the health system. It seems that the healthier the person is, the less willing they are to invest in health; however, the situation is vice versa when it comes to the disease, the person is willing to give everything to regain health.

3. *Tertiary prevention* includes health measures and activities conducted when the treatment of disease is terminated. Health services are related to:
   a. Rehabilitation, both physical and psychological,
   b. Provision of orthopedic facilities,
   c. Occupational and rehabilitation therapy of the disabled person,
   d. Reintegration into society, including education, re-qualification, and employment,
   e. Support of society as a whole to accept physically or mentally challenged persons in various ways i. e. organizing schools for the blind, deaf or mentally handicapped; providing schools and universities with access platforms for disabled persons; establishing clubs and supportive groups; providing additional health care at home; and adopting policies regarding employment or social help for people with disabilities.

Access to Health Service

Access to appropriate preventive care depends on many barriers, including those that involve the patient (► consumer), health professionals (► providers), and system of care (U.S. Department of Health and Human Services 2000; Docteur 2003).

- Patient barriers include lack of knowledge, skepticism about the effectiveness of prevention, lack of a usual source of primary care, and lack of money to pay for preventive care. Sexual orientation, cultural differences, language differences, geographic isolation, cultural norms, economic status, or environmental challenges also present important limitations in access to care. Certain people, such as those who are disabled, elderly, chronically ill, or HIV-infected, require access to health care providers who have the knowledge and skills to address their special needs.
- Health provider barriers include limited time to dedicate to each patient, lack of training (or specific skills), lack of effectiveness in work, etc. Another important issue is the timely availability of health services, problems can occur when demands for services exceed the capacity of the system to supply them on a timely basis (e. g. in emergency situations – earthquakes, floods, war conflicts).
- System barriers include lack of resources or attention devoted to health services – problems with the quantity and distribution of facilities (hospitals, ambulances, or medial equipment); problems with the quantity and distribution of health care professionals (e. g. small number of physicians or inadequate distribution of physicians in rural areas); financial barriers – lack of insurance coverage or inadequate reimbursement for services; and lack of systems to track the quality of care provided to the public.

Reforming the Health Systems to Provide Effective Health Services

Establishing a health system and improving the quality of health services it provides is a great challenge for every national government (► health systems).

The major indicators of *quality of health systems* are:

- sustainability – assuring that the current generation's need for high quality health services may be met without compromising the ability of future generations to meet their needs;

- efficiency – the production of the maximum possible outcome for a given level of expenditure;
- effectiveness – the extent to which health system interventions achieve defined health goals;
- equity – an equitable health system is one which ensures equality of opportunity, where anyone receives as much health care as anyone else in the same medical condition, regardless of any factors thought to be irrelevant e. g. income, race, sex, and age (Institute of Medicine 2001).

Health systems in many countries face major problems related to workforce shortages, misdistribution and waste of financial, human, knowledge, and other resources, poor quality health information, and shortfalls of essential health services, including problems with quality, and inability to scale up rapidly (WHO 2004). In order to meet these goals and to provide better health services, restructuring of health systems toward primary health care services is of prime importance (WHO Regional Office for Europe 2004). The advantages of strengthening primary care services are:

- Better access to health care services and therefore more equality in health care provision. The primary health care system is widespread, longitudinal, well coordinated and oriented toward community, i. e. accessible for the whole population. Access to health systems improves inequalities in health, which is important for both low-income and developed countries (Macinko 2003).
- Better quality and efficiency of care. Both general practitioners and specialists are obliged to provide the highest quality of health care, but the fact that primary care physicians provide continuous and comprehensive care may result in improved health outcomes. Improved access to primary care physicians and their gate-keeping function have added benefits such as less hospitalization, less utilization of specialist and emergency hospital care, and less chance of being subjected to inappropriate health interventions (Roberts 1998).
- Cost-effectiveness of health services. Primary health care, when compared with secondary care, was shown to be more cost effective, with lower use of diagnostic investigations, lower referral rates to secondary services, lower prescription levels, and lower tendency to use expensive technology (Franks, 1992; Starfield 2002).
- Patient satisfaction with health services. A comparison of ten Western countries suggested that users reported more satisfaction with health systems based on a strong primary care system (i. e. Denmark) when the influence of expenses on the health care was controlled with other countries (Mossialos 1997). However, patient satisfaction with primary care is strongly influenced by many other factors, such as the mode of care delivery, physician's style of work, continuity of care, etc.
- Better health of the population. International comparisons have revealed that countries with very weak primary care infrastructures have poorer performance on major aspects of health, especially for indicators early in life – low birth weight ratios, high postneonatal mortality rate and years of potential life lost in adulthood (Starfield 2002).

Conclusion

The factor that marks a difference between countries with overall good health and those with poor health at all ages is the strength of primary health care within the overall health services. Recognizing the role of preventive services across the continuum of care must be the base point for the development of projects and policies designed to help providers and patients shift to a prevention-oriented health care system.

Cross-References

- ▶ Consumer
- ▶ Health Service
- ▶ Health Service Area
- ▶ Health Services Research
- ▶ Health Systems
- ▶ Home- and Community-Based Services
- ▶ Institutional Health Services
- ▶ Occupational Health Services (OHS)
- ▶ Population-Based Services
- ▶ Prevention, Primary
- ▶ Prevention, Secondary
- ▶ Prevention, Tertiary
- ▶ Preventive Services
- ▶ Provider

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National Identity

Synonyms

Ethnic group

Definition

The national identity refers both to the distinguishing features of the group, and to the individual's sense of belonging to it. It is often used as synonym for ► ethnic identity due to shared cultural or social identity for the nation members.

Cross-References

► Cultural Identity

National Institute for Health and Clinical Excellence

Synonyms

NICE

Definition

NICE is part of the National Health Service for England and Wales. Its most important task is to identify and assess cost-effective health care technologies and develop ► clinical guidelines that include economic criteria.

Cross-References

► NICE

National List of Occupational Diseases

Definition

National list of occupational diseases is a list of ► occupational diseases adopted by the competent national authority, in consultation with national occupational health experts and most representative organizations of employers and workers. The purpose of this list is prevention, recording, notification and, if applicable, compensation of occupational diseases. It is suggested that in ILO member countries these list have to include at least the diseases enumerated in Schedule I of the Employment Injury Benefits Convention, 1964 (amended in 1980). Also, it is suggested by ILO that other diseases with a proved occupational origin have to be included on that list. As each country has to decide on the contents of their own list there are huge differences in national lists of occupational diseases; thus international comparison of occupational disease incidence is almost impossible.

Native

Synonyms

Indigenous; Endemic; Autochthonous; Aboriginal; Genuine; Inherited; Inborn; Natural

Definition

The term native refers to denote indigenous origin, growth or production. It is used for members of the original inhabitants of a particular place (tribal, aboriginal). Also, it may refer to feature of being such by birth or origin, or occurring in nature pure, existing as such by nature.

Cross-References

► Ethnic
► Indigenous Health, South America

Native Americans

► Indigenous Health, North America
► Inuit

Natives

► Autochthonous Population
► Indigenous Peoples

Natural

► Indigenous
► Native

Natural History

Definition

Natural history refers to the progression of a disease in an individual over time, including all disease-related stages from before initiation of a disease (the stage of susceptibility) until the resolution of a disease (the stage of recovery, disability or death). In other words, it is the evolution of a disease without medical intervention. The natural history model includes the several stages of the disease: stage of susceptibility, sub-clinical stage, clinical disease stage, and stage of recovery, disability or death.

Cross-References

► Preclinical Phase of Disease

Natural Rights

Synonyms

Human rights

Definition

In order to defend the individual against abuses by government, institutions and also by other individuals (e. g. a majority group), there have been in the last century some declarations which have pointed out some absolute rights of each and every human being. They embrace the most important aspects of life and in some countries some of them have been embodied into specific laws.

Cross-References

► Human Rights
► Human Rights and Public Health

Natural Science

Definition

A study of living and non-living matters and the description and definition of the information gathered. Chemistry, physics, and biology are traditionally included.

Natural Selection

Definition

The theory of natural selection states that changes in the ability of an organism to thrive in its environment caused by specific ► allele(s) in its ► genome will affect the ability of this organism to reproduce and thus affect the frequency of these alleles in future generations. Natural selection can be positive or negative in direction.

NCCHTA

Definition

The National Coordinating Center for Health Technology Assessment (NCCHTA) manages, supports

and develops the UK's National Institute for Health Research HTA program under contract from the Department of Health Research and Development Division. NCCHTA is based at the University of Southampton. The HTA program is a national program of research whose purpose is to ensure that high quality research information on the costs, effectiveness, and broader impact of health technologies is produced in the most effective way for those who use, manage, and provide care in the ► NHS. Once ► NICE has identified the technologies it wishes to appraise and the timetable leading to the publication of NICE guidance, the HTA program becomes the interface between NICE and the review groups contracted to produce the assessment reports.

Needs

► Motivation

Negative Predictive Value

► Screening

Negative Selection

Synonyms

Purifying selection

Definition

The process by which deleterious ► alleles are removed from the gene pool due to a reduction in fitness caused to the organism which carries them in its ► genome. This is often seen in genes which are functionally constrained, whereby any changes in the amino acid structure of the protein deleteriously affects its function. The ongoing process of occurrence and removal of deleterious alleles has been incorporated into the neutral theory resulting in the nearly neutral theory of evolution.

Neoplasms

► Cancer

Nephropathia epidemica (NE)

► Hanta Fever

Nested Case Control Study

Definition

A nested case-control study is a case-control study "nested" within an ongoing cohort study. Assessment of exposure may be time-consuming and costly. Instead of undertaking measurement on everyone in a cohort, it may be more efficient to construct a case-control study within the cohort once a significant number of cases of the disease of interest have emerged at follow-up (the cases for the nested case-control study). Thereafter, a control group could be selected among those from the cohort who had not developed the disease. Compared with case-control studies, a nested case-control study can reduce recall bias and temporal ambiguity. Compared with cohort studies, nested case control studies can have a lower cost and save time.

Nest Protection

Synonyms

Antibodies transferred during pregnancy

Definition

During pregnancy maternal ► antibodies of the IgG-type can pass through the placenta and are transferred to the unborn child. These antibodies protect the baby from a number of infectious diseases. After birth the protective effect remains for a while but it gradually declines with the antibodies being inactivated and vanishing completely within 3–6 months. Despite the presence of maternal antibodies there is no nest protection against pertussis (whooping cough).

Cross-References

► Immunization, Passive

Net Reproduction Rate (NRR)

Definition

Net reproduction rate (NRR) is the average number of daughters that would be born to a woman during her lifetime if she passed through her lifetime from birth to the end of her reproductive years conforming to the ► age-specific fertility rates (ASFR) and mortality rates of a given year. NRR is always lower than GRR because it takes into account the fact that some women will die before entering and completing their childbearing years. Also, NRR will be less than half the magnitude of the TFR. Replacement level ► fertility is said to have been reached when NRR=1.0 (► total fertility rate (TFR); ► gross reproduction rate (GRR); ► fertility replacement).

Network

Definition

A grouping of individuals, organizations and agencies organized on a non hierarchical basis around common issues or concerns, which are pursued proactively and systematically, based on commitment and trust. WHO actively initiates and maintains several health promotion networks around key settings and issues. Networks of networks are also being established. Examples include the WHO (EURO) initiative "Networking the networks" and global networking initiatives for health promotion in order to build a global alliance for health promotion.

Networks

Definition

A network is a grouping of individuals, organizations and agencies organized on a non hierarchical basis around common issues or concerns, which are pursued proactively and systematically, based on commitment and trust. WHO actively initiates and maintains several health promotion networks around key settings and issues like health promoting hospitals, cities, workplaces, etc.

Neural Network

► Artificial Neural Network

Neural Tube Defects

Definition

Neural tube defects are congenital defects of the central nervous system, including the spinal cord, skull and brain, resulting from failure of the neural tube to properly close during embryonic development. Defects may include anencephaly (absence of the skull), and protrusions of the brain or spinal cord (spina bifida). Neural tube defects may be detected prenatally by amniotic fluid or blood tests and by ultrasound technology. The intake of folic acid before and during the first weeks of pregnancy is effective in the prevention of neural tube defects.

Neuraminidase Inhibitors

Definition

Neuraminidase inhibitors impair the effect of neuraminidase. By blocking the virus release, the spread of the virus is inhibited. Two different substances are available: oseltamivir (Tamiflu®) can be given orally, zanamivir (Relenza®) is inhaled. The treatment with neuraminidase inhibitors should begin within 48 hours after the onset of infection. If therapy starts in time, severe courses and lethal outcomes can be prevented. Neuraminidase inhibitors are effective against influenza viruses A and B. As influenza C viruses do not produce neuraminidase, neuraminidase inhibitors are, of course, not effective against this subtype.

Neuraminidase (NA)

Definition

Neuraminidase is a viral protein, which plays an important role in virus release. Today, 9 different serotypes are known. Neuraminidase is built by influenzaviruses A and B, but not by influenzavirus C.

Neuro-Endocrine Immune-Network

► Psychoneuroimmunology

Neurology

Definition

Neurology refers to the medical specialty concerned with the diagnosis and treatment of disorders of the nervous system, which includes the brain, the spinal cord, and the nerves.

Neuropsychologist

Definition

A neuropsychologist has finished a special education in the neurobiological causes of brain disorders, specialized in diagnosing and treating these illnesses with a primarily medical approach. The field of neuropsychology has bonds with psychology and neurology and examines how the structure and function of the brain relate to specific psychological processes and overt behaviors. Neuropsychologists may work in academia, clinical settings, forensic settings, or industry.

Neurosurgery

Definition

Neurosurgery is the specialized branch of surgery that treats diseases that affect the ► central nervous system (CNS). A neurosurgeon is a physician who has received extensive training in the surgical and medical management of neurological diseases. Neurosurgery is one of the most sophisticated surgical specialties and includes advanced surgical and imaging technology and new research in molecular neurosurgery and gene therapy.

Neurotic Depression

► Dysthymia

Neutral Theory of Evolution

Definition

The neutral theory of evolution states that the majority of polymorphisms within a ► genome have no effect on the fitness of an organism. Changes within a population in the frequency of these alleles over time occurs by a process of genetic drift, caused by random sampling effects in the formation of successive generations. A neutral ► allele may be expected to increase or decrease in any given generation with equal probability, however, over time the neutral theory predicts that an allele will be either eliminated or fixed within the population by genetic drift. An equilibrium is produced by the counteracting effects of genetic drift homogenizing the gene pool and mutation introducing novel alleles into it. Genetic drift has the greatest effect in populations which are very small, such as ones which have undergone a population bottleneck.

New Testament

Definition

The New Testament provides the main source of religious information for devoted Christians. It readily accepts the Jewish scriptures taken out of the Old Testament. It contains some record of the speech and actions of Jesus Christ as well as records about some selected followers, especially the apostles.

NHS Economic Evaluation Database (NHS EED)

Definition

NHS EED has been funded by the Departments of Health of England and Wales to assist decision-makers by systematically identifying and describing economic evaluations, appraising their quality, and highlighting their relative strengths and weaknesses. NHS EED saves decision-makers time that might have been spent searching for studies in databases such as MEDLINE and EMBASE. The economic evaluation literature is recorded in many electronic databases and paper-based resources. A strength of the database is that not only

does NHS EED save time by gathering information together in one place, it also provides critical assessments of the quality of the economic evaluations included.

NICE

Definition

The UK's National Institute for Health and Clinical Excellence (NICE) is the independent organization responsible for providing national guidance on the promotion of good health, and the prevention and treatment of ill health. NICE produces guidance in three areas of health: public health (guidance on the promotion of good health and the prevention of ill health for those working in the NHS, local authorities, and the wider public and voluntary sector), health technologies (guidance on the use of new and existing medicines, treatments, and procedures within the NHS), and clinical practice (guidance on the appropriate treatment and care of people with specific diseases and conditions within the NHS). Although the methods for developing the various forms of guidance differ, all the development processes are underpinned by the key Institute principles of basing recommendations on the best available evidence and involving all stakeholders in a transparent and collaborative manner.

Cross-References

► National Institute for Health and Clinical Excellence

Nicobari

► Indigenous Health, Asian

Nicotine Use

► Smoking Behavior

Nietzsche, Friedrich

Definition

Friedrich Wilhelm Nietzsche was born on 5th October 1844 and died on 25th August 1900 in Weimar. He was a German philosopher and scholar of classical traditions.

Noise

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Definition

Noise is a class of sounds that are considered as unwanted. ► Sound is produced by vibratory movement of molecules in solid bodies and fluids, causing a series of pressure changes.

Basic Characteristics

Physical Aspects of Noise

Sound frequency is defined as the number of sound pressure changes per time unit. It is expressed in Hertz units (1 Hz = one pressure change per second). Sound level is defined as the logarithmic ratio between the actual sound pressure (P) and the sound pressure at hearing threshold (P_0), according to the following formula:

$$L = 20 \log_{10} P/P$$

Sound level is expressed in decibel units (dB). Concerning the time characteristics of sound, it can be continuous or intermittent (pauses longer than 1 second), while a sudden change of sound pressure during a period shorter than one second is referred to as an impulse.

Public Health Importance

Noise is a ubiquitous noxious factor in living and occupational environments. Globally, some 120 million people are estimated to have disabling hearing difficulties caused in part by excessive noise exposure in the workplace or during recreational activities. It has been estimated that every fifth European citizen lives in so-called "black acoustic zones" with an ► equivalent continuous noise level over 65 dB measured in A, a ► frequency weighting that is considered to produce strong acoustical stress. Furthermore, every third European citizen may suffer from sleep disturbances due to exposure to

noise levels over 55 dB (A) at nighttime. In industry, about 50% of workplaces are exposed to unacceptable noise levels.

Hearing Impairment

Normal hearing is the ability to hear sounds in the frequency range from 16 Hz to 20000 Hz, and in a dynamic range of 10^{-12} to 10^{2} W/m^2. It is a well-known fact that hearing sensitivity decreases with age, and this physiological phenomenon is referred to as ► presbyacusis. Besides hearing impairment caused by profession, there is sociacusis – a hearing impairment provoked by life-style factors – frequent exposure to loud noise in discotheques or rock concerts, or from driving sport motorcycles. A person entering a very noisy area may experience a measurable loss in hearing sensitivity, but may recover some time after returning to a quiet environment. This phenomenon can be measured as a reversible or temporary shift in audiometric thresholds, and is called noise-induced temporary threshold shift (NITTS). It is usually followed by the symptom of tinnitus. Measurements of NITTS are made by comparing pre- and post-exposure ► audiograms. A typical audiogram of NITTS shows impairment in both bone and air conduction, because the loss is sensoneurial, with a symmetrical and bilateral loss that reaches a maximum of around 4000 Hz. If a person with NITTS is exposed to noise before full restitution of hearing, NITTS could turn into a permanent threshold shift (NIPTS). When NIPTS exceeds the arithmetic mean level of 25 dB at the frequencies 500, 1000, 2000, and 4000 Hz, this is referred to as noise-induced permanent hearing loss, which is incurable. The adverse effects of noise on hearing may be enhanced by a variety of ototoxic drugs and environmental chemicals. Ototoxic drugs include streptomycin, gentamicin, aspirin, and cisplatin. Ototoxic chemicals comprise asphyxiants (carbon monoxide, cyanides), organic solvents (toluene, styrene, carbon disulfide), and metals (lead, arsenic, and mercury).

Sleep Disturbances

The optimal sound level for normal sleep is 30 dB (A) L_{eq}. If the noise level is higher, disturbances may occur before, during, and after sleep. Effects before sleep include a prolonged time to fall asleep. During the sleep period, the most important ► electroencephalogram changes include shortening or absence of ► sleep stage 4, and awakenings. Sleep stage changes towards lighter sleep can be detected in the laboratory when sound pressure levels exceed 40 dB (A), while awakenings start at 45 dB (A). After-effects of noise-disturbed sleep include fatigue on awakening and during the whole day, and changes in mood, particularly depression and low mental performance.

Cardiovascular Effects

On acute exposure of humans to noise levels of about 90 dB (A), blood pressure may be raised as a consequence of the increased secretion of catecholamines; increased concentration of lipids in the blood and raised aggregation of thrombocytes may also be observed. The major cardiovascular diseases that have been studied for possible correlation with long-term exposure to noise are arterial hypertension and myocardial infarction. Professional exposure to noise above 85 dBA for 10–20 years brings a significantly higher risk of arterial hypertension. In community settings, noise levels are much lower and the results of epidemiological studies on the relationship between noise and cardiovascular diseases are not consistent.

Behavioral Effects

The effects of community noise may be evaluated by assessing the extent or degree of general annoyance among exposed individuals or the interference with different activities. A noisy environment can have a negative impact on various aspects of human behavior: a) overt everyday behavior patterns (e. g. opening windows, using balconies, TV and radio use, writing petitions, complaining to authorities), b) human performance on specific test tasks (school achievement, vigilance, choice-reaction time, short-term memory, air traffic control), c) social behavior (aggression, unfriendliness), and d) social indicators (residential mobility, hospital admissions, drug consumption, accident rates).

Mental Health

Noise is a stressor that may have a significant negative effect on the mental health of people with already pronounced neurotic traits and weak ability to cope with stress. The most frequent psychological symptoms

in people chronically exposed to noise are headaches, irritability and anxiousness, depression, insomnia, and fatigue. Consumption of tranquillizers and hypnotics is usually higher in these people.

Noise Counter-Measures

These measures are performed at the source of noise, or are used to prevent propagation of the noise to recipients. At the source, noise reduction and sound-isolation is performed on machinery, vehicles, planes, etc. The noise limit for light vehicles in Europe is 75 dB (A) and for heavy vehicles it is 80 dB (A). A reduction in traffic is enforced by regulations in the night period (22h–06h). Other measures to reduce noise are "pedestrian days" in busy streets and "car free days", when people are advised to use public transport or to go on foot to and from work. "Ecological traffic lights" warn drivers to turn off their engines while waiting for the green light. The measures to prevent propagation of noise include sound-isolating windows and doors, paving with asphalt, sound-isolating boards inside rooms, plant or concrete screens beside motorways, and ► active noise control. If these measures do not lower the level of noise to below 85 dB (A), ► personal hearing protection is needed. Earplugs, earmuffs, and helmets must have a minimal noise reduction effect of 15 dBA, 25 dBA, and 40 dBA, respectively.

Cross-References

► Active Noise Control
► Audiogram
► Electroencephalogram
► Equivalent Continuous Noise Level
► Frequency Weighting
► Personal Hearing Protection
► Presbyacusis
► Sleep Stage
► Sound

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Noise Cancellation

► Active Noise Control

Noma

Synonyms

Cancrum oris; Gangrenous stomatitis

Definition

Noma, from the Greek word "nomein" (to devour), is a devastating gangrene of the mouth, cheek and face. It starts with ulcers of the oral mucous membranes. Rapid, painless tissue breakdown continues and this gangrenous process can destroy soft tissues and bone within days. Noma is associated with high mortality and leads to disability and disfigurement in the survivors.

The disease affects almost exclusively young children in underdeveloped countries, particularly in Africa, who are living under conditions of severe malnutrition and poor sanitation that undermine their resistance. Frequently, the disease commences during the regression phase of illness such as measles, scarlet fever, tuberculosis, or immunodeficiency.

Several elements of a plausible aetiology have been identified: extreme undernutrition/malnutrition and poverty, a compromised immune system, poor oral hygiene, and an unidentified bacterial factor acting as a trigger for the disease.

Nomad

Definition

Nomad is defined as a member of a group of people who have no fixed home and move according to the seasons from place to place in search of food, water, and grazing land. Many of indigenous peoples worldwide used to have or adopted such a way of life.

Cross-References

► Indigenous Health Care Services

Non-Clinical Trials

Definition

Non-clinical trials are all forms of studies generating knowledge in healthcare besides those in a clinical setting. Examples are studies or research on prevention, diagnosis, prognosis, and therapy, retrospective database analysis, and modeling, etc.

Non-Communicable Diseases

Synonyms

Non-infectious; Non-contagious diseases

Definition

A non-communicable disease or NCD is a disease which is not contagious. Such diseases usually derive from genetic predisposition and/or certain lifestyle characteristics. Diseases that occur due to different lifestyle factors sometimes are called diseases of affluence. For example, NCDs are obesity, diabetes, hypertension.

Non-Contagious Diseases

► Non-Communicable Diseases

Non-Contaminated Water

► Drinking Water

Non-Directional Test

► Two-Sided Test

Non-Directiveness of Genetic Counseling

Definition

► Genetic counseling shall ensure that individuals have the facts to enable them to make their own decisions.

Non-Exercise Activity Thermogenesis (NEAT)

Definition

Describes the energy consumption of all physical activities other than volitional sporting-like exercise. NEAT includes all the activities that render us vibrant, such as working, posture, etc.

Non-Experimental Studies

Synonyms

Observational studies

Definition

A type of study in which individuals are observed or certain outcomes are measured. No attempt is made to affect the outcome (for example, no treatment is given).

Cross-References

► Cohort Studies
► Observational Studies

Non-Gonococcal Urethritis (NGU)

► *Chlamydia trachomatis* Infection

Non-Infectious

► Non-Communicable Diseases

Non-Maleficience

Definition

Non-maleficience goes back to the ► hippocratic oath (forth century before Christ), which concerns the doctor–patient relationship, focusing on the physician's code of conduct. It stated: "I will use treatment to help the sick according to my ability and judgment, but I will never use it to injure or wrong them." To the letter it means " Not doing harm."

Nonmarital Birth Rate

► Nonmarital Fertility

Nonmarital Fertility

Synonyms

Out-of-wedlock childbearing; Nonmarital birth ratio; Nonmarital birth rate

Definition

Nonmarital fertility is childbearing by unmarried women, including women in cohabiting partnerships. One common measure is the nonmarital birth ratio, or the percent of all births that occurred to unmarried mothers. A second measure is the birth rate among unmarried mothers. The nonmarital birth ratio measures how common nonmarital childbearing is among new mothers or among newly born children, whereas the nonmarital birth rate measures the overall levels childbearing among unmarried women. The nonmarital birth ratio can increase even when the nonmarital birth rate declines, for instance if fewer women marry or if marital birth rates decrease.

Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)

Synonyms

Drugs to treat AIDS; AIDS-therapeutics; Anti-HIV medications; Antiretroviral medications

Definition

Nonnucleoside reverse transcriptase inhibitors (NNRTIs) bind directly to the enzyme. The substances are very sensitive, thus resistance can easily develop. A problem, which has to be faced, is the possibility of cross-resistance, that means when there is a resistance against one NNRTI, all NNRTIs become ineffective. Available NNRTIs are efavirenz (EFV, SUSTIVA®), nevirapin (NVP, Viramune®) and delaviridin (DLV, Rescriptor®). The most frequent side effects are allergic reactions and liver toxicity, furthermore, exanthema can develop; as for efavirenz, central nervous system effects have been observed.

Nonparametric Test

Definition

Inferential statistical method that is sometimes referred to as distribution-free procedure. In general, these procedures can be used with nominal or ordinal measures and do not have assumptions requiring that distributions of variables be of certain shapes (in contrast to parametric procedures, which invariably require normal distributions and interval or ratio measures).

Non-Prescription Drugs

Synonyms

Over-the-counter drugs

Definition

Non-prescription drugs are medications that can be sold legally without a prescription, in contrast to drugs that are only available on prescription. In general, OTC drugs have to be primarily used to treat conditions that do not require a direct medical supervision and which must be proven to be reasonably safe and well tolerated.

Cross-References

► Over-the-Counter Drugs

Non-Specific Occupational Diseases

► Work-Related Diseases

Non-Specific Urethritis (NSU)

► Chlamydia trachomatis Infection

Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Synonyms

Pain-reliever; Painkillers; Drugs against pain; Analgesics; Antipyretics; Drugs against fever

Definition

Prostaglandins play an important role in development and maintenance of inflammatory processes, pain and fever. For there synthesis two enzymes are necessary, cyclooxygenase (COX) 1 and 2. The effect of non-steroidal anti-inflammatory drugs (NSAIDs) is due to a more or less specific impediment of cyclooxygenases and thus of the synthesis of prostaglandins. As they are very effective against inflammation, fever and pain, NSAIDs are the most often used drugs, not only on prescription but also as self-medication. Due to their widespread use, the sometimes severe side effects of NSAIDs should be taken into consideration. In most cases these side effects relate to the gastrointestinal tract; gastrointestinal ulcers, bleeding or even perforation. The most common drugs in this group are acetylsalicylic acid (aspirin), diclofenac, ibuprofen, paracetamol and metamizole.

Non-Surgical Diagnostics and Therapy

► Internal Medicine

Noongar (Southern and Western Australia)

► Indigenous Health – Australooceaninan

Normal

Definition

The term normal can refer to:

1. a value of a diagnostic test which defines patients who are not diseased.
2. a value of a screening test which defines patients who probably do not have the disease.
3. a Gaussian distribution of variables or a normal distribution, the bell-shaped curve.

In a ► screening test, any value can be considered normal if no increased risk has been found to be associated with it. Normal can therefore be defined as any usual or typical value of some human characteristic (e. g. average weight). It is opposite of the abnormal or unusual.

Normal Distribution

Definition

A normal distribution is a theoretical probability distribution with a symmetric and bell-shaped probability density curve. This can be expressed mathematically using the formula:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/2\sigma^2},$$

where σ is ► standard deviation, μ is the ► mean, e is approximately 2.72, and π are approximately 3.14. The shape of this curve is completely determined by the ► mean and ► standard deviation. A special type of normal distribution is the standard normal distribution in which $\mu = 0$ and $\sigma = 1$. Any normal distribution can be converted to a standard normal distribution by the transformation: $Z = (X - \mu)/\sigma$. With this formula any score from an original normal distribution can be converted to a ► z-score.

The normal distribution is the most important distribution in statistical theory. It was developed by de Moivre as an approximation to the ► binomial distribution, and later used by Laplace to study measurement error, and by Gauss in the analysis of astronomical data.

The normal distribution is depicted as curves which are mesokurtic symmetrical, or bell-shaped. The mean value corresponds to the highest point on the curve and is identical to the mode and median value. Many phenomena in medicine conform to a normal distribution and the variables most often tend to follow a Gaussian curve with most of the values grouped near the mean and few in the tails. Nevertheless, empirical distributions always possess some degree of distortion from an ideal normal curve:

1. When the mean increases, because of more extremely large values, the curve becomes skewed to the right or positively skewed and the mean becomes

greater than median and mode (mean > median > mode);
2. When the mean decreases, because of more extremely low values, the curve becomes skewed to the left or negatively skewed and the mean becomes less than the median and mode (mean<median<mode);
3. When the variance increases the curve becomes flattened – platykurtic distributions;
4. When the variance decreases the curve becomes more peaked – leptokurtic distributions.

Deviation of the empirical distribution from the normal distribution can be estimated by applying statistical tests, for example chi-square ► goodness-of-fit test or ► Kolmogorov–Smirnov test, for testing the null hypothesis that the sample data come from a normal population.

The normal distribution is widely used in statistics. Examples are (a) classic statistical tests based on assumptions about the normality of data, (b) determination of significance levels in many hypothesis tests and confidence intervals, and (c) approximation of other probability distributions by a normal distribution, such as ► binomial distribution or ► Poisson distribution. This is possible because of the central limit theorem, which states that regardless of the distribution of the parent population, the distribution of the sample means approaches a normal distribution for a large sample.

Norovirus Infection

► Norwalk Virus Infection

Northern Indigenous Peoples of Russia (Siberia and Russia)

► Indigenous Health, Asian

Norwalk Virus Infection

Synonyms

Norovirus-infection

Cross-References

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Nosocomial Infections

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Synonyms

Hospital-acquired infections; Infections occurring in hospital patients; Infections originating in medical facilities; Infections with hospital pathogens; Infections with hospital germs; Infectious hospitalism

Definition

Nosocomial infections are caused by microorganisms and appear in hospitals or other medical institutions (doctor's practices, out-patient care). Most frequently, they are transmitted by medical or nursing activities. The condition of hospital buildings and organizational processes play an important role in the development of infections with hospital germs.

Basic Characteristics

History

The term nosocomial infections stems from the Greek word for hospital, "nosokomeion" (νοσοκομειον). Ever since people have been treated in hospitals, infections have occured during their stays. How hospital-acquired infections develop began to be understood when bacteria and other microorganisms were detected as the cause of infectious diseases during the 19th century. In the middle of the 19th century, the Hungarian obstetrician Ignaz Philipp Semmelweis discovered that the high postpartum lethality in women was due to the transfer of germs on the unwashed hands of physicians (http://inventors.about.com/library/inventors/blantisceptics.htm). At the same time, the American physician Oliver Wendell Holmes engaged in studies about childbed fever (puerperal fever) revealed the same results as Semmelweis. The British surgeon and biologist Joseph Lister succeeded in showing that germs were spread through the air and that they stuck to the instruments and the hands of surgeons.

In 1867, Lister introduced phenol (carbolic acid) as an ► antiseptic and thus inaugurated the era of antiseptic surgery. Thanks to the establishment of hand washing, heat-sterilization of instruments and antiseptic measures the number of nosocomial infections considerably declined. Although standards are high today, hospital-acquired infections are still significant and costly.

Origin of Nosocomial Infections

Microorganisms exist worldwide and do not stop at the walls of a hospital or exempt physicians, nurses or other medical staff. Due to the multitude and the variety of germs, it is impossible to achieve absolute sterility. Up to 10% of patients acquire a nosocomial infection during their stay in hospital with the probability depending on the duration of the stay and the severety of the illness. Up to 25% of patients in intensive care units can be expected to develop a nosocomial infection. The most common infections are pneumonias and urinary tract infections. The development of a ► sepsis must also be mentioned. The most common nosocomial infections are caused by enterococci, staphylococci and bacteria of the family *Pseudomonaceae*. Many microorganisms belong to the natural flora of different parts of the body; whenever they penetrate into other, untypical regions, they can cause disease. As microorganisms are not visible to the naked eye, it is difficult to assess the danger of transmission. To avoid transmitting pathogens it is necessary to comply with particular hygienic rules. Developing countries often face the problem that, due to a lack of human resources and equipment, a sufficient hygienic standard cannot be achieved, but similar situations can facilitate the occurrence of nosocomial infections in industrial nations too. For example, the transmission risk is increased by certain structural conditions, such as a lack of space or substandard buildings. In this connection, the risk of ► legionellosis due to faulty water pipes and air-conditioning systems has to be mentioned. Also the quality and conditions of work of staff has to be taken into consideration; a lack of sufficiently qualified team members, missed training courses about hospital hygiene, rate settings, bad working conditions and a high workload can all cause a disregard of hygienic rules. The hands of medical staff are the most important mode of transmission of pathogens; infections are frequently caused by insufficient ► hygienic hand disinfection. Among the medical measures that facilitate the occurrence of nosocomial infections are: venous cannulation, central vein catheterization, urinary (urethral) catheterization and mechanical ventilation. The risk of infection increases if these procedures continue for a long time or if frequent manipulations are necessary. Also, in severe injuries, if the wounds have large surfaces or if the immune status is weakened, there is an increased risk of nosocomial infections. Moreover, it has to be mentioned, that the uncritical use of antibiotics has led to the development of (multi-)resistant strains of bacteria. These so-called problem germs can appear either in a single patient or in complete sectors of a hospital and are difficult to kill by antiseptic measures or antibiotic therapy.

Disinfection

Disinfection is a very important hygienic measure, not only used in medicine. By its means, objects, rooms, surfaces or parts of the body (hands and other parts) achieve a almost pathogen-free state. Disinfection has to be differentiated from ► sterilization. Disinfectants can eliminate pathogens, impair their growth or kill them. The reduction of germs at least has to reach the factor 10^{-5}. That means, that out of 100,000 germs only one microorganism survives. Mechanical disinfection involves hygienic hand disinfection as well as well as measures of washing and rubbing. Physical disinfection can be carried out with radiation (UV-light) and with moist or dry heat. Furthermore, a number of substances are effective chemical disinfectants. To be usable, disinfectants have to fulfill three criteria: the effects have to be reached within an acceptable time interval; the measure has to be tolerated well, that means, the disinfectant must not be toxic, and it must neither damage the materials nor be a smell annoyance; the disinfectant has to be efficient. There are, however, disadvantages to using disinfectants; one has to remember that there is no differentiation between useful and pathogenic germs, natural skin flora will be eliminated; the skin is degreased; skin irritations and eczema can appear; furthermore, the skin is more susceptible to allergens and fungal infections; unthinking disposal of disinfectants has a harmful environmental effect as the natural microbial balance is influenced (http://en.wikipedia.org/wiki/Disinfection).

Further Hygienic Measures/Prophylaxis

Members of the medical team should know that their own hands are the main source of infection when coming into contact with patients. Due to this fact, careful hygienic hand disinfection always has to be carried out. Drawing up standards concerning invasive procedures or the treatment of indwelling foreign bodies (catheters, drains, etc.) may help to make the execution of hygienic procedures automatic and increase compliance. Moreover, rational antibiotic therapy, which is exactly matched to the pathogens involved, is important. By the uncritical use of antibiotics, development of resistant (or even multiresistant) pathogens is facilitated. When multiresistant pathogens evolve, special hygienic measures are necessary; despite the increase in time and work they involve for the staff, as they prevent the spread of infection. Infected patients should be isolated with separate toilet facilities. Beside disinfecting their hands, the staff have to wear protective clothing (gloves, mouth-nose mask and protective coat). Materials, which even hint of being contaminated, have to be marked and properly disposed of. If diagnostic or surgical measures are necessary the infected patients must be placed at the end of the theater list. After any procedure, a total surface disinfection has to be carried out. The isolation of the patient does not end until the multiresistant organism cannot be repeatedly cultivated. Any carriers, including staff and other patients, must be treated until free of the infecting organisms. The application of these precautions against carriers of multiresistant germs is only necessary in hospitals and certain nursing care institutions as carriers present no risk to healthy individuals.

Multiresistant Problem Pathogens

► Methicillin- (or multi-)resistant ► *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE) belong to the multiresistant pathogens, which are found in hospitals. It is important to differentiate between a ► colonization and an infection with a multiresistant germ. MRSA, which is spread worldwide, is characterized by a changed penicillin-binding protein. As this protein is resistant against beta-lactam antibiotics (penicillins, cephalosporines, carbapenems), treatment becomes more difficult. Factors which increase the risk of MRSA-infections are vascular catheters, wound drains, wounds with large surfaces and chronic skin lesions (decubitus ulcers, ulcus cruris). If a MRSA-infection needs treatment, linezolid, fusidic acid, ► vancomycin or teicoplanin can be used. However, vancomycin-resistant strains of MRSA have already appeared. An MRSA infection in the nasal vestibules can be treated with a local application of mupirocin ointment (Turixin®). VRE first appeared in 1994. Enterococci belong to the natural intestinal flora and are also found in the female urogenitary tract. Similar to MRSA, VRE show no higher virulence than germs of the same species which are sensitive to antibiotics. The mere presence of VRE is not dangerous, but an infection is difficult to treat as only a few effective antibiotics are available (http://www.who.int/csr/resources/publications/drugresist/WHO_CDS_CSR_EPH_2002_12/en/).

In conclusion, it has to be pointed out that, due to the omnipresence of microorganisms, the transmission of germs during a stay in hospital and the resulting occurrence of a nosocomial infection is a great problem even in modern medicine. To prevent hospital-acquired infections, hygienic rules have to be followed consistently, particularly hygienic hand disinfection. Furthermore, a critical use of antibiotics has to be instituted in order to avoid the development of multiresistant germs.

Cross-References

► Antiseptic
► Colonization
► Hygienic Hand Disinfection
► Legionellosis
► Methicillin
► Sepsis
► Staphylococcus aureus
► Sterilization
► Vancomycin

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http://en.wikipedia.org/wiki/Nosocomial_infection
http://en.wikipedia.org/wiki/Disinfection

Notifiable Disease

Synonyms

Reportable disease

Definition

Notifiable (reportable) diseases are diseases that are required by law to be reported to governmental authorities by medical practitioners. They used to vary according to individual state laws. Each country will have its own arrangements for developing surveillance data according to its own needs and resources. The World Health Organization (WHO) maintains worldwide coverage of selected diseases and solicits the reporting of other diseases on a voluntary basis. By international law, plague, cholera, and yellow fever are reportable to the WHO. Data on these diseases are summarized in a weekly epidemiologic report prepared and distributed by the WHO.

Within the U.S., each state has its own laws concerning what diseases are reportable and how they should be reported to the state health department. The number of diseases reportable within the states varies from 35 to 120. State laws include penalties for not reporting reportable diseases.

The main concern of the modern statutory notification system is speed in detecting possible outbreaks; accuracy of diagnosis is only secondary.

Nuba (Eastern Africa, Sudan)

► Indigenous Health – Africa

Nuclear Medicine

Definition

Nuclear medicine is the branch of medicine that is concerned with the use of radioisotopes in the diagnosis, management, and treatment of disease. It usually uses small amounts of radioactive materials or radiopharmaceuticals, substances that are attracted to specific organs, bones, or tissues. The radiopharmaceuticals that are utilized in nuclear medicine emit gamma rays that can be detected externally by special types of cameras so that images can be formed to provide data and information about the respective area of the body.

Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)

Synonyms

Drugs to treat AIDS; AIDS-therapeutics; Anti-HIV medications; Antiretroviral medications; Nukes

Definition

Nucleoside and nucleotide reverse transcriptase inhibitors (NRTIs) were the first drugs used for the treatment of AIDS. These substances, which are colloquially called “nukes”, introduce elements which disrupt viral reproduction. According to the characteristics of the agent used, the mistakes in viral construction appear at different parts of the virus. Thus the combination of different NRTIs can increase the antiviral effect. Azidothymidin or zidovudin (AZT, ZDV, Retrovir®), stavudin (D4T, Zerit®), zalcitabin (DDC, HIVID®Roche), didanosin (DDI, Videx®), lamivudin (3TC, Epivir®, Zeffix®), abacavir (ABC, Ziagen®), tenofovir (TDF, Viread®) and emtrictabin (FTC, Emtriva™) are some of the available NRTIs. They can be given as capsules or suspensions. Possible side effects are headache, stomach ache, nausea, diarrhea, exanthemas and an interference with the formation of blood.

Nukes

► Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs)

Null Hypothesis

Definition

A statistical statement of no effect or no difference. Since the statement of the research generally predicts the presence of an effect or a difference with respect to whatever it is that is being studied, the null hypothesis will generally be the hypothesis that the researcher expects to be rejected. The null hypothesis claims the results obtained from the study, experiment, or test are

no different from those obtained as a result of a coincidence. It is represented by the notation H_0.

Number of Children Born Alive

► Parity

Number Needed to Treat (NNT)

Definition

The number needed to treat (NNT) is a way of expressing the size of a treatment effect which is easier to interpret clinically. The NNT is the number of patients needed to be treated to prevent one additional bad outcome. This number is the inverse of the absolute risk reduction (ARR).

$$\text{NNT} = 1/\text{ARR}$$

$$\text{ARR} = \text{CER (control even rate)} - \text{EER (experimental even rate)}$$

NNT are always rounded up to the nearest whole number. The NNT is the number of patients who need to be treated with a given intervention/medication to prevent one bad outcome. It is the inverse of the ARR (absolute risk reduction): NNT = 1/ARR. Advantages of the use of the NNT are: incorporation of changes in baseline risk, greater clinical relevance than the absolute and relative risk reduction, and the possibility to compare the relative merits of drugs. Disadvantages are: placing emphasis on the positive side of therapeutic interventions, the lack of information on the magnitude of the baseline risk, and the lack of comparability for different baseline risks.

Number Treated Needlessly (NTN)

Definition

The NTN is the number of individuals who are treated with a given intervention/medication without benefit. The formula is: NTN = NNT − 1. Advantages of the NTN are: it incorporates changes in baseline risk, it is complimentary to the NNT, it can compare the relative burden of different interventions, and it encourages selective targeting of drug treatment versus a broad application of treatment results.

Numerator-Denominator Bias

Synonyms

Numerator-denominator mismatch

Definition

A numerator-denominator bias is a systematic distortion due to a denominator that does not match the numerator, or *vice versa*. For example, when calculating the mortality rate of a population, a numerator-denominator bias will occur if the numerator does not relate to the population in the denominator. This would be the case if the numerator contained *all* deaths that occurred within a particular country, whereas the denominator contained only the resident population. The mortality rate calculated on this basis would systematically overestimate the true mortality rate of the resident population as deaths among visiting foreigners would be included in the numerator, but the foreign population is not part of the denominator.

Nunga (Southern South Australia)

► Indigenous Health – Australooceaninan

Nursing

► Breastfeeding

Nursing Bottle Syndrome

► Nursing Bottle Tooth Decay

Nursing Bottle Tooth Decay

Synonyms

Nursing-bottle syndrome (NBS)

Definition

Nursing bottle tooth decay is a severe kind of dental caries in young children caused by the frequent and

long lasting use of baby bottles with sugar-containing drinks or fruit juices. This kind of rampant tooth decay can either destroy the milk tooth or have negative effects on eating, speaking and the permanent dentition. In severe cases, all baby teeth are destroyed and have to be extracted under general anaesthesia. To prevent that kind of tooth decay it is recommended that children be encouraged to begin drinking from a cup as they approach their first birthday. At nap times or at night, children should not fall asleep with a bottle.

Nursing Homes

Synonyms

Residential health care facility

Definition

Nursing homes are residential health care facilities that provide institutional care for people recovering from an acute illness or suffering from a ► chronic disease, and who require skilled nursing care and 24-hour supervision. Besides the skilled nursing services, nursing homes offer significant assistance with ► activities of daily living as well as physical, occupational, and speech therapy. The objectives of the therapies offered are to enable the residents to recover from their disease or injury and to improve their ► functional ability. The majority of the residents, who are usually elderly, have chronic or long-term care needs that range from independent home care to care within intensive-care units of hospitals. The services offered by the nursing homes differ and range from nursing homes that offer only basic services to facilities with highly skilled and technologically state-of-the-art services that can be compared with medical units in hospitals.

Nutrition

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Synonyms

Eating; Ingestion

Definition

Nutrition is the absorption of liquid and solid food. Nutrition describes the processes whereby cellular organelles, cells, tissues – in short the whole human body – uses necessary substances which are obtained from food to maintain structural and functional integrity and to avoid deficiency. Nutrition is a complex interaction between internal or constitutional factors and external environmental factors which determine nutritional status. Nutrition is determined by cultural, social, economical and individual aspects. In addition to other ► lifestyle and environmental factors, nutrition influences health and well being. It is a major, modifiable and powerful element in promoting health, preventing and treating diseases and improving the quality of life. Nutrition is affected by consumption and communication. Nutrition contributes to prevention by containing vaccines like ► bioactive substances. Thereby it contributes to the physical, mental and social well being of people (Gibney et al. 2002; Gibney et al. 2004).

Basic Characteristics

Optimal balanced nutrition of a high quality has a major impact on health, well being and the quality of life. It is a complex interaction between internal and external environmental factors. The relationship between nutrition and health can be described in six quality levels:

Fulfillment of Demand

An ideal ► nutritional status provides the maintenance of all bodily functions of an organism, the avoidance of ► malnutrition and thereby it serves the maintenance of health and efficiency. In industrial countries there exists a big gap between food recommendations (► nutritional recommendations) and the supplied nutrients and the energy intake. Food is often too fat and it often consists of low fiber. Furthermore, salt, sugar and alcohol are consumed excessively. This malnutrition leads to a nutritionally adverse situation. The ongoing availability of food with a high energy supply in contrast to a low energy requirement is the main cause of the widely spread ► overnutri-

tion and obesity in industrial countries. ► Undernutrition and malnutrition are one of the main causes for diseases in the developing countries (► nutritional diseases). Malnutrition leads to diet-related diseases, e. g. protein-energy-malnutrition in developing countries (Leitzmann 2001; World Health Organization (ed.) 2003; Kasper 2007).

Prevention

Certain components of food, like bioactive substances or ► antioxidants fulfill, as protective elements, important preventive functions in the development of diseases.

Bioactive substances block the development of certain tumors and arteriosclerotic vascular diseases. The biggest group of these protective substances are ► secondary plant compounds. They are found in plants as pigments, growth regulators, repellents against vermins and parasites as well as aroma and scents. Approximately 1000 secondary plant compounds are absorbed daily. Thereof just a little group of approximately 100 substances has been investigated up until now. In a mixed diet approximately 1.5 g of secondary plant compounds are absorbed daily (Leitzmann 2001; Biesalski 2004).

Among other things antioxidants operate as scavengers in the human body. Free radicals emerge in the human body through tobacco smoking, certain drugs or UV-radiation. Free radicals are associated with diseases like tumors, arteriosclerosis and senile dementia. Antioxidants consist of vitamin C, E and carotenoids. A lot of vitamin C is bound, e. g. citrus fruits. The antioxidative effect can be best described by a little experiment with a sliced apple; the brownish coloration of the slice of an effected oxidation can be slowed down if it is dripped with lemon juice. Antioxidants appear in fresh fruits (e. g. citrus fruits) and vegetables (e. g. tomatoes, broccoli), herbs, nuts, coffee and tea. A rich vegetable diet which contains a lot of nutritional components provides good protection from chronic and degenerative diseases.

► Functional food products are frequently advertised as health improvers. This diverse food group consists of food and drinks, which are enriched with, for example, vitamins, bacteria cultures or secondary plant compounds. Good examples of functional food are pro- and prebiotica which are often offered in the form of yoghurts (► prebiotics, ► probiotics) (Biesalski 2004; Kasper 2007).

Pleasant Taste

People do not eat only to nourish themselves but also to enjoy the actual consumption of food and drink (► pleasant taste). Thereby food and drink are appreciated as individually learned sensual experiences. The sensual quality of food (► sensoric quality of food) gives a sense of enjoyment. The loss of the ability to taste, smell, judge the consistency and the color of food can lead to sensorial deprivation which can lead to a sensual loss or even to a lack of the ability to enjoy food at all.

The task of nutritional education is to develop and activate early sensuality and enjoyment. Those who enjoy develop situations of enjoyment and cultivate associations with the object of enjoyment, e. g. they choose dishes and refine them. Gourmets are in a position to maintain a proper balance, to control themselves and to accept abstinence. Enjoyment is one of the basic factors which leads to conserving health and, thereby, contributing to the well being of the individual (Thimm and Wellmann 2004; Kasper 2007).

Communication

Eating in a community takes place according to social rules. Common meals can be influenced through devotion, love and communication. People exchange views, share thoughts and experience, reach agreements and norms and values are facilitated. Common meals contribute to security and trust. They are also embedded in common care for each other and especially for children. In this way information can be exchanged, social behavior can be trained, relationships can be promoted and thus social well being can be enhanced. This “table community” symbolizes togetherness. Common meals offer a chance to develop social networks. Since the 70s common meals, taken with the family, have more and more been relegated to weekends; this development has led to a loss of social values and relationships (Hurrelmann 2002; Hurrelmann et al. 2006).

Lifestyle

Where, what and how much people eat and drink - in short their nutritional behavior (► behavior of nutri-

tion) – is basically influenced by their lifestyle; daily routine is affected by lifestyle which affects food preferences or dislikes and ways of eating and drinking.
In the course of the development of an individual, patterns of behavior are built up step by step until a whole individual lifestyle is adopted. Already by the stage of adolescence there are different styles found with regard to free-time and nutritional behavior. The "sportive type" for instance prefers healthy food; milk, fruit and vegetables are regularly on the menu. In contrast, the "television type" likes sweets, and rarely consumes healthy food. Whether adolescents follow a sportive or television orientated lifestyle may be, to a lesser degree, self-determined or dependent on their parents' influence, their education and social levels as well as on their educational environment. The nutritional behavior of adolescents and adults is part and parcel of their particular lifestyles and factors like attitude, knowledge, economic status and gender can have an influence (Gerhards and Rössel 2003).

Food Safety

Safe food, which is free from microorganisms, noxious and other hazardous substances that cause diseases, is an important condition for healthy nutrition (► food safety). Recent experiences with animals suffering from bovine spongiform encephalopathy (mad cow disease) have shown how quickly the global marketing of products can become an international health problem. The safety of food can be enhanced by a quality management system like the ► HACCP-concept. Furthermore, monitoring of the food supply by health officials is necessary (Gibney et al. 2004).
The six quality levels clarify that nutrition is determined by cultural, social and individual factors. Nutrition is a major, modifiable and powerful factor in promoting health, preventing and treating diseases and improving the quality of life. Thereby nutrition contributes to physical, mental and social well being. The slogan "You are what you eat!" concisely sums up the concept.

Cross-References

► Antioxidants
► Behavior of Nutrition
► Bioactive Substances
► Diet
► Food Safety
► Functional Food
► HACCP-Concept
► Lifestyle
► Malnutrition
► Nutritional Diseases
► Nutritional Recommendations
► Nutritional Status
► Overnutrition
► Pleasant Taste
► Prebiotics
► Probiotics
► Secondary Plant Compounds
► Sensoric Quality of Food
► Undernutrition

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Nutritional Behavior

► Behavior of Nutrition

Nutritional Condition

► Nutritional Status

Nutritional Diseases

Definition

Nutritional diseases are diseases in which ► malnutrition plays an import role in terms of the development and course of the illness. Nutritional diseases are, for example, caries, obesity, obstipation, high blood lipids and arterial circulatory disturbances.

Nutritional Recommendations

Definition

Nutritional recommendations are guidelines for nutritional and energy intakes that are adapted to meet proper levels of ► nutrition and that avoid ► malnutrition and further the maintenance of health. They are produced by different international organizations such as WHO/FAO and by national expert panels in different countries such as the Food Nutrition Board, USA and the Deutsche Gesellschaft für Ernährung.

Nutritional Status

Synonyms

Nutritional condition

Definition

Nutritional status is the current body status of a person or a population group related to their state of nourishment. The nutritional status is determined by a complex interaction between internal or constitutional factors and external environmental factors like age, gender, ► nutrition, behavior, ► physical activity, diseases, ► food safety, social and economic circumstances. An ideal nutritional status occurs when the supply of nourishment conforms to the need for nourishment. People can have an optimal nutritional status or they can be under-, over- and/or malnourished. The nutritional status of an individual has consequences: an optimal nutritional status is a powerful factor for health and well being whereas ► malnutrition may increase to infection and chronic diseases, ► undernutrition may lead to increased infections and decreases in physical and mental development, and ► overnutrition may lead to obesity as well as to metabolic syndrome or type 2 diabetes.

Nutritionist

► Dietician

N-Year Event

Definition

Event whose magnitude is exceeded, on average, once in N years.

Obesity

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Synonyms

Severe overweight; Adiposity

Definition

Obesity is defined as disease in which excess body fat has accumulated to such an extent that health is adversely affected. ► Body Mass Index (BMI, i. e. weight in kg / (height in m)^2) is the population measure of obesity BMI does not account for body composition and variations in fat distribution. Cut offs are defined according to BMI-associated morbidity. Ethnic populations differ in the level of risk associated with a particular BMI. In Caucasian adults BMI is normal between 18.5 and 24.9 kg/m^2. Values between 25.0 and 29.9 kg/m^2 correspond to overweight (overweight or preobese), >30.0 kg/m^2 denotes obesity. Obesity can be further classified into class I (moderate, 30.0–34.9 kg/m^2), class II (severe, 35.0–39.9 kg/m^2) and class III (very severe, >40.0 kg/m^2). In children and adolescents national and international BMI reference percentiles are used with the 90th and 97thP as cut offs for overweight and obesity, respectively. In the US 85th and 95thPs are used. The association between BMI and body fat varies according to body build and proportion as well as across populations. Alternatively direct measures of body fat (e. g. anthropometric or bioelectrical impedance measurements) are used in population surveys with values >25 (males) and >30% of body weight (females) denoting overfat. Abdominal (or visceral) fat carries the highest metabolic risk. Waist circumference (measured at the midpoint between lower border of the rip cage and the iliac crest) is a population measure of abdominal fat. Risk is increased above 94 (males) and 80 cm (females). Risk is substantially increased at >102 and >88 cm, respectively. The waist associated risk is independent and additive to the BMI-associated risk. The waist to hip ratio (w/h) is related to cardiovascular risk. w/h is the ratio between risk (i. e. w = excess abdominal fat) and protective factors (i. e. hip circumference is related to fat free mass). w/h-cut offs are >1.0 in males and >0.85 in females. Taken together weight, fat and waist characterize obesity and its health risks.

Basic Characteristics

Levels and Trends

There is a world wide increase in the prevalence of overweight and obesity. In adult populations prevalence of overweight plus obesity varies between about 30% (China) and more than 60% (industrialized countries). Corresponding prevalences of obesity range between 3 and above 25%. Prevalence of overweight children and adolescents is between 5 to 20% with considerable differences between countries, e. g. there is a north-south gradient in Europe with highest values in southern European countries. Trend data suggest steep rises in prevalences of overweight and obesity during the past 25 years, e. g. there is a 2- to 5-fold increase in overweight prevalence in children and adolescents in Germany. In non developed countries increases in overweight and obesity are strongly associated with transition and economic growth. A further increase in over-

weight and obesity is likely. According to the WHO prognosis for 2040 obesity prevalence will reach 50% in industrialized countries.

Causes

Overwight and obesity are mainly considered as a problem of energy balance. Thus the high intake of energy and energy dense foods (e. g. fast food), animal fat, sugar sweetened beverages, high portion sizes at concomitantly low energy expenditure due to low physical activity (due to increases in car ownerships, automatization at occupational and household work, low leisure time activities, urban residence) and high inactivity (i. e. sedentary lifestyle due to high TV and media use) all result in a positive energy balance. In population surveys crude proxies for inactivity such the amount of hours spent viewing TV per day or the number of cars per household show close associations with the prevalence of overweight and obesity. In addition increases in inactivity over time are closely related with rises in overweight and obesity. Breast feeding seems to be protective with respect to childhood overweight. Additional determinants of overweight and obesity are high parental weight and low socioeconomic status (SES). Genetic studies suggest a susceptibility of some people to become overweight and obesity under the influence of gene-environment interactions. However up to now this idea has not been substantiated. There are steep and inverse social gradients in overweight and obesity in children, adolescents and adults. The lower the social position the higher the prevalence of overweight as well as overweight-related co-morbidities. The inverse SES gradient in overweight remains after adjustment for SES-related lifestyle variables suggesting psychosocial factors in addition to health-related behaviors as determinants. Other factors promoting weight gain include smoking cessation, excess alcohol intake, drug treatment (e. g. tricyclic antidepressants, corticosteroids), certain endocrinological (e. g. Cushing disease) and genetic disorders (e. g. Prader Willi syndrome) as well as changes in social circumstances (e. g. marriage, birth of a child). In developing countries the trend towards industrialization and global market economies has improved living standards but also increased the risk of diseases (i. e. obesity, diabetes mellitus type 2, cardiovascular diseases). Obesity is the first of the so-called diseases of civilization to emerge. Taken together, obesity is considered as a complex multifactorial disease with considerable inter-individual variations.

Consequences

Health consequences of overweight and obesity include non communicable diseases such as type 2 diabetes mellitus, dyslididemia, insulin resistance and gallbladder disease with a more than 3-fold increase in relative risk (RR). Moderately increased risks (RR 2–3) are observed for hypertension, gout, cardiovascular disease and osteoarthritis. RR is slightly increased (RR 1–2) for certain cancers (breast cancer in postmenopausal women, endometrial cancer, colon cancer, prostate cancer), polycystic ovary syndrome, impaired fertility, low back pain and fetal defects associated with maternal obesity. In addition there are a number of psychosocial problems associated with obesity (e. g. body shape dissatisfaction, stigmatization). Eating disorders (i. e. binge eating, night eating syndrome) may be seen in up to 30% of severely obese patients seeking medical help. Life expectancy is reduced in overweight and obesity subjects. When compared with a 40-year-old normal weight subject 3 and 7 years of life are lost in overweight and obesity. Smoking is an additive health risk causing a further loss of 6 years of life in obesity individuals. In children health consequences of obesity include faster growth, psychosocial problems (e. g. due to stigmatization), persistence into adulthood (e. g. >80% in obesity adolescents), dyslipidemia, hepatic steatosis, impaired glucose tolerance, metabolic syndrome, orthopedic complications, cholelithiasis and hypertension. For example, in 10-year-old obesity children the prevalences of hypertension and dyslipidemia exceed 30% when compared to values below 5% in their normal weight counterparts.

Treatment and Prevention

Priorities to control the obesity epidemic include prevention of excessive weight gain, sustained weight loss as well as elimination of disparities in obesity and its complication. Principle strategies to prevent weight gain are reduction of energy intake (with an increase consumption in low energy dense foods like fruit and vegetables at concomitant decreases in sugar sweetened beverages and portion sizes), increase in energy expenditure (by increased both exercise- and non

exercise activities), decrease in inactivity (reduced TV and media use) and recommendation of breast feeding. Areas to intervene include (i) the individual (e. g. lifestyle counseling), (ii) family and household settings, (iii) kindergarten, school and workplace, (iv) community and neighborhood as well as (v) the macro-environment. Today most experience is in the (i), (ii) and (iii) areas. Studies on the feasibility and effectiveness of school– and community programs have only recently been undertaken. The information has been systematically analyzed in different Cochrane reviews.

Treatment strategies of the obese patient include diet (i. e. low calorie diets) together with increased physical activities as part of a behavior-oriented lifestyle program. Pharmaco-therapy tackles energy intake by reducing appetite and digestion of dietary lipids. In the severely obese with high co-morbidity bariatric surgery (e. g. gastric banding) may be indicated. Theoretically all these measures are capable of inducing significant weight loss as well as lessening co-morbidity. However, to present, experience suggests high efficacy but low long term (i. e. 3 to 5 year) effectiveness, i. e. none of the above mentioned strategies (except bariatric surgery) has sustained positive effects in terms of reduction of weight and co-morbidities. This is mainly due to low rate of adherence to protocols (e. g. during the first year less than 20% of the patients recruited followed dietary advice). However in controlled studies with high adherence rates significant weight losses were observed (e. g. a reduced energy intake by 600 kcal/d reduced body weight by 5 kg/year compared to the spontaneous increase of about 0.5 kg/year before treatment).

Most of our observations on prevention of childhood overweight have been carried out in the school setting. Health education as well as changes in school environment have been used to increase the knowledge and competence of children. Long-term follow up (i. e. up to 2 to 4 years) data suggest some improvements in knowledge and health-related behaviors but only minor or no changes in BMI prevalence and incidence. Selective positive effects were observed in children of normal weight mothers and high SES families. The intensity and expense of the program did not affect outcome. School-based health promotion works better in a health promoting environment. Family-based programs have been used for families of overweight and obesity children. These programs reach a high intensity but are expensive. There are some long-term experiences (i. e. up to 12 years) showing some long-lasting positive effects in terms of BMI. However this strategy reached high rather than low SES families thus increasing the SES gradient in overweight. Comparing family programs, school-based health promotion or more general measures (e. g. reducing TV advertising for snacks, sweets and soft drinks) BMI reduction of 1.7, 1.1 and 0.2 kg/m^2 per child have been calculated. However, expressing these data in terms of DALYs, 2700, 8000 and 37 000 respectively have been saved. These data argue in favor of general measures to prevent childhood overweight. More recently various community-led action plans resulted in effective long-term prevention. Different settings (e. g. community health centers, primary care, schools, after school programs, churches, sport clubs, fast food outlets) and experts (e. g. politicians, physicians, nutritionists) were involved resulting in community building, awareness raising and long-term (i. e. 3 to 8 years) effectiveness in terms of improved knowledge, lifestyle and nutritional status and costs.

Outlook

There is lack of intervention at government level. Obesity, like most other challenging public health problems, probably requires multifaceted educational and environmental interventions. These approaches work against a strong trend which favors consumerism and thus a high percentage of unhealthy lifestyle. This trend limits the success of health promotion. Overweight is not only a problem of low SES people or even the poor. Since there are considerable differences between all social groups, the gradient reflects problems between different SES groups within our societies. Then the obesity epidemic is an epiphenomenon of other (e. g. economic, educational, social) problems within our societies. Thus the solution of obesity problems follows the solution of economic, educational and/or social problems. Tackling the obesity epidemic indirectly by improving capabilities and thus autonomy as well as social participation of parents and children is health promoting. This does not neglect the value of an "ecological" approach (e. g. tackling the obesogenic environment). Changing the food environment, reconsidering the value and consequences of economic growth and consumerism as well as changing views about obe-

sity (i. e. reducing stigma) all add to the reduction of the incidence and prevalence of obesity.

Cross-References

► Body mass index

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Observational Studies

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Synonyms

Nonexperimental studies

Definition

An observational epidemiologic study is a type of study in which the investigator observes and measures the effect of a ► risk factor, diagnostic test, or treatment on a particular outcome but does not intervene (in contrast with an experimental study, no attempt is made to affect the outcome).

Basic Characteristics

Appropriate use of observational studies permits the investigation of prevalence, incidence, associations, causes, and outcomes. Where there is little evidence on a subject, such studies are cost effective ways of producing and investigating hypotheses before larger and more expensive study designs are embarked upon. In addition, they are often the only realistic choice of research methodology, particularly where a ► randomized controlled trial would be impractical or unethical. Observational studies can be classified into descriptive studies, which are usually undertaken when little is known of the epidemiology of a disease, and analytic studies, which are carried out when leads about etiology are already available.

Descriptive Studies

Descriptive studies provide information on patterns of disease occurrence in populations, particularly in relation to people, places, and times. Generally, the emphasis in these studies is on estimation (e. g. of the disease prevalence, the natural history of disease, the resources required to treat the disease, or attitudes and perceptions about the disease). These types of study can sometimes be used to generate hypotheses. Descriptive study designs include ► case reports, ► case series (an extension of the case report), and ecological (correlation) studies (► ecological study).

Analytic Studies

Analytic studies (hypothesis testing studies) are designed specifically to test causal hypotheses that have usually been generated from descriptive studies. The three major types of analytic studies are cohort studies (prospective and retrospective), case control studies, and cross sectional studies.

Cohort Studies (Synonyms: Follow-up; Incidence; ► Longitudinal Studies) Cohort studies are considered the strongest of all observational designs. In a cohort study, the investigator usually starts with two ► cohorts who are apparently free of the disease of interest – one exposed to a possible risk factor and another who are not exposed. These cohorts are then followed through time in order to determine the out-

come events (e. g. incidence) among the exposed and the unexposed. The follow-up period depends on the natural history of the outcome disease and the frequency of disease occurrence. The incidence in the exposed cohort is then compared with the incidence in the unexposed cohort. The resultant ratio is called ► relative risk or ► risk ratio (RR) and it is considered the best measure of effect. In addition to the relative risk, the ► attributable risk (AR) and ► population attributable risk (PAR) can be calculated (Gordis 2004).

Cohort studies are used to study incidence, causes, and prognosis. Because they measure events in chronological order, they can be used to identify cause and effect.

In a *prospective cohort study (concurrent cohort study)*, the investigator collects information on the exposure status of the cohort members at the time the study begins (or at the time the exposure occurs during the study), and identifies new cases of disease from that time forward (the cohort is "followed up" prospectively).

Example: A prospective cohort study on mortality in relation to smoking that took place between 1951 and 2001 in the United Kingdom has recently been published in the British Medical Journal by the eminent epidemiologist Sir Richard Doll and coworkers (Doll et al. 2004). The cohort was a group of 34,439 British male doctors listed in the British Medical Register. Information about their smoking habits was obtained in 1951, and periodically thereafter; cause-specific mortality was monitored for 50 years. The study revealed that, among the men born around 1920, prolonged cigarette smoking from early adult life tripled age specific mortality rates, but cessation at age 50 halved the hazard, and cessation at age 30 avoided almost all of the increase.

A problem that occurs when the cohort method is applied to the study of chronic diseases such as coronary heart disease or cancer is that large numbers of people must be followed up for long periods before sufficient cases accrue to give statistically meaningful results. The difficulty is further increased when there is a long induction period between first exposure to a hazard and the eventual manifestation of disease, as with most carcinogens, for example. An approach that can help to counter this problem is to carry out the follow up retrospectively. Obviously, such a study is only feasible when the health outcome of interest can be measured retrospectively (Coggon et al. 1997).

In a *retrospective cohort study (historical or nonconcurrent cohort study)*, the exposure status is established from information recorded at some time in the past, and disease incidence is determined from then until the present (i. e. the cohort is "followed up" retrospectively). The study period may be many years but the time to complete the study is only as long as it takes to collate and analyze the data (Gordis 2004).

Example: To determine whether the frequency and pattern of use of the accident and emergency (A&E) department by individuals with diabetes is different from that of the general population, a historical cohort of 696 individuals with diabetes and a non-diabetic comparison cohort, matched on age, sex, and general practice, was conducted in 1997. The use of an urban A&E department by the two cohorts was compared (number of visits between 1984 and 1996). Individuals with diabetes made more frequent visits to the A&E department than the general population. Since there was no excess of visits for injuries and the proportion requiring admission was similar, the hypothesis that they have a different threshold for attending was not supported (Goyder et al. 1997).

Case Control Studies (Case Referent Studies; Case Comparison Studies) In a case control study, the investigator selects two groups – a group of individuals with a disease of interest (or other outcome), called cases, and a suitable group of people without that disease, called controls. The history of exposure to suspected risk factors is then determined and compared retrospectively between "cases" and "controls". The measure of association in a case control study is called an ► odds ratio (OR). It is the ratio of the odds (chance) of exposure among cases in favor of exposure among controls. However, true incidence estimates cannot be generated from a case control study (Gordis 2004).

The starting point of most case control studies is the identification of cases. This requires a suitable case definition. Ideally, the cases studied should be a random sample of all of the patients with the disease. Selecting the controls is often a more difficult problem. The controls may be a matched (► matching) or unmatched random sample from the unaffected population.

Case control studies are often used to generate hypotheses that can then be studied by prospective cohort or other studies. They are useful for studying rare diseases or outcomes. When there is a long latent period between

an exposure and a disease, case control studies are the only feasible option.

Example: A case control study was conducted in order to assess possible relationships between potential risk factors and Graves' disease. The study included 100 newly diagnosed patients with Graves' disease and 100 controls matched with respect to sex, age (+/− 2 years), and type of residence (rural, urban). All the subjects were interviewed by the same doctor. The findings indicated that stressful life events, lack of social support, and family history of Graves' disease were significantly associated with the occurrence of Graves' disease (Janković et al. 1997).

► Nested case control studies and ► case cohort studies combine elements of both case control and cohort studies.

Cross Sectional Studies (Prevalence Studies; Surveys) In cross sectional studies, the presence or absence of both the exposure and the disease in a given population are measured at a point in time or over a short period. Prevalence rates among those with and without the exposure or at different levels of exposure are then determined and compared. Because both exposure and disease are measured at the same time, it is impossible to determine, in most cases, which came first. Therefore, cross sectional studies can suggest associations between an exposure and a disease but do not permit identification of cause and effect.

Cross sectional studies are the best way to determine the prevalence of diseases and they are appropriate studies for planning health care. They are relatively quick and inexpensive.

The principal summary statistic of cross sectional studies is the Odds Ratio (OR).

Among the more widely known cross sectional studies are the periodic national household (interview) surveys by the U.S. National Center for Health Statistics (NCHS), the annual (telephone) Behavioral Risk Factor Survey conducted by the U.S. Centers for Disease Control and Prevention (CDC), etc.

Comparison of Various Study Designs The decision to choose an appropriate study design is not an easy task. "There an only a handful ways to do study properly but a thousand ways to do it wrong" (Sackett and Wennberg 1997). Each observational study has its own strengths and weaknesses (Table 1) and there is rarely only one type of study design that is appropriate to answer a study question.

Observational Studies, Table 1 Comparison of cohort, case control, and cross sectional studies (Source: modified from Beaglehole et al. 1993)

Characteristics of the study	Cohort study	Case control study	Cross sectional study
Time required for study	Generally long	Relatively short	Relatively short
Cost of study	Expensive	Relatively inexpensive	Relatively inexpensive
Strength of causal inference	High	Medium	Low
Investigation of rare disease	–	Best	–
Investigation of rare exposure	Best	–	–
Study of multiple outcomes of an exposure	Best	–	Possible
Study of multiple exposures	Possible	Best	Possible
Measurement of temporal sequence	Best	Possible	–
Measurement of incidence rates and Relative Risk (RR)	+	–	–
Measurement of Odds Ratio (OR)	+	+	+
Selection bias	Low	High	Medium
► Recall bias	Low	High	High
Loss to follow-up	High	Low	–

Cross-References

- ► Attributable Risk (AR)
- ► Case Cohort Study
- ► Case Series
- ► Cohort
- ► Confounding and Interaction
- ► Ecological Study
- ► Individual Case Description
- ► Longitudinal Study
- ► Matching
- ► Nested Case Control Study
- ► Odds Ratio (OR)
- ► Population Attributable Risk (PAR)
- ► Randomized Controlled Trials
- ► Relative Risk
- ► Risk Factor
- ► Risk Ratio (RR)

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Observer Bias

Synonyms

Interviewer bias

Definition

Observer bias means that investigators who know which treatment has been assigned to a given subject may be more watchful for certain side effects and benefits. The best protection against observer bias is to have neither investigator nor participants knowing the group to which the subject has been assigned. This type of study is called double blind. Protection against this bias is also possible in triple blind studies in which not only the participant and the investigator but also those responsible for data analysis do not know the group to which the participant has been assigned. In open trials, it is important to follow the experimental and control group with equal intensity for evaluation of the outcome.

Obsessive-Compulsive Disorder (OCD)

Definition

Obsessions are recurrent, intrusive thoughts, impulses, or images that are perceived as inappropriate, grotesque, or forbidden. A characteristic feature of an obsessive-compulsive disorder is the repetitive inner compulsion, perceived as tormenting, to think or do certain things. Common themes include contamination with germs or body fluids, doubts (i. e. the worry that something important has been overlooked or that the sufferer has unknowingly inflicted harm on someone), order or symmetry, or loss of control of violent or sexual impulses. The subjects often try in vain to resist their impulse. Compulsions are repetitive behaviors or mental acts that reduce the anxiety that accompanies an obsession or "prevent" some dreaded event from happening. These tasks or rituals are seen as being neither pleasant nor useful, but are designed to prevent events or situations that, objectively, are unlikely to occur. Compulsions include both overt behaviors, such as hand washing or checking, and mental acts including counting or praying.

Cross-References

- ► Anxiety Disorders

Obstetrics and Gynecology

Definition

Obstetrics is the field of medicine specialized in the art and science of managing pregnancy, labor, and the time after delivery. Gynecology is the branch of medicine specifically concerned with the health of the female organs of reproduction and diseases thereof.

Occupational Accidents

Synonyms

Accidents at work

Definition

According to the ILO definition from 1998, occupational accidents can be define as accidents that happen at work and accidents on the way to and from work. As a result of occupation accidents, ► occupational injury, disease, or death can occur. Another definition describes an occupational accident as an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death. It is suggested that travel, transport or road traffic accidents in which workers are injured and which arise out of or in the course of work, i. e. while engaged in an economic activity, or at work, or carrying on the business of the employer should be considered as occupational accidents.

Occupational Cancer

Synonyms

Occupational malignant diseases

Definition

Occupational cancer is a group of different diseases that have the same feature, the uncontrolled growth and spread of abnormal cells and well documented association between occupational exposures to carcinogens and onset of disease. There are different national and international lists and classifications of potential carcinogens like: WHO International Agency for Research on Cancer (WHO IARC) (http://www.iarc.fr), National Institute of Occupational Health (NIOSH) (http://www.cdc.gov/niosh/topics/cancer/), Occupational Safety and Health Administration (OSHA) (http://www.osha-slc.gov/SLTC/carcinogens/index.html).

Occupational Disability

Synonyms

Workplace disability

Definition

Occupational disability can be described as a partial or complete loss of ► working capacity due to the ► chronic diseases or injuries related to ► occupational exposures. Disability at workplace usually results from repeated exposure to mild stressors or agents, rather than from a single incident. For example, some agents can cause or activate asthma; repeated or loud ► noises can lead to hearing loss; production pressure, such as piece-rate demands, can cause symptoms of psychological stress; and repetitive motions can lead to cumulative stress disorders (e. g. carpal tunnel syndrome). Exposure to such stressors can exacerbate disabilities that already exist and make them more debilitating. As a consequence, some workers are no longer capable of performing their specific job tasks or are partially or completely unable to perform any particular job.

Occupational Disease Incidence

Definition

Occupational disease incidence is the number of new cases of ► occupational disease in a given population. It can be calculated on a national, industrial, or even an individual enterprise level. Occupational disease incidence is less informative than occupational disease incidence rate (which is the number of new cases of occupational disease during the calendar year divided by the number of workers in the examined group during the year, multiplied by 100 000) due to fact that a denominator is missing. However, disease incidence can usefully be used in a situation where there is a stable population (when the number of workers does not vary in examined periods). In all other situations the use of incidence rate is much more suitable.

Occupational Disease Registry

Definition

Occupational disease registry is a register of officially recognized cases of ► occupational diseases. Registration is usually organized on a national level and the register is managed by the national institution responsible for occupational health. National legislation specifies the procedures for registration of occupational dis-

eases as well as procedures for its recognition. As each country decides on the amount and the structure of data in the occupational disease registry there is a huge variability among countries which causes a lot of problems in comparison at an international level.

Occupational Diseases

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Synonyms

Industrial disease

Definition

Occupational disease is any disease contracted as a result of an exposure to risk factors arising from work activity (ILO definition). This definition, like most of occupational disease definitions, specify causality between the disease and the exposure factor (physical, chemical, biological and others) present in the work/activity taken into account. On the other hand some definitions are focused on legal aspects of occupational disease, like the European Occupational Diseases Statistics (EODS) definition. According to EODS an occupational disease is a case of disease recognized by the national authorities as being caused by a factor at work.

Basic Characteristics

In contrast to the definitions of occupational diseases, which are similar in different countries, the systems of recognizing occupational diseases are not uniform. Generally, there are three systems:

- Open system (every disease with sufficient proofs that it is caused by ► occupational exposure is an occupational disease);
- Closed system (only diseases which are listed on the ► national list of occupational diseases can be recognized as occupational ones);
- Mixed system (a combination of open and closed systems).

Each of those three systems brings some advantages and disadvantages so there is no ideal system for occupational disease recognition. Even among countries applying a similar system there are a lot of differences. For example, in the European Union most countries use a 'mixed system' but there is a significant difference in a list of occupational diseases for each country. According to official EU sources in Italy there is a list of 58 occupational diseases, in France there are 98 tables of occupational diseases, in Germany a list of 67 occupational diseases, in Austria a list of 52 occupational diseases, and in the United Kingdom a list of 70 occupational diseases.

ILO propose a list with four groups of occupational diseases:

- Diseases caused by agents
  - Chemical (like: beryllium, cadmium, phosphorus, chromium, manganese, arsenic, mercury, lead, fluorine, carbon disulphide, the toxic halogen derivatives of aliphatic or aromatic hydrocarbons, benzene or its toxic homologues, nitro- and amino-derivatives of benzene or its homologues, nitroglycerine or other nitric acid esters, alcohols, glycols or ketones, etc.)
  - Physical (like: ► hearing impairment caused by noise, diseases caused by vibration, diseases caused by work in compressed air, diseases caused by ionizing radiations, etc.)
  - Biological (infectious or parasitic diseases contracted in an occupation where there is a particular risk of contamination)
- Diseases by target organ systems
  - Respiratory diseases (like: ► pneumoconioses caused by sclerogenic mineral dust (silicosis, anthraco-silicosis, asbestosis) and silicotuberculosis, bronchopulmonary diseases caused by hard-metal dust, cotton, flax, hemp or sisal dust (byssinosis), occupational asthma, extrinsic allergic alveolitis caused by the inhalation of organic dusts, siderosis, chronic obstructive pulmonary diseases, etc.)
  - Skin diseases
  - Occupational musculo-skeletal disorders
- ► Occupational cancer (caused by: asbestos, benzidine and its salts, chromium, vinyl chloride, benzene or homologues, ionizing radiations, tar, pitch, bitumen, mineral oil, anthracene, or the compounds,

products or residues of these substances, nickel compounds, wood dust, etc.)
- Other diseases

According to the ILO recommendation, 194 member states should develop a national list of occupational diseases including, at least, the diseases mentioned in the ILO proposal, but it seems that many countries did not follow that recommendation.

Besides differences in the systems of occupational disease recognition, there are huge diversities in prerequisite conditions for recognition of an occupational disease. Usually, there are two steps in the process: proving the disease is related to an occupation or working conditions and proving there has been exposure. As one might expect there are great differences in criteria for diagnosing disease among countries (for example almost every country has its own criteria for diagnosing silicosis or asbestosis). Then there is problem of proving that a worker was exposed to a certain risk factor exceeding the maximum levels established for regulatory purposes. Also, there is the problem of ► individual susceptibility so that even in a case where workplace exposure did not exceeded the maximum permissible values there is always a possibility that it caused disease in an individual. These mentioned differences are only a top of the iceberg problem compared to ► occupational disease incidence on an international level. It has to be said that some countries do not have a proper system for registering occupational diseases (► occupational disease registry) or possess a registry which is not functioning (some countries—not only developing ones—do not have a registry at all) so there are no reliable data on global incidence of occupational diseases. However, based on available data, incidence of occupational diseases in 2001 varies from 0.47 per 100 000 inhabitants in Armenia to 453.72 in Sweden. The estimated number of cases of occupational diseases per year worldwide is in the range 4 240 700–10 010 800. The estimated number of deaths due to occupational diseases per year is in the range 583 700–704 200.

According to the estimated annual incidence of occupational disease in the world (Leigh et al. 1999) musculoskeletal disorders are linked with more than 30% of the total number of occupational diseases.

The estimates of ► disability-adjusted life years (DALY) for 2000 shows that the selected occupational risk factors were responsible worldwide for 37% of back pain, 16% of hearing loss, 13% of chronic obstructive pulmonary disease (COPD), 11% of asthma, 9% of lung cancer and 2% of leukaemia (Nelson et al. 2005). Occupational disease compensation also varies amongst countries. Most of the developed countries compensate workers all direct and indirect losses caused by occupational disease. But some countries in cases in which the occupational disease does not cause a physical impairment or loss of earnings do not compensate anything except the costs of medical treatment. Nevertheless, the cost of occupational diseases to society has been estimated at 2–14% of the gross national product in different studies in different countries.

Occupational Diseases, Table 1 Estimated annual incidence of occupational diseases in the world

Pesticide poisoning	109 000
Other poisoning	122 000
Cancer	191 000
Mental disorders	318 000
Pneumoconioses	453 000
Noise-induced hearing loss	1 628 000
Skin disorders	1 895 000
Chronic respiratory disease	2 631 000
Musculoskeletal disorders	3 337 000

Cross-References

► Disability Adjusted Life Years (DALYs)
► Hearing Impairment Caused by Noise
► Individual Susceptibility
► National List of Occupational Diseases
► Occupational Cancer
► Occupational Disease Incidence
► Occupational Disease Registry
► Occupational Exposure
► Pneumoconioses

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Occupational Diseases in Wider Sense

► Work-Related Diseases

Occupational and Environmental Health

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Introduction

Occupational and environmental health are closely related disciplines that share a history, methodology, problems, etc. Development of medicine, science, technology, and society led to differentiation between those disciplines and nowadays they are fully separated with clearly different objectives in most countries.

Occupational and Environmental Health History

The history of occupational and environmental health (OEH) can be traced to the ancient period. In old Egypt, rules were established for burying corpses, cleaning streets, waste management, and food and water quality control. Observations of increased rates of illnesses and mortality among miners date back to Greek and Roman times. Hippocrates warned his followers to observe the environment in order to understand the origins of illnesses in their patients. However, Bernardino Ramazzini (1633–1714) is recognized worldwide as the father of preventive, and especially occupational, medicine. He published in a book in 1700: "De Morbis Artificum Diatriba" (Diseases of Workers). This was the first systematic study of trade diseases and was based on visits to workshops in Italy. Bernardino Ramazzini described diseases in a number of occupations such as painters, intellectuals, potters, midwives, miners, etc. He recognized mercurialism, lead intoxication among potters using lead glaze, etc. Bernardino Ramazzini emphasized the importance of data on occupation in patient history.

The real development of OEH started during the industrial revolution. The first OEH laws originate from the 19th century. During the 19th century, the first laws regulating child labor, work safety, and limiting working hours were established in England. In 1901 the first law regulating periodical check ups of workers was empowered in England. Subsequently, similar laws were empowered in Germany, France, and Russia. The first Institute of Occupational Health was established in Frankfurt (Germany) at the start of the 20th century. In 1910, the first clinic of Occupational Diseases was established in Milan (Italy), as was the first hospital for occupational diseases in New York (USA). The first scientific meetings on OEH started with a Berlin (Germany) conference on occupational diseases in 1890. The first international congress on occupational health (OH) was held in Milan (Italy) in 1906; during which the International Commission on Occupational Health (ICOH) was established. This organization is still active and plays a major role in international OH.

Since the start of the 20th century, development of OEH in developed countries has been much more rapid than in past centuries, especially in countries with developed industry where continuous development has occurred. In Russia, due to political reasons, a huge development of OEH was observed after the revolution. The same trend occurred in so-called Eastern countries after the Second World War, under Russian influence.

Occupational and Environmental Health Definitions

Occupational Health

Occupational health is a discipline devoted to the prevention and management of occupational injury, illness, and disability; and promotion of health and productivity of workers, their families, and communities.

Environmental Health

Environmental health comprises those aspects of human health, including quality of life, that are deter-

mined by interactions with physical, chemical, biological, and social factors in the environment.

Occupational Health Objectives

According to the joint committee of the International Labor Organization (ILO) and the World Health Organization (WHO) in 1950, occupational health should aim for:

- the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers in all occupations;
- the prevention amongst workers of departures from health caused by their working conditions;
- the protection of workers in their employment from risks resulting from factors adverse to health;
- the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities and;
- to summarize: the adaptation of work to the man and of each man to his job.

In 1995, the ILO/WHO joint committee (Anonymous 1995) made an addition to the previous definition. They proposed that the main focus in occupational health should be on three different objectives (► occupational health objectives):

1. the maintenance and promotion of workers' health and working capacity;
2. the improvement of working environment and work to become conducive to safety and health and;
3. development of work organizations and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings. The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the undertaking concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies, and quality management of the undertaking.

Beside the more global view on occupational health objectives from the ILO/WHO, there are many other more or less detailed views, like Felton's (1998). According to his view, OH objectives are:

- to protect the health and well-being of workers against the stressors and potential health hazards of the work environment;
- to place job applicants or current employees in work commensurate with their physical and emotional capacities, work that can be performed without endangering the worker or fellow employees and without damaging property;
- to provide emergency medical care for injured or ill workers and definitive care and rehabilitation for those with work-generated injuries or illnesses, in keeping with the medical, surgical, or psychotherapeutic expertise of the staff, medical department policy, managerial policy, and the availability of community resources;
- to maintain or improve the health of the worker through promotional, educational, counseling, or informational activities, preventive health measures including fitness or wellness programs, and periodic clinical reviews of health status.

Environmental Health Objectives

There are a number of classifications of environmental health objectives. Generally, environmental health objectives are:

- to ensure adequate and safe living conditions (flat, water, sanitation, environmental safety);
- to promote healthy lifestyles;
- to prevent and significantly reduce the morbidity and mortality arising from gastrointestinal disorders and other health effects by ensuring that adequate measures are taken to improve access to safe and affordable water and adequate sanitation for the population;
- to prevent respiratory diseases due to outdoor and indoor pollution in order to ensure an environment with clean air;
- to reduce the risk of diseases and disability arising from exposure to hazardous chemicals, physical agents, and biological agents in working and living environments;
- to prevent harmful effects on the environment from new technologies implemented in industry and agriculture, as well as to prevent abuse of natural resources.

In integrated health protection, environmental health has the foremost goal of protecting human health against harmful factors of the environment.

Environmental Factors

Air Quality and Pollution

Air pollution is any change in physical, chemical, radiological, or biological properties of air exceeding the adaptation mechanism of living beings and the environment. It can be classified as outdoor and indoor air pollution, with occupational and non-occupational exposure (► air quality and pollution) (Anonymous 1999; Backović et al. 2001).

Air pollution is the result of emission (into the air) of hazardous substances at a rate exceeding the capacity of natural processes in the atmosphere to alter, deposit, or dilute them. Natural processes, such as rain or wind, play an important role in the vanishing and/or alteration of chemical substances discharged into the atmosphere. The definition above relates to chemical outdoor pollution. Microbiological pollution, on the other hand, is primarily an indoor problem.

Air pollutants can be in any of three forms: gas, aerosol, or particle. An aerosol is a fine, mist-like suspension of liquid or solid. Particles, sometimes called particulates, are small specks of solid matter.

Classification of toxic substances in the air may be based on acute toxicity expressed through LD50 (the dose of a substance that kill 50% of the organisms in a test), or on carcinogenic potential. The most highly toxic substances are those that cause death or severe illness in a very small dose.

The general health effects of air pollution can be divided into four groups: short-term or acute respiratory effects, long-term or chronic respiratory effects, lung cancer, and no respiratory effects.

Wide scientific interest in indoor air quality is now quite understandable because of the variety of indoor environmental problems, increasing amount of time spent indoors, and numerous adverse health consequences.

Water Quality and Pollution

Water is essential for life and plays a vital role in the proper functioning of the Earth's ecosystems. The Water Supplies Department is committed to supply the public with water that is clear, odorless, wholesome, and free from pathogenic bacteria. In the treatment process, water quality throughout the supply system is continuously monitored by professionally qualified chemists through a series of physical, chemical, bacteriological, biological, and radiological examinations (► water quality and pollution).

Surface water is all water that is naturally open to the atmosphere, such as lakes, rivers, seas, and reservoirs. In addition to being an important source of drinking water and recreation, these waters are also vital parts of local and regional ecosystems.

Inadequate water supply and poor sanitation services lead to contamination through the input of sewage water into groundwater.

More than 2.6 billion people – forty per cent of the world's population – lack basic sanitation facilities, and over one billion people still use unsafe drinking water sources. As a result, thousands of children die every day from diarrhea and other water-sanitation and hygiene-related diseases, and many more suffer and are weakened by illness.

Every community water supplier must provide an annual report (sometimes called a consumer confidence report) to its customers. The report provides information on local drinking water quality including the water's source, contaminants found in the water, and how consumers can get involved in protecting drinking water.

In future, a sufficient quantity and excellent quality of drinking water can only be guaranteed through more integrated management of water resources.

Food Safety

Food is an essential human right, but food combination in a diet must be well balanced and nutritious overall. In modern societies, food habits are rapidly changing and many new foods are on the market. Cooking many foods makes them more palatable, and easier and safer to eat (Ekhard et al. 1996); however, poor cooking may destroy many valuable nutrients (► food safety).

The continual evolution of new and improved methods of agriculture and food processing is essential for feeding the world population. Some examples of developments which have benefited mankind are the use of pesticides, introduction of inorganic fertilizers, intensive rearing of livestock, use of antibiotics in animal husbandry, and introduction of food radiation as a means of food preservation.

National legislation sets standards for the production and distribution of safe foodstuffs. It is mostly oriented towards establishing regulations for:

- safe animal feeding (regarding recent BSE infection);
- animal welfare and husbandry (prevention of zoonoses);
- extensive requirements on hygiene of food;
- setting the list of contaminants and residues that arrive unintentionally into food;
- residues arrived at intentionally – pesticides, antibiotics, hormones;
- radioactive contamination of food;
- food additives;
- packaging materials and other materials coming into contact with food;
- novel food stuffs;
- emergency situations, like dioxin and other PCBs in food, or other chemical compounds present in food and known as industrial chemicals.

It must be stressed that legislation is only one part of solving the problem, but it is essential that there is always good hygiene and excellent cooperation between each individual concerned in food handling.

Soil Pollution

The soil is the surface layer of the Earth's crust that is not covered with water. It represents 1/3 of the continental part of the lithosphere, and reaches circa 150,000,000 m^2. The importance of the soil for people is reflected in agriculture, construction and location of buildings, engineering and infrastructure, and industries that exploit the Earth's goods. In all segments, the anthropogenic factor leads to permanent modification of the natural appearance and composition of the soil.

► Soil pollution can be defined as modification of natural characteristics, in a physical, chemical, biological, and radiological sense, by accumulation of a large quantity of natural materials or occurrence of new synthetic materials that disturb natural relations and disable self-cleaning or auto purification of the soil. Soil pollution can be a reason for chemical intoxication or infection of humans and all living beings. Pollution of the soil depends on both the emission and disposal of harmful materials and soil composition, structure, and physicochemical characteristics that influence accumulation and self-cleaning ability (Backović et al. 2001).

The polluted surface layer of the soil may be the source of comitial intoxication, infection, and infestation of people with microorganisms and parasites through water and food originating from that soil. It may also be the source of pollution of the air and water in a larger area in combination with the influence of meteorological factors.

The next important form in which the quality of the soil can influence health is if there is a lack of oligoelements, which is directly related to the natural chain of nutrition, where a low content of oligoelements in the soil leads to low content in plants and animal organisms, and finally to a lack in humans.

Climate and Microclimate

The world's climate is an integral part of the complex of life-supporting processes. Climate and weather have always had a powerful impact on human health and well-being (► climate and microclimate). However, like other large natural systems, the global climate is coming under pressure from human activities. Global climate change is, therefore, a new challenge to ongoing efforts to protect human health (Anonymous 2000).

According to the definition from the International Panel for Climate Change, the weather is day-to-day changing of atmospheric conditions, and climate is the average state of the atmosphere and the underlying land or water in a particular region over a particular time-scale (Kirch et al. 2005).

Radiation

Ionizing ► radiation represents the outermost frequency band of the electromagnetic spectrum and is capable of ionizing molecules of the irradiated substance, including biological media. During the interaction, ionizing radiation delivers a certain amount of energy to the irradiated substance, which results in changes of baseline characteristics of both the radiation and the irradiated medium.

Major types of radiation emitted as a result of spontaneous decay are alpha and beta particles and gamma rays. X-rays, another major type of radiation, arise from processes outside the nucleus.

Non-ionizing radiation is a general term for those electromagnetic waves that do not have sufficient energy to break the bonds between molecules and to produce ions (positive and negative electrically charged atoms or parts of molecules).

Non-ionizing radiation covers two main regions in the non-ionizing part of the electromagnetic spectrum:

- electromagnetic fields – static electric and magnetic fields, extremely low frequency fields, microwave and radiofrequency fields;
- optical radiation – ultraviolet radiation, visible light, and infrared radiation.

Noise

► Noise is a ubiquitous noxious factor in living and occupational environments in the modern world.
The most frequent psychological symptoms in people chronically exposed to noise are headaches, irritability and anxiousness, depression, insomnia, and fatigue. The consumption of tranquillizers and hypnotics is usually higher in these people.
The pathogenic concept that links noise with the well-known risk factors of cardiovascular diseases is based on a general stress model. Noise as a stressor stimulates the hypothalamopituitary-adrenal axis, the medulla of the suprarenal gland, and the sympathetic nervous system. Consequently, an increase in the release of circulating "stress hormones" occurs: ACTH, cortisol, adrenaline, and noradrenaline, which are of crucial importance in regulating arterial blood pressure and coronary circulation.

Urban Environments

A housing culture is a group of characteristics that represent the housing of a family, group of people, or population (► urban environments).
In choosing location, the important things are:

- size and configuration (10%)
- exposure – insulation
- climate conditions
- distance from water flows
- ground water
- distance from recreation zone
- number of inhabitants
- water supply options
- sewage disposition
- traffic connections – food transport

In each urban area, there are four zones: housing zone, economy zone, recreation zone, and vegetation zone.
The types of housing culture are semi rural, rural, semi urban, urban and ultra urban.
It is important to notice that proper housing is important for the health and well-being of an individual or family. Living on higher floors or living in inappropriately constructed and unmaintained buildings (for example with humidity walls > 3%) could seriously affect the health of inhabitants. In addition, sick building syndrome has to be mentioned, a consequence of modernly constructed buildings with inappropriate ventilation and/or lamination as well as noncritical use of synthetic materials in interior design. This syndrome is frequently connected with increased incidence of respiratory infections, cardiovascular diseases, and mental disorders.

Communal and Industrial Waste

Waste is something that is left over or that it is no longer needed. Waste can cause pollution and impact upon our environment if not properly managed. Disposing of waste that cannot be otherwise reused, recycled, or avoided in any other way also represents a waste of resources, a lost opportunity, and is a waste of money (► communal and industrial waste).
Waste is defined by the Environment Protection Act of 1970 as any matter prescribed to be waste and any matter, whether liquid, solid, gaseous, or radioactive, which is discharged, emitted, or deposited in the environment in such volume or manner as to cause an alteration of the environment.
Waste can be divided into many different types. The most common methods of classification are by physical, chemical, and biological characteristics. One important classification is by consistency of the waste. Solid waste is waste material that contains less than 70% water. This class includes such materials as household garbage, some industrial wastes, some mining wastes, and oilfield wastes such as drill cuttings. Liquid waste is usually wastewater that contains less than 1% solids. Such wastes may contain high concentrations of dissolved salts and metals. Sludge is a class of waste between liquid and solid; it usually contains between 3% and 25% solids, while the rest of the material is water-dissolved materials.

Workplace Factors

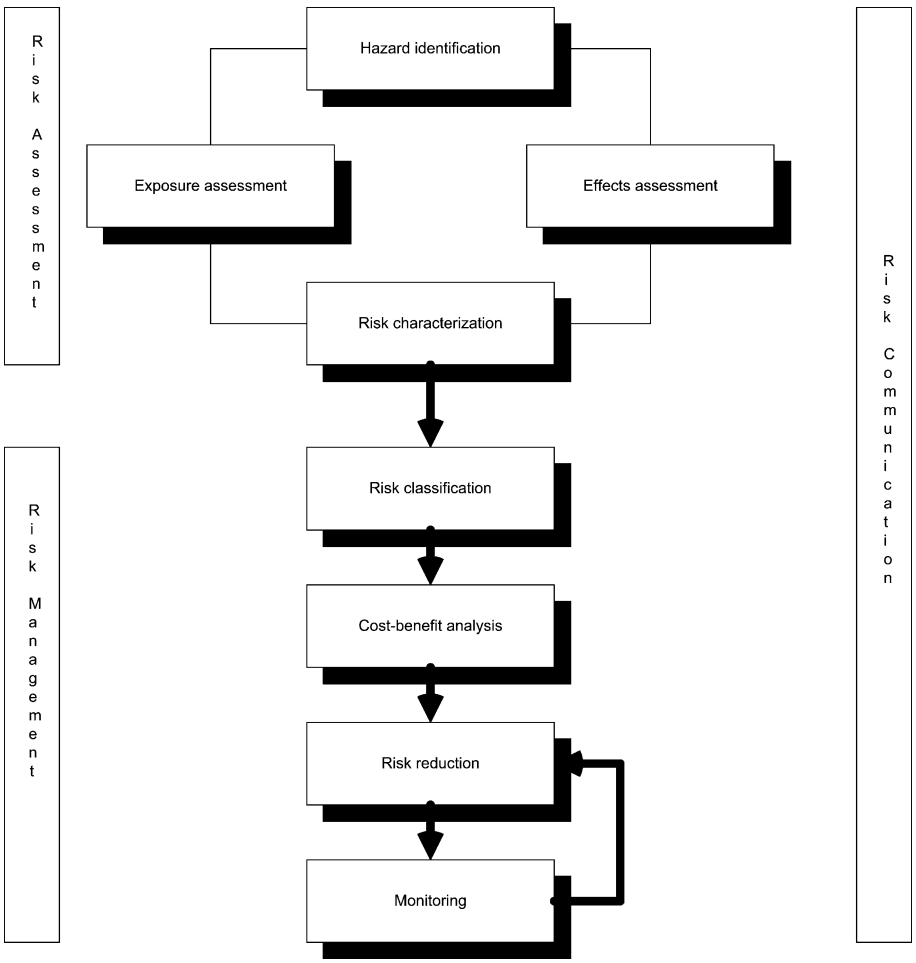
Workplace Hazards and Risk Assessment

Workers in almost every work place are exposed to some hazards. There are a number of different ► workplace hazard classifications, but the most common is classification into the following four groups:

1. Physical hazards:
   a. Exposure to high/low temperatures
   b. Mechanical hazards (noise, vibration)
   c. Ionizing and non-ionizing radiation
2. Chemical hazards:
   a. Gases
   b. Fumes
   c. Particles
   d. Fibers
3. Biological hazards:
   a. Bacteria
   b. Viruses
   c. Fungi
4. Psycho-Socio-Economicalhazards:
   a. Job stress
   b. Organizational factors
   c. Corporate closing and downsizing

In most cases, workers are not exposed to a single hazard. Usually, they are exposed to a number of different hazards. Exposure assessment, in some cases, is a rather complex task. Even in the simplest situations, when the worker is exposed to a limited number of well-known physical and chemical hazards, exposure assessment includes a number of rather complicated procedures of ambience and biological monitoring, job analysis, and evaluation. In more complex situations when the worker is exposed to new chemicals, various physical factors, work under stress, or a hostile environment, hazard assessment is rather difficult.

Modern OH involves a ► risk assessment during analysis of factors influencing the health of workers, besides analysis of hazards. It is the process of characterizing and quantifying potential adverse effects of hazards. In risk assessment, the goal is shifted from con-



Occupational and Environmental Health, Figure 1
Risk Assessment and Risk Management

cern for immediate hazards with readily perceptible linkages between a specific hazardous situation and an adverse outcome, to situations where there are only probabilistic linkages between exposure to an agent and the occurrence of an adverse health effect over a long period of time. Risk assessment usually includes hazard identification, exposure assessment, effects assessment and risk characterization (Fig. 1: Risk assessment and risk management). Once risk assessment has been completed, the focus turns to risk management decision-making, the process of selecting the appropriate response to the potential health hazard. Risk management usually includes risk classification, cost-benefit analysis, risk reduction, and monitoring (Van Leeuwen CJ 1995). During processes of risk assessment and management, effective risk communication with all stakeholders is of utmost importance (► risk management and communication). This includes communicating the nature and level of risks associated with certain processes or operations to workers, the local population, and regulatory authorities, as well as to plant managers.

As it has already been mentioned, workers in almost every workplace are exposed to different hazards that may cause occupational disease, work related disease, and/or occupational injury.

Occupational Disease

Occupational disease is any disease contracted as a result of exposure to risk factors arising from work activity (ILO definition) (Anonymous 2002). All definitions of occupational diseases specify causality between the disease and the exposure factor (physical, chemical, biological, and others) present in the work/activity taken into account.

In contrast with the definition of ► occupational diseases, which is often similar in different countries, the process of occupational disease recognition is not uniform. In most countries (such as Germany, France, and Belgium), there is a list of diseases that might be recognized as occupational and there is the possibility to prove that certain diseases are occupational. In some countries (such as Serbia), there is a so-called closed list system. In those countries, only diseases that are on the list of occupational diseases can be recognized as occupational. In contrast to that system, there is a so-called open system, operating without a list of occupational diseases. In some countries like the USA, each state has its own system for recording occupational diseases and there is no federal register. All of these differences make any international comparisons almost impossible. WHO data (2005) on occupational disease incidence rate (Table 1) clearly shows huge differences between countries. These differences cannot only be explained by differences in the process of recognition of occupational diseases. In addition, it should be noted that in Table 2, data on incidence are missing for a number of developed countries (EU members) (France, the Netherlands, Spain, Belgium, Italy, etc.).

Occupational and Environmental Health, Table 1 Occupational disease incidence rate per 100,000 population for the years 2000–2004

Country	2000	2001	2002	2003	2004
Armenia	0,33	0,47	0,19	0,23	
Austria	27,6	28,4	29,04	24,84	25,78
Azerbaijan	3,25	3,32	1,01	3,57	
Belarus	3,66	4,32	3,32	2,72	3,3
Croatia	2,73	3,06	3,55	4,09	3,45
Czech Republic	23,6	22,7	21,32	20,61	18,36
Denmark	403,72	397,06			
Estonia	38,75	30,77	14,08	11,03	
Finland	144,12	141,86	138,2		
Georgia		0,71			
Germany	33,47	33,35	32,94	31,35	
Hungary	8,14	6,91	7,02	7,79	
Israel	38,42	46,47	45,96	32,18	
Kazakhstan	2,83	3,58	4,33	3,62	
Kyrgyzstan	0,48	0,87	0,53		
Latvia	30,99	45,58	55,52	60,76	119,07
Lithuania	24,72	24,66	34,57	34,83	40,45
Luxembourg	6,84	9,43	26,71	10,59	10,19
Norway	126,24	122,34	119,15	114,85	
Poland	27,67	22,5	18,58	16,41	
Portugal	10,14	18,97	31,4		
Romania	10,31	15,08	16,78	9,28	6,58
Slovakia	17,53	15,21	15,97		
Sweden	405,19	453,72			
Switzerland	83,8	75,66	72,51		
Tajikistan	26,06				
Ukraine	7,65	11,97	21,55		21,29
Uzbekistan	1,54				

Work Related Diseases

Work related diseases are a group of diseases to which the workplace environment and/or performance of work contribute significantly as one of several causative factors (Lesage 1998). The lay public quite often misunderstands them as occupational diseases. Generally, the main difference between them is that in the case of occupational diseases there is a strong and/or specific relation to workplace hazards. In the case of work-related disease, it is not easy to prove that workplace hazards caused the disease, due to multifactorial etiology. Another important difference is that occupational diseases are compensable. In some cases, it is not easy to discriminate work-related disease from occupational disease, even for experts. Probably the best example is chronic bronchitis, which is in some countries is recognized as an occupational disease and in others as a ► work related disease.

In the last decades, musculoskeletal disorders (MSDs) became one of the major work-related problems in the population, often causing absenteeism. According to the UK Health and Safety Executive, 5.7 million working days were lost due to back pain in 2001/2002, 4.1 due to MSDs of upper limbs or neck and the total estimated loss was £5.7 billion (Buckle 2005). Even if ergonomics provides a tool for solving a number of problems that cause musculoskeletal disorders, they are not fully implemented even in developed countries.

Occupational Injuries

Occupational injury is any personal injury, disease, or death resulting from an occupational accident (Anonymous 2001). According to the ILO definition, an occupational accident is an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work, which results in one or more workers incurring a personal injury, disease, or death. The ILO suggests that occupational accidents should include travel, transport, or road traffic accidents in which workers are injured and which arise out of or in the course of work, i. e. while engaged in an economic activity, at work, or while carrying out the business of the employer.

According to the Occupational Health and Safety Administration (OSHA) record keeping requirements, occupational injury is defined as any injury that results from a work accident or from an exposure involving a single incident in the working environment.

As almost every country has its own definition of ► occupational injury and accident, there are plenty of problems in comparisons at an international level. For example, there are differences in the inclusion or exclusion of commuting accidents from the total number of occupational injuries. There are also plenty of other problems in comparisons of occupational injuries. In some countries, regulations force employers to report every injury, even minor ones, whereas in some countries, employers must only report injuries that lead to sick leave. Furthermore, there is a problem of underreporting in some countries, as well as injuries among workers that are not officially employed. The data on occupational injuries in Europe (Table 2) probably give the best overview of the problems in registration and reporting of occupational injuries (WHO 2005). The paradox that developed countries have a higher incidence of occupational injuries than developing ones is mostly caused by the problems mentioned.

There is also a problem in comparing two injuries; from a statistical point of view, one minor accident resulting in a finger slash is the same as a serious accident resulting in a lost eye or death. To overcome that problem, tree indicators have been introduced: frequency rates, incidence rates, and days lost by economic activity.

Prevention of Occupational Accidents, Injuries, and Diseases

The estimate of global work-related deaths is around 2,000,000 per year and this number is likely to underestimate the real number of deaths due to limited data availability (Driscoll et al. 2005). The authors linked most of these deaths to diseases. It is also estimated that there are 263 million occupational accidents with 345,000 fatalities per year globally (Hämäläinen et al. 2006). These numbers clearly indicate a need for intensive preventive activities. In prevention of ► occupational injuries, accidents, and diseases, as well as ► work related diseases, there are a number of stakeholders: workers, employers, trade unions, ► company doctors, OH nurses, regulatory authorities, local communities, etc. Preventive activities in OH usually involve a multidisciplinary team that includes the company doctor, OH nurse, ergonomist, and others.

Occupational and Environmental Health, Table 2 Occupational injury incidence rate per 100,000 population for the years 2000–2004

Country	2000	2001	2002	2003	2004
Armenia	2,23	2,46	3,42	2,96	2,64
Austria	1768,6	1647,17	1620,41	1683,84	1667,52
Azerbaijan	2,2	1,42	2,19	2,28	2,87
Belarus	82,14	72,28	60,4	57,14	55,86
Belgium	2061,88	1979,65	1740,91	1608,72	1576,01
Bulgaria	84,92	74,76	70,54	62,32	
Croatia	503,38	490,08	476,77	518,75	494,44
Cyprus	320,7	337,4	235,33	289,49	294,68
Czech Republic	904,41	912,35	890,79	813,78	800,32
Denmark	897,51	815,94			
Estonia	177,29	177,48	229,27	238,63	246,5
Finland	1121,59	1123,28	1110,78	1079,38	
France	1263,53	1247,16	1274,61	1200,27	
Germany	1841,79	1694,92	1584,31	1384,84	
Greece	156,37	150,53	145,9		
Hungary	276,37	258,83	256,65	260,54	240,97
Iceland	496,88	462,37	449,99	476,71	592,64
Ireland	332,49	681,02	668,84	525,28	
Israel	1211,36	1072,94	1065,84	919,9	966,02
Italy	1130,34	1096,52	1039,39	1022,64	993,58
Kyrgyzstan	6,32	5,68	5,34	4,15	
Latvia	36,24	60,34	60,04	58,62	56,04
Lithuania	79,92	74,17	74,8	78,51	77,57
Luxembourg	6084,38	6157,31	6190,5	6010,43	5844,03
Malta	1370,11	1302,71	1247,58	1193,73	1010,8
Netherlands	690,72	623,2	544,93	499,22	
Norway	710,59	636,28	594,71	522,82	495,82
Poland	236,29	210,39	198,71	211,6	212,38
Portugal	2286,6	2376,09			
Republic of Moldova	15,62	15,09	14,31	18,32	18,92
Romania	29,57	30,48	29,29	27,47	25,97
San Marino	4131,74	3323,08	2818,52	3181,48	
Serbia and Montenegro			56,89		
Slovakia	409,5	388,35	361,38	322,9	246,57
Slovenia	2029,62	2023,26	2044,08	2070,09	2106,81
Spain	2322,26	2330,7	2265,58	2079,14	2055,52
Sweden	443,34	421,09	415,35		
Switzerland	1261,35	1257,37	1213,53	1159,63	
Tajikistan	1,45	1,17	1,77	2,71	1,63
TFYR Macedonia	179,78	76,02			
Turkey	111,02		104,39	109,17	117,82
Ukraine	69,63	69,51	57,95	145,8	121,81
United Kingdom	281,06	273,5	269,38	276,96	
European Region	764,96	738,6	715,33	679,17	674,02

Beside classical OH preventive activities in the last decades, a new concept of workplace health promotion has been developed. It includes a number of strategies that go far beyond education or communication, to accomplish significant behavioral changes among groups or individual workers (Engbers et al. 2005).

Summary

Occupational and Environmental Health, two closely related disciplines, are involved in a number of very important issues for the human population. Air and water quality and food safety affects not only the human population. The importance of these factors, as well as soil pollution, is enormous and in the coming years they will stay on the lists of global priorities. With social and industrial development, the waste management issue becomes more and more important. Industries as well as communities are faced with the fact that waste management takes a significant part of their budget. Industrial development is quite often followed by increased environmental and occupational exposures to noise and radiation. Decreasing such exposure is not always an easy task, especially in the case of environmental exposure. In an occupational environment, noise and radiation are only part of the workplace hazards. Nowadays, workers are exposed to a number of hazards that could cause adverse health effects. In the case of occupational diseases, the link between workplace hazard and adverse health effect is much more direct and specific than in the case of work related diseases, which have multifactorial etiology so it is not easy to prove that workplace hazards caused disease. Occupational injuries and accidents are rather frequent in developing as well as in developed countries. It is estimated that there are 263 million occupational accidents with 345,000 fatalities globally per year. The fact that around 2 million deaths per year are work related gives an impression of the importance of occupational health preventive activities. Workplace ► risk assessment, ► workplace health promotion, introducing ► ergonomics in modern industries and services, and availability of occupational health specialists (company doctors) for employees and employer are only a fraction of the occupational health preventive tools.

Cross-References

► Air Quality and Pollution

- ► Climate and Microclimate
- ► Communal and Industrial Waste
- ► Company Doctor
- ► Ergonomics
- ► Food Safety
- ► Noise
- ► Occupational Diseases
- ► Occupational Health Objectives
- ► Occupational Injuries
- ► Radiation
- ► Risk Assessment
- ► Risk Management and Communication
- ► Soil Pollution
- ► Urban Environments
- ► Water Quality and Pollution
- ► Workplace Hazards
- ► Workplace Health Promotion
- ► Work-Related Diseases

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Occupational Exposure

Synonyms

Occupational factors

Definition

Occupational exposure can be defined as the presence of a substance or ► risk factor in the work environment external to the worker. Occupational exposures include physical factors (for example, ► noise, vibration, or ► radiation), chemicals (for example, dusts or solvents), biological agents (for example, bacteria or viruses), physical stress (for example, lifting heavy weights or repetitive strain injuries), and psychosocial stressors (for example, low control over job tasks or poor communications with workmates). Apart from the nature of occupational exposure, it is also characterized by the intensity, duration and frequency of exposure. Occupational exposure can occur in different time frames, such as: short-term, long-term and cumulative exposure. Although many occupational exposures may occur as environmental exposures for the general population, workers are usually exposed to higher levels, and are frequently the focus of research on health effects of these exposures and agents.

As occupational exposure does not result only from the presence of a harmful agent in the environment, it is sometimes defined as “the contact of a chemical, physical, or biological occupational agent with the outer boundary of an organism.”

Cross-References

- ► Occupational Factors
- ► Occupational Hazards
- ► Workplace Environmental Exposure
- ► Workplace Exposure

Occupational Factors

Synonyms

Occupational exposure; Occupational hazards

Definition

Occupational factors include any aspect of a worker's behavior in the workplace, an ► occupational exposure, or an inherited worker's characteristics that, on the basis of epidemiologic evidence, is known to be associated with ► occupational diseases and injuries, and a ► work-related disease which is considered important to prevent.

Cross-References

- ► Occupational Exposure
- ► Occupational Hazards

Occupational Hazards

Synonyms

Occupational exposure; Occupational factors

Definition

Occupational hazard is a general term covering all workplace hazards, i. e. attributable to all forms of environmental contamination and physical, ergonomic, psychological, and social stress.

Cross-References

- ► Occupational Exposure
- ► Occupational Factors
- ► Workplace Hazards

Occupational Health

- ► Workplace Health

Occupational Health Care

Synonyms

Occupational medical health

Definition

Health care or healthcare means the prevention, treatment, and management of illness and the preservation of mental and physical well-being through the services offered by occupational health care services. The organized provision of such services may constitute a part of the national health care system.

Occupational health care refers to the care of the health of workers. It includes preventive health care, health promotion, curative health care, first aid, rehabilitation and compensation, where appropriate, as well as strategies for prompt recovery and return to work. Occupational health care is usually provided on the basis of the legislation (an occupational health care act). The goals of occupational health care are to reduce industrial accidents, to prevent occupational hazards/diseases, to reduce sick absenteeism and to achieve maximum human efficiency without unwanted health outcomes. The objective of occupational health care is a healthy and safe working environment, a well-functioning working community, prevention of work-related diseases as well as the maintenance of employees' working ability and functional capacity, and promotion of their health.

Occupational Health Care Service

Synonyms

Occupational medical health services

Definition

Occupational health care service refers to the institutionalized organizational arrangement that provides services in the field of occupational health care. Functionally, occupational health care service must be considered both as a part of country-level health infrastructure as well as a part of the infrastructure that exist for the implementation of relevant legislation on occupational health. There are a large number of models for occupational health care services because of variations in

national traditions, legislation and past experiences in the field of occupational health.

Occupational Health Department

Definition

The occupational health department is a part of the occupational health infrastructure. It is an organized enterprise within an establishment or in a health-care facility. It may consist of several occupational health units and a central (administrative) office. It usually offers multidisciplinary occupational health services for the enterprise (in-plant) or several enterprises at a local level.

Occupational Health Doctor

► Company Doctor

Occupational Health Needs

Definition

Occupational health needs may be viewed as (a) needs of an individual employee at his/her working environment (often specific and related to health and well-being of an employee), (b) needs of a company (often more general and related to reduction of occupational health risks and improvement of the health, safety and work ability of the employed population) or (c) needs on a national level (e.g. establishment of an national occupational health service system, or occupational injury prevention, etc.).

Health needs assessment in occupational health is a process of collecting information on ► workplace hazards and risks and on workforce characteristics, which are then analyzed to identify the occupational health issues and health problems of employed people. Results of needs assessments are considered in light of available financial and human resources, national and local tradition and experience, regulatory requirements and nature of the workforce. A health needs assessment will provide information on the prevalence and cost of different occupational health problems, both at the workplace and within the workforce, allowing assessment of prevention opportunities from both programmatic and financial points of view. Priorities and resource allocation can be agreed that will lead to improved occupational health provision and the overall health of a workforce.

Health needs assessment may also cover attitudes toward existing or potential employer policies.

Occupational Health Nurse

Synonyms

Company nurse

Definition

An occupational health nurse is responsible for the health and well-being of employees in the workplace. They could work in large enterprises, for private consultancies, as part of an ► occupational health and safety team, or alone. Occupational health nurses are involved in assessment of the work environment for potential health and safety problems; processes of health education and promotion for accident and disease prevention; delivering first aid, and health and safety training; providing first aid treatment; and in a number of other activities leading to better workplace conditions.

Occupational Health Objectives

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Definition

Occupational health is a discipline devoted to prevention (► prevention of occupational diseases) and ► management of occupational diseases, accidents (Occupational Accidents) and disabilities (► occupational disability) and to elimination of ► occupational factors and conditions hazardous to health and safety at work (► occupational health and safety); development and promotion of healthy and safe work, ► work environments and work organizations; enhancement of physical, mental and social ► well-being of workers and maintenance of their working ability, professional and

social development at work, and productivity of workers; and enablement of workers to conduct socially and economically productive lives and to contribute positively to sustainable development (WHO 1995).

In practice, occupational health is most frequently understood as activity aiming at minimizing the risk to employees' health from occupational factors and preventing ► occupational accidents and diseases (Westerholm, Baranski 1999).

Basic Characteristics

Workplace and Occupational Hazards

► Workers represent a half of the global population (around 2.9 billion in 2005) (Eijkemans, Takala 2005). Their work sustains economic and social value of modern society. Worldwide, most adults, and many children spend much of their daily hours at work. However, the ► workplace can be a hazardous environment. Many workers are exposed to unacceptable levels of chemicals, biological agents, physical, psychological and ergonomic factors (Rom 1998). They face various kinds of job-related hazards, such as job insecurity, time pressure, increasing job demands, job-related stress, etc.

The International Labor Organization estimated that poor occupational health and safety resulted in 2005 in 270 million occupational accidents and 360 000 fatalities, and caused 260 million occupational diseases (ILO 2005). Altogether these lead annually to 2.3 million deaths of people at their best working age. Deaths, occupational diseases and injuries take a particularly heavy toll in developing countries. However, it is increasingly recognized that a healthy workforce is a prerequisite for success of economic and social policy and a necessary condition for the achievement of ► sustainable development (Fedotov 2005).

Major traditional occupational health needs still prevail among the global workforce, in particular in developing and undeveloped countries. In addition, due to the rapid changes in economy, technology and demography, such as growing ► globalization (internationalization), major changes in the enterprise structures, new patterns of work, aging of the workforce, child labor, etc., occupational health has been faced and challenged by these new occupational health risks (Cooper 2006). There is increasing evidence that workers' health is determined not only by the traditional and newly emerging occupational risks, but also by social inequalities, such as employment status, income, gender, race, health related-behavior, and access to health services (WHO 2006).

Main Occupational Health Objectives

The Joint International Labor Organization (ILO) and World Health Organization (WHO) Committee on Occupational Health on their Twelfth Session in 1995 updated the definition of occupational health, focusing primarily on three key objectives (Coppée 1998):

1. The maintenance and promotion of worker's health and ► working capacity;
2. The improvement of the working environment and work, to become conductive to safety and health; and
3. The development of work organization and working cultures in a direction which supports health and safety at work, and in doing so also, promotes a positive social climate and smooth operation, and may enhance the productivity of the undertaking.

This comprehensive concept is designed to include both occupational and non-occupational determinants of employees' health. It has been broadened considerably from simply protection against ► occupational hazards toward prevention and ► health promotion.

The 10 priority objectives were proposed for the development of occupational health in the WHO 'Global Strategy on Occupational Health for All – The way to Health at Work' (WHO 1995). These priority objectives of occupational health are as follows:

1. Strengthening of international and national policies for health at work and developing the necessary policy tools;
2. Development of a healthy work environment;
3. Development of healthy work practices and promotion of health at work;
4. Strengthening of ► occupational health services (OHS);
5. Establishment of support services for occupational health;
6. Development of occupational health standards based on scientific risk assessment;
7. Development of human resources for occupational health;
8. Establishment of registration and data system, development of information services for experts,

effective transmission of data and raising of public awareness through public information;
9. Strengthening of research; and
10. Development of collaboration in occupational health and with other activities and services.

These objectives emphasize the importance of primary prevention and ask and encourage countries to establish national policies and programs with required infrastructure and resources for occupational health. Further improvement of the health of workers requires combining efforts of occupational health safety with disease prevention, health promotion and tackling social determinants of health and reaching out to workers' families and communities. It is, therefore, obvious that current occupational health problems cannot be solved only by the health care sector. Other relevant factors, such as employment, social and economic development, trade, environmental protection, education, science and trade unions should be involved.

Cross-References

- ► Globalization
- ► Health Promotion
- ► Management of Occupational Diseases
- ► Occupational Accidents
- ► Occupational Disability
- ► Occupational Factors
- ► Occupational Hazards
- ► Occupational Health and Safety
- ► Occupational Health Services (OHS)
- ► Prevention of Occupational Diseases
- ► Sustainable Development
- ► Well Being
- ► Work Environment
- ► Worker
- ► Working Capacity
- ► Workplace

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Occupational Health Physician

Definition

An occupational health physician (OHP) is a medical doctor who diagnoses and treats occupational diseases, work-related illnesses and injuries of employees, and conducts fitness-for-work physical examinations. He or she attends patients in-plant or at a hospital, and re-examines disability cases periodically to verify progress. An OHP oversees maintenance of case histories, health examination reports, and other medical records. They formulate and administer workers health programs, inspects plants and make recommendations regarding sanitation and elimination of health hazards. Most occupational physicians are engaged in private practice or in-plant services (► in-plant health service). The occupational physician is one of the core professions in the occupational health multidisciplinary team and plays a part in reducing the incidence of diseases and injuries, alleviating suffering and promoting and protecting people's health throughout their lives. The occupational physician is an expert adviser, part of the enterprise's senior management team, able to assist in planning and re-engineering the work process with regard to health and safety, legal requirements, good business and human resources practice.

In the past an important number of practicing occupational physicians lacked full formal training in the field of occupational medicine and did not hold appropriate board-certification in the specialty of occupational medicine. The term "occupational physician", therefore, does not necessarily imply obliged specialist preparation.

Cross-References

► Company Doctor; Industrial physician; Occupational physician

Occupational Health Risk

Synonyms

Workplace health risk

Definition

Occupational health risk is the probability that the health of an employee (or group of employees) will be adversely affected by exposure to an occupational health hazard within a specified time period or in specified circumstances. Occupational health risk is usually determined by two variables: the probability that a ► workplace hazard will result in an undesired health event and the severity that such a health event would have. It may be classified by qualitative terms or by quantitative values.

Occupational health risk is different from occupational health hazard. Occupational health hazard refers to the workplace agents (physical, chemical, biological, ergonomic or psychosocial) with an inherent potential to cause a harm.

Occupational Health and Safety

Synonyms

Occupational safety and health; Workplace health and safety; Worker's safety and health

Definition

Occupational health and safety, according to the ILO, is the discipline dealing with the prevention of work-related injuries and diseases as well as the protection and promotion of the health of workers. It aims at the improvement of working conditions and environment. Members of many different professions (e.g., engineers, physicians, hygienists, nurses) contribute to occupational safety, occupational health, occupational hygiene and improvement of the working environment.

Occupational health and safety also is viewed as a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. As a secondary effect occupational health and safety may also protect employers, customers, suppliers, and members of the public who may experience an impact from the workplace environment. As occupational health and safety is recognized as the field which has benefits for the worker (through maintenance of health) and for the enterprise (through improved productivity and quality) many countries established enforcing authorities to ensure that the basic legal requirements relating to occupational safety and health are met.

Occupational health and safety may involve interaction among many related disciplines, including occupational medicine, occupational hygiene, public health, safety engineering, health physics, ergonomics, toxicology, epidemiology, sociology and psychology.

Cross-References

► Workplace Health and Safety

Occupational Health and Safety Service

Synonyms

Occupational safety and health service; Workplace health and safety service

Definition

Occupational health and safety service refers to the institutionalized organizational arrangement that provides services in the field of ► occupational health and safety at the company level. Functionally, occupational health and safety service must be considered as a part of the infrastructure that exists for the implementation of relevant legislation on occupational safety and health at a national level. The type of arrangements and services varies from country to country and depends on legislation, local tradition and past experience.

Occupational Health Services (OHS)

Synonyms

► Workplace Health Services

Definition

Occupational health services (OHS) are services entrusted with essentially preventive functions and responsible for advising the employer, the ► workers and their representatives in the undertaking on the requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work and the adaptation of work to the capabilities of workers in the light of their state of physical and mental health.

Provision of OHS means carrying out activities in the ► workplace with the aim of protecting and promoting workers' safety, health and ► well-being, as well as improving working conditions and the working environment. These services are provided by occupational health professionals, including occupational medicine and nursing, occupational hygiene, work physiology and physiotherapy, ► ergonomics, safety and psychology. In that sense, OHS are multidisciplinary and multisectoral, involving in addition to occupational health and safety professionals competent authorities, the employers, workers and their representatives.

OHS can function individually or as part of special service units of the enterprise or of external services.

Cross-References

► Workplace Health Services

Occupational Health Unit

Definition

An occupational health unit is viewed as a part of the occupational health infrastructure. In the past it was often just an extended part of the large in-plant health center which provided occupational health services for a company. Occupational health units may be organized as independent units or part of municipal health centers that provides basic occupational health services for small-medium enterprises or municipal workers.

Occupational Hearing Loss

► Hearing Impairment Caused by Noise

Occupational Injuries

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Synonyms

Work injury; Workplace injury

Definition

Occupational injury is any personal injury, disease, or death resulting from an occupational accident (Anonymous 2001). According to the ILO definition, an occupational accident is an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work, which results in one or more workers incurring a personal injury, disease, or death. The ILO suggests that travel, transport, or road traffic accidents in which workers are injured and which arise out of or in the course of work, i. e. while engaged in an economic activity, at work, or while carrying out the business of the employer, should be considered occupational accidents.

According to the Occupational Health and Safety Administration (OSHA) record keeping requirements, occupational injury is defined as any injury that results from a work accident or from an exposure involving a single incident in the working environment. There is therefore an important difference between an occupational injury and an occupational disease. An occupational disease is a consequence of exposure to one or more risk factors over a period of time; in contrast, occupational injury is the result of a sudden event (occupational accident).

Basic Characteristics

Even if it looks straightforward there are plenty of misunderstandings in the field of occupational injuries. For

example, there are differences in recognition of ► commuting accidents among countries. ILO labor statistics suggest that travel, transport, or road traffic accidents in which workers are injured and which arise out of or in the course of work but are not commuting accidents, should be considered as occupational accidents.

Occupational injuries cause a lot of harm especially to the victim and his family but also to society through direct and hidden costs. So, it is in public interest to decrease the number of occupational accidents. ► Registration of occupational injuries is one of the most important sources for prevention. The register provides necessary data for identifying workplace problems, and developing and implementing corrective measures. To fulfill those goals, the register must incorporate reasonable detailed data on the characteristics of occupational injury, like industry, how the incident happened, part of body affected, ► source of injury, ► cause of injury, date, time, number of lost workdays due to injury, data on the victim (age, gender, occupation), etc. There are many different schemes of registering occupational injuries; the two most common are the accident reporting system and the occupational injury compensation system but almost every country has its own modification of these systems. In some countries, regulations force employers to report every injury, even minor ones; in other countries, employer must only report injuries that lead to sick leave. Also, there is a problem of underreporting in some countries, as well as injuries among workers who are not officially employed.

There is also a problem of comparison of two injuries; from a statistical point of view, one minor accident resulting in a finger slash counts the same as a serious accident resulting in a lost eye or death. To overcome that problem, tree indicators have been introduced: ► frequency rates, ► incidence rates, and ► days lost by economic activity. Only having all these differences and difficulties in mind can we use available data. The yearly global estimates of occupational injuries causing at least 3 days absence are in the range of 181,957,318 to 345,718,904 with an average of 263,838,111 (Hämäläinen et al. 2006). This impressive number of occupational injuries is even more impressive if it is expressed as a daily average, which is around 720,000 occupational injuries. The same situation occurs with ► fatal occupational accidents; the global estimate is that there are 345,719 fatal occupational accidents a year, or almost 1,000 per day. The estimates of Nelson et al. (2005) suggest that in the year 2000 there were 850,000 deaths related to occupational exposure and among them 312,000 fatal occupational injuries, which is similar to the estimate of Hämäläinen et al. (2006). Nelson et al. (2005) estimate that 44% of the total of disability-adjusted life years (DALYs) lost due to work related fatalities could be linked to occupational injuries in the year 2000. They estimated that fatal occupational injuries caused a loss of 10.5 million years of healthy life.

According to Hämäläinen et al. (2006), the estimated number of fatal occupational accidents in India is 48,176; in China, 73,615; and in other Asian countries (including islands), 83,048 per year. So, those three regions account for more than half of total fatal occupational accidents in the world. It has to be mentioned that only a fraction of the global estimate of occupational injuries are reported to the ILO (3.9%).

Having in mind all these figures, it is obvious that occupational accidents are a serious public health problem. Comparing those estimated 350,000 fatal occupational injuries in the year 2000 with fatalities in road accident estimates for 1999; 1,200,000 (WHO 2001), and more conservatively 750,000–880,000 (Jacobs et al. 2000), gives a clearer picture of the importance of dealing with occupational injuries. However, comparison of the estimated total number of occupational injuries (345 million) with the estimated number of persons injured in road accidents (23–34 million, Jacobs et al. 2000) indicates the real magnitude of this problem.

Occupational Injury Prevention

In prevention of occupational injuries, a number of stakeholders are involved: workers, employers, trade unions, company doctors, ► occupational health nurses, regulatory authorities, local communities, etc. As in other cases when there are many stakeholders involved there is always a question (or a problem) of who is responsible. In this case, from a legal point of view, all stakeholders are responsible but most responsibility is on the employer. He is responsible for the occupational injury prevention program which usually contains the following:

- Identification and evaluation of risk for injury in the workplace;

- Measures for reducing risks including administrative measures and engineering interventions in the workplace environment;
- Risk communication;
- Occupational rehabilitation and return to work of injured workers;
- Management and development of safe work programs.

In many countries, especially developing ones, there is no adequate awareness of the necessity of such programs. In those countries, there is no stimulation for the employer to invest in safety, so such programs are very rare and depend on employer goodwill. Having in mind globalization and influences of multinational companies (even in cases where those companies in developing countries do not apply all the safety measures used in developed countries) one could expect that their presence in developing countries could lead to better understanding of occupational safety issues and particularly the importance of occupational injury prevention.

Cross-References

- ► Cause of Injury
- ► Commuting Accident
- ► Days Lost by Economic Activity
- ► Fatal Occupational Accident
- ► Frequency Rate
- ► Incidence Rate
- ► Occupational Health Nurse
- ► Registration of Occupational Injuries
- ► Source of Injury

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Occupational Malignant Diseases

► Occupational Cancer

Occupational Medical Health

► Occupational Health Care

Occupational Medical Health Services

► Occupational Health Care Service

Occupational Medicine Specialist

Definition

Occupational medicine specialists are medical doctors – practitioners – who have full formal postgraduate training in the field of occupational medicine and an appropriate board-certification in the specialty of occupational medicine. They diagnose and treat occupational diseases, work-related illnesses and injuries of employees, and conduct assessments of fitness for work. They attend patients in-plant or hospital, and reexamine disability cases periodically to verify progress. Occupational medicine specialists oversee maintenance of case histories, health examination reports, and other medical records. They also formulate and administer workers' health programs, inspect plant and make recommendations regarding sanitation and elimination of health hazards. Occupational medicine specialists are core professionals in the occupational health multidisciplinary team. They play a part in reducing the incidence of disease and injury, alleviating suffering and promoting and protecting people's health throughout their lives. The occupational medicine specialist is an

expert adviser, part of the enterprise's senior management team, able to assist in planning and re-engineering the work process with regard to health and safety, legal requirements, good business and human resources practice. The term "occupational medicine specialist" mandatory implies specialist preparation.

Occupational Physician

► Company Doctor
► Occupational Health Physician

Occupational Safety and Health

► Occupational Health and Safety

Occupational Safety and Health Service

► Occupational Health and Safety Service

Occupational Stress-Mediated Disorders

Definition

Stress is viewed as a state of elevated activation of the autonomic nervous system with coordinated manifestations at the affective, cognitive, and behavioral levels. Occupational stress refers to cases where work is the sole cause of the experience of stress and associated symptoms of ill health. Occupational stress may affect health in the long run by (a) direct effects via sustained activation of the autonomic nervous system and enhanced neuroendocrine responses and (b) through unhealthy behavior that undermines self-control and therefore may contribute to occurrence and aggravation of multifactorial diseases. Occupational stress as a risk factor mediates the association between work exposure and some health disorders. It is widely conceptualized as lying, at least partly, on the causal pathway.

Common health outcomes linked to occupational stress include cardiovascular disease (hypertension, ischemic heart disease, and ischemic cerebral disease), musculoskeletal disorders (low back pain, upper limb disorders) and mental illness (depression). The health outcomes as a burnout, anxiety state, or depression may be recognized as real occupational stress-mediated disorders. Underlying pathophysiological processes include increased blood pressure, increased corticosteroid levels, increased peripheral neurotransmitters, sympathetic arousal, increased muscle tension, peripheral vasoconstriction, decreased immune system response, and stress-induced hyperventilation.

Occupational Therapy

Definition

Occupational therapy is a ► health care profession concerned with restoring physical functionality following disabling accidents and sickness. Its goal is to aid individuals in achieving the maximum level of independent function to become as independent as possible in carrying out daily life tasks. It addresses people of all ages, with a broad range of physical, mental, or developmental problems. The primary tool of occupational therapists is the active involvement of the patient in therapeutic tasks and activities.

Occupational Therapy in Palliative Care

Synonyms

Reconstruction aide

Definition

Occupational therapy is an applied science and health profession involving skilled treatment. Individuals undergoing occupational therapy develop, regain or maintain the abilities to participate in all facets of their lives ("skills for the job of living"). Thus they are prepared for a meaningful and satisfying way of life. Occupational therapy in palliative care provides: a) treatment for an improving performance of daily activities; b) home and job site evaluations and adaptive recommendations; c) performance assessments and treatment; d) adaptation equipment planning and training in their use; e) teaching assistance skills to family members and caregivers.

Occurrence

Synonyms

Frequency

Definition

In ► epidemiology, a general term describing the frequency of a disease or other attribute or event in a population without distinguishing between incidence and prevalence.

Odds Ratio (OR)

Synonyms

Cross-product ratio; Relative odds

Definition

Odds ratios are one way of expressing the size of the effect of a treatment on an even rate. The odds of an event are ratio of the probability of occurring to the probability of it not occurring. The odds ratio is the ratio of the odds of an event in the treatment (or exposed) group compared to the odds in the control (or unexposed) group.

$$\mathrm{OR} = \frac{a/c}{b/d} = \frac{ad}{bc}$$

$$95\%CI_{\mathrm{OR}} = \exp[\ln \mathrm{OR} \pm 1,96SE_{(\ln \mathrm{OR})}]$$

OR equal 1 means no effect of treatment. An OR of different from 1.0 suggests that positive or negative effect of treatment.

The Mantel-Haenszel method is appropriate for use in combining odds ratio.

The odds are a ratio of probabilities. The odds of exposure in a group is the number exposed divided by the number not exposed. If the odds of exposure among cases and controls in a case control study are determined, an odds ratio can be calculated as the ratio of two odds (odds of exposure among cases/odds of exposure among controls). An odds ratio close or equal to 1 indicates that the odds of exposure are very similar in the two groups. If the odds ratio is greater than 1, it indicates that cases are more likely to be exposed to a particular factor than controls, and if the odds ratio is less than 1, the opposite is true. The odds ratio (obtained from a case-control study) may be used as an estimate of the ► relative risk (obtained from a prospective cohort study) if the risk of disease in the population is low (less than 5%).

In medical research, the OR is favored for case-control studies.

Cross-References

► Relative Odds

OECD

Synonyms

Organisation for Economic Co-operation and Development

Definition

OECD is an international organization originating from the context the Marshall Plan implementation in Europe after the Second World War. Currently 30 countries are full members (mostly high-income countries within and outside Europe), which accept the principles of free market economy and representative democracy. The OECD is a forum for developing, analyzing and monitoring national and international policies in a wide range of sectors, e.g. trade, technology, environmental and social affairs. Dialog and capacity building activities also include a number of associated non-members. A focus of the OECD's work is on the compilation of comparable statistics, which allow for analysis and forecasts of economic developments.

The Organization for Economic Co-operation and Development (OECD) is an international organization of those developed countries that accept the principles of representative democracy and a free market economy. It originated in 1948 as the Organisation for European Economic Co-operation (OEEC), led by Robert Marjolin, to help administer the Marshall Plan for the reconstruction of Europe after World War II. Later its membership was extended to non-European states, and in 1961 it was reformed into the Organization for Economic Co-operation and Development. The organization provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and co-ordinate domestic

and international policies. The mandate of the OECD is very broad, as it covers all economic, environmental and social issues.

Offender

► Tortfeasor

Ogiek (Eastern Africa, Kenya)

► Indigenous Health – Africa

Ogoni People (Western Africa, Nigeria)

► Indigenous Health – Africa

Older People and Health

► Aging and Health

Omnipotency

Synonyms

Totipotency

Definition

An omnipotent stem cell is able to give rise to cells derived both from the trophoblast and the embryoblast. Therefore, only ESC or ESC-lines can be considered omnipotent.

On Chance Distribution

► Randomization

Onchocerciasis

Synonyms

Onchocercosis; River blindness; Infection with Onchocerca volvulus; Dermatitis nodosa tropica

Definition

Onchocerciasis, which primarily occurs in Africa and Central and South America, is caused by the microfilaria *Onchocerca volvulus*. It is transmitted by blackflies, which breed in rapidly running water. Worldwide, about 20 million people are infected. With the bite, larvae get into the host organism. Within 10–20 months, they develop into adult worms. The worms settle in the subcutaneous tissue, where they appear as firm, nontender nodules, which can reach a size of 5 cm. Via lymphatic vessels the parasites can also reach the eyes. Without treatment, 10% of the eye infections lead to blindness. The medicinal treatment of onchocerciasis is administration of ivermectin (Mectizan®, Strometol®. Preventive measures include extermination of blackflies with insecticides, the prophylaxis of insect bites and the administration of ivermectin once yearly.

Cross-References

► Tropical Diseases and Travel Medicine

Onchocercosis

► Onchocerciasis

One-Sidedness

► Confounding and Interaction
► Prejudice

One-Sided Test

Synonyms

One-tailed test; Directional test

Definition

Test of statistical significance based on the assumption that the data have only one possible direction of variability.

One-Tailed Test

► One-Sided Test

O

One-Way ANOVA by Ranks

► Kruskal-Wallis Test

Onlay

Definition

► Inlay, Onlay

Open Trial

Definition

An open trial is a trial in which the participants and investigator know which individuals are in the experimental or control group. This type of trial is open to challenge regarding bias. The best protection against bias is to use a blind trial.

Operating Characteristics of Diagnostic Tests

► Sensitivity

Operator

Definition

The human operator is a critical component in a "► man-machine system" whose characteristics, capabilities and limitations must be integrated into the design of equipment. ► Human factors engineering takes into consideration the capabilities and limitations of the human operator – both physical and mental – and how these should be used to guide the design of systems. They view human operators and the objects they use as one unit, and ergonomic design blends the best abilities of people and machines. The scope of ► ergonomics has now passed beyond the concern of individual worker and his machine or workplace to include consideration of the total work environment.

Opioid Analgesics

► Opioids

Opioids

Synonyms

Opioid analgesics; Narcotic analgesics

Definition

Opioids are ► analgesics that reduce pain. The term is applied to opiate alkaloids and their synthetic analogues. Opioids are psychoactive drugs and they have the capacity to produce a sense of well-being (euphoria). In higher doses they can cause coma, seizures, respiratory depression and potential death.

Opportunistic Infections in AIDS

► AIDS-Defining Symptoms

Opportunity Costs

Definition

The concept of opportunity cost is based on the assumption of scarcity of resources for health care and the necessity for ► resource allocation. If the cost and the benefit of using one defined activity are not occurring, because the choice was made for an alternative, the opportunity cost is the cost and the value or benefit of the best alternative option. The concept of opportunity cost is important for all health economic analysis involving alternative resource use. It is particularly relevant for the determination of the cost of items without a market price.

Oral Diseases

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Synonyms

Oral disorders; Dental diseases

Definition

Oral diseases comprise a range of conditions, including ► dental caries and ► periodontal diseases as the most important global oral health burdens, but also other important illnesses like oral cancer. They are highly prevalent and their impact on both the society and the individual is significant. Oral diseases affect a person's physical and psychological well-being and as a result reduce quality of life. The two most common conditions are to a great extent preventable.

Basic Characteristics

Dental Caries

Dental caries is among the most frequent chronic diseases in the world and is therefore still a major oral health problem in most industrialized countries. Between 60 and 90% of all schoolchildren and a vast majority of adults in developed countries and some states in Asia and Latin America suffer from tooth decay (Petersen 2003). The situation in most African countries is not that severe. Due to changing living conditions, it is expected that the incidence of dental caries will increase in many developing countries in Africa, particularly as a result of growing sugar consumption.

Dental caries can be defined as a localized destruction of the ► hard tooth tissue by microorganisms (infectious disease) leading to a ► cavity. It is a multifactorial disease and results from a combination of four factors:

1. host and teeth,
2. microorganisms (bacteria),
3. substrate (principally sucrose), and
4. time.

The hard tooth tissue is predominantly composed of calcium and phosphate in the form of hydroxyapatite. In the case of normal pH levels, there is a chemical equilibrium between the minerals of the tooth and the adjoining oral fluids – a balance between the tooth's re- and de-mineralization. If food particles remain on the tooth-surface, this balance is disrupted because the oral bacteria that adhere to the tooth surface (particularly *Streptococcus mutans*) metabolize the available substrate originating acid metabolites. These acids lead to a decrease of the pH-value, which results in a local demineralization of the tooth. With each exposure to sugar, the plaque pH falls sharply and rises slowly back to normal levels over the following hours. The bacteria also form extracellular polysaccharides, which they use to build and to increase the bulk of a covering named ► dental plaque.

A large amount of host factors inhibit the loss of mineral salts, for example the flow rate or the chemical composition of the saliva. The protective role of saliva against caries consists of simple dilution, buffering plaque acids, and being a source of minerals and immunological plaque inhibitory factors. However, the flow of saliva to the tooth surface is more and more restricted when dental plaque becomes established. Other conditions that promote demineralization are, for instance, plaque retention corners like ► approximal surfaces and a high frequency of ingestion.

Progressive demineralization is defined as ► dental caries, a condition which passes through different stages, starting with chalky white spots and leading to a ► cavity. When reaching the underlying dentine, pain usually occurs because dentine is sensitive to thermal, physical, and osmotic stimuli. If the process still continues, it can spread to the ► pulp and then along the ► root canals to the ► alveolar bone, causing an inflammation or even a dental abscess. These progressions cause spontaneous and intense pain and discomfort, often of longer duration. As a consequence, the tooth frequently has to be extracted (tooth loss).

Periodontal Diseases

► Periodontal diseases have been prevalent throughout human history. They cover a group of inflammatory diseases that arise in the gum sulcus, the crevice between the gum and the tooth, as a response to dental plaque. Even in healthy mouths, the gum sulcus is teeming with bacteria, but they tend to be harmless varieties. If dental plaque remains in the sulcus, the population of the microorganisms changes and these bacteria and their waste products (exo- and endotoxins) attack the crevicular epithelial cells. Some of the microorganisms can even pass through the epithelium. In order to eliminate the detrimental bacteria and their toxins, the body activates an immune response to infection. This reaction passes through different stages. Due to these reactions, periodontal diseases are generally divided into two groups: ► gingivitis and ► periodontitis.

Gingivitis is an inflammatory process exclusively affecting the gingiva (gum). The inflammation of the gingiva is characterized by tender, red, swollen gums that bleed on gentle provocation like cleaning the teeth.

In most cases, gingivitis causes no pain. The junctional epithelium remains attached to the tooth at its original level. Gingivitis is nearly always chronic, but occurs infrequently in an acute form, the most severe being acute necrotizing ulcerative gingivitis (ANUG).

Periodontitis is the consequence of progressive gingivitis, although not every gingivitis leads to periodontitis. It is characterized by loss of clinical attachment of the ► periodontal ligament and by loss of bony support of the tooth. This occurs because exotoxins and endotoxins, as well as decomposition products of the host, represent a stimulus. They encourage the activation of osteoclasts, which are responsible for purposeful decomposition and reconstruction of bony tissue in order to protect the surrounding tissue and to prevent deeper infection. As a result, the supporting bone starts to atrophy. This loss of attachment manifests by deepening of the pockets between the gingiva and teeth and by recession of the gingiva. In severe cases, the supporting structures are so depleted that the teeth become loose. All things considered, periodontal destruction arises directly as a result of pathogenic bacterial components and indirectly via host destructive mechanisms. In most cases, this oral disorder is chronic with recurring acute phases. Pain only occurs in cases of exposed ► roots and during acute inflammation. It can be severe in the event of an abscess of the pocket or alveolar bone. Whereas gingival bleeding, ► calculus, and mild ► periodontal pocketing are highly prevalent among adult populations all over the world, advanced disease with deep ► periodontal pockets ($\geq$ 6 mm), leading to severe loss of supporting periodontal tissues and tooth loss, affects 10–15% of adults worldwide (Petersen 2003). ► Dental plaque does not seem to be the only cause for periodontitis, since destructive diseases only occur in a minority of people although dental plaque is ubiquitous. Research has shown that the appearance of periodontal diseases is affected by genetic and environmental factors, for example smoking and stress.

The influence of periodontitis on other medical subjects has become a point of research within the last few years. Periodontitis as a risk for bacteraemia has been described. This is especially important for patients suffering from certain cardiac diseases who are at high risk of endocarditis. Furthermore, not only an influence of diabetes and its risk factors on periodontitis, but also the influence of periodontal diseases on progression of diabetes, is also being discussed at the moment. Periodontitis has also been linked to preterm birth and low birth weight.

Oral Cancer

Oral cancer is the eighth most common cancer in the world, showing marked geographic variation. In most cases, oral malignancies are squamous cell carcinomas. Many are painless until they get large. The carcinomas appear as ulcers, swelling, or red or white patches. They can arise on the lip, tongue, gum, mouth floor, salivary glands, pharynx, or on other unspecified parts of the mouth, and often emerge from premalignant lesions as *leukoplakias* and *erythroplakias*. Malignant change of oral *lichen planus* and hyperplastic *candidiasis* occurs less frequently. Hence, as oral cancer quite often goes through initial benign states, it is largely preventable. The major risk factors are tobacco, alcohol, exposure to sunlight, and poor diet (Pine 1997). The single risk factor most consistently associated with oral cancer is the use of tobacco in its various forms (Burt and Stephen 2005). Oral malignancies are high among men. Their incidence increases with age.

Dental Trauma

Dental trauma is an injury to the teeth, lips, gum, tongue, or ► jawbones. The most common dental trauma is a fracture or a bodily movement of the tooth, including complete avulsion. Tooth fracture can affect the crown and/or the ► root of the tooth. The anteriors, which are also the most visible teeth, are primarily involved. In ► primary dentition, the incidence is greatest at the toddler age of 2 to 3 years, when motor coordination is developing (especially finding one's feet; Flores 2002). ► Permanent teeth are most frequently affected in the event of falls, followed by traffic accidents, violence, and sport activities. Depending on the location of the fracture, the tooth may cause toothache pain (e. g. crown-root fractures). Broken teeth often have a sharp edge that may cut the tongue and cheek. If the upper and lower teeth no longer fit together properly (malocclusion) or if there is jawache accompanied by a limited ability to open and close (mobility) the mouth, a jawbone may be broken.

Congenital Malformations

Within the possible congenital malformations of the digestive system, craniofacial anomalies (CFA) are

a highly diverse group of irregularities in the growth of the head and facial bones. There are many factors that may contribute to their development, including the combination of genes, environmental factors, and folic acid deficiency. They affect a significant proportion of the global population and still remain a major cause of infant mortality and morbidity in many countries. Their impact on speech, hearing, appearance, and cognition has a prolonged and adverse influence on health and social integration. One of the most common types of CFA is a cleft lip and/or cleft palate which occur in around 1 per 600 births (WHO 2002). The rate varies substantially across ethnic groups and geographical areas.

Dentofacial Anomalies

Temporomandibular Disorder Temporomandibular disorder (TMD), also called temporomandibular joint syndrome (TMJ) or craniomandibular disorder (CMD), comprises a group of painful and distressing conditions related to the ► jaw joint (*temporomandibular joint*) and the surrounding facial muscles that control chewing and moving the jaw, or both (Okeson 1996). The three most common types of temporomandibular disorders are ► myofascial pain and ► dysfunction, internal derangement of the joint, and degenerative joint disease (osteoarthrosis). Among them, myofascial pain and dysfunction is by far the most common form (Dimitroulis 1998).

TMD are ubiquitous in cultures around the world. Signs and symptoms vary in their presentation and can be very complex, for example headache pain, neck pain, noises or ringing in the ear, problems in biting, popping sounds during biting (joint noises), and many more. The three cardinal features of temporomandibular disorders are orofacial pain, joint noises, and restricted jaw function (Dimitroulis 1998). TMD primarily affect young adults, especially women aged 20–40 years (Dworkin 1990).

The etiology of the most common types of temporomandibular disorders is multifactorial and still largely unresolved. Beside occlusal (bite) interferences, psychological stress, depression, and the presence of other somatic complaints have been shown to influence the course of these disorders considerably (predisposing factors). Psychosocial variables have been found to be more strongly associated with pain intensity and activity interference than clinical examination findings have (Turner and Dworkin 2004). Trauma and parafunctional habits (e. g. clenching and bruxism) are often cited as possible initiating factors, the latter being the most frequent cause of myofascial pain and dysfunction. Hence, both the assessment and the management of TMD require a multidisciplinary perspective with strong emphasis on psychosocial variables (Rollman and Gillespie 2000).

Malocclusion Occlusion of the teeth means the meeting of upper and lower teeth. Malocclusion is therefore the term used to describe states in which the occlusion departs from the normal (Osborn 1981). Malocclusion is not a disease but rather a set of dental deviations which, in some cases, can influence quality of life. It refers to a misalignment of teeth or may be caused by a disproportion between the size of the upper and lower jaws or between jaw and tooth size. Hence, it can range from gross disfigurement to minor irregularities in the alignment of the teeth. Most people have some degree of malocclusion, although it isn't usually serious enough to require treatment. Those who have more severe malocclusion may require orthodontic treatment. Correction of malocclusion can reduce the risk of tooth decay and periodontitis. Under certain conditions, it may help relieve excessive pressure on the temporomandibular joint, avoiding dysfunctions known as temporomandibular disorders (TMD). However, besides the medical rationale, the growing significance of aesthetics contributes considerably to the very high demand for orthodontic treatment.

Cross-References

► Alveolar Process
► Approximal Surfaces
► Calculus
► Dental Caries
► Dental Plaque
► Dysfunction, Craniomandivular
► Gingivitis
► Hard Tooth Tissue
► Jawbone
► Myofascial Pain
► Oral Health in Different Age Groups
► Periodontal Diseases
► Periodontal Ligament

- ▶ Periodontal Pocket
- ▶ Periodontitis
- ▶ Permanent Teeth
- ▶ Premolar
- ▶ Primary Dentition
- ▶ Pulp
- ▶ Root

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Oral Disorders

- ▶ Oral Diseases

Oral Health

Definition

Oral health means more than just having healthy teeth. It comprises chewing and eating the full range of foods, speaking clearly, having a socially acceptable smile and dentofacial profile, being free from pain, and having a fresh breath.

Oral Health Behavior

Synonyms

Dental health behavior; Health belief

Definition

The term "oral health behavior" describes the complex effect on individual oral health of oral hygiene habits, nutritional preferences and the pattern of a person's utilization of dental services. Since these behaviors exist in a social framework of lifestyles typical of the relevant culture, not only these direct parameters but also the indirect influences on people's oral health need to be taken into account. These are determined principally by the social opportunity structure offered by a society, which underlies the distribution of access to knowledge about oral health, the availability and utilization of dental services and the provision of the necessary funding. Empirical studies have repeatedly shown that the distribution of oral morbidity in industrial societies is unequal, with persons lower down the social scale on the whole exhibiting oral health problems more frequently than those in higher social categories.

Oral Health Care Services

- ▶ Health System in Dentistry

Oral Health Care System

- ▶ Health System in Dentistry

Oral Health in Different Age Groups

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Synonyms

Dental health; Oral diseases

Definition

Oral health means more than just having healthy teeth. It comprises chewing and eating the full range of foods, speaking clearly, having a socially acceptable smile and dentofacial profile, being free from pain, and having fresh breath. Due to changes in the importance of these factors, the prevalence of oral diseases varies with regard to age, sex, and culture.

Basic Characteristics

Background

Oral health depends on a range of individual factors such as socio-economic, socio-cultural, and nutritional conditions. Other characteristic factors influencing oral health are, for instance, the individually available number of teeth, consequences of traumatic injuries, and oral cancer. There are still wide discrepancies between the availability of medical care and health care utilization in developed countries and between the availability and access to Oral Health Care in developing countries. Worldwide, these discrepancies lead to differences in the distribution of oral diseases, varying not only between different regions but also between different age groups. The two main oral diseases of public health importance are dental caries and periodontitis (gingivitis and periodontitis), followed by oral cancer and dental trauma.

Dental caries is a common chronic disease occurring at any age. It is a process of demineralization of the ► hard tooth tissue caused by products of bacterial metabolism and leading to cavities in the teeth. Untreated caries can give rise to infection of the dental ► pulp, which can spread to the supporting tissues and the jaws, culminating in advanced disease conditions that are often painful. In Thailand for example, recent surveys of a sample of 12-year-old children revealed that 53% had suffered from pain or discomfort from their teeth over the past year (Petersen et al. 2001). The corresponding figures in China were 34% for 12-year-olds (Peng et al. 1997) and 74% for adults. ► Dental caries is the single most common childhood disease in the United States (U.S. Public Health Service 2000). These figures demonstrate that tooth decay is a public health problem worldwide.

The prevalence of dental caries is measured by the ► DMF(T)-index (Klein et al. 1938). This Index-system describes the lifetime-caries-experience of an individual. Every tooth is given one of the following categories:

D	Decayed	Tooth with a cavity (decay)
M	Missing	Tooth is missing (because of caries)
F	Filled	Tooth with a filling (has had a cavity)

The sum of the three figures forms the DMFT-value, which ranges from 0 (no caries) to 28 (all teeth affected) for each person. If a tooth has both a caries lesion and a filling, it is calculated as D only. Wisdom teeth are not counted.

Periodontal diseases are an inflammation either of the gingiva (► gingivitis) or of the gum, periodontal ligament, and alveolar bone (► periodontitis). The prevalence of gingivitis and periodontitis is measured by the ► CPI-Index (Table 1). According to this index, the mouth is divided into sextants, each sextant having special index teeth. The index teeth are examined and assigned to a certain score. The highest score per sextant is recorded.

For examining differences between several ages, the World Health Organization, in their manual for oral health surveys, suggests five age-groups as representative index ages for monitoring disease trends and enabling international comparisons (Table 2).

Children

Dental Caries In early childhood, a very severe kind of Early Childhood Caries (ECC) of the ► primary dentition is the so-called nursing-bottle syndrome (NBS)

Oral Health in Different Age Groups, Table 1 CPITN-Index (Ainamo et al. 1982)

Code	Status	Sign of
0	Healthy gingival and periodontal conditions	Healthy conditions
1	Gingival bleeding on probing	Gingivitis
2	Calculus or iatrogenic marginal imperfections and gingival bleeding	Gingivitis
3	Depth of the gingival pocket: 4–5 mm	Periodontitis
4	Depth of the gingival pocket: 6 mm or above	Severe periodontitis

Oral Health in Different Age Groups, Table 2 Representative WHO index age groups (WHO 1997)

Index age	Description	Main examination goals
5	Children (complete primary dentition)	– Caries in primary dentition
12	Children (complete permanent dentition) (except third molars)	– Caries monitoring
15	Adolescents	– Caries monitoring – First assessment of periodontal disease indicators
35–44	Adults	– Caries monitoring – Status of periodontal diseases – Evaluating effects of oral health care
65–74	Elderly	– Planning and evaluating effects of oral health care

which is more and more common in developed countries. NBS results from calming a child down by giving sweet sugar-containing drinks in light plastic bottles frequently and for any length of time, leading to massive destruction of the hard tooth tissue. This kind of rampant tooth decay can either destroy the milk tooth or have negative effects on eating, speaking, and the permanent dentition (▶ permanent teeth). Its prevalence differs between developed countries (1% to 12%) and developing countries (e. g. 70% among Native Americans; Milnes 1996; Broderick 1989).

Looking at the 12-year-old children worldwide, a substantial decline in dental caries levels can be identified. In several regions, prevention programs show good effects in this age-group. The WHO and the FDI World Dental Federation formulated goals for oral health in 1981 to be achieved by the year 2000. The global average was committed to be no more than 3 DMFT at 12 years of age. In 2001, the global weighted mean DMFT value for this age group was reported to be 1.74, and is continuing to decrease (global weighted mean DMFT = 1.61 in 2004). Although efforts have been made, dental caries is still a public health concern. There are still countries which suffer from a high rate of caries, for instance Lebanon (DMFT score of 3.4 in 2000) and Bulgaria (DMFT score of 4.4 in 2000). Only 74% of the nations reached the formulated goal, representing 86% of the world population in 2004. In several developing countries, a trend toward higher levels of dental caries has even been reported. Dental caries still affects between 60 and 90% of 12-year old children.

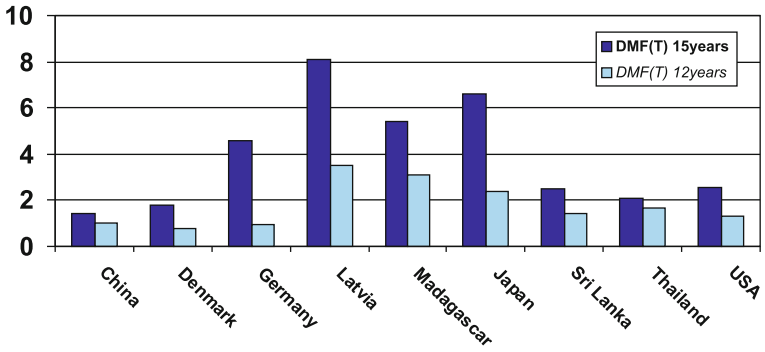
Periodontitis In the young population, the frequency of gingivitis is nearly 100%. The prevalence increases from primary dentition onwards, and reaches highest scores in puberty (Stamm 1986; Jenkins and Papapanou 2001). Periodontal diseases are very seldom identified in children; CPI-codes 3 and 4 are normally not found in this age group. However, chronic gingival inflammation could be a potential risk for periodontal diseases in later age.

Other Diseases Dental trauma occurs very often to toddlers. In the 0–6-year-old group, the prevalence of traumatic injuries varies from 12–30% (Flores et. al. 2002). In general, a child's activities bear an unavoidable risk of accidents.

Adolescents

The DMF(T) rates at the age of 15 are naturally higher than at the age of 12 in nearly every country worldwide. The decreasing prevalence of caries within children (5 years, 12 years) does not continue in adolescents (Fig. 1).

Periodontal Diseases Beside the high prevalence of gingival inflammation (nearly 100% with CPI-code 1 or 2), the first signs of elevated probing depths can



Oral Health in Different Age Groups, Figure 1
Mean DMFT-values of 12- and 15-year-olds in selected countries

already be recorded in young people. Although CPI-code 4 is only measured in a small portion of adolescents, the prevalence of code 3 is up to two thirds in this age group. Two percent of adolescents suffer from an aggressive periodontitis, which is also called "juvenile periodontitis". This severe type leads to a tremendously fast loss of the tooth supporting structure.

Other Diseases The different kinds of oral cancer and premalignant lesions have nearly no importance in adolescence.

Adults

Dental Caries A large majority of adults suffer from dental caries. The severity depends on many life circumstances and environmental factors and can be very different between individuals of the same population. Such factors include the socio-economic status and nutritional factors, as well as personal oral hygiene or even cultural traditions. In general, the increase in the prevalence of caries is lower than at younger ages. Complications of dental caries, kinds of pulpitis (inflammation of the dental pulp), and periodontitis are very common in adults with untreated caries lesions. Although caries lesions themselves seldom cause pain, the inflammatory complications can lead to very severe pain and sick leave.

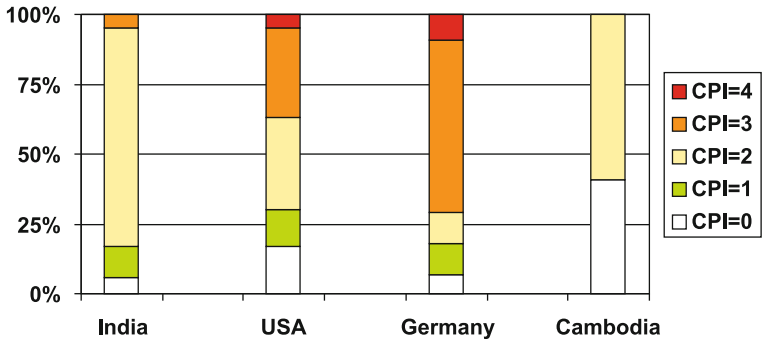
Periodontal Diseases Mild forms of periodontal diseases affect nearly every adult person. Only with perfect personal oral hygiene may it be possible to diagnose a patient with no forms of gingivitis. Periodontitis – a chronic loss of tooth supporting tissues – is on one hand a reaction of an untreated gingivitis. On the other hand, there are individual dispositions that even make patients with perfect oral hygiene suffer from aggressive loss of periodontal attachment. Therefore, periodontitis is a multifactorial process depending, for example, on hygiene, plaque-retention, and professional periodontal treatment but also on genetic dispositions and environmental factors.
Periodontitis is mainly divided into an aggressive and a chronic form.

Other Diseases Dental trauma occurs not only at a young age. Sports injuries, traffic accidents, or other accidents may cause very serious damage to oral structures. The potential for regeneration of tissues, however, decreases during the aging process, so that regeneration becomes more difficult.

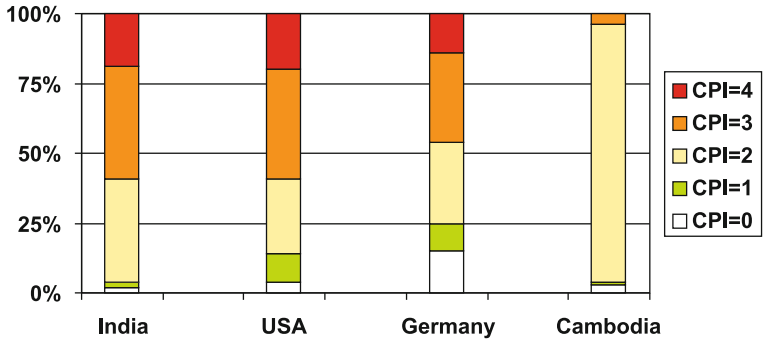
Elderly

Dental Caries Dental caries is a major public health problem at older age and is closely associated with social and behavioral factors. There is a tendency among elderly people with lower incomes to miss regular dental examinations and treatments and neglect regular ► oral hygiene. In addition to this, they frequently consume too much sugar and smoke, and therefore suffer more often from dental caries. The prevalence of coronal and ► root caries in older people is very high worldwide. In developed countries, the number of filled and decayed tooth (crown) surfaces ranges from 22 to 35, the filled and decayed root surfaces from 2.2 to 5.3.

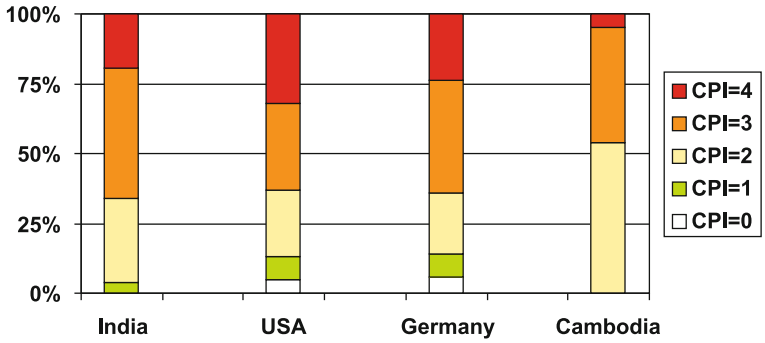
Periodontal Diseases Because of discrepancies between aggressive and chronic types of periodontitis, the differences in prevalence and progression between adults and the older ages are not that big in comparison to dental caries. The prevalence of CPI-codes 3 and 4 in elderly people in Western Europe are 15–30% and 30–60%, respectively (Miyazaki et al. 1991).



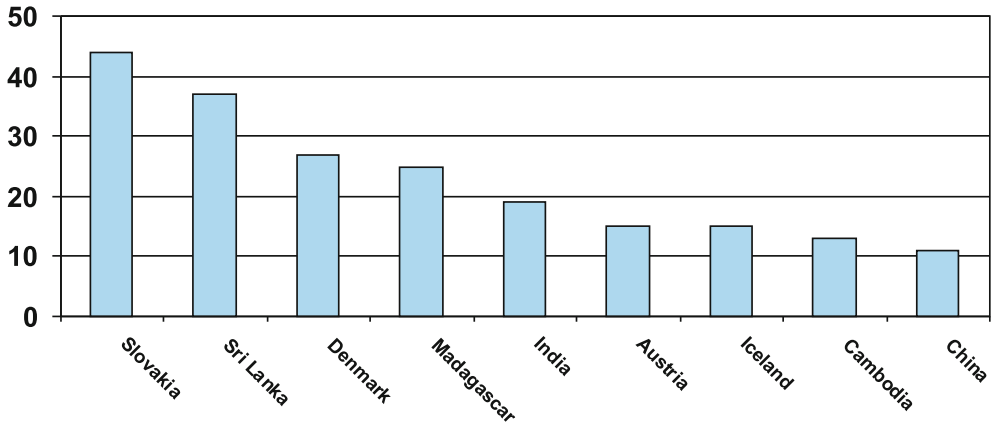
Oral Health in Different Age Groups, Figure 2 Distribution of CPI-Codes (maximum) within adolescents in selected countries (WHO Oral Health Database)



Oral Health in Different Age Groups, Figure 3 Distribution of CPI-Codes (maximum) within adults in selected countries (WHO Oral Health Database)



Oral Health in Different Age Groups, Figure 4 Distribution of CPI-Codes (maximum) within elderly people in selected countries (WHO Oral Health Database)



Oral Health in Different Age Groups, Figure 5 Prevalence of edentulousness (%) in elderly people (65–74 years) in selected countries. (WHO Oral Health Database)

Other Diseases Not a disease itself, *tooth loss* and *edentulousness* is worth mentioning as a consequence of oral diseases. The main reasons are caries and periodontitis.

Edentulousness is mainly a problem in older people. However, there are big regional differences worldwide. The highest rate is found in Bosnia and Herzegovina (78% of all persons over 65 are edentulous) – the lowest rate in Gambia (6%) (WHO 2002). Besides chewing problems, there is a psychological component to tooth loss. Persons without teeth are regarded as old because in most cultures, white, good-looking teeth are a symbol of youth and health. The consequence is an objective and subjective treatment need, especially in developed countries, which also has big implications for health economics.

The different kinds of *oral cancer* are most common in older people. First time diagnoses of carcinoma are predominantly found in the above 60 age group. Oral cancer and premalignant lesions are associated with several risk factors such as high alcohol consumption, low education levels, and smoking.

Older men in France, for example, suffer from oral cancer significantly more often than those in other European regions, which may be due to more excessive consumption of wine and cigarettes (Menegoz et al. 2002). Women's rates are still lower. Consequently, the measures to minimize the risk of a malignant disease have to be started at younger ages. The prevalence of oral cancer has increased in several European countries such as Germany, Denmark, and Scotland, but also in New Zealand, Japan, and the United States (WHO). Treatment of oral cancers is not easy in most cases and often leads to an esthetically and functionally compromised outcome. The 5-year-survival-rates are below 50% (WHO 2003).

Cross-References

- ▶ CPI (Community Periodontal Index)
- ▶ Dental Caries
- ▶ DMFT-Index
- ▶ Gingivitis
- ▶ Hard Tooth Tissue
- ▶ Nursing Bottle Tooth Decay
- ▶ Oral Hygiene
- ▶ Periodontitis
- ▶ Permanent Teeth
- ▶ Primary Dentition
- ▶ Pulp
- ▶ Root

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Oral Health Effects

- ▶ Oral Health Related Quality of Life

(Oral) Health Indicators

► (Oral) Health System Performance

Oral Health Plans

► Oral Health Policies

Oral Health Policies

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Synonyms

Oral health plans; Oral health programs

Definition

Oral health policies are oral health-related formal statements or courses of action that affect institutions, organizations, services, funding arrangements, groups and individuals. Oral health policy statements set overall guidelines and outline future directions.

Basic Characteristics

Oral health policies can take the form of explicit written documents, but they may also be implicit or unwritten (Schou 1995). In this sense, health policies refer to what health agencies actually do, although their decisions or actions may not be intended or even recognized as policy. Health policies include actions of both public and private organizations inside and outside the health system.

The terms policy, programs and strategy are sometimes used interchangeably. A strategy can be defined as to outline the content of policies more specifically (Fig. 1). Taking part in policy development is an important task for oral health facilitators. Practical considerations and steps have been described to guide those who are unfamiliar with this kind of work (Freire 2006).

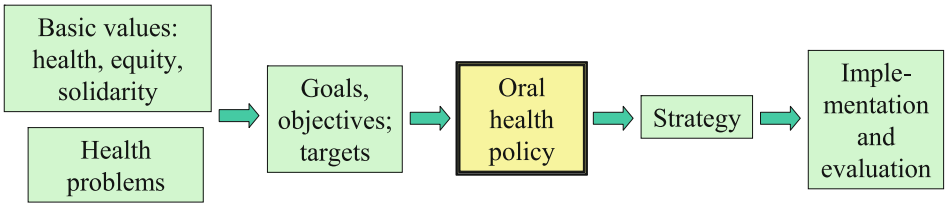
Values, Policy Fields and Objectives

The WHO (2005) has described that a basic policy value is equity, which means that everyone should have a fair opportunity to attain his or her full health potential. Closely linked is the value of solidarity: everyone contributes to the health system according to his or her ability. A health policy that promotes solidarity is better able to counterbalance social inequities.

Oral health policies can be applied to a wide range of issues, e. g. to training dental personnel or the planning of oral health education programs. A much contested policy field is the extent of coverage of dental services by public health care. In the United Kingdom, the availability of dental services is regarded a core element of the national health service (NHS). However, as a result of government decisions, some dentists became dissatisfied with NHS conditions and no longer offered NHS services, which caused access problems for patients. Dental care *de facto* became a private service in these areas, and the process was regarded as "rationing through the back door" (Ham 2004). The failure of subsequent governments to respond to this development is an example that public policy is not only what governments choose to do, but also what they choose *not* to do.

In the US, many oral health policies put improved access for disadvantaged populations high on the agenda. The polices refer e. g. to the access to fluoridated water, to enhancing public health infrastructure, and to integrating primary care providers into early life oral programs. Health boards in rural Australia recommend vocational training for dental graduates and the expanded use of therapists and hygienists. Policies in Cambodia refer to supporting dental materials and equipments, cooperating with other sectors, oral health service delivery, and quality standards. In the UK, oral health strategies on the regional level relate to a national oral health plan.

On the international level, global oral health objectives have been presented, one of which is to promote evidence-based policies. The targets relate to disease and disability indicators and have to be adapted by local authorities (Hobdell et al. 2003). For the European region, one target is that by the year 2020 at least 80% of children aged 6 years should be free of ► caries. The strategy is built around the twin goals of improving population health and reducing health inequalities.



Oral Health Policies, Figure 1

Policies for Tackling Health Inequalities

Disadvantaged people experience much higher levels of oral disease than well-off people. An example is ► noma (cancrum oris), which is a disfiguring and deadly gangrenous condition of the oral and facial tissues, particularly found in Sub-Saharan Africa (Bratthall et al. 2006). Poverty has been identified as the single most important risk indicator. Accordingly, improving the overall socio-economic conditions can prevent noma.

A number of specific innovative approaches to reduce health inequalities has been employed in various European countries, examples of which are active labor market policies for chronically ill citizens, preventive interventions at annual occupational check-ups, the serving of low-fat food products through catering in schools and workplaces and comprehensive health strategies for deprived areas (Mackenbach 2006). Concerning oral health, the widening of the gap between children with caries and the majority without caries has been described as "polarization". Community water fluoridation remains an ideal public health measure because it decreases the gap (USPHS 2005). Whether targeting high-risk populations is an effective strategy remains a matter of debate (Batchelor and Sheiham 2002). Screening programs fail to reduce inequalities in dental services use.

Content of Oral Health Policies

With regard to the content of oral health policies, the WHO proposes to address the following priority action areas:

- Fluorides
- Diet and nutrition
- Tobacco
- Health promoting schools
- Young people
- The elderly
- Oral health, general health and quality of life
- Oral health systems
- HIV/AIDS
- Oral health information systems
- Evidence for oral health policy
- Research for oral health.

One of WHO's practical policies is to support the widespread use and the promotion of affordable fluoridated toothpaste in developing countries. This is particularly important in the light of a changing diet.

In industrialized countries, a diet which is compatible with the maintenance of oral health means to substantially reduce the intake of sugars. Authoritative and non-commercial nutritional guides and guidelines are extremely valuable. Such recommendations should be integrated into the national agriculture, nutrition and health policies (Freire 2006). Not only educative strategies but also regulation, replacement and pricing strategies should be used.

Some countries have emphasized secondary rather than primary prevention. They will still be faced with high ► DMFT levels.

Health Policy: Process and Power

The process of health policy making refers to the way in which policies are initiated, formulated, negotiated, communicated, implemented and evaluated (Buse et al. 2005).

Trying to influence oral health policy requires maintaining a strong oral health unit within health agencies. Opportunities for funding may arise in conjunction with key policy developments currently taking place. Oral health policies should explicitly relate to policies in the health and social sectors. Partners have to be found among policy makers, professionals, organizations, groups and the public.

The framework for policy development has been described: to outline gathered information by means of a mapping exercise, to set an agenda, to draft the policy, to present the case to all interested parties, to set up a working group, to consult others, to finalize the

policy and eventually to implement and to monitor it. But policy making is seldom a linear, rational process. Frequently it resembles "muddling through". A reason is that policy making is the result of power struggles between competing groups of actors.

Interest groups try to influence public policy on particular issues at various stages of the policy process. Companies and for-profit-organizations are powerful interest groups. But also organizations registered as not-for-profit may not be independent. For instance, the International Life Sciences Institute (ILSI), which was established in 1978 with funding by soft drink manufacturers, gives the impression of a learned society, but the commercial interests of its Assembly of Members cannot be overlooked (James 2002). Similarly to ILSI-supported publications by dentists, the Center for Food and Nutrition Policy goes to great lengths in order to question the association between sugar and caries (Storey and Forshee 2004). As a counterbalance, a voluntary network of health professionals – Action and Information on Sugars – claims to confront disinformation about sugar and to provide clear information. This is an example of how health professionals who strive for health promotion can use their legitimacy and expert status powers to lobby for particular causes.

Policy as Option-Setting: Healthy Public Policy

A health-making policy deals effectively with the environments and ways of living. The concept of "healthy public policy" has been described as follows (Milio 1989): Personal behavior patterns are not simply "free" choices about "lifestyle", isolated from the social and economic context. Lifestyles are patterns of choices made from the alternatives that are available to people according to their socio-economic circumstances and to the ease with which they are able to choose certain ones over others.

Choice options available to the population and to social groups do not simply "happen". Rather they are themselves the result of policy choices: governmental and corporate decisions concerning technology, income maintenance, taxation, health care and other services. These policies represent the scope of health-making policy. Policy, from this perspective, is *option-setting*. A health-making strategy eliminates those options that result in health-damaging situations, or increases the cost of those options. It provides new, easier opportunities, or reduces the costs of these options. This approach emphasizes neither prohibition nor prescription, but rather new opportunities for choice-making. Individuals and organizations that want to continue to choose health-damaging options would be able to do so. However, they would pay higher costs than if they made health-promoting choices.

An impressive example for the strength of option-setting is the fluctuation of sales of fluoridated table salt in Switzerland. Originally, fluoride salt had been marketed successfully in economic 1kg packets, the price being slightly subsidized by the other types of salt. But in 1992 the producer changed the content of the 1kg packets from fluoridated to non-fluoridated salt. Immediately the market share of fluoride salt dropped. Dental researchers were alarmed and intervened. Subsequently, fluoride salt was sold again in 1kg packets and non-fluoridated salt in half-kilo packets only. The result of this deliberate pricing strategy was that the market share of the caries-preventive salt increased again and reached nearly 90%. This example from trade and industry shows that for a health-making policy several sectors should be linked conceptually within a concept of an ecological health framework.

Healthy public policy is extremely efficient. The caries decline in the industrialized countries was due to the public health measure of adding fluorides to various substrates. The largest proportion of the caries decline had occurred before practice-based professional prevention was introduced. This shows that oral health policy interventions have much more potential for effectiveness than individualized preventive measures (Strippel 2004).

In the developing countries, the promotion of health is intimately related to "big politics": a process of ending underdevelopment. In the developed world, progressive oral health workers could show that any struggle for social change policies and equity is also a struggle for health (Sanders 1985). These tasks can be supported by researchers who perform analysis-for-policy and analysis-of-policy.

Cross-References

► Dental Caries
► DMFT-Index
► Noma

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Oral Health Programs

► Oral Health Policies

Oral Health Promotion

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Synonyms

Promotion of oral health

Definition

Oral health promotion is any combination of oral health education and legal, fiscal, economic, environmental, organizational and technical interventions designed to facilitate the achievement of oral health and the prevention of disease. Oral health promotion directs multi-sectoral actions to the determinants of health in order to ensure that the environment is conducive to health. A key concern is the achievement of equity in health. Methods are community involvement, multi-sectoral working, empowerment, advocacy and mediation.

Basic Characteristics

The consumption of sugars in processed food and drinks is the major cause of ► dental caries. Smoking and oral hygiene are the major influences related to periodontal health. Further factors are the optimal exposure to fluoride and the appropriate use of good-quality dental care. Excess alcohol consumption predisposes for oral cancer. Dental and facial trauma are influenced by traffic management and occupational safety. All of these factors are shaped by culture, economy and politics, which means that the fundamental determinants of oral health are socio-economic. Individuals have only a limited control over these determinants, but oral health promotion is a way to deal effectively with them (Sheiham and Watt 2003).

People with low income and migrants show a consistent pattern of high oral disease levels, compared to the majority populations (Chen 1995). Tackling such health inequalities has become a key policy objective. There is an argument that health inequalities can only be addressed through a significant redistribution of income, e. g. by tax and benefit reform. But programs

can also aim directly at oral health. For instance, school dental services are valuable in promoting equity of oral health outcomes.

Oral health education is a part of oral health promotion. But health education can only develop its full potential if it is supported by structural measures – legal, environmental, regulatory etc. Peoples' environment has to be changed in order to enable them to transform new knowledge into action. Nancy Milio (1981) formulated the core concept of health promotion: *Make the healthy choices easy choices*.

Multi-Sectoral Approach

Many sectors in society have a significant influence on health, for instance industry, commerce, agriculture, education and the health service. Oral health promotion uses techniques for multi-sectoral working and develops partnerships across agencies. Potential partners are not only doctors, pediatric nurses, pharmacists and midwives, but also teachers, parents, social workers, food producers, the advertising industry and local, national and international government (Daly et al. 2002).

► Advocacy is a means by which health professionals can influence the creation of policies supporting oral health. Community advocacy is a powerful tool because it fosters problem ownership and empowers people when they adopt advocacy roles.

Key Areas for Action

Sustainable improvements in oral health can be achieved through:

- Applying fluoride
- Reducing sugar intake to a maximum of 6–10% of food energy or four times daily (Moynihan and Petersen 2004)
- Improving nutrition in young children with regard to breast and bottle feeding
- Reducing smoking and alcohol consumption
- Using fissure sealants
- Reducing dental injuries: a safer environment should be established; seatbelts, child restraints, mouth protectors and helmets should be used
- Increasing early detection of mouth cancer.

Oral health should be improved by activities in all five areas delineated in the Ottawa Charter of Health Promotion.

Building Healthy Public Policy

The addition of fluoride to table salt and to salt used for the food production is an example of healthy public policy. A further example is offered by legislation which has banned smoking in the workplace and public areas including bars and restaurants. This acts to support those who aim to reduce or give up smoking (Schou and Locker 1998).

In the target group of young children, local initiatives would seek to set up oral health and nutrition policies and work with child carers to implement them. Practical steps in a nursery may start with establishing an alternative policy for the celebrating of birthdays to make the birthday child feel special and finish with a reappraisal of contracts for meal suppliers (Munday 1999).

Creating Supporting Environments

An example for the creation of political, legal, educational, social and economic environments which support health is the fluoridation of water supplies.

On the local level, supportive environments can be created in settings, for instance by implementing "sugar-free morning and afternoons" in schools. Further support can be provided by fluoridated school milk. Healthy options have been offered at tuck shops, and a healthy vending machines policy in schools, colleges and youth centers has been pursued. In areas of relative deprivation, families may receive fluoride toothpaste/brush kits on a continuing basis.

Companies can act on oral health of their employees by pursuing policies concerning healthy eating, smoking, alcohol, oral hygiene and attendance at dental services. They can buy toothbrushes and fluoride toothpaste in bulk and ensure that hygienic facilities are available for ► oral hygiene. Health education at work-sites and preventive and screening services have been shown to improve oral hygiene status and reduce the amount of work-time lost.

For older people or those who are handicapped, ► organizational change at care homes, day centers and day care facilities have been induced which lead to the establishment of healthy catering and to improved oral hygiene.

Strengthening Community Action

Experience shows that change is best achieved and sustained when the people it affects are involved in initi-

ating this change by social action (Nutbeam and Harris 2000). Essential elements of community development are the importance of participation and "starting where people are at" and the creation of critical consciousness among a community. Health professionals will take on the role of a facilitator. Liasing with stakeholders in the community is a method, as is instructing other professionals who access risk groups, e. g. maternal and child care nurses, meals on wheels managers or youth workers. A lack of preventive dental knowledge and skills in some migrant populations can be addressed by training oral health advocates from minority groups.

Developing Personal Skills

The plaque biofilm develops within days, which means that it has to be removed on a daily basis by effective oral self-care. Dentists and auxiliary personnel are well acquainted with teaching the necessary personal skills to their clients.

In the community, skills development can mean to train teachers and classroom assistants to encourage improved brushing and diet. By this, the oral health workforce is multiplied.

Reorienting Health Services

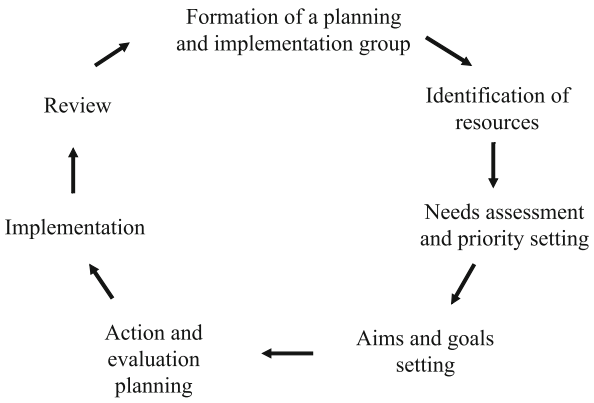
Reorienting health services means to shift resources from curative towards preventive services. There is a necessity to include health promotion in the dental curriculum and to train specialized oral health promotion personnel. Employing community dental nurses who facilitate change and visit people at home or in the workplace means to recognize fully that health is created where people live, work, study and play. Auxiliaries can apply fluoride varnish in risk-group settings.

Reorienting dental practice in a health promoting way means to encourage high-quality oral care. This will strengthen secondary and tertiary prevention. The access to dental sealants has to be improved, especially for high caries risk individuals.

Program Planning and Implementation

The development, implementation and evaluation of oral health promotion strategies can be divided into stages (Fig. 1).

Programmed planning starts with assessing the preconditions. Epidemiological, social, behavioral, educational and administrative diagnoses are performed. Predisposing factors (e. g. knowledge and perceptions), enabling factors (e. g. skills and barriers), and reinforcing factors (like rewards) are identified (Green and Kreuter 2004).



Oral Health Promotion, Figure 1 Oral health promotion strategic planning model (modified from Watt and Fuller 1998)

For assessing needs, both normative and lay measures are used. Normative need is interpreted as the quantity of dental health care which dental expert opinion judges necessary. Lay measures may simply consist of asking people for their priorities in oral health. Additionally, ► sociodental indicators can be used.

It is inspiring to create a matrix as a planning tool and to complete it with options for activities. The row headers relate to potential settings or target groups. The column headers relate to potential oral health promotion interventions: health education, community development, organizational change, legislation/regulation, fiscal/economic and service reorientation (Daly et al. 2002).

Health promotion identifies existing effective interventions and adapts them to the present situation. There is a call for evidence-based public health. But there is also a growing critique concerning the use of systematic reviews as the only research basis for health promotion (Asthana and Halliday 2006). It has to be taken into account that some interventions will work for certain groups, under certain conditions, and in certain context, but may not work in others. They are conditionally effective.

If political agreement and high scientific certainty support the planned intervention, the field is ready for the development of control mechanisms, such as guidance,

application of standards of practice, and performance management. Where agreement and certainty are low, there will be room for experimentation, local innovation and reflective learning of those who implement the programs.

Evaluation

Evaluation of health promotion is important as a means of developing effective interventions, for sharing and disseminating examples of good practice and for providing feedback to funding agencies, staff and participants. Outcome measures should measure change in inequalities. Samples, control and test groups have to be chosen properly. It is recommended to include information about the intervention design, the contextual circumstances in which the intervention was implemented, and information on how the intervention was received. Process evaluation is as important as outcome evaluation. Both qualitative methods (like focus group discussions) and quantitative methods should be used. This multi-method approach corresponds to the multidimensional nature of health itself – physical, mental, and spiritual.

Cross-References

- ► Advocacy
- ► Dental Caries
- ► Oral Hygiene
- ► Organizational Change
- ► Sociodental Indicators

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Oral Health Related Quality of Life

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Synonyms

Oral health status; Oral health effects

Definition

Oral Health-related Quality of Life (OHRQoL) characterizes a person's perception of how oral health influences their overall well-being and ability to perform the activities of daily life.

Basic Characteristics

Importance of Oral Health

► Oral health is often a low priority for individuals, policy makers, and public health specialists. In fact, oral health is an important public health concern because ► oral diseases have a significant impact on society and individuals. They restrict, for example, activities in school, at work, and at home, causing millions of lost school and work hours worldwide each year. Oral health influences how people grow, enjoy life, look, speak, chew, taste food, and socialize, as well as their

feelings of social well-being (Locker 1997). A cross-sectional survey in London (UK) showed, for instance, that one in six 8-year-olds had experienced toothache that caused them to cry (Sheperd 1999).

Oral health is integral to general health. This interrelationship is proven by evidence. Severe ► periodontal disease, for example, can be influenced by diabetes or increases the risk of a cardiovascular disease. Furthermore, the role of bacteraemia as a sequela of oral disease and treatment is well known in the etiology of bacterial endocarditis. Oral lesions may also be the first signs of other life threatening diseases such as HIV/AIDS.

All things considered, oral health affects people's life physically *and* on a psychosocial level, can often diminish quality of life, and therefore means more than just having healthy teeth. In recognition of this, oral health has been more broadly defined as "the ability to chew and eat the full range of foods native to the diet, to speak clearly, to have a socially acceptable smile and dentofacial profile, to be comfortable and free from pain, and to have fresh breath" (Sheiham 1997). Hence, the impact of oral diseases can range between initial ► dental caries and effects on general health and quality of life.

Oral Health and Quality of Life

Quality of life (QoL) and not just survival has become a core issue in public health. QoL has been defined by the World Health Organization (WHO) as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept incorporating in a complex way the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of the environment" (WHO 1997). According to this definition, QoL is closely related to health aspects. It is a concept that brings together the multidimensional and widespread character of health status. A broader understanding of health was expressed in the WHO definition of health in 1946, which states "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". A patient based assessment of health status is, therefore, essential to the measurement of health. Involving the individual perspective (for instance the worries about and expectations of a new denture) can lead not only to greater patient satisfaction but also to a more effective use of the available resources. Hence, in recent decades, patients' awareness of health has become more important (patient centeredness).

Oral Health-Related Quality of Life

Health, one domain of well-being, includes OHRQoL as a subset of Health-Related Quality of Life (HRQoL). OHRQoL is based on *self-ratings* and comprises the patients' perceptions of their illnesses and the resulting limitations to their daily activities, and assesses the success of the therapy after treatment from the patients' point of view.

In the past, aspects concerning quality of life were an integral part of medical care and were not regarded as something independent. During treatment, the patients' subjective awareness regarding their health status has only been considered by rather broad inquiries about their current health state (e. g. How are you?). Studies have, however, revealed that objective diagnostic findings in dentistry often differ from the patients' subjective views (Heydecke et al. 2003a). Within the frame of health needs assessment as one part of ► health services research, a high objective need for dental treatment is often contrasted by considerably lower subjective need. Whereas restorations after tooth loss in the posterior region are required from most professionals' point of view, leaving untreated open spaces in the ► premolar and ► molar regions is often accepted by patients of different age groups even in countries with highly developed oral health care systems. Furthermore, discrepancies between diagnostic findings and patients' health status have been recognized. A comparison, for example, between HIV infected dental patients and general patients receiving public-funded care showed that, despite similar clinical indices, the occurrence of pain, functional limitations, and social disability was significantly more frequent in HIV infected patients (Coates 1996). This emphasizes that assessments of Oral Health Status should cover more than merely clinical-somatic components.

As a consequence, measuring OHRQoL as an indicator of patient's well-being and the quality of health care services has become accepted as an explicit criterion of evaluation. The rehabilitation of QoL can be regarded

as one of the main goals of medical interventions. Within the context of oral health, some authors consider the improvement of QHRQoL as the most important contribution of dentistry. OHRQoL is an essential component within the assessment of outcomes of oral health care, as it captures the outcomes of public health programs.
Additionally, because of increasing life expectancy, more health professionals have to identify therapies that preserve or even enhance the patient's quality of life effectively in order to keep the patient well and fit over a long period of their life (reduction of morbidity).

Measurement

When trying to quantify the consequences of disease, it has been recognized that objective measures of disease provide little insight into the impact of oral disorders on daily living and an individual's QoL. In studies that have assessed the association between objective measures of dental disease and patient based ratings of oral health status, objective measures did not accurately reflect patients' perceptions. They only reflect the endpoint of a specific disease process and give no indication of the impact of the disease and its course on function or psychosocial well-being.
A search for more appropriate concepts and indicators that integrate oral and general health and identify the multifactorial impacts on quality of life has therefore been started. Generic measures of health status are not useful, because they are not sensitive to all oral health problems (e. g. effects of tooth loss and edentulousness; see also Heydecke et al. 2003b).
As a consequence, a number of OHRQoL measures have been developed to assess the functional, psychological, social, and economic implications of oral health problems, recording the patient's own assessment of health by using questionnaires (Table 1).
Objective measures of dental disease (such as the presence of dental caries or periodontal attachment loss) and patient based measures are not conflicting but complement one another in collecting clinical findings and diagnostic data, in formulating the aim of the therapy, and in assessing the therapeutic success.
In general, patient-based measures of oral health status can be used for:

- Screening and monitoring for psychosocial problems in individual patient care
- Clinical trials
- Population surveys of perceived health problems
- Medical audit
- Cost-utility and cost-effectiveness analyses
- Outcome measures in health services or evaluation research.

Oral Health Related Quality of Life, Table 1 Examples of currently available oral-specific health status measures

Authors	Name of Measure
Cushing et al.1986	Social Impacts of Dental Diseases
Atchison and Dolan. 1990	Geriatric Oral Health Assessment Index (GOHAI)
Srauss and Hunt, 1993	Dental Impact Profile (DIP)
Slade and Spencer 1994	Oral Health Impact Profile (OHIP)
Locker and Miller, 1994	Subjective Oral Health Status Indicators
Leao, Sheiham 1996	Dental Impact on Daily Living (DIDL)
Adulyanon, Sheiham 1997	Oral Impacts on Daily Performances
McGrath and Bedi, 2000	OH-Qol UK

Source: Allen PF (2003) Health and Quality of Life Outcomes

The best-documented and most popular instrument for measuring OHRQoL is the Oral Health Impact Profile (OHIP; Slade, Spencer 1994). This questionnaire has been widely used in population based studies and clinical research and is available in different languages such as English, French, Spanish, German, and even Chinese. Forty-nine questions capture seven conceptually formulated dimensions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. A major advantage of this measure is that the statements were derived from a representative patient group, and were not conceived by dental research workers. Short versions of this instrument with 20 and 14 items have also been published.

Cross-References

- ▶ Dental Caries
- ▶ Health Services Research
- ▶ Molar
- ▶ Oral Diseases
- ▶ Oral Health
- ▶ Periodontal Diseases
- ▶ Premolar

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Oral Health Status

► Oral Health Related Quality of Life

(Oral) Health System Performance

Synonyms

(Oral) health indicators

Definition

To permit international comparability of the efficiency and performance of health care systems, clearly defined and operational criteria are essential. The principal criterion for assessing the quality of a health care system's outcomes is the state of health of the population, which can be determined empirically from morbidity and mortality statistics. The most important indicators commonly used in dentistry and oral epidemiology are the DMFT value for the caries burden and the CPI for the population's periodontal status. Other aspects to be considered in a performance analysis are the fairness of distribution of health benefits among the various population strata and, increasingly, the extent of patient orientation and responsiveness. Comparative performance analyses of this kind can identify weak points in national health care systems. However, the methodological problems associated with such comprehensive performance analyses should not be underestimated.

Oral Hygiene

Definition

All methods suitable to keep up clean conditions in the oral cavity such as tooth, gum and tongue brushing, flossing, and denture cleaning. An appropriate oral hygiene is essential for oral health. Oral hygiene should be a daily routine. Certain measures as plaque and calculus removal and hygiene instructions can be delivered by dental professionals (dental hygienist, dentist).

Oral and Maxillofacial Surgery

Definition

Oral and maxillofacial surgery covers a wide spectrum of diseases, injuries, and defects in the head, neck, face, jaws, and the hard and soft tissues of the oral and maxillofacial region. Oral and maxillofacial surgery is at the bridge of dentistry and medicine, and can therefore be recognized as either a medical specialty or a dental specialty as it addresses problems like the extraction of wisdom teeth, misaligned jaws, tumors and cysts of the jaw and mouth, and dental implant surgery. Oral and maxillofacial surgeons are highly qualified and usually spend more aggregate time in training than other surgical specialties.

Organisation for Economic Co-Operation and Development

► OECD

Organizational Change

Synonyms

Organizational development

Definition

Organizational change is a health promotion approach that seeks to develop policies within local organizations such as kindergartens, schools, workplaces and hospitals in order to promote the health of clients and staff. The underlying concept is that health is "created" in the places where people live, work and play. Organizations are a promising setting for health promotion efforts, because their core activities, administrative structures, policies and regulations can facilitate health promotion. The aim of organizational change is to make changes in organizations that are conducive to better health. Organizational change involves activities like lobbying for support, negotiating with management, supporting policy development, developing skills and partnerships and making organizational plans. There are conceptual links to workplace health promotion. Examples for organizational change activities include the establishment of non-smoking areas or catering services with an offer of healthy food choices such as low-calorie or sugar free foods and drinks.

Organizational Development

► Organizational Change

Organizational Interactions or Relations

► Human Relations

Organizations of Persons with Disabilities

► Disabled People's Organizations

Oriental Sore

► Leishmaniasis, Cutaneous

Original Inhabitants

► Autochthonous Population

Orphan Diseases

Definition

Orphan diseases are diseases, including those of genetic origin, that are life-threatening or chronically debilitating diseases which are of such low prevalence that special combined efforts are needed to address them. As a guide, low prevalence is taken as prevalence of less than 5 per 10 000 in the community. Orphan diseases are treated with ► orphan drugs.

Orphan Drug

Definition

Orphan drugs depicts a status of a drug that is granted by regulatory authorities for drugs (e. g. the Food and Drug Administration in US or the European Agency for the Evaluation of Medical Products – EMEA in Europe) to medications developed for rare diseases. Orphan drug status gives the drug's manufacturer a right to exclusively market the drug substance. This protection of orphan drugs encourages their development since there are few financial incentives for drug companies to develop therapies for diseases that affect few people.

Orthodox Medicine

► Western Medicine

Orthodox Medicine Treatment

► Conventional Treatment

Orthopedic Surgery

Definition

Orthopedic surgery is the branch of surgery that is broadly concerned with the skeletal system (bones).

Some orthopedic specialists maintain a general practice; others specialize in sub-specialties like joint replacements or disorders of the spine. Orthopedic surgery addresses acute and chronic disorders, and sports medicine is a rapidly growing area. The range of treatments is wide and includes traction, amputation, hand reconstruction, spinal fusion, and joint replacements.

Osteoporosis

Definition

Osteoporosis refers to the loss of bone mass and density. Osteoporosis increases the risk of fractures. Primary osteoporosis may be postmenopausal or age-related (senile). Osteoporosis may also be caused by genetic defects, metabolic disorders, cancer, medical treatment, inadequate nutrition and immobility.

OTC Drugs

► Over-the-Counter Drugs

Otolaryngology

Definition

Otolaryngology is both a medical and surgical specialty which is concerned with the diagnosis, management, and treatment of diseases and disorders of the ear, nose, throat, and related structures of the head and neck, which includes the sinuses, larynx (voice box), oral cavity, and upper pharynx (mouth and throat). Otolaryngology is commonly called ENT.

Ottawa Charter

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Definition

The Ottawa Charter was developed in the eighties of the last century and depicts the main concepts and principles of health. It was adopted at the 1st International Conference on Health Promotion in Ottawa/Canada in 1986. The Charter, based originally on the policy statement ► health for all of the ► World Health Organization (WHO), encompassed numerous developments in ► health policy. It built on the progress made through the Declaration on Primary Health Care at Alma Ata, the World Health Organization's Targets for Health for All document and the recent debate at the World Health Assembly on intersect oral action for health The Ottawa Charter defines health promotion as a process enabling people to increase control over, and to improve, their health (WHO 1986).

Basic Characteristics

Development of the Ottawa Charter

After they were developed as a program for action to achieve the general goal "Health for All 2000" by the European regional office of the WHO, the core elements, aims and goals, as well as the principles of the Ottawa Charter on health promotion, were summarized in a discussion paper in 1984. The development of the Ottawa Charter was based on a resolution of the ► World Health Assembly in Geneva 1977. The Assembly aimed at enabling "health for all" in order to provide all citizens with the possibility of leading productive and socially rewarding lives. This overall goal was adopted as the general strategy "Health for All" in 1979 and it has so continued (Declaration "Health for All in the 21st Century", adopted 1998).

The Ottawa Charter is the key document and it describes both the basic fields of action (► health promotion fields of action) and basic strategies of health promotion. The Charter was translated into many languages and disseminated widely in the eighties. It is the basic program for governmental and non governmental ► health promotion actors. Important terms of health promotion are defined and characterized in the Charter and a resolution adopting the Charter was carried at the 1st International Conference on Health Promotion (WHO in collaboration with the Canadian Public Health Association) in Ottawa in November 1986 (Kaba-Schönstein 2003).

Content

The Ottawa Charter highlighted the three basic essential strategies for health promotion: advocacy for health (► advocate) to create the essential conditions for health in general; to ► enable all people to achieve their full health potential; and to ► mediate between the different interests in society in the pursuit of health.

Action areas in health promotion were also outlined and support the implementation of the three basic strategies of health promotion. The participants of the conference in Ottawa have committed to be active in the following five action areas in health promotion:

- To build healthy public policy.
- Create supportive environments for health.
- Strengthen community action.
- Develop personal skills (► life skills).
- Re-orient health services.

Further Development of the Charter

A differentiation of the above mentioned fields of action took place at the following successor global conferences on Health Promotion (WHO 1997):

- 2nd Global Conference on Health Promotion: Adelaide in 1988
- 3rd Global Conference on Health Promotion: Sundsvall in 1991
- 4th Global Conference on Health Promotion: Jakarta in 1997
- 5th Global Conference on Health Promotion: Mexico in 2000
- 6th Global Conference on Health Promotion: Bangkok in 2005.

The conference in Adelaide paid further attention to the detail of the Ottawa Charter. Confirming that health promotion demands a collaboration at all levels of society, people and primary health care, further fields of action were defined. Discussion was directed towards the health of women since it was perceived that this section of the population is characterized by few opportunities in health promotion due to poor access to resources and information. Moreover, further topics emphasized the need to eliminate hunger in the world and to make it possible for all people to have healthy nutrition. It was also decided that health risks had to be minimized, particularly those associated with the consumption of alcohol and tobacco products. In spite of the enormous economic importance of these products, all participants agreed that the influences of advertising of these products had to be decreased. The creation of health promoting living conditions and environment were identified as a further field requiring action.

The 3rd Conference on Health Promotion in Sundsvall in 1991 was a joint conference of the WHO and the Environmental Programme of the ► United Nations with the participation of developing countries and industrial nations. This Conference considered to a larger extent the interests of the developing countries since health promotion in the industrialized nations had been the main topic of discussion up to this point.

"New Players for a New Era: Leading Health Promotion into the 21st Century" was the title of the 4th International Conference on Health Promotion held in Jakarta in 1997. The experiences and results since the adoption of the Ottawa Charter in 1986 were reflected on. The 5th Health Assembly of the WHO adopted the 1st Resolution (on health promotion with the statements of the Ottawa Charter and the conference of Jakarta) (WHO 1997):

- Promoting social responsibility for health.
- Increasing community capacity and empowering the individual.
- Expanding and consolidating partnerships for health promotion.
- Increasing investment for health development.
- Securing an infrastructure for health promotion.

The 5th International Conference on Health Promotion with the title "Health Promotion: Bridging the Equity Gap" was held in Mexico City in 2000. The content of the conference was twofold; one part of the conference was addressed to the representatives of health ministries, the second part to the scientific community. The Conference adopted a declaration on health promotion which was signed not only by the invited representatives but also by the health ministries from 87 countries. Concerning this declaration, health ministries undertook to put programs for health promotion into national action.

The declaration of the conference in Mexico emphasized three key aspects in health promotion: improvement of ► health determinants, reduction of risk factors and consideration of all population groups and settings as well as at all levels of society. It was also stated that health promotion had not been implemented in all areas and needed further consistency. The Ottawa Charter was also discussed at the 6th International Confer-

ence on Health Promotion held in Bangkok 2006. The new "Bangkok Charter for Health Promotion in a Globalized World" is complementary to the Ottawa Charter but additionally considers new aspects arising from globalization and the new demands in public health. It identifies major challenges, actions and commitments needed to address the determinants of health by reaching out to people, groups and organizations that are critical to the achievement of health. Health promotion is mentioned as the core function of public health. Further important documents that mention the importance of public health in the new millennium like the ► Millennium Development Goals (abbreviation: MDG) were also compiled (UN 2000).

The Declaration states that to further advances in implementing strategies, all sectors and settings are necessarily involved and consideration should be given on how to:

- advocate for health based on human rights and solidarity;
- invest in sustainable policies, actions and infrastructure to address the determinants of health;
- build capacity for policy development, leadership, health promotion practice, knowledge transfer and research, and health literacy;
- regulate and legislate to ensure a high level of protection from harm and enable equal opportunity for health and well being for all people;
- partner and build alliances with public, private, non governmental and international organizations and civil society to create sustainable actions (► sustainability).

Cross-References

► Advocate
► Enable
► Health for All
► Health Determinants
► Health Policy
► Health Promotion Actors
► Health Promotion, Fields of Action
► Life Skills
► Mediate
► Millennium Development Goals
► Sustainability
► United Nations
► WHO
► World Health Assembly

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Outbreak

► Epidemiology, Aims and Scope
► Outbreak Investigation

0

Outbreak Investigation

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Synonyms

Epidemic investigation

Definition

"An outbreak can be defined as an increase in the number of cases for a given period and place, clearly in excess of normal expectancy" (Last 2001).

Basic Characteristics

A report of a suspected outbreak may be received in a variety of ways (active or passive ► surveillance systems, healthcare workers, patients, media, law enforcement, etc.). Outbreak investigation requires the col-

lection and processing of a great deal of information. This includes determining that an outbreak has in fact occurred and defining the extent of the ► population at risk, determining the ► mode of transmission and ► reservoirs, and characterizing the agent. The urgency of the outbreak investigation depends upon the severity of the disease, the rapidity of transmission, the number of affected persons, and the need to control further spread of the disease.

To satisfy all requirements, the ten basic steps commonly used in an outbreak investigation are the following (Gregg 2002):

- Determine the existence of the epidemic
- Confirm the diagnosis
- Define a case and count cases
- Orient the data in terms of time, place, and person
- Determine who is at risk of becoming ill
- Develop a hypothesis that explains the specific exposure that caused disease and test this hypothesis by appropriate statistical methods
- Compare the hypothesis with the established facts
- Plan a more systematic study
- Execute control and prevention measures
- Prepare a written report

These steps are listed in logical order, but they may be carried out simultaneously or in a different order in practice. It is important to highlight that control measures should be implemented as soon as a potential mode of transmission is known in order to prevent additional cases.

Determine the Existence of the Epidemic

Most outbreaks are recognized by clinicians, through regular analysis of surveillance data, or through calls from concerned citizens. One of the first tasks in an outbreak investigation is to evaluate the quality of information from various sources and to verify that a suspected outbreak is a real outbreak. Thus, it is necessary to compare the number of cases in the outbreak with the number of cases from a previous period (this can be a few weeks, months, or years). The major source of these data for a notifiable disease is health department surveillance records. An increased number of cases may be the result of pseudo epidemics that occur because of laboratory error, changes in case definition, diagnostic and reporting procedures, or increased interest in a certain disease.

Confirm the Diagnosis

It is important that the diagnosis be confirmed early in the investigation. Clinical findings (the symptoms and features of the illness) and laboratory results should be reviewed. Those investigating an epidemic must be aware of laboratory errors as the basis for an increase in diagnosed cases. Additionally, the investigator should visit several of the ill people to gather important information about their exposure before they became ill.

Define a Case and Count Cases

A case definition is needed to decide whether an individual should be classified as having the health condition of interest. The initial case definition may include simple and objective clinical criteria, laboratory findings, and information about the time and place of exposure. Later, this definition can be refined in order to exclude unrelated cases.

All cases can be classified as "► confirmed", "► probable", or "► possible cases" (CDC 2006). The process of case finding includes reviewing existing surveillance and laboratory data, surveying physicians' offices, and hospitals, and questioning known cases in order to identify other exposed cases. Identification and demographic information, and clinical and laboratory data, as well as information about exposure to different sources, (► source of infection) should be collected for every affected person.

Orient the Data in Terms of Time, Place, and Person

The organization of data in terms of time, place, and person is called descriptive epidemiology.

Time. Traditionally, the time course of an epidemic is shown by a graph, called an epidemic curve, in which the cases of a disease are plotted according to the time of onset of illness.

An epidemic curve gives information about the magnitude of the outbreak, its possible mode of transmission, and the time trend. If the ► incubation period of the disease is known, a probable time period of exposure can be estimated. The shape of the curve is determined by the pattern of the epidemic—whether it is a ► common source outbreak, ► person-to-person transmission (propagated outbreak), or both.

Place. Assessments of an outbreak by place often become more useful when a map is used. A spot map is usually used to plot location of cases' residence, their place of work, or the place where they may have been exposed.
Person. The characteristics of the ► host (age, sex, and race) and opportunities for exposure (occupation, use of medication, etc) are related to disease risk.

Determine Who is at Risk of Becoming Ill

The investigator should determine what populations are at risk for the disease and should look carefully to identify other affected cases not known at the time of the initial report.

Develop a Hypothesis that Explains the Specific Exposure that Caused Disease and Test this Hypothesis by Appropriate Statistical Methods

The next conceptual step in an investigation is formulating hypotheses about the source of the agent, mode of transmission, and the exposures that caused the disease. In practice, the investigator should begin to formulate the hypothesis at every stage of the investigation. Sometimes the evidence obtained from descriptive epidemiologic techniques obviously supports the hypothesis that formal testing is unnecessary. In other circumstances, when the cause is less clear, the ► analytic method should be used to quantify the relationship between various exposures and the disease.

Compare the Hypothesis with the Established Facts

When analytic epidemiological studies do not confirm hypotheses, they must be reconsidered. Sometimes, it is necessary to obtain more specific exposure histories or a more specific control group in order to test a more specific hypothesis.

Plan a More Systematic Study

When an outbreak occurs, whether it is routine or unusual, some questions may remain unanswered about that particular disease. Additionally, the investigator may perform studies that are more detailed in order to expand knowledge of the disease. Such studies can improve the sensitivity and specificity of case definition and improve the quality of numerators and denominators.

Execute Control and Prevention Measures

Control measures should be implemented as soon as possible when the investigator knows the mode of transmission and the source of an outbreak. Control measures should be aimed at the weak links in the chain of infection. In some cases, control measures should be aimed at the specific agent, source, or reservoir of the agent. In other situations, control measures might be directed at interrupting transmission or exposure.

Prepare a Written Report

The final task in an investigation is to prepare a written report to document the investigation with the usual scientific format (background, methods, results, discussion, conclusion, and recommendations).

Cross-References

► Common Source Outbreak
► Confirmed Case
► Host
► Incubation
► Mode of Transmission
► Observational Studies
► Person-to-Person Transmission Outbreak
► Population at Risk
► Possible Case
► Probable Case
► Public Health Surveillance
► Reservoir of Infection
► Source of Infection

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Outbreak Management and Surveillance of Infectious Diseases

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Synonyms

Registration of infectious diseases; Evaluation of infectiological data; Surveillance of transmissible diseases; Measures in case of outbreak of communicable diseases

Definition

Surveillance of infectious diseases involves the registration and evaluation of data collected on infections as well as the transmission of the results to regional, national and international institutions that are responsible for preventing and combating these diseases. Outbreak management subsumes all measures that are instituted to control an infectious disease and prevent its spread.

Basic Characteristics

Basics of the Surveillance of Infectious Diseases

Surveillance of infectious diseases involves the registration and evaluation of data with the aim of using the results to prevent and control any transmission of infection. To judge the extent of the spread of an infectious disease, mathematical epidemiological models can be utilized. The rate of spread of an infectious disease is characterized by its ► basic reproduction rate (R_o). Various factors have to be considered when utilizing this formula: the registration of the vaccination status, suspicion of an infectious disease, a manifest infection or death. Another significant factor may be the source of infection. This factor plays an important role in infections that are transmitted fecal-orally (► fecal-orally transmitted diseases) with food or ► drinking water. If data concerning infectious diseases are registered by public institutions, the time and the economic costs involved in gathering the information have to be reasonable and justified by their usefulness. Surveillance of infectious diseases can be performed on regional, national or international levels. In industrial countries there are legal rules concerning the announcement of infectious diseases and the specific procedures to be followed. The occurrence of certain infectious disease has to be notified to the responsible health institution (for example, the local public health department) which then takes the necessary measures or procedures for the detection of the source and the mode of transmission of the infectious disease and for giving hygienic advice. To achieve a maximum surveillance, a complete registration of all the notifiable infectious diseases is necessary. Modern documentation and communication techniques considerably facilitate this data interchange. However, in developing countries, the fight against infectious diseases is impaired by a lack of financial resources and skilled staff, by a weak health care systems and an absence of support from local authorities and governments. The World Health Organization is the global coordinating authority for the surveillance of communicable diseases. World Health reports provide extensive data and statistical evaluations about infectious diseases (http://www.who.ch). Other national and international institutions of surveillance exist, for example, the European Center for Disease Prevention and Control (ECDC, Stockholm, Sweden), the Centers for Disease Control (CDC, Atlanta, USA), the Communicable Disease Control Section (Public Health Branch, SDCS, Melbourne Victoria, Australia), the National Institute of Infectious Diseases (NIID, Tokyo, Japan) or the Robert-Koch-Institute (RKI, Berlin, Germany).

Surveillance on Regional and National Level

In general, regional health authorities are the first level of surveillance where the registration of infectious diseases data is centered. It depends on the specific infectious disease whether or not further procedures have to be undertaken. Some tasks may remain a regional responsibility, like the supervision of communal services with regard to infectious diseases, the detection of the source of food-borne infection, or the training of hygiene inspectors. The surveillance of ► endemic infectious diseases can be carried out on a regional or national level.

Education plays an important role in the prevention of infectious diseases. A basic knowledge and the availability of basic social and medical services are indispensable to implementing the recommendations and rules of hygiene within a population. Improvement in children's health in the developing countries is only possible through the education of the female population, particularly mothers. The social position of females in these countries needs to be strengthened and improved. Active vaccinations (► vaccination, active) are one of the piers in the prevention of infectious diseases. In industrial nations, immunization programs are carried out by family doctors or pediatricians.

Some countries control vaccination status by refusing to enroll children into kindergarten or elementary school without evidence that they have been vaccinated. In order to reach as many children as possible in developing countries, national immunization days (NIDs) are organized; announcements by radio or megaphone draw people's attention to these events; immunization teams travel around and even reach outlying villages.

Surveillance at International Level

After cardiovascular diseases, infectious diseases rank as the second cause of death worldwide. Due to the significance of infectious diseases, worldwide migration and the general increasing mobility of people, data interchange and international cooperation are important. Under the leadership of WHO, international health regulations have been developed, the latest version being made in May 2005. Various topics regarding infectious diseases cause worldwide interest, for example, the spread of /► AIDS and the problems concerning ► tuberculosis, with the development of multiresistant germs making consistent treatment difficult. The latter was the reason for the introduction of ► DOTS-strategy. As for AIDS and tuberculosis, successful therapy is difficult due to a lack of the availability of effective drugs or financial capacities. Because of an extensive use of antibiotics the development of resistances has become a global concern. For this reason, there is an international data interchange that specifically includes ► nosocomial infections. Efforts to make antibiotics only available on prescription could help to minimize this uncritical use. Another topic of interest is influenza surveillance (► WHO influenza surveillance program) and the development of vaccines. As there is a discrepancy between the immunization status of industrial and developing countries, ► GAVI, Global Alliance for Vaccines and Immunization was instituted to try to close this gap. In the fight against ► malaria, in 1998, Unicef, WHO, United Nations Development Program (UNDP) and the World Bank Group started the campaign Roll Back Malaria. This campaign aims to improve health services by the distribution of mosquito nets. Other internationally organized surveillance programs of infectious diseases include WHO Surveillance Programme for Control of Foodborne Infections and Intoxications in Europe and the Partners for Parasite Control (PPC, http://www.who.int/wormcontrol/en/). Various organizations and institutions engage in the surveillance of HIV-infections and AIDS. Among others are: UNAIDS, the Joint United Nations Programme on HIV/AIDS (http://www.unaids.org/en/HIV_data/default.asp), EuroHIV (http://www.eurohiv.org/) and the CDC'S HIV/AIDS surveillance system in America (http://www.cdc.gov/hiv/topics/surveillance/index.htm).

Eradication of Pathogens

To be able to control a disease various factors have to be known and understood. In infectious diseases the pathogens, their contagiousness, their incubation periods, their effects, their modes of transmission as well as the prophylactic and therapeutic possibilities have to be ascertained. The more a germ is spread, and the more it is resistant against environmental influences, the less is the chance of eradication. However, if humans are the only reservoir of a pathogen, an eradication of the disease is possible; this can be assumed for ► measles and ► polio. ► Smallpox, was declared eradicated in 1980, and poliomyelitis seems to be within our grasp as, to date, North and South America, South Africa, Europe and East Asia are declared to be free of polio, complying with the requirements that no cases of polio have been registered for at least 3 years. However, polio still occurs in India, Nigeria, Pakistan and Afghanistan. Vaccination campaigns are made difficult by social and political instability. If poliomyelitis was eradicated, 1.5 billion dollars could be saved worldwide every year – money, which still has to be spent on vaccination campaigns, therapy, rehabilitation and surveillance systems. Unfortunately, measles eradication has not even been achieved in the industrial nations yet, not least of all due to an increase of what has been termed vaccination fatigue. Currently, measles, a preventable infectious disease, causes the most deaths worldwide.

Outbreak Management at Regional Level

To prevent the spread of an infectious disease, an early diagnosis, which is confirmed quickly, is essential. In industrial nations, the responsible health institution (for example, the public health department) is informed about any case of an infectious disease that is legally notifiable. The health authority then institutes the necessary measures and procedures; it is responsible for the detection of the source of infection and providing

advice on appropriate hygienic methods to be undertaken. The closure of schools or other public institutions is only reasonable when diseases are transmitted by droplets, fecal-orally or by contact with blood. There might be restrictions concerning jobs dealing with teaching, training, nursing or supervising people. Furthermore, outbreaks of infectious diseases may have consequences for employees in the food industry; they may not be allowed to work with open foodstuff. These restrictions especially concern ► permanent shedders of fecal-orally transmitted infectious diseases. Isolation of infected people may be necessary and their contacts may require special monitoring. In infections with meningococci, close contacts should receive a prophylactic antibiotic therapy. After exposure to particular pathogens, active or passive vaccination (► immunization, active; ► immunization, passive) may be necessary to prevent outbreaks, for example, possible infection with ► tetanus, ► rabies or ► hepatitis B.

Management of Catastrophe

► Epidemics or even ► pandemics present not only medical difficulties, but also organizational and ethical problems. If effective preventive or therapeutic measures are to be possible then the question of sufficient resources arises. Supplies can fail due to production related, logistical or financial problems.

Whenever resources are restricted, decisions have to be made about how they should be distributed. In 1994, a declaration was published by the World Medical Association (WMA) concerning the medical ethics of catastrophe (http://www.wma.net/e/policy/d7.htm). The first aim in such a state of emergency should be the reduction of morbidity and mortality of the whole population. As the maintenance of the health care system is very important, and as medical staff faces a high risk of infection, a decision has to be made about whether or not the involved professionals should be given preferential prophylactic therapy when stocks are scarce. Another important consideration is the effects of public policy and security on individual rights. Those facing the highest risk of infection, according to current medical knowledge, deserve compassionate care but in a catastrophic situation, when the rest of the population may be at risk, they may suffer a restriction of their personal rights – maybe due to quarantine (► quarantine diseases) measures – that cannot be avoided. The recommendation of the Council of Ethics and Judical Affairs of the American Medical Association can help to weigh up public and individual interests (http://www.ama-assn.org/ama1/pub/upload/mm/31/quarantine15726.pdf).

It is very important to inform people about the necessary measures involved in a pandemic prior to its outbreak. The reasoning behind the pandemic plan, in which there may be a distribution of resources to particular groups and possible restrictions on individual freedom, has to be understood, otherwise, the emergency plan could be put in jeopardy.

In conclusion, the process of surveillance holds a significant position in the fight against infectious diseases. A sufficient health service, extensive preventive measures, a precise registration and evaluation of infection data and an active data interchange – maybe even on international levels – are the basic conditions for dealing with infectious diseases successfully. An exact and fixed procedure is essential to achieve a quick barrier to the spread of infectious diseases. In epidemics or even pandemics professional outbreak management is indispensable, even if the acceptance of individual restriction is inevitable.

Cross-References

► Acute Life-Threatening Infections
► Basic Reproduction Rate
► DOTS
► Endemic Infectious Diseases
► Epidemic
► Food-Safety and Fecal-Orally Transmitted Infectious Diseases
► GAVI, Global Alliance for Vaccines and Immunization
► Hepatitis B
► HIV/AIDS
► Immunization, Passive
► Infectious Diseases Due to Contaminated Water
► Malaria
► Measles
► Nosocomial Infections
► Pandemic
► Permanent Shedders
► Polio
► Quarantine Diseases
► Smallpox

► Tetanus
► Tuberculosis
► Vaccination, Active
► WHO Influenza Surveillance Program

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Victorian Government Health Information — Infectious Disease Epidemiology & Surveillance. http://www.eurohiv.org/
Commonwealth of Massachusetts - Department of Public Health - HIV/AIDS Surveillance Program. http://www.health.vic.gov.au/ideas/
UNAIDS - HIC Data. http://www.unaids.org/en/HIV_data/default.asp
WHO. http://www.who.chhttp://www.who.int/csr/en/
WHO - World Health Organization Report on Infectious Diseases removing obstacles to healthy development. http://www.who.int/infectious-disease-report/pages/textonly.html
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WHO - Partners for Parasite Control (PPC). http://www.who.int/wormcontrol/en/
World Medical Association - Policy. http://www.wma.net/e/policy/d7.htm

Outcome Evaluation

► Summative Evaluation

Outcome (Health Economics)

Synonyms

Benefits; Consequences

Definition

In ► health economics, the term outcome describes the results and the general benefit of the use of a health care technology as a defined measure. As outcome measures adequate medical parameters such as blood pressure reduction or improvement of a symptom score, epidemiologic parameters such as events avoided or life years gained, or utilities such as ► quality-adjusted life years can be chosen. The type of outcome measure defines the type of ► health economic evaluation. The choice of the outcome measure in health economic evaluation studies can strongly influence the result.

Cross-References

► Event
► Outcome Research Variable

Outcome Intervention Effect

Synonyms

Effectiveness

Definition

Effectiveness is the extent to which an intervention produces favorable outcomes under usual or everyday conditions. Using different terminology, effectiveness studies must have a high degree of external validity. The end-points of clinical trials and effectiveness studies tend to differ. Usually, clinical trials are focused on end-points such as mortality and clinical symptoms. Effectiveness studies often include these end-points but there is now movement towards including outcome measures that are more meaningful to patients.

Outcome Measure

Definition

Measure which assesses relevant endpoints of any intervention.

Outcome Research Variable

Synonyms

Resulting variable; Result; Outcome; Dependent variable

Definition

Each measurement or observation relevant to the researched phenomenon and which is noted with the experimental unit. All possible results that can be derived from exposure to the trigger (causative) factor.

The result of the experiment or another situation that implies uncertainty.

Outliers

Definition

An outlier is an unusually small or unusually large ► data value. For every such value an assessment should be as to why it has occurred, e. g. ► measurement error, data error, data from another population, or a value that represent an abnormality of some unit of observation and which lies in the tail of assumed theoretical ► probability distribution. A value indicates a possible outlier if it is 2.5 ► standard deviations from the mean. The most common reason for outliers is data error, and when such outliers are identified they must be corrected. If correction of erroneous data is not possible, outliers must be removed from the analysis. Deciding to eliminate an outlier from analysis must be done carefully because retaining a wrong value may be misleading while removing a correct value may produce an underestimated measure of variability. It may be useful to perform the statistical analyses twice, the first time with all the data and the second time without the outliers, and then estimate the impact the outliers had on the results and statistical inferences.

Outline of Dental Public Health

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Synonyms

Public health dentistry; Community dentistry

Definition

Dental public health is an interdisciplinary field of research, work and activity with special focus on ► oral health and oral and dental diseases. The paradigms of public health apply likewise. Basically, dental public health aims at sustaining the oral health of the population by using structured community based measures for oral health promotion and organized efforts of society.

Basic Characteristics

In the United Kingdom and North America, dental public health has a long tradition. Many universities offer postgraduate programs in dental public health. In other countries including many European, however, this field is still evolving, its potential being not yet fully utilized. Still, many dental professionals have difficulties in understanding and implementing the public health paradigm. It can be best described by a population-based view on oral health and ► oral diseases. This perspective can considerably contribute to a better and broader understanding of oral diseases and oral health promotion. The significance of oral and dental diseases as common chronic diseases with extremely high prevalence rates in the population is apparent and underlines their relevance for public health. Like public health in general, dental public health has shifted from old public health to new public health. The scope of "old" public health covers prevention, oral health in high risk groups (e. g. deprived children, institutionalized elderly or migrants), sociology, psychology, environmental health, and epidemiology. "New" public health additionally focuses on health policy, health system research, economics, political and management sciences and thereby even more acknowledges the significance of interactions between oral health and basic conditions and society related parameters.

► Caries and ► periodontitis are among the most common diseases. The sequelae of these diseases with tooth loss on top affect all health dimensions. Still, tooth loss has very high incidence rates in adults. In many industrial countries the prevalence of edentulism is over 25% in people over 65 years of age. To a relatively high extent, caries and periodontitis are preventable diseases. They are associated with ► bacterial plaque and sugar consumption. Caries is a sugar dependent infectious disease. On the average, more than half of the teeth can be decayed, filled or missing in a middle aged adult. Periodontitis is an infectious disease leading to inflammation of the ► periodontium, the formation of gingival pockets and bone loss. In adults aged 40 years and older, periodontitis is responsible for more tooth loss than caries.

An array of measures at individual, professional and community levels is available for the prevention of oral diseases. Measures at the individual level are regular ► oral hygiene, fluoride applications, healthy food choices and smoking cessation. Services delivered by dentists or auxiliaries include professional oral hygiene procedures, topical fluoride applications and ► fissure sealing. Caries prevention for groups can be offered in schools or kindergartens and encompasses healthy food choices, the use of fluoridated salt, and oral health education. Community level measures are water fluoridation, campaigns for healthy food choices and actions suitable to reduce common risk factors.

Dental diseases can be successfully treated. In many cases restorative procedures are part of the treatment. However, most ► dental restorations have a more or less limited lifespan. Most important are the successful management of the underlying disease and the compliance of the affected patient. Defects due to caries are commonly treated by removing the affected tooth structure and depending on their size by fillings or crowns. In advanced cases, a root canal treatment becomes necessary. Periodontitis is most commonly treated by cleaning the root surfaces for infection control. Tooth loss is compensated for by different prosthetic means like ► bridges, removable prostheses or ► dental implants.

The World Health Organization's definition of health encompasses a state of complete physical, mental and social well being that enables a person to lead a socially and economically productive life and not merely the absence of disease or infirmity. Transferring this definition to oral health means a high oral health related quality of life in the absence of oral diseases. The importance of sound good looking teeth and fresh breath for a person's well being is apparent. Considering oral health a multi-dimensional construct increasingly becomes a widely accepted perspective. Oral health related quality of life has physical, psychological and social dimensions. We know from many studies that there is a significant discrepancy between subjective perception and objective views (as seen by dental professionals) on oral diseases and treatment need. Moreover, there is a great diversity of views among patients. A good example for this is the loss of ► molars (back teeth). Whereas some people might feel uncomfortable with a situation without back teeth others might hardly feel any discomfort. Most professionals, however, recommend molar replacement.

There has been a considerable ► caries decline in most industrial countries in the last decades. This decline has been found predominantly in children and adolescents. The foundation of this improvement of oral health is not quite clear and multi-causal. The situation in the adult population is much less straightforward. There is some concern that the effect of prevention in children and youth can be equally transferred to higher age groups. Periodontitis is not declining in a similar way. Still, the prevalence rates are high or even increasing. Oral health and the epidemiology of oral diseases are strongly affected by demographic changes. Most analysts expect a shift of tooth loss towards higher age groups. Because of the increase in life expectancy, dental treatment need will most probably not decrease as expected by many health politicians. Most experts are of the opinion that treatment need might be even higher because of a high number of remaining old teeth in high age groups. Treatment cases might become more complex and affected by non-carious lesions and tooth wear that occur in old age even after lifelong absence of dental caries and periodontitis. Reacting to both epidemiological and demographic changes will be the main challenge of public health dentistry in the future.

Risk factors for oral diseases are unhealthy diet with high sugar consumption, poor oral hygiene and smoking. In addition, low social status and low income have been shown to be associated with an increased risk. Many common risk factors like smoking have a high significance. The ► common risk/health factor approach aims at reducing risk and promoting health factors, no longer focusing on single diseases but rather aiming at an improvement of health conditions for the whole population. Common risk factors are unhealthy diet, obesity, stress, lack of exercise and smoking. They affect the incidence of heart disease, cancer and oral diseases. Smoking has a significant influence on the onset and progression of periodontitis and also on the success of dental implants. Associations between cardiovascular diseases, diabetes and periodontitis are assumed.

In many surveys and studies, caries, periodontitis and tooth loss had a significant association with a person's social status. Looking at caries for example in children and adolescents shows that there is a considerable polarization of the disease. A high portion of dental caries occurs in a relatively small group of socially deprived people. Caries in deprived portions of a pop-

ulation in children and adolescents might be accompanied by high prevalence rates of early onset type II diabetes, obesity and malnutrition. Seen from this angle, only an interdisciplinary approach under consideration of society related public health principles can be appropriate. Mere patient centered prevention in the dental office will not be effective.

Depending on national characteristics, dental services are delivered by private dentists, policlinics or non-academic professionals as ► dental hygienists or ► denturists.

Health system and reimbursement policies have a considerable impact on the access to dental services, treatment modalities, and social disparities. Dental services demand a considerable portion of health expenses. Therefore, oral health policies are often in the focus of public interest. Among the different parties concerned with health services there are frequent controversies about the most feasible allocation of the available resources. For political reasons changes are very often implemented hurriedly and without any appropriate scientific background. Rules of national insurance plans strongly affect treatment modalities especially in those countries in which the reimbursements for dental services are high. Changing those rules can lead to under-, over- or false treatment at the population level. In many ways a health service system resembles a black box in which the impact of change is hardly predictable. ► Health services research can deliver data that improve our knowledge in this field.

A core competency of dental public health is health promotion. The respective WHO goals include reducing the disease burden and disability, especially in poor and marginalized populations, promoting healthy lifestyles and reducing risk factors that arise from environmental, economic, social and behavioral causes and developing oral health systems that equitably improve oral health outcomes, respond to people's legitimate demands, and are financially fair.

Cross-References

► Bridges
► Caries Decline
► Common Risk/Health Factor Approach
► Complete Removable Dental Prosthesis
► Dental Caries
► Dental Hygienist
► Dental Implants
► Dental Plaque
► Dental Restoration
► Dental Sealant
► Denturist
► Health Services Research
► Molar
► Oral Diseases
► Oral Health
► Oral Hygiene
► Partial Removable Dental Prosthesis
► Periodontitis
► Periodontium

Outpatient Care

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Synonyms

Ambulatory care

Definition

Outpatient care services are the health care services that are provided to patients who are not hospitalized for an overnight stay. The outpatient care services are delivered in different settings like a physician or therapist's office, a clinic, or a day surgery center. Outpatient care covers diagnosis, observation, treatment, and rehabilitation. It is usually provided to persons that are able to ambulate or walk about.

Basic Characteristics

Providers of Outpatient Care

The expenditures for outpatient care in the Organisation for Economic Co-operation and Development (OECD) countries average at 33%, ranging from 21% in the Slovakia Republic to 51% in Denmark. The USA also has a very high share of outpatient care expenditures, with 47% of the total health care expenditures. Outpatient care is provided in different settings and in different proportions depending on the health

care system and infrastructure in the respective country. Medical practitioners and therapists with private practices are the key providers of outpatient care. Other providers of outpatient care are ambulatory departments within hospitals as well as day surgery centers, where patients can go for minor surgical interventions allowing them to return to their homes the same day. The outpatient care in private practices is offered by personal ► primary care physicians (specialized in ► internal medicine, ► family medicine, and ► pediatrics), subspecialty physicians (gastroenterologists or cardiologists), and non-physicians (e. g. nurse practitioners, physical therapists). The practices are either single practices or collaborations in clinics or group practices, which can consist of physicians of similar or different medical specializations. The primary care physician, often a ► general practitioner, plays a vital role in many countries' outpatient care settings. The primary care physician is the first point of contact of the patient with the health care system and offers services for acute and chronic diseases as well as preventive medicine. She or he coordinates the patient's journey through the health care system by acting as gatekeeper when it comes to referring the patient to outpatient medical specialist practices, clinics, or hospitals.

The Physician-Patient Relationship

The relationship between the physician and the patient is of high importance, which is particularly the case for the primary care physician. The relationship should be understood as an interaction where each party influences the other, as well as the process of consultation. The consultation can also be described as a negotiation process, where the patient is the expert on his or her own health and life and the physician is the expert on medical conditions and possible treatment paths. There are an increasing number of physicians shifting from a disease-centered practice towards a more patient-centered one that integrates biomedical knowledge of disease with personal knowledge of the patient's illness experience in the context of the patient's and physician's environment.

Integrated Care

The gatekeeper model described above is one element of a more integrated care approach. Integrative approaches like ► managed care will be further enforced in the mid-term future, primarily driven by cost constraints but also quality of care objectives. A more integrated model aims at better coordination of all the elements of a health care system, be it inpatient care, outpatient care, long-term care, rehabilitation, or prevention. Barriers between the different sectors will be dissolved by better aligning the outpatient and inpatient services to avoid double-work, and shifting more services to the outpatient sector. The increasing prevalence of chronic diseases will be addressed by integrated disease management programs, which are systems of coordinated health care interventions and communications for people with conditions that require significant self-monitoring. Disease management programs include collaborative practice models, evidence-based practice guidelines, patient self-management education, process and outcome measurement, and routine reporting.

Conclusion

As it is expected that health care costs will absorb larger and larger parts of national economies worldwide, there will be ongoing cost pressure on the different sectors of care. Primary care-led health care systems have proven to be cheaper than systems with direct access to outpatient medical specialists and hospitals. It is therefore a realistic scenario that additional countries will refine their outpatient care delivery towards a more primary care based approach. It can be assumed that this transition towards primary care models will go along with the evolution towards more integrated health care delivery models that can also address the challenge of a rising share of chronic diseases more efficiently and effectively.

Cross-References

► Family Medicine
► General Practitioner
► Internal Medicine
► Pediatrics

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Outpatient Health Care

Synonyms

Ambulatory health care

Definition

Outpatient health care comprises all kinds of health care services that are delivered outside the hospital. This includes health care services delivered in physicians‘ practices, medical centers or at home by physicians, dentists and other health practitioners such as chiropractors, mental health specialists, speech therapists and physiotherapists. It also includes ambulatory services delivered by medical and diagnostic laboratories, ambulance services such as first aid, blood and organ banks and outpatient care centers for family planning, mental health, ► substance abuse, ► ambulatory surgery and dialysis in which the patient does not stay over night.

Outpatient Surgery

► Ambulatory Surgery

Out-of-Pocket Payments

Definition

Out-of pocket payments are health care costs that are financed directly by individual patients, because they are not covered by insurance or tax-financed schemes.

Cross-References

► Co-payments

Out-of-Wedlock Childbearing

► Nonmarital Fertility

Overall Rates (Total or Crude Rates)

Definition

Crude rates are based on the actual number of events in a population over a given time period. Calculation of crude rates makes no allowance for the influence of population structure on the phenomenon of interest. The crude Death Rate approximates the proportion of a population that dies during a particular time period.

Overeating Associated with Other Psychological Disturbances

Synonyms

Psychogenic overeating

Definition

Psychogenic overeating is overeating due to stressful events (e. g. bereavement, accident, childbirth).

Cross-References

► Eating Disorders

Overnutrition

Synonyms

Supernutrition

Definition

Excessive food consumption over a long period of time leads to an increased energy intake (► nutrition).

Over-the-Counter Drugs

Synonyms

OTC drugs; ► Non-Prescription Drugs

Definition

Over-the-counter (OTC) drugs are preparations that may be sold to consumers without a physician's prescription. Unlike their name would suggest, in many cases these items are openly placed on the shelves of stores and can be bought like any other packaged product. Prescription drugs are only available at the pharmacy counter. The most common over-the-counter medication are supposed to treat aches and pains, allergies, cold and influenza symptoms. They also often address coughs and sore throats, constipation and diarrhea. OTC drugs aim at treating a condition where a direct supervision by a doctor is not required and it needs to be proved that the OTC drugs are reasonably safe, well-tolerated and have little or no abuse potential. In cases where prescription drugs, over time, prove to be safe and appropriate for self-medication they might then be switched to OTC.

Cross-References

► Non-Prescription Drugs

Overweight

► Obesity

Ozone Depletion

Synonyms

Ozone holes

Definition

Ozone depletion is the process of decline of the total amount of ozone in the Earth's stratosphere during the past few decades, especially over Polar Regions (the ozone holes). The cause of this trend is catalytic destruction of ozone by atomic chlorine and bromine, originating from chlorofluorocarbon (CFC) compounds, called freons, and bromofluorocarbon compounds, known as halons. Depletion of the ozone layer leads to an increase in ultraviolet light passing through the Earth's atmosphere, which is known to induce skin cancer, damage to plants, and reduction of plankton populations in the ocean's photic zone. The Montreal Protocol, adopted in 1987, bans the production of CFCs, halons, and other ozone-depleting chemicals such as carbon tetrachloride and trichloroethane.

Ozone Holes

► Ozone Depletion

P4P

► Pay-for-Performance

Paediatric Palliative Care

Synonyms

Palliative care in children; Hospice care in children

Definition

As the spectrum of malignancies is dissimilar between adults and children, the palliative treatment of adults and children differs. In children, leukemia, cerebral tumors and sarcomas predominate, whereas carcinomas are seldom observed. The response to chemotherapy in childhood cancer is fast and effective. However, because of the stage of cognitive development, the reaction in children to palliative measures, such as pain treatment, is often difficult to manage. This had led to the creation of authorative guidelines for systemic pain pharmacotherapy in combination with an interdisciplinary team approach in pediatric palliative care.

Paedophilia (or Pedophilia)

► Paedo-Sexual Behavior

Paedo-Sexual Behavior

Synonyms

Paedophilia (or pedophilia); paedo-sexuality

Definition

Paedo-sexual behavior is the more appropriate term for the commonly used term paedophilia (or pedophilia) which literally means "being fond of children". Paedo-sexuality refers to the notion of being sexually attracted primarily or exclusively to children and adolescents, potentially leading to child sexual abuse with its profound harmful effects for the child. According to international conventions, a person below the age of 18 years is considered a child and the various forms of sexual exploitation of underage girls and boys constitute violations of human rights.

► Migrants, Sexual Exploitation

Paedo-Sexuality

► Paedo-Sexual Behavior

Pain

Definition

The International Association for the Study of Pain defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. The intensity of pain may range from slight to agonizing and there are different specifications for pain like sharp, throbbing, dull, nauseating, burning, and shooting. Pain has, in most cases, both an emotional quality and a sensed bodily location, which is the basis for the determination of the pain receptor. Pain can be acute or chronic, and the most common types of pain are somatic pain (originating from ligaments, tendons, bones, blood vessels, and nerves), visceral pain (orig-

ination from the body's viscera or organs), and neuropathic pain (resulting from injury or disease to the nerve tissue).

Painkillers

► Analgesics
► Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Pain Medications

► Analgesics

Pain-Reliever

► Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Paired Groups Design

Synonyms

Dependent groups design; Dependent samples design; Within-subjects design; Repeated measures design

Definition

Paired groups design is when each subject serves in all of the experimental conditions.

Palawah (Tasmania)

► Indigenous Health – Australooceaninan

Palliation

► Palliative Medicine

Palliation at Home

► Hospice Care

Palliative Care

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Synonyms

Terminal care; Hospice care

Definition

Palliative care is an approach or a philosophy of care that emphasizes the quality of life of patients and their families. Palliative care addresses the problems associated with life-threatening illness through the prevention and relief of suffering by early identification, assessment, and treatment of ► pain and other physical, psychosocial, and spiritual problems. Although palliative care has been predominantly connected with cancer patients, it is now increasingly used in conjunction with other diseases like chronic heart failure or progressive neurological conditions. Furthermore, there is a growing field of pediatric palliative care services driven by the fact that more than 11 million children under the age of 5 die worldwide each year. Palliative care should be offered by a multidisciplinary team, often with the primary health care team in the lead and supported by specialist practitioners and specific palliative care units or hospices.

Basic Characteristics

Background

It can be observed that life expectancy is increasing in at least most of the developed countries, with more and more people living beyond 65 years of age. As a consequence of this population ageing, there is a shift in the patterns of diseases people suffer and die from. Increasingly, people nowadays die at older ages after suffering from serious chronic conditions, which often cause physical, psychological, and social problems. In the past 20 years, there has been a significant shift towards stronger focusing on the patient's quality of life. Today, in the United States, 55% of the hospitals with over 100 beds offer a palliative care program –

amongst the ► community hospitals there is still one fifth having a palliative care program. Palliative care is no longer restricted to hospice care; however, that is where palliative care actually began. The first ► hospices for the dying were established by religious orders in the 19th century in England and Ireland. The modern hospice is a relatively recent concept that originated and gained momentum in the UK after the founding of St. Christopher's Hospice in 1967. St Christopher's Hospice was founded by Dame Cicely Saunders and her extraordinary contribution to alleviating human suffering has resulted in the hospice being considered a center of innovation and insight ever since. She is widely acknowledged as the pioneer of the modern hospice movement. The hospice movement has grown tremendously since its beginning. Whereas the hospices focus on dying patients, palliative care programs in hospitals offer care for non-terminal patients well as hospice patients. Palliative care programs in hospitals are often difficult to be funded due to the multiple employees that constitute a palliative care team and the time-intensive involvement without adequate reimbursement. As a consequence, most strategies for funding palliative care programs focus on cost-savings as opposed to revenue-generating models.

Pain Management

Pain can be described as an extraordinary experience that has a severe impact on the psychology and physiology of the person affected. Pain includes a combination of sensory, affective, and cognitive dimensions that are different for each person. The perception of pain and the resulting description varies according to the sufferer's reaction and there is often a discrepancy between the pain subjectively perceived by the affected person and the objective charting by the doctor.

As pain is one of the most dreaded elements of dying for many patients and their families. Therefore pain management constitutes the cornerstone of good palliative care, as a minimization of pain increases the patients' quality of life and reduces their fears. As pain is entirely subjective, pain management has to be tailored to each patient's needs. This requires an accurate determination of the cause and nature of the pain, a decision upon appropriate medication and non-medication pain relief measures, and a regular reassessment of the pain control.

Dr. Cicely Saunders developed the concept of total pain associated with the dying process. Total pain consists of four elements: physical noxious stimuli, affect or emotional discomfort, interpersonal conflicts, and non-acceptance of one's own dying. All these elements may effect the patient's perception of the total pain. Physical pain is the most familiar component of total pain. In terms of its temporal nature, it can be differentiated into acute and chronic pain and it is usually categorized into three types: somatic pain, visceral pain, and neuropathic pain.

From a temporal perspective, acute pain is time-limited and results from nociceptor stimulation, like from an acute injury. Chronic pain is often differentiated from acute pain from a temporal perspective, meaning that pain that lasts beyond 3 months after an acute injury is described as chronic pain. More recent distinctions see acute pain as pain that serves as protection after an injury, with acute pain being defined as the symptom of pain. Chronic pain, in contrast, is defined as the disease of pain, which represents a completely different challenge to the patient and physician. The treatment objectives for such patients are the reduction of related symptoms and the restoration of maximal function.

When comparing the three types of pain, somatic pain results from the activation of nociceptors in the skin and deep musculoskeletal tissues. Potential sources of somatic pain are bone pain caused by metastases, arthritic joints, osteopathic lesions, fractures, and abscesses. Visceral pain arises from stretching or activation of nociceptors in the linings or serosa of organs. In contrast to somatic pain, visceral pain is often poorly localized, dull, aching pain which is difficult to describe. Exemplary descriptions of the pain are "deep pressure", "cramping", "spasms", or "squeezing". It is frequently associated with sensations like bloating and nausea. Neuropathic pain originates from damage to the ► peripheral nervous system (PNS) or the ► central nervous system (CNS), or both. The pain is often described as "sharp", "electric", or "burning" pain.

Besides those three types of pain, there also exist the terms breakthrough pain and incident pain. Breakthrough pain describes a temporary increase in pain from the basal, acute, or chronic pain level, which is not relieved by the scheduled dose of medication, it "breaks through" regular analgesia. Incident pain can occur during diagnostic or therapeutic procedures, or be associated with voluntary physiologic maneuvers like walk-

ing or sitting up. Physicians should anticipate the pain before the provoking activity takes place and have the appropriate pain management in place, which is often a challenge.

Practice

The options for the location of terminal care differs by country and comprises the patient's home, a long-term care setting, a hospice, a palliative care inpatient unit in an acute care hospital, or acute in-hospital care. Whereas in the 1980s, 70–90% of deaths occurred in hospitals, the scale began to move back towards deaths occurring at home by the turn of the millennium. The most anticipated causes of deaths are chronic diseases like cancer, cardiovascular disease, neurologic disease, chronic obstructive pulmonary disease, and AIDS.

In most countries, palliative care is provided by interdisciplinary teams consisting of physicians, nurses, social workers, hospice chaplains, physiotherapists, occupational therapists, complimentary therapists, volunteers, and last but not least, the family, as one of the most important elements. As palliative care covers a wide array of conditions in patients at varying stages of their illness, palliative care teams have to offer a broad range of care. A large part of the work involves helping patients with complex or severe physical, psychological, social, and spiritual problems. Clear and accurate communication to the patient is always important but of specific relevance in the phase where the patient is approaching death.

Conclusion

Due to the advancements in treatment and supporting technology as well as social changes, life expectancy has increased significantly in the last century. As a consequence of this development, medicine has devoted its effort and resources to preventing and postponing death and put less focus on the care of dying, which in medicine is often interpreted as failure. Furthermore, in many societies, death is seen as a taboo. All of these aspects affect patients, their families, carers, friends, and children, and staff in health, social, and other services. Although every individual has to die and death is an inevitable part of life, the suffering of the patients and their families is often covert and best practices to treat and support those individuals are not yet universally available. Yet, progress can be observed, with changes in medical treatments and technologies. They are now more often targeted at increasing survival or improving quality of life of the severely ill. Going forward, the elements of successful palliative care are assessment, accurate diagnosis, skilled management, and anticipatory care. This implies a consistent review of the medications for the dying and cessation of those that are not essential, in conjunction with a provision of nursing care and communication. Family and friends of the patient have to be included and educated both practically and psychologically. This is reinforced by the fact that home death has turned out to be a common preference amongst terminal patients.

Cross-References

- ▶ Central Nervous System
- ▶ Community Hospitals
- ▶ Pain
- ▶ Palliative Medicine
- ▶ Palliative Medicine and Hospice Care
- ▶ Peripheral Nervous System
- ▶ "A Safe Place to Suffer"

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Palliative Care in Children

► Paediatric Palliative Care

Palliative Medicine

Synonyms

Palliation; Palliative care

Definition

Compared with palliative care and hospice care the term palliative medicine is a more general concept. Palliative medicine does not only describe the tasks of attending and caring for the severely ill patient, who is suffering an end-stage disease with corresponding symptoms, but also implies ethical aspects, health economic considerations, quality of life (QOL) research and patient education.

Cross-References

► "A Safe Place to Suffer"

Palliative Medicine and Hospice Care

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Synonyms

Palliative care; Hospice; "A safe place to suffer"

Definition

According to a report of the World Health Organization (WHO 2006) palliative care is defined as "the active total care of patients whose disease is not responsive to curative treatment." This definition underlines the ► end stage of the diseases. However, palliative medicine as term can also be used more generally for the alleviation of symptoms, even if there is also hope of a cure by other treatment. In a more recent WHO statement ► palliative medicine is described as "an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness." Palliative care may also be used to ease the unwanted effects of curative treatments, such as improving certain symptoms associated with chemotherapy.

Basic Characteristics

Correspondingly palliative care (from Latin *palliare*, to cloak) is any kind of medical treatment or help that reduces the severity of the symptoms of an illness, or slows the disease's progress, rather than to cure it. However, it may occasionally be used in combination with curative therapy, when the latter does not cause additional morbidity. Palliative care is supposed to improve ► quality of life (QOL), by reducing or eliminating pain and other symptoms, helping the patient to better deal with psychological problems (► psychological distress and palliative care), and supporting partners and family. Recently the concept of having a good quality of life has gained ground, although many assume that there is still a long way to go to improve the palliative medicine issue. A relatively new development is the concept of ► health care teams in palliative care that is entirely focused on palliation; this is often called hospice and/or palliative care. Though the concept of palliative care has been known for hundreds of years, in the past physicians have often aggressively tried to treat patients, so that the idea of making a patient comfortable was supposed as "giving up" on him.

The term palliative care principally does not refer to the care of patients with chronic diseases such as diabetes mellitus which, although actually incurable, has effective enough treatments so that it is not considered as a progressive or life-threatening disease like cancer (► cancer palliative care). It is, however, more often used regarding other life-threatening illnesses, such as progressive pulmonary disorders, terminal renal insufficiency, advanced heart failure or progressive neurological diseases. Additionally, the field of ► pediatric

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palliative care is rapidly growing. Furthermore, cancer survival is considerably increasing with many patients living far longer than patients with, for example, progressive neurological conditions.

The hospice movement started in the 1980s and 1990s indicating that the issue had become more significant to health care professionals (Husebo and Klaschik, 2000). It was driven by the debate on ► euthanasia, following liberal legislation in certain countries, such as the Netherlands (Jansen-van-der Weide et al. 2005); "good" palliative care is considered as an alternative to euthanasia (Lennert 2003).

There is an ambiguity in the term palliative care: most oncologists consider any treatment that is not curative as palliative. Thus a therapy that leaves a patient in comfort rather than dying in pain, without changing the duration of life, is palliative. And a treatment that lets a patient live ten years longer is also palliative.

History

Hospices were originally places of rest for journeymen in the 4th century CE. In the 19th century hospices were established for the dying in Ireland and London. The modern hospice is a relatively new concept that gained momentum after the founding of St. Christopher's Hospice in 1967 (United Kingdom). Since its start, the hospice movement has grown fast. For example, in the UK there were just fewer than 1700 hospice services in 2005 consisting of inpatient units for adults, inpatient units for children, home care services, hospice at home services, day care services and hospital teams. In the United States the first hospice was established in 1974. Medicare reimbursement for hospice treatment has greatly enforced hospice usage in the United States. Today, there are roughly 4100 hospice services operated in the United States (NHPCO) (http://nhpco.org/files/public/2005-facts-and-figures.pdf). The first United States Hospital-based palliative care programs started in 1989, at the Cleveland Clinic. Thereafter adequate care for seriously ill and dying patients was established in more than 1200 new acute care hospitals (www.capc.org). The service is always free to patients. In Germany meanwhile about 200 hospice units and 956 ambulant hospice services have been reported to contribute to palliative medicine.

Palliative Medicine and Hospice Care, Figure 1 Hospice Care Room

Aims

According to dictionary.com (http://dictionary.reference.com/search?query=hospice&db=*) a hospice is defined as "A program that provides palliative care and attends to the emotional and spiritual needs of terminally ill patients at an inpatient facility or at the patient's home," and according to Cancer Web Internet site a hospice is "An institution that provides a centralized program of palliative and supportive services to dying persons and their families, in the form of physical, psychological, social, and spiritual care; such services are provided by an interdisciplinary team of professionals and volunteers who are available at home and in specialized inpatient settings. Origin: L. Hospitium, hospitality, lodging, fr. Hospes, guest" (http://cancerweb.ncl.ac.uk/cgi-bin/omd?query=hospice&action=Search+OMD).

Palliative care does not try to hasten or postpone dying. It aims for symptom relief (► symptom relief in palliative medicine) and promotion of general well being and psychological and social comfort for the person with a life-threatening or life-limiting disease. For palliative medicine quality of life has become more and more important not only in the dying stages, but also in the last weeks, months and years of life. As already pointed out palliative care deals not only with cancer, but also with patients (adults and children) suffering from ter-

LIVING WILL

PERSONAL DETAILS

Name _____

Address _____

Date of birth _____

Doctor's details _____

National Health Number _____

I, _____, am of sound mind and make this Advance Directive now on my future medical care to my family, my doctors, other medical personnel and anyone else to whom it is relevant, for a time when, for reasons of physical or mental incapacity, I am unable to make my views known.

INSTRUCTIONS

Medical treatment I DO NOT want:

I REFUSE medical procedures to prolong my life or keep me alive by artificial means if:

(1) I have a severe physical illness from which, in the opinion of _____ independent medical practitioners, it is unlikely that I will ever recover; ☐

or

(2) I have a severe mental illness which, in the opinion of _____ independent medical practitioners, has no likelihood of improvement and in addition I have a severe physical illness from which, in the opinion of _____ independent medical practitioners, it is unlikely that I will ever recover; ☐

or

(3) I am permanently unconscious and have been so for a period of at least ___ months and in the opinion of ___ independent medical practitioners there is no likelihood that I will ever recover. ☐

Medical treatment I DO want:

I DO wish to receive any medical treatment which will alleviate pain or distressing symptoms or will make me more comfortable. I accept that this may have the effect of shortening my life. ☐

If I am suffering from any of the conditions above and I am pregnant, I wish to RECEIVE medical procedures which will prolong my life or keep me alive by artificial means only until such time as my child has been safely delivered. ☐

Palliative Medicine and Hospice Care, Figure 2a Advance directive : Living Will

HEALTH CARE PROXY

I wish to appoint _____of_____ _____ as my Health Care Proxy. S/he should be involved in any decisions about my health care options if I am physically or mentally unable to make my views known. I wish to make it clear that s/he is fully aware of my wishes and I request that his/her decisions be respected.

ADDITIONAL DIRECTIONS ON FUTURE HEALTH CARE

_____
_____
_____
_____
_____
_____
_____
_____

SIGNATURES

Signature _____ Date_____

Witness's signature _____ Date_____

I confirm that my views are still as stated above.

	Date	Signature	Witness's signature
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____
4)	_____	_____	_____

Palliative Medicine and Hospice Care, Figure 2b Advance directive : Living Will (Continuation)

minal kidney, liver or neurological diseases including Alzheimer's disease. In palliative medicine the patient **and** his family have to be paid attention to.

Palliative care was called "► a safe place to suffer" in 1987 by the Oxford psychiatrist Averil Stedeford and involved measures of building the patient's trust, good symptom control and listening in a therapeutic relationship. These are the focal points of effective palliative medicine. Thus *a safe place to suffer* may be one of the best descriptions of palliative care.

Practice

Hospice and palliative care are two different aspects of end stage medicine with different locations of care. Palliative care services are most often based in hospitals with interdisciplinary consultation services and, possibly, with an inpatient palliative care ward. Palliative care may also be in dying persons' homes or in long-term care facilities. Hospice care is given in patients' homes or in long-term care facilities. In contrast to the US, in the UK no differentiation is made between 'hospice' and 'palliative care.'

In most countries hospice and palliative care are the responsibility of interdisciplinary teams consisting of physicians, registered nurses, ► hospice chaplains, social workers, physiotherapists, occupational therapists (► occupational therapy in palliative care), complimentary therapists, volunteers and, most importantly, the family. In addition, home health care aides, volunteers from the community (largely untrained but some being skilled medical personnel as well), and housekeepers are team members. The aim of the team is to optimize the patient's comfort. Family members and volunteers are crucial to the palliative care system and may find themselves under severe emotional and physical stress. As there is a wide range of conditions that may occur in patients at varying stages of their illness, palliative care teams offer very differing kinds of care: managing the physical symptoms in patients receiving active treatment for cancer, treating depression and attending patients in their last days and hours. This means the teams have to help patients with complex and/or severe physical, psychological, social and spiritual problems.

In many countries *board certification* in palliative medicine has been established for physicians following specialty training for 1 or 2 years. The mode of payment or funding for hospice and palliative care services varies widely throughout the world.

Conclusion

Concerning the definition and the tasks of palliative care and hospice the World Health Organization has published the following statement: "The primary goal of palliative care is to optimize the Quality of Life (QOL) of patients with advanced incurable illness through control of physical symptoms and through attention to the patient's psychological, social and spiritual needs" (WHO Technical Report Series No. 804). Thus palliative medicine is provided for patients with incurable illnesses, such as relapsed cancers, other chronic diseases in end stage situations like cardiac, renal or hepatic failure, diabetes mellitus, the acquired immunodeficiency syndrome (AIDS), and chronic progressive neurological disorders. Palliative care concentrates on issues like management of symptoms such as pain, cachexia, intestinal obstruction, nausea and vomiting, neutropenic infections, dyspnea, and depression. Themes like ► ethics in palliative medicine, health economics, quality of life (QOL) research and patient education also have to be given consideration when devising care schemes. So the quality of the team members is crucial. Carers require an understanding of the fundamental mechanisms of symptoms in patients who are undergoing palliative or hospice care. Available information should be integrated into any care plan so that obstacles to better palliation can be overcome, and the knowledge and system of collaborative work developed in palliative medicine must be expanded to a multinational level for the benefit of all who require such care.

Cross-References

► Cancer Palliative Care
► Determinant of Disease
► Ethics in Palliative Medicine
► Euthanasia
► Health Care Teams in Palliative Care
► Hospice Chaplains
► Occupational Therapy in Palliative Care
► Paediatric Palliative Care
► Palliative Medicine
► Patient's Comfort
► Psychological Distress and Palliative Care
► "A Safe Place to Suffer"
► Symptom Relief in Palliative Medicine

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Palliative Therapy in Oncology

► Cancer Palliative Care

Pandemic

Synonyms

Widespread epidemic

Definition

The term "pandemic" stems from the Greek and means "all people." A pandemic infectious disease spreads without local restriction, extending over large regions, or even worldwide. Although pandemics ignore frontiers and reach nearly all corners of the globe, some regions can be spared due to their isolated location; these can be lonely mountain villages, islands or particular regions of the jungle.

Cross-References

► Infectious Diseases
► Widespread Epidemic

Panic Disorder

Synonyms

Episodic paroxysmal anxiety

Definition

A panic disorder is characterized by repeated, sudden bouts of anxiety that reach maximum intensity in a very short period of time. The panic attack is distinguished from other forms of anxiety by its intensity and its sudden, episodic nature. Panic disorders are associated with numerous somatic and cognitive symptoms. Symptoms include tachycardia, sweating, trembling, shortness of breath, chest pain, nausea or gastrointestinal distress, dizziness or lightheadedness, tingling sensations, and fear of dying. The attack typically has an abrupt onset, building to maximum intensity within 10 to 15 minutes, it rarely lasts longer than 30 minutes. The experiences generally provoke a strong urge to escape or flee the place where the attack begins and, when associated with chest pain or shortness of breath, frequently results in seeking aid from a hospital emergency room or other type of urgent assistance.

Cross-References

► Anxiety Disorders

Paper-Based Patient Record

Definition

A paper-based patient record is a collection of data on a patient's health status, stored in the formats in which they are collected (as text, numbers, images, biosignals and codes). It is the oldest and most widely applied type of patient record because it is fast, portable, unbreakable, easy to use, and provides health professionals with great freedom in entering various types of data. The disadvantages of paper-based patient records include vulnerability to ► data errors – loss, incompleteness or incomprehensibility, and chronological orientation of data, which makes retrieval and research difficult.

Paradigm Shift

Definition

The term *paradigm shift* was introduced by Thomas Kuhn in his book *The Structure of Scientific Revolution*, published in 1962. Kuhn shows how almost every significant break-through in the field of scientific endeavor is first a break with tradition, with the old way of thinking, and with old paradigms. For Ptolemy, the great Egyptian astronomer, the earth was the center of the universe. However, Copernicus created a paradigm shift, by placing the sun at the center, and suddenly everything was viewed differently. Paradigm shifts move us from one way of thinking to another, from one way of seeing the world to another, and create powerful change. They create a revolution, a transformation, or a sort of metamorphosis.

Paralysis agitans

► Parkinson's Disease

Parameter

Definition

Value of a population characteristic, unknown by definition, which consequently needs to be evaluated, i. e. population mean is a value usually used as an indicator of a mean value of a quantity. In a population, a parameter is a fixed value that does not vary. Each sample of the population has a statistical value, which is used for grading the parameter. Numerical property of a population. The unique number that depicts a population of measurements of the resulting variable and depends on it.

A parameter is a summary value (numerical quantity measuring some aspect of a population values) which in some way characterizes the nature of the population in the variable(s) under study. Often, it is a mathematical function of the population values of the variable(s) (e. g. the population mean, the population variance, the population proportion, the population correlation coefficient). Parameters are represented by Greek letters (μ ,σ^2, π, ρ, respectively). The parameters are rarely known and they have to be estimated.

Parametric Test

Definition

Inferential statistical method that is based on the specific assumptions regarding one or more of the population parameters that characterize the underlying distribution(s) for which the test is employed. In general it is designed to be used with normally distributed quantitative (interval or ratio) variables.

Parasites

Synonyms

Leech; Sponge; Sponger

Cross-References

► Zoonotic and Parasitic Infections

Parasitic and Zoonotic Infections

Synonyms

Parasitoses and zoonoses; Infections transmitted by parasites; Infections transmitted by parasitic organisms; Infections transmitted by animals

Cross-References

Paratyphoid

Synonyms

Infection with *Salmonella paratyphi*

Cross-References

► Water Quality and Waterborne Infectious Diseases

Parens patriae Power

Definition

Parens patriae power stands for the legal authorization of states entitling them to act paternalistically on behalf of and for the benefit of an individual in order

to save the individual from harm. Particularly, mentally ill persons and children are subject to public health actions based on the state's parens-patriae-power (e. g., by hospitalizing mentally ill persons even against their expressed will). In such situations, states through their public health agencies act, metaphorically speaking, as parents of the country and of the endangered individuals.

Parenting

Synonyms

Child-rearing; Raising children

Definition

All of the activities involved in raising a child, for the child to become a healthy and functional adult. Parenting begins during pregnancy and may continue until either the parent dies or the child dies. Three general types of parenting styles are: (1) the authoritarian parenting style (strict enforcement of rules; frequent use of punishment) (2) the permissive parenting style (leniency in the enforcement of rules; little or no actual use of punishment), and (3) the authoritative parenting style (considered the "ideal" parenting style), the enforcement of rules necessary to maintain discipline and clearly telling children why the rules are necessary.

Pareto Efficiency

Definition

Pareto efficiency describes a condition that implies that it is impossible to improve the level of individual welfare of one individual without reducing the level of individual welfare of other individuals. If it is possible to improve the individual welfare of one individual without hurting the individual welfare of other individuals by reallocating resources, this reallocation is desirable from a Paretian point of view. It is important to note that the Pareto criterion does not include any notions about the distribution of income, which is considered to be given.

Pariser

► Condom

Parity

Synonyms

Number of children born alive

Definition

Parity represents the number of children born alive to a woman. For example, a primiparous woman has given birth to one child, while a nulliparous has not had a live birth.

Parity Progression Ratio

Definition

Parity progression ratios represent the proportion of women at a given parity level who progress to the next higher parity level; for example, the percentage of women with one child who go on to have a second child. This measure is useful for studying tempo versus quantum changes in ► fertility patterns, and can be specific to a cohort or time period.

Parkinson's Disease (PD)

Synonyms

Paralysis agitans; Shaking palsy

Definition

Parkinson's disease is a chronic, progressive neurological disease, which is characterized by a fixed inexpressive face, tremor (shaking), rigidity in some muscles, slow movements, and problems with maintaining normal posture. This is caused by degeneration of brain cells in a part of the brain known as the substantia nigra (SN) which controls many types of muscular movement by releasing a neurotransmitter called dopamine. Dopamine is needed to carry nerve messages from one brain cell to another. The majority of patients are older than 50 but at least 10% of patients are under 40. The

basic cause for Parkinson's disease has not been discovered, yet it is assumed that the disease is hereditary. There are also researchers who think that environmental factors may be the reason for damage of the SN brain cells. There is no cure for Parkinson's disease, but the symptoms can be reduced by drug therapy and surgery supported by exercise, good nutrition, and ► physical therapy.

Criteria for Parkinson's disease include the motor symptoms bradykinesia, rigidity, rest tremor, and postural instability. Additionally, mental symptoms like psychotic disorders or depression may occur as well as autonomic and gastrointestinal dysfunction. PD is one of the most prevalent neurodegenerative diseases and its relentless progression results in severe disability.

Parochialism

Definition

Parochialism means ignoring the impact of cultural concepts and diversity on organizations, professions, policies, procedures and programs. One's own concepts are perceived as culture-free and the only and universal way of thinking and acting. Diversity is trivialized or considered as irrelevant. When problems occur, the underlying role of culture or diversity is denied. Parochialism is a limiting view because it precludes options for managing diversity effectively. The term parochialism is derived from 'parish', which has both religious and governmental connotations (compare ► ethnocentrism).

Partial Removable Dental Prosthesis

Synonyms

Removable partial denture

Definition

A dental prosthesis that replaces some or all teeth in a partially dentate arch. It can be inserted and removed from the mouth by the patient.

Participation

Synonyms

Involvment; Commitment; Engagement

Definition

Involvement in a life situation.

Participation Restrictions

► Impairment and Disability

Particulate Matter (PM)

► Suspended Particles

Partnership

► Alliance

Parvovirus B 19 Infection

► Erythema Infectiosum

Passive Smoking

Synonyms

Secondhand smoke; Involuntary smoking; Involuntary inhalation of tobacco smoke; Environmental tobacco smoke

Definition

Passive smoking refers to the involuntary inhalation of a mix of mainstream and sidestream smoke (smoke given off the burning end of a cigarette) by a non-smoker. There is evidence that passive smoking causes diseases in the fetus, the newborn, children, adolescents, and adults.

Passive Surveillance

Definition

In this context, passive surveillance means that physicians are required to report to the health department certain diseases, when they are diagnosed, by filling out a form with information about the patient (name, age, sex, race and residential address), the diagnosed disease, the date of diagnosis, and the reporting physician.

Pasteurization

Definition

In 1856, the technique of pasteurization was developed by Louis Pasteur. The French scientist is accepted as one of the fathers of microbiology. He recognized that heating for a short period of time killed the microorganisms contained in a product without relevantly changing the characteristics of the product itself. Pasteur revealed that when milk was heated to a temperature of 72 to 75 °C for 15 to 40 seconds, 99.5% of the germs were killed. If afterwards the milk was stored in a refrigerator (which was invented nearly at the same time as pasteurization), it remained drinkable for 6 to 10 days.

Cross-References

► Tuberculosis and Other Mycobacterioses

Patent

Definition

A patent is an intellectual property right that is granted to an inventor to allow him to exploit exclusively an invention he has made. Patents are time limited and granted by states. They are territorially effective in the countries where the right has been granted. Patents provide a defense and damage claim against anyone who makes use of the patent without the permission of the patent holder. Patents can be obtained for invented products and procedures.

Paternalism

Definition

Paternalism, etymologically, simply means treating one in a fatherly way, taking decisions on an individual's behalf, just like a father who knows better than his child what is in his child's best interest. Applied to the doctor–patient relationship, its meaning was intended to be a positive one; the doctor really thought that taking decisions on behalf of his patients and withholding information from them or their legal guardian was the best he could do, in a fatherly way. Paternalism has been strongly criticized because it interferes with patients' freedom and right over their own bodies. Applied to public health practice, it refers to coercive measures over the individual taken by government on account of protecting the common good.

Pathogen Organisms

Definition

The pathogen organisms in water are bacteria, viruses, protozoa and helminths which may cause diseases that vary in severity and sometimes have fatal outcomes.

Pathogens that Cause Tuberculosis

► Mycobacterium Tuberculosis

Pathologising

Synonyms

Demonizing; Victim blaming

Definition

Pathologising refers to the tendency to make someone or something into a problem without remainder. It focuses on disease or disfunction rather than health. While it is appropriately used of processes whereby tissue becomes diseased, it is typically demeaning when used with reference to people. Blaming the victim for their reduced circumstances without taking into account other factors is one form of pathologising practice.

Pathology

Definition

Pathology is the scientific study of the essential nature of disease and its causes, processes, development, and consequences. A medical doctor who specializes in pathology is called a pathologist and is an expert at interpreting microscopic views of body tissues.

Patient-Care Information System

► Health Information System

Patient-Centred Approach

Definition

The patient-centered approach refers to the way the physician approaches patients, being committed to the individuals rather than to their diseases. It aims at understanding the meaning diseases may have for specific patients; this implies understanding patients' feelings and fears about their conditions, and their expectations of the consultation process.

Patient Confidentiality

► Consumer Confidentiality

Patient Data

Definition

Patient data are data about an individual patient and potentially relevant to decisions about his/her current or future health or illness. Patient data include clinical measurements, laboratory values, medication dosages, treatments etc. Patient data should be collected using methods that minimize systematic and random error.

Patient Empowerment

Definition

In ► health promotion, empowerment is a process through which people gain greater control over decisions and actions affecting their health. It may be a social, cultural, psychological or political process through which individuals and social groups are able to express their needs, present their concerns, devise strategies for involvement in decision-making, and achieve political, social and cultural action to meet those needs. Patient empowerment includes collective ► advocacy of patients' rights as well as enabling processes on the individual level (e. g. patient education, enhancement of ► health literacy) that improve patient participation, self-determination in treatment and patient-centred health care. Together, they help patients to take an active role in the improvement of their health and to diminish psychological and social consequences of disease.

Patient Orientation

Definition

Patient orientation means the concept of shared decision-making, i. e. the participation of the patient regarding the selection of therapeutic goals and treatment options. The quality of patient care must not only be measured by the professional standards of the medical, nursing, and other staff, but also by the patients' satisfaction with their medical care. Patient orientation means that all the parties involved in patient care try to get to know and meet the expectations and needs of the patients within the framework of therapeutically correct medical care.

Patient Preferences

Definition

Patient preferences result from deliberation about specific elements, such as anticipated treatments or health outcomes. Patient preferences refer to the individual's evaluation of dimensions of health outcomes and are one of a large number of preferences that may influence

health care choices. These judgments are expressed as statements or actions. Patient preferences result from cognition, experience, and reflection; and exist as the relatively enduring consequences of values. In order for patient preferences to be effectively used in the delivery of health care, it is important that patients are able to formulate and express preferences, that these judgments are made known to the clinician at the time of care, and that these statements meaningfully inform care activities.

Patient Privacy

► Consumer Privacy

Patient Protection

► Consumer Protection

Patient Record

► Health Record

Patients

Definition

Patients are people with defined medical conditions seeking treatment. The term is usually used for individuals participating in clinical trails to determine the efficacy of a treatment or therapy by comparison with historical data (efficacy in a previously treated cohort within the same medical setting and with previous standard therapy), or by direct comparison with standard therapy, or, if no standard therapy is available, by direct comparison with placebo administration. In patients, the risk of an intervention has to be compared with the risk of the disease, the risk of standard treatment and the potential benefit of a successful therapy, so that a final risk–benefit evaluation can be given. Because such patients need therapy anyway, usually only the expenses incurred by the trial regimen are financially compensated (e. g. travel expenses).

Patient Safety

► Consumer Safety

Patient Safety HTA

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Definition

Patient safety technologies are any that reduce the risk of ► adverse events related to exposure to medical care, either by directly reducing the probability of injury or by reducing errors that may lead to injury. Patient safety practice is defined as a type of process or structure whose application reduces the probability of adverse events resulting from exposure to the health care system across a range of diseases and procedures (Shojania et al. 2001). Patient safety Health Technology Assessment (HTA) is the use of HTA methods to rate patient safety technologies and to prepare decisions on their implementation.

Basic Characteristics

HTA is a process used to evaluate the clinical ► effectiveness and ► cost-effectiveness of health technologies by systematic review of clinical, economic, and utilization research. HTA can also be applied to patient safety projects and approach-respective technologies. There are four categories of patient safety HTA, including HTA for existing safety technologies, underutilized safety technologies, emerging safety technologies, and safety aspects of technologies with a non-safety primary purpose.

The rapid rise of patient safety to the attention of policymakers and the public left healthcare providers and researchers little time to evaluate the effectiveness of many patient safety technologies. In the case of patient safety technologies, HTA is urgently needed to evaluate the clinical and economic effectiveness of existing technologies and to prioritize their implementation in health care practice (Mulcahy and Walley 2005).

In the context of patient care, safety issues can emerge in traditional clinical areas (e. g. adverse drug events and complications of surgery), less traditional clinical areas (e. g. ► provider fatigue and in information transfer), and from non-medical approaches to safety (e. g.in► information technology and human factors research) (Shojania et al. 2001).

Most patient safety issues involve both an error and physical or psychological harm. The patient safety literature distinguishes between two approaches to patient safety; one is minimizing injury and the other is minimizing error. It seems clear that healthcare should strive to minimize as many errors and injuries as possible (Cole 2000).

Patient Safety Technology

This term is reserved for technologies with patient safety as their primary purpose. However, many other technologies with a therapeutic or diagnostic primary purpose can affect patient safety. They can indirectly influence the impact of patient safety by raising or lowering the risk of injury or error in health care.

Patient safety technologies are already used in some health care settings. They are mostly developed by following the US safety reports created by The Agency for Healthcare Research and Quality (► AHRQ), which include drug bar-coding, computerized order entry, and work hour regulations. Additional well known and widely implemented patient safety technologies are, for example, patient self-management of anticoagulation and pressure relieving bedding materials to prevent pressure ulcers.

Emerging patient safety technologies are new technologies with a probable improvement for patient safety. An example are drug-eluting coronary artery stents.

However, most technologies that will probably affect patient safety have not been implemented. Different reasons lead to the underutilization of these technologies, such as high capital cost, lack of knowledge, lack of evidence, or investment in other technologies. Policy makers have to weight the potential patient safety and quality benefits against the costs of these technologies.

Patient safety has received increased attention in recent years, but mostly with a focus on errors and adverse events, rather than on practices that reduce such events. Efforts to introduce a patient focus in HTA programs are therefore necessary, because most HTA programs today focus only on clinical and economic effectiveness. Patient safety is considered indirectly as a factor in effectiveness (impact of adverse events or errors on clinical outcome) and in cost effectiveness (costs of adverse events). HTA rarely considers the social, political, and ethical aspects of health technologies, despite their inclusion in the definition of HTA. These factors are particularly critical in the assessment of patient safety technologies, where ethical, legal, and political dimensions and the concept of patient safety closely guide decision makers (Mulcahy and Walley 2005).

Implementation of Patient Safety HTA Results

The implementation of patient safety technologies is often prioritized lower than the implementation of new treatment technologies. This is due to limited resources in most healthcare systems. However, economic pressure in healthcare systems makes patient safety HTA important.

Ignoring HTA safety evidence risks adopting improvements that are not cost-effective; this could prevent investment in other patient safety interventions and limit resources available for actual patient care and services. Linking HTA evidence to patient safety guidelines like the US National Quality Forum's Patient Safety Practices may be the best way to provide healthcare providers with reliable HTA information to decide which patient safety technologies to implement.

Cross-References

► Adverse Events
► AHRQ
► Cost-Effectiveness
► Effectiveness
► Information Technology
► Provider Fatigue

References

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Patient Satisfaction

Definition

Patient satisfaction serves as an indicator to evaluate ► health care quality. To obtain this measurement, patients report their perception of received health care services in hospitals, doctors' offices or other provider settings by means of ratings or questionnaires.

Patient's Comfort

Synonyms

Quality of Life (QOL); Well-being; Wellness

Definition

The concept of a measure of good quality of life for each patient has gained popularity recently. Quality of life may be determined by so-called Qualys which are a measure of the state of well being. A better quality of life for patients undergoing palliative care is affiliated to the alleviation of certain physical symptoms, like pain, nausea, vomiting and dyspnea, etc., and to improvements in their psychological situations and social contacts (trust, listening, therapeutic relationship).

Patient Security

► Consumer Security

Patient-Specific Information

► Medical Information

Pausimenia

► Menopause

Payer's Perspective

Definition

The most common perspective besides the societal perspective is the payer's perspective. It refers to all expenses of the public payer, e. g. a sickness fund, government health service, or private health insurance company, for reimbursed health care due to a defined health care intervention or disease. From a payer's perspective, only the health care described in the catalog of reimbursed items is relevant and to a large extent the reimbursement rates directly reflect the costs.

Pay-for-Performance

Synonyms

P4P

Definition

Pay-for-performance payment systems associate part of the physician's payment with performance indicators such as clinical outcome and patient satisfaction.

Pearson's Correlation Coefficient

Definition

Pearson's correlation coefficient (r) is a measure of the linear association of two variables. Correlation analysis usually starts with a graphical representation of the relation of data pairs using a scatter diagram. The values of correlation coefficient vary from –1 to +1. Positive values of correlation coefficient indicate a tendency of one variable to increase or decrease together with another variable. Negative values of correlation coefficient indicate a tendency that the increase of values of one variable is associated with the decrease of values of the other variable and vice versa. Values of correlation coefficient close to zero indicate a low association between variables, and those close to –1 or +1 indicate a strong linear association between two variables. The square of the correlation coefficient is the coefficient of determination, which gives the proportion of the variation in one variable that can be explained from the variation of the other variable. The assumptions for applying Pearson's correlation coefficient are (a) linear relationship between variables, (b) continuous random variables, (c) variables must be normally distributed, and (d) variables must be independent of each other. Nonparametric counterparts of Pearson's correlation coefficient, such as Spearman's rank correlation coefficient,

Kendall's tau, and Goodman–Kruskal gamma, can be applied when data are presented as ranks or when data come from an ordinal scale of measurement.

Cross-References

► Descriptive Statistics

Pediatrics

Synonyms

Children medicine

Definition

Pediatrics is the field of medicine that is concerned with the diseases and health of infants, children, and adolescents, as well as their growth, development, and opportunity to achieve their full potential as adults.

Cross-References

► Child Health and Development

Pediculosis capitis

► Head Lice

Pediculosis pubis

► Pubic Lice

Pediculosis vestibularis

► Body Lice

Pedigree

► Family Tree

Pedogenesis

Synonyms

Formation of soil; Soil genesis

Definition

Pedogenesis or soil formation (evolution) is the natural geobiological process by which soil is created. Formation of the lithosphere as well as the whole biosphere is influenced by factors classified as: a) abiotic factors: climate, edaf (physicochemical properties of the soil), and orograf (the relief) factors; and b) biotic factors, which consider the influence of all living beings: microbes, flora, fauna, and anthropogenic influence. Soils are more developed in areas with higher rainfall and more warmth, and the rate of chemical weathering increases 2–3 times when the temperature increases by 10 °C. The final composition of the soil depends mostly on the base on which the soil is formed (for example via hydration, hydrolysis, ion exchange, oxydoreduction, or calcification). Previously, soil was considered to be a product of physicochemical transformations of rocks, a dead substrate from which plants derive nutritious mineral elements. The soil is now considered to be a natural body having its own genesis and history of development, with complex and multiform processes that take place within it.

Pedometer

Definition

Step counter.

Peer Education

Definition

Peer education is defined as involving people from a similar societal group, age group, or specific ► community who inform and educate each other to achieve positive health outcomes. It can be conceptualized as learning from one's peers. Peer educators are not professionally trained educators, but usually undergo a special training. The term peer education is often used to describe young people teaching young people. However, the peer education approach has also been successfully used with other groups, e. g. homosexuals in terms of HIV/AIDS prevention. The advantages of this approach are that peers are insiders in a certain culture, have a history of shared experiences and consequently are especially sensitive to the needs and atti-

tudes of other individuals from the ► target group. The insider status may also allow peers to gain a better access to the people in question. Peer education may also effect change at the group or societal level by modifying norms and stimulating collective action that contributes to individual change as well as changes in programs and policies.

Education that is offered by trained people who are members of the same group (or at least fit similar criteria, such as age or educational level) as the relatively homogeneous group they are educating. This type of intervention aims at increasing acceptance of messages through avoiding hierarchy or socio-cultural traps between counselors and those seeking advice. This method is often used with groups such as young people or sex workers. Peer education is used widely in the US and is part of the academic curricula. Positive experiences exist for the following topics: Primary prevention of smoking and substance and alcohol abuse; counseling and information on eating disorders; HIV prevention and prevention of unintentional pregnancy; and coping with stress.

Peer Group

Definition

A peer group consists of male and female people of about the same age and status. It is regarded as a type of sociological group with a homogeneous system of values. Adolescent behavior, both positive and negative, can be influenced by membership in peer groups. Peer-based intervention programs, especially school-based programs have been used as a preventive strategy for a range of adolescent risk behaviors.

Pelvic Inflammatory Disease (PID)

Definition

Pelvic inflammatory disease (PID) is an infection of the upper genital tract (the uterus, fallopian tubes and/or ovaries) that results from an initial infection, often beginning at the cervix. If severe or left untreated, the result of PID can be extensive scarring of the fallopian tubes leading to tubal occlusion and infertility.

Cross-References

► Infertility

Penal Law

► Criminal Law

Penan

► Indigenous Health, Asian

Penetrance

Definition

Penetrance is defined as the fraction of the ► mutation carriers that develops the given phenotype of the ► allele. In most hereditary disorders, penetrance is below 100%, i. e. not every mutation carrier becomes affected throughout life.

Penicillin

Definition

Penicillin, the first antibiotic available, is produced by different species of the fungus *Penicillum*. Penicillin's can be given orally or parenterally. They are bactericidal, that means they kill bacteria by interfering with the synthesis of the bacterial cell wall. Penicillin's are effective against gram positive and gram negative germs. Some pathogens have an enzyme called penicillinase (a particular type of β-lactamase), which is able to inactivate penicillin. By chemical alteration penicillin's can be produced that cannot be inactivated by penicillinase. They are called penicillinase-stable penicillin's. The structure of cephalosporins and penicillin's is similar. In allergic reactions both groups of substances can be involved. This phenomenon is called cross-allergy.

People

► Nation

Per Capita Payment

Synonyms

Capitation payment

Definition

Per capita payment is a payment method by which physicians are paid per patient treated. This payment method aims to assure time efficient treatment of each patient and creates incentives for physicians to treat as many patients as possible. This payment method contrasts with the ► fee-for-service payment where payment depends on the number of services provided. As payment systems of physicians are seen as mechanisms to achieve policy objectives, such as controlling health care cost or improving ► health care quality, the per capita payment seems to save more health care costs than the fee-for-service payment method. But still little is known on the impact of different methods of payment (per capita, salary, fee-for-service) on the clinical behavior of the physicians.

Per-Case Payment

Definition

Per-case payment is a financing method of hospitals in which hospitals receive a payment according to the 'medical case' they treat. These cases are based on ► Diagnosis Related Groups (DRGs), determining the level of payment according to the principal diagnosis, age, ► co-morbidities and other criteria of a patient. This financing method of hospitals has become popular as a measure to contain costs in contrast to the method of ► prospective budgets.

Perinatal Health

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Definition

The ► perinatal period refers to the period about 5 months before and right after a birth. External risk factors and the in-utero environment can impact birth outcomes, and adversities during pregnancy can impact the health of the newborn as well as the trajectory of long-term health and development of the infant.

Basic Characteristics

Preterm Labor and Birth

► Preterm Delivery (PTD) is defined as a birth before 37 weeks of pregnancy, and occurs in approximately 10% of births. PTD continues to increase in most western countries, and is associated with 75–80% of all ► perinatal mortality, and increased morbidities. Preterm labor can result from spontaneous labor or prolonged rupture of membranes (PROM) resulting in spontaneous preterm births (SPB), or due to medical indication (► prolonged or preterm rupture of membranes). There are several pathways that lead to SPB: 1) premature activation of the fetal hypothalamo-pituitary-adrenal (HPA) axis which could lead to elevation of prostglandins, 2) ascending genital tract infections, 3) decidual hemorrhage, or 4) uterine overdistention (Aagaard-Tillery et al. 2005). Sociodemographic and biologic risk factors associated with PTD include maternal age, race and ethnicity, low socioeconomic status, stress, drug abuse, family genetics, and poor nutritional status. History of PTD and past history of miscarriages in the second trimester also increase the risk of PTD (Goldenberg et al. 1993). Risk factors for PTD during the current pregnancy include multiple gestation, uterine anomalies, cervical abnormality, bleeding and infection (Halbreich 2005) .

Infants that survive are at higher risk for damage to the central nervous system, and increased rate of hypertension, cardiovascular disorders and diabetes.

Current methods to identify women at high risk for PTD include detection of vaginal secretion of fetal fibronectin (fFN), and use of cervical sonography to detect funneling and shortening of the cervix. Due to the multiple and overlapping risk factors for PTD, advances in prevention have been modest. Current successful approaches include antibiotic treatment of bacterial STIs, progesterone intake, and identification of early labor and transport of mothers to a delivery facility before onset of early labor and rupture of mem-

branes. Hence it is crucial to continue to find additional methods to prevent PTD, screening to identify women at high risk of PTD, and continue to work on designing effective interventions to prevent and better manage PTD (Ancel 2004).

Intrauterine Growth Retardation (IUGR)

IUGR is defined as a process that leads to limited potential for intra-uterine growth of the fetus, resulting in low birth weight (► intrauterine growth retardation (IUGR)). It occurs in about 5% to 7% of pregnancies, and results in babies being born at birth weights that measure less than 3% to 10% using standard growth curves. The growth restriction is caused by inadequate supply of nutrients and/or limited oxygen supply to the fetus. A majority of fetal growth retardation occurs in the 3rd trimester (~70% to 80%) resulting in an 'asymmetrical' growth restriction, whereas in about 20% to 30% of babies, the growth restriction occurs in the 1st or 2nd trimesters, resulting in a 'symmetrical' growth restriction. Symmetrical IUGR is typically caused by chromosomal and congenital malformations, early fetal infections, drugs or early onset of severe preeclampsia, and results in a greater rate of morbidity and mortality compared with asymmetrical IUGR, that is typically caused by placental-cord abnormalities and maternal vascular factors, as well socioeconomic and nutritional factors (Brodsky, Christou 2004).

Growth restricted fetuses have been shown to be at a higher risk of morbidities as well as ► fetal mortality. Some perinatal effects associated with IUGR include an increased prevalence of perinatal depression, hypoglycemia, hypothermia, prematurity and infection. Long-term effects include growth problems (prevalent in about 10% of IUGR children), and some studies have also shown an increase in adult onset of hypertension, type 2 diabetes and coronary artery disease associated with in-utero growth restriction.

It is crucial to improve the early detection and management of fetuses experiencing growth restriction. Once the IUGR is diagnosed, the cause of the growth restriction has to be determined, followed by more specific tests and regular monitoring of the mother and fetus so as to determine optimal timing and method of delivery. Umbilical Doppler flow measurements that show blood flow in fetal arteries and veins are recommended to diagnose sick IUGR fetuses and have been shown to improve perinatal outcomes. At delivery, it is important to have a neonatology team present to diagnose the effects of IUGR on fetal outcomes. Since IUGR fetuses are more likely to be born preterm, they are exposed to the same risks as preterm births. Prevention strategies should continue to focus on prevention of smoking during pregnancy, optimal maternal nutrition, and in developing countries, malaria prophylaxis during pregnancy.

Low Birth Weight (LBW)

► Low birth weight infants are born weighing 2500 gms or less, measured within the first hour of birth. Within the category of LBW infants, infants can be born premature or preterm (born before 37 weeks gestation), at term (born between 37 and 42 weeks gestation), or post-term (born after 42 weeks gestation). '► Very low birth weight' infants weigh between 1000 to1499 gms and ► 'extremely low birth weight' infants weigh between 500 to 999 gm (Carroll et al. 2005). The incidence of LBW ranges from 5–8% in developed countries to 25% in some developing countries, and after premature births, is the 2nd leading cause of perinatal morbidity and mortality. The impact of LBW on subsequent development of these infants depends on the cause leading to fetal growth restriction, timing of this risk exposure, and the duration of the impairment (Lawn et al. 2005).

Sociodemographic risk factors include low SES, maternal age (less than 19 years and over 35 years), ethnicity (African Americans), marital status (single mothers), and decreased educational level. Medical history of risk factors that can increase the risk of LBW include chronic hypertension in the mother, glucose metabolism disorders, chronic cardiorespiratory disease (any complication that limits oxygen to fetus), obstetrical history (higher risk with 1st pregnancy), and history of low birth weight. Risks during the current pregnancy include gestational hypertension (development of high blood pressure after week 20 weeks gestation), ► pre-eclampsia (high blood pressure and proteinuria and edema), gestational diabetes, low weight gain during pregnancy, maternal malnutrition, short birth intervals, multiple pregnancies, alterations in the placenta and umbilical cord that could impair oxygen to the fetus, bleeding during pregnancy, extremes of hemoglobin concentrations (less than 9 g/dl or more than 12 g/dl), infections (such as STIs, HIV), and fetal

congenital anomalies (such as trisomy 21). Some environmental and behavioral risk factors are over-work, stress or physical/sexual abuse, smoking, moderate to heavy alcohol consumption, caffeine consumption, illicit drug use, exposure to toxic substances, and ionizing radiation.

Ways to prevent LBW include improved access to health services and adequate prenatal care to improve detection of LBW and identify causes of the fetal growth restriction, counseling mothers on risks associated with smoking, alcohol and drug use, as well as use of family planning to increase birth spacing over 2 years, and educating mothers about adequate nutrition during pregnancy.

Perinatal Mortality

Perinatal mortality is the sum of fetal and neonatal mortality. Fetal mortality is defined as still births or fetal deaths after 20 weeks gestation. ► Early neonatal mortality is defined as mortality within the first 7 days of life, whereas ► late neonatal mortality is a death between 7 and 29 days of life. More than 70% of deaths occur in the 1st week of life and the highest risk of mortality is in the first day of life. There are an estimated 8 million perinatal deaths globally per year, with 4 million fetal and an equal number neonatal deaths. Globally, the main causes of neonatal deaths are preterm births (28%), severe infections (26%), asphyxia (23%), tetanus (7%), congenital abnormalities (7%), and diarrhea (3%) (Lawn et al. 2005).

Maternal health and care, are important determinants of neonatal health, with obstetric outcomes during the intrapartum period which include complications during labor, having the most significant impact on neonatal survival. Complications of pregnancy and childbirth are the leading cause of death and disability among women of reproductive age in less developed nations. Over 90% of maternal mortality is in developing countries and the main causes of mortality are bleeding, chronic anemia, hypertensive disorders, infections, obstructed labor, and unsafe abortions. The most common causes of perinatal deaths are early childbearing, poor maternal health, and lack of appropriate and quality health services.

Interventions to reduce the burden of maternal and perinatal mortality need to focus on maternal education, access to health services (with a focus on prenatal and labor and delivery services), nutrition during and after the pregnancy, as well as opportunities to improve her socio-economic status (Moss et al. 2002).

Cross-References

- ► Early Neonatal Mortality
- ► Extremely Low Birth Weight Infants
- ► Fetal Mortality
- ► Intrauterine Growth Retardation (IUGR)
- ► Late Neonatal Mortality
- ► Low Birth Weight
- ► Perinatal Mortality
- ► Perinatal Period
- ► Pre-eclampsia
- ► Preterm Delivery (PTD)
- ► Prolonged or Preterm Rupture of Membranes (PROM)
- ► Very Low Birth Weight Infants

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Perinatal Mortality

Synonyms

Perinatal death

Definition

Perinatal mortality is the sum of fetal and neonatal mortality.

Perinatal Period

Definition

The perinatal period is the period between 5 months gestation to about 4 weeks after birth.

Periodical Health Examination

Synonyms

Periodic medical examination; Periodical medical examination

Definition

Periodical health examinations are carried out as a type of follow-up health examination at regular intervals. The periodicity of these examinations should depend on the type and the level of the health risk assessed, and the probability of adverse health effects occurring. Periodical health examinations are usually carried out on employees that are at risk of exposure to a known health hazard. They are required by legislation for employees placed in high-risk workplaces. There are two types of periodical health examinations, general health examinations and specific health examinations. The general health examinations are routine comprehensive medical evaluations aimed at the ascertaining the health status of employees. The specific periodical health examinations are aimed at detecting the effects of any specific exposure to a known health hazard, or to detecting functional impairments which may affect ability to meet work demands.

Between different countries there are considerable differences in the organization and contents of this kind of workers' health examination.

Periodontal Diseases

Synonyms

Periodontal inflammation

Definition

Periodontal diseases cover a group of inflammatory diseases that arise in the gum sulcus, the crevice between the gum and the tooth, as a response to dental plaque. Even in healthy mouths, the gum sulcus is teeming with bacteria, but they tend to be harmless varieties. If dental plaque remains in the sulcus, the population of the microorganisms changes. These bacteria and their waste products attack the crevicular epithelial cells. In order to eliminate the detrimental bacteria and their toxins the body activates his immune response to infection. This reaction passes through different stages. Due to these reactions periodontal diseases are generally divided into two groups: ► gingivitis and ► periodontitis.

Periodontal Inflammation

► Periodontal Diseases

Periodontal Ligament

Definition

Teeth are not embedded in bone directly but suspended in the socket on elastic fibers which attach the tooth by bridging the space between the ► root cement and the surrounding alveolar bone. This specialized connective tissue is called periodontal ligament.

Periodontal Pocket

Definition

In healthy conditions, there is a crevice between the gum and the tooth (gum sulcus) of about 2 mm in size. In the case of periodontitis, the alveolar bone housing the ► roots of a tooth is being resorbed and the periodontal ligament is destroyed. This loss of attachment clinically manifests as recession of the gum and deepening of the gum sulcus into the periodontal ligament to the original level of the resorbed alveolar crest, causing a periodontal pocket.

Periodontal Pocketing

► Periodontal Pocket

Periodontitis

Definition

Periodontitis is a disease involving inflammation and infection of the ligaments and bones that support the tooth. In most cases, the course of the disease is chronic. Periodontitis is the primary cause of tooth loss in adults.

Periodontium

Definition

The tissues that surround and support the tooth, including the gum, the root cement, the periodontal ligament, and the supporting ► alveolar bone.

Peripheral Nervous System

Definition

The peripheral nervous system (PNS) is the part of the nervous system that is outside the brain and spinal cord. The nerves in the PNS connect the ► central nervous system (CNS) to the sensory organs, other organs of the body, muscles, blood vessels, and glands. In contrast to the CNS, the PNS is not protected by bone. The PNS comprises the 12 cranial nerves, the spinal nerves and roots, and the automatic nerves for the automatic body functions of the body (e. g. heart muscle).

Permanent Carriers of Pathogens

► Permanent Shedders

Permanent Dentition

► Permanent Teeth

Permanent Shedders

Synonyms

Permanent carriers of pathogens; Chronic carriers of pathogens

Definition

In infections with fecal-orally transmitted pathogens, the germs are shed through the stool of the infected individual. In a small percentage of people the shedding of germs persists over a longer period of time, sometimes over months or even years. These people are called permanent shedders or chronic carriers. In general, they are asymptomatic, but they are a source of infection for other individuals. In industrial nations permanent shedders are supervised and controlled by responsible authorities and institutions. Chronic carriers have to be informed about the required hygienic rules. There may be restrictions concerning different professions: permanent shedders are not allowed to work with open food, in different sectors of the health service or in public institutions, like homes or children's nurseries.

Cross-References

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Permanent Teeth

Synonyms

Permanent dentition

Definition

The permanent teeth replace the baby tooth (milk tooth). Usually adults have 32 permanent teeth: 8 incisor teeth, 4 canine teeth 8 ► premolar, and 12 ► molars.

Persistent Anxiety Depression

► Dysthymia

Persistent Somatoform Pain Disorder

Definition

Persons with persistent somatoform pain disorders suffer from a persistent, severe, and distressing pain, which cannot be explained fully by a physiological process

or a physical disorder, and which occurs in association with emotional conflict or psychosocial problems that are sufficient to allow the conclusion that they are the main causative influences. The result is usually a marked increase in support and attention, either personal or medical.

Personal Care Home

► Assisted Living Facilities

Personal Factors

Synonyms

Individual factors

Definition

The particular background of an individual's life and living.

Personal Health Factors

► Individual Health Factors

Personal Hearing Protection

Definition

A personal hearing protector is a device, or pair of devices, designed to be worn over, or inserted into, the ears of a person to protect hearing. It should be used if the ► noise level at a workplace exceeds 85 dB(A). There are three types of hearing protectors: earplugs, earmuffs, and helmets. Earplugs are inserted to block the ear canal. They may be premolded (preformed) or moldable (foam earplugs). Earplugs are sold as disposable products or reusable plugs. Earmuffs consist of sound-attenuating material as soft ear cushions that fit around the ear, and hard outer cups. They are held together by a headband. Helmets are worn in the noisiest conditions (by pilots and astronauts, and for weapons testing) and also provide mechanical protection for the head. In order to get full benefit, hearing protectors must be worn all the time during noisy work.

Personal Identity

► Identity

Person-to-Person Transmission Outbreak

Synonyms

Propagated outbreak

Definition

This type of outbreak does not have a common source and arises from the introduction of an infection into a susceptible population with subsequent transmission from person to person and a progressive increase in incidence.

Persons Providing Medical Treatment and Care

► Health Care Professionals

Perspective

Definition

The perspective of a health economic analysis defines the point of view of the analysis. The perspective affects the costing process but also the outcome measurement. The most common and most important perspectives are the ► societal perspective and the ► payer's perspective. Further perspectives are the health care system perspective, provider's perspective (e. g. a hospital) and patient's perspective.

Perspective Taking

► Role Taking

Pertussis

► Whooping Cough

Pertussis Vaccination

Synonyms

Pertussis immunization; Whooping cough vaccination; Whooping cough immunization

Definition

A ► vaccine against pertussis has been available since 1954. In 1960, its combination with the vaccines against diphtheria and tetanus (DPT) was introduced. Up until the 1990s, whole germ vaccines were common. These were then replaced by better tolerated vaccines, which only contain certain pathogen antigens, acellular vaccines. Pertussis immunization is generally implemented as part of the 6-fold vaccination, starting from the third month of age, with 3 inoculations at intervals of at least 4 weeks, followed by a further vaccination after 4–12 months. Only after the third injection, and not before the age of 7 months, a relatively good protective effect is achieved. The protective rate is 80–95%. Due to its decreasing effectiveness, a fifth vaccination at the age of 9–17 years is recommended. Contraindications for the pertussis vaccine are, apart from acute illness with fever and a known severe allergic reaction to components of the vaccine, the appearance of a central nervous system's disease of unknown origin within 7 days of the vaccination.

Pharmaceutical Industry

► Health Care Profession

Pharmaceutical Products

► Drugs

Pharmacodynamics

Definition

Pharmacodynamics describes what a pharmacological drug does to the body.

Pharmacoeconomics

Definition

Under the scientific discipline pharmacoeconomics, assessment of the value of pharmaceutical products and health care programs involving pharmaceuticals is carried out. Clinical, economic, and ethical issues are addressed. The most important methodological approach of pharmacoeconomic analysis is ► health economic evaluation. The field of pharmacoeconomics is interdisciplinary and covers health technology assessment, health economics, outcomes research, risk analysis, clinical research, epidemiology, decision sciences, and others.

Pharmacoepidemiology

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Definition

Pharmacoepidemiology can be defined as the study of the utilization and effects of drugs in large numbers of people, such as a country's population. "To accomplish this study, Pharmacoepidemiology borrows from both Pharmacology and Epidemiology. Thus, Pharmacoepidemiology can be called a bridge science spanning both Pharmacology and Epidemiology" (Strom 2000). In general, pharmacoepidemiology (often called drug epidemiology) can be considered as the application of epidemiological methods to pharmacological issues.

Basic Characteristics

Although pharmacoepidemiology is one of the youngest epidemiological disciplines, only 20–30 years old, it has shown progressive improvements in methodology and the development of new approaches to the investigation of drug safety and effectiveness.

"Doing the studies needed to provide an estimate of the probability of beneficial effects in populations, or the probability of adverse effects in populations and other parameters relating to drug use, epidemiological methodology is essential" (Strom 2000). Some-

times, pharmacoepidemiology focuses primarily on techniques for conducting ► drug safety studies. These techniques can also be applied to pharmacoeconomic and outcome research studies.

Methodological Aspects of Pharmacoepidemiological Studies

Similar to other areas of epidemiology, in pharmacoepidemiology, both clear case and exposure definitions are critical for the success of a study. However, in pharmacoepidemiology, providing these clear definitions is more complex than in classic epidemiology, due to the following reasons: a) drug exposures are constantly varying and are thus difficult to define precisely; b) outcomes are often associated in some way to the exposure, creating biases and confounding the results and requiring essential adjustments to the study design to be fully understood (Garbe and Suissa 2005).

It is well known that new drugs must be investigated through preclinical animal studies followed by three phases (phase I, II, and III) of clinical trials in humans. But, because of flaws in design, crucial answers to questions of drug safety cannot be provided even by the most valid and complex phase III studies. Keeping in mind these facts, different types of epidemiological studies should be involved in the ► postmarketing investigation of drugs. The case-control design (► case–control studies) is the method of choice for the investigation of rare drug risks, while ► cohort studies are used to assess the risk of more frequent events or if several outcomes need to be followed simultaneously.

Confounding by Indication

Special attention in pharmacoepidemiological studies has been paid to the control of ► confounding factors, especially ► confounding by indication. This occurs when the drug investigated is selectively used or not used by those who developed the outcome of interest. Although confounding by indication is often difficult to control, there are several methods for avoiding this type of bias. One option is to restrict the study to a group of patients homogeneous with respect to disease severity. Another option is to compare two medications prescribed for the same indications, with evaluation of their relative and absolute effectiveness (Rothman and Greenland 1998).

Potential confounding variables are: changes in drug use from one part of the world to another, variations between men and women, differences in age, variations in length of time of treatment. Therefore, age, sex, geography and calendar time, must be controlled in drug-epidemiological studies.

Data Sources

Several sources of data can be used to identify both harmful and beneficial effects of drugs as well as provide information for pharmacoepidemiological studies. They are spontaneous reporting systems, multipurpose cohorts, administrative databases, large health databases (record linkage studies), physician-based databases, etc. All of these sources of data have some advantages as well as certain limitations. Intensive development of powerful computer technologies (e. g. neural networks) facilitates using large databases in pharmacoepidemiological research.

Spontaneous reporting systems were developed in the early 1960s in many Western countries especially after the "thalidomide disaster", with the aim of providing a systematic collection of information about adverse drug reactions. These systems are based on the spontaneous reporting of suspected adverse drug reactions by physicians, dentists, pharmacists, and other health professionals. Trained reviewers then analyze every report to estimated the likelihood that the drug intake is causally linked to the adverse reactions (Wiholm et al. 1994).

Multipurpose cohorts are usually used to investigate two or more different research hypotheses at the same time. Today, these cohorts (for example, US Nurses' Health Studies I and II) have been extensively used to investigate a specific pharmacoepidemiological research question, such as, for example, the association between nonsteroidal anti-inflammatory drugs and Parkinson's disease (Chen et al. 2003).

Administrative databases (for example, Health Databases in Saskatchewan in Canada) "consist of patient-level information from two or more separate files which can be linked via a unique patient identifier contained in each file" (Garbe and Suissa 2005).

Drug Utilization Studies

► Drug utilization studies are also an important tool in pharmacoepidemiology. They are conducted to improve

rational drug use and to provide data for ► cost-benefit analyses. Both qualitative and quantitative approaches are used in these studies. In qualitative studies, the appropriateness of drug prescribing is estimated, while quantitative ones are undertaken for various purposes, such as, providing information about the quantities of drugs consumed in a specific period of time and/or in a specific geographical area. Additionally, these studies can be used to determine trends in drug use according to the demographic characteristics of populations, etc. (Garbe and Suissa 2005).

Cross-References

► Case Control Studies
► Cohort Studies
► Confounding by Indication
► Confounding and Interaction
► Cost-Benefit Analysis
► Drug Safety Studies
► Drug Utilization Studies
► Postmarketing Investigation of Drugs

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Pharmacogenetics

Definition

Pharmacogenetics is the study of the inter-individual differences in responses to drug treatment resulting from ► polymorphisms or ► mutations in DNA (► deoxyribonucleic acid) sequence. In these studies the differences among individuals with regard to the clinical responses to individual drugs are determined. ► Pharmacogenomics expands upon this definition to include the study of the genome and its products, both RNA and proteins.

Pharmacogenomics

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Definition

Pharmacogenetics is the study of the inter-individual differences in responses to drug treatment resulting from polymorphisms or mutations in DNA sequence. In these studies the differences among individuals with regard to the clinical responses to individual drugs are determined. Pharmacogenomics expands upon this definition to include the study of the genome and its products, both RNA and proteins.

Basic Characteristics

With the recent advances in the human genome sequencing project, one of the initial applications is the emerging field of pharmacogenomics. Pharmacogenomics encompasses both the prediction of disease susceptibility and drug response. Given the fact that the underlying mission of public health is to prevent disease and improve health, tools which can be used as biomarkers of disease susceptibility and outcome are critical. Currently, the majority of pharmacogenomics based assays are focused on identifying individualized drug therapy strategies for treatment of disease, but as current translational research efforts continue, pharmacogenomic endpoints have the potential to provide a vast array of tailored intervention targets to prevent disease.

The human genome is made up of approximately three billion nucleotides that code for all the macromolecules necessary for human life. The most common human genetic variations are ► single nucleotide polymorphisms (SNPs), which are defined as DNA sequence variations that occur when a single nucleotide (A, T, C or G) in the genome sequence is changed (Cooper et al. 1985). It is estimated that only one in every thousand bases is different, or that the DNA code is

approximately 99% identical between human subjects. The SNPs may occur in coding and noncoding regions, and may or may not result in altered gene expression or gene products. Even SNPs that do not themselves change protein expression and cause disease may be close on the chromosome, i. e. in ► linkage disequilibrium (LD) to deleterious mutations. Recently, it has been recognized that the genome is organized into largely invariant DNA fragments at the population level characterized by rare recombination events intermingled with "hotspots" of recombination and designated as "haplotype blocks". These haplotype blocks can be determined by creating a dense map of SNPs across the gene of interest and analyzing population level LD. A few SNPs can then be selected which designate ("tag") each haplotype block and these htSNPs can be screened to comprehensively assess disease associations across the entire gene. Applying this approach to multiple genes in pathways critical to disease development and assessing combinations of genes is likely to increase the power to discover genetic associations with specific disease risk. Haplotype-based association studies are powerful procedures for detecting genetic influences on complex diseases (Daly et al. 2001; Gabriel et al. 2002; Stram 2004). Such markers help unearth the mutations and accelerate efforts to find therapeutic drugs.

Applications

Using cancer as an example of the disease model, pharmacogenomic based tests can be used in three important ways as markers to predict drug response and efficacy, to screen for markers of disease susceptibility and as markers of disease prognosis and outcome. The initial emphasis in identifying cancer susceptibility biomarkers focused on association studies evaluating both phase I and II metabolic enzymes, particularly among tobacco smokers. More recently, the panel of candidate markers has extended to screening for genetic polymorphisms in DNA repair enzyme pathways, immune response genes and a variety of growth factor signal transduction pathways. Although multiple risk factors have been characterized in several large scale genetic epidemiological studies, further studies are ongoing and required prior to translation to routine clinical screening tests. The discovery of common low-penetrant genes that are associated with cancer risk, either directly or through interaction with environmental exposures, particularly smoking, would be of great importance, and would open new avenues of prevention. Studying the relationship between a gene and disease has evolved into haplotype-based approaches to provide greater information about genes and pathways and to evaluate how variation relates to cancer risk (Wu et al. 2004; Spitz et al. 2005; Buch et al. 2005).

Not only are these pathways relevant in determining risk of cancer or other diseases, they may also represent markers of disease prognosis and outcome. A growing number of studies are evaluating these potential associations. For example, it is well known that the nucleotide excision repair (NER) pathway is important in the repair of chemical carcinogen, induced genotoxic damage including that induced by tobacco carcinogens. There are several ongoing studies evaluating the association of NER gene polymorphisms and haplotypes with tumor recurrence and overall survival and initial data has shown poorer survival among individuals carrying NER gene polymorphisms associated with reduced DNA repair capacity (Wu et al. 2004; Spitz et al. 2005; Buch et al. 2005).

In addition to these studies of pharmacogenomic endpoint and disease risk and prognosis, the possibility of using these markers in the search for improved chemotherapeutic efficacy is growing. Many cancer chemotherapeutic agents, including cis-platinum, cause interstrand breaks and consequently cytotoxicity. Several recent studies have shown that reduced NER DNA repair capacity may be associated with enhanced response and survival with platinum-based chemotherapy. Despite the frequency of resistance, the use of platinum based therapies will remain the current practice for chemotherapeutic regimens for some time to come, until novel agents that target specific therapeutic targets are available. In the meantime, however, it would be highly beneficial to develop strategies to identify subjects most and least likely to benefit from platinum based agents to reduce the frequency of adverse side effects and improve outcomes (Wu et al. 2004; Rosell et al. 2003; Gurubhagavatula et al. 2004).

Several of the first US Food and Drug Administration (FDA) approved pharmacogenomic tests are in fact tests that are relevant for cancer treatment. In August 2005, the FDA approved a test marketed by Third Wave, the Invader *UGT1A1* Molecular Assay, to screen for polymorphisms in the UDP-glucuronosyltransferase enzyme, which is involved in the metabolism of a num-

ber of drugs, including irinotecan, a drug used in colorectal cancer treatment. *UGT1A1* genetic variations can modulate a patient's ability to metabolize irinotecan, which may lead to increased blood levels of the drug and a higher risk of adverse side effects. For patients with specific *UGT1A1* genetic polymorphisms, a dose of irinotecan that is safe for another person might be too high for these patients, raising the risk of certain side effects. The Invader assay joins a growing list of genetic tests used by clinicians to personalize treatment decisions, including the Roche AmpliChip, used to individualize dosage of antidepressants, antipsychotics, beta-blockers, and some chemotherapy drugs (Food and Drug Administration 2005).

The FDA has also approved the product label for 6-mercaptopurine (Purinenthol and Imuran) to include information about the pharmacogenetics of thiopurine methyltransferase (*TPMT*)(Food and Drug Administration 2005). Patients with low or absent TPMT activity are at an increased risk of developing severe, life-threatening myelotoxicity if receiving conventional doses of 6-MP (Huang et al. 2006). As noted above, there is a growing awareness that it is not only important to consider pharmacogenomic tests, such as *TPMT*, in the context of optimal treatment in the short-term and avoidance of adverse events, but also to consider the overall risk/benefit of such testing in the context of overall drug efficacy and disease outcome. Relling et al. have studied this question for TPMT and found that individualization of 6-mercaptopurine dose based on *TPMT* genotype could be used to avoid toxicity without compromising efficacy (Rocha et al. 2005). This may not be true for all pharmacogenomic tests however.

As additional pharmacogenomic endpoints are characterized and validated as markers of disease susceptibility and outcome and particularly as markers of drug response, it is important to also consider the implications of such genetic testing in the context of public health. While many of the recent technological advances make it more economical and simple to perform these tests for a given individual, there are many potential barriers to the implementation of these tests. These barriers include possible privacy or discrimination issues not only with reference to insurance and employment questions, but also in terms of general societal acceptance. It is also important to consider who will pay the associated test costs and the availability of the tests for ethnically and geographically diverse populations. A third significant barrier is possible negative psychosocial consequences. Currently there are several commercial laboratories in the US which have made several genetic tests available to the general public. However, the results of these tests are provided directly to the patient in the absence of clinical and genetic counseling. This may lead to significant confusion and misuse of the genetic results. For example, one test currently available is for *CYP2D6*, an enzyme involved in the metabolism of up to 20% of commonly prescribed medications including antidepressant/psychotics, antiarrhythmics, and beta-blockers. However, some of these drugs are active as prodrugs, for others, the metabolites are the active agent, so the fact that an individual is a *CYP2D6* poor metabolizer means that they may be at increased risk of adverse events for some *CYP2D6* drugs, but not all *CYP2D6* drugs. Further, over 70 allelic variants in the human *CYP2D6* gene have been identified, many of which are associated with either decreased or enhanced metabolic activity. Unless the genetic test screens for all of these variants, even though some variants may be very rare, there is the potential for misclassification. For the average patient, these implications may not be understood when the results are provided without professional counseling. Both the Human Genome and HapMap projects have identified these and other ethical, legal and social issues, but clearly society as a whole will need to consider these issues as the science of genetics and its applications continues to rapidly move forward. Increased education of both the clinical professionals and the lay public are required before the promise of pharmacogenomics as a tool for improved public health and individualized medicine can be achieved.

Cross-References

- ▶ Linkage Disequilibrium
- ▶ Single Nucleotide Polymorphism (SNP)

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Pharmacokinetics

Definition

Pharmacokinetics describes what the body does to a pharmacological drug.

Phenotype

Definition

Phenotype describes the (clinical) consequences of a certain ► genotype (► mutation) or, in general, the observable characteristics of an individual as a whole. Depending on the pathophysiological level, the phenotype can be described as biochemical changes (e. g. altered protein level) or on a morphological level (appearance).

Philosophy

Synonyms

Love of Wisdom

Definition

In philosophy, there is an attempt to analyze ones own thoughts on a rational self-examination basis. A moral contemplation with a tendency to determine the reason behind the world's existence and also that of mankind. The science of philosophy was defined as "something you can not talk about" without first becoming involved in its work.

Phobic Anxiety Disorder of Childhood

Definition

Fears in childhood that show a marked developmental phase specificity and arise (to some extent) in a majority of children, but that are abnormal in degree.

Phoniatrics

► Speech Therapy

Phtisis

► Morbus Koch (Koch's Disease)
► Tuberculosis and Other Mycobacterioses

Physical Activity

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Synonyms

Fitness; Sport; Exercise

Definitions

Physical activity covers all muscular activities that go hand in hand with a verifiable increase in energy expenditure. It includes the wide-ranging possibilities of enhancing energy consumption. In literature, the following terms are generally used to describe it: ► *exercise, non-exercise-activity thermogenesis (NEATs), sports and exercise.* The boundaries are seamless, the definitions are not clear.

Physical activity is a broad term that encompasses all forms of muscle movements. These movements can range from sports and exercise to lifestyle activities. It is frequently referred to as movement involving a minimal increase in energy expenditure. In another definition, however, physical activity means repetitive, structured movement aimed at enhancing a person's fitness.

Sports and exercise can be distinguished as subcategories of leisure-time physical activity in which planned, structured and repetitive bodily movements are performed to improve or maintain one or more components of ► physical fitness (Hardman and Stensel 2003). Exercise may be classified in one of two categories, anaerobic and aerobic, depending on where energy is derived from depending on intensity and duration. There is a distinct difference between the two, and specific training techniques are needed to enhance both. As such, *physical fitness* can be construed as a subcategory of a person's global fitness which is determined by exertion and effort processes involved in certain sporting activities. Fitness is also determined by mental, emotional and psychosocial factors.

► Non-exercise activity thermogenesis (NEAT) describes the energy consumption of all physical activities other than volitional sporting-like exercise. It includes all the activities that render us vibrant as working, posture, etc.

Basic Characteristics

Recommendations

Regular moderate training will provide optimal health benefits. In addition, it has become apparent that there is a positive dose-response relationship between frequency and intensity, in other words the more exercises, the more benefit. An increase in physical fitness reduces the risk of cardiovascular disease and mortality. To this end, more than 700 kcal (► Kcal – kilocalories) per day should be burnt off through exercise. The guideline for adults is to participate in physical activity for 30 minutes each day, children should spend 60 minutes each day engaging in physical activity, either en bloc or in "single 10-minute doses". The focus here is on endurance training. It can be controlled through the ► heart rate, among other things, and should be carried out at around 50 to 70% of the maximum heart rate or 40 to 60% of maximum oxygen intake capacity. Perception of exertion can also be used to control intensity with the help of the BORG scale (► BORG scale / RPE scores). In this case, training should be carried out in such a way that the intensity is perceived as low to moderately hard (Borg scale 11–13). In addition, moderate strength training should be carried out at least two days per week. The resistance level should be set so that the respective exercise can be repeated 10 to 12 times.

Epidemiology

In Germany, around one third of men (37.3%) and women (38.4%) do not engage in any kind of physical activity, 20.9% of men and 28.4% of women engage in some kind of sporting activity for more than 2 hours per week. As such, there is an inverse correlation between a person's age and their socio-economic status. Similar data is also found in Europe where around 40% of people are physically inactive (HEPA), with the definition of physical inactivity apply to those who spend less than 3.5 hours per week engaging in physical activity. Eurobarometer came up with similar results. The World Health Organization assumes that approximately 60% of the global population do not participate in the recommended 30 minutes of physical activity each day.

Benefits

The benefits of physical activity have meanwhile been proven through a large number of studies. Some of the health benefits include improved ► carbohydrate metabolism and ► lipometabolism, reduction in weight and blood pressure, positive influence on the blood coagulation. The key benefit in terms of prevention is that a person who exercises lowers the risk of developing cardiovascular disease by approximately 30%, and lowers the risk of suffering a stroke by 40%. They can also lower their risk of cardiovascular disease (e. g. arterial hypertension, diabetes mellitus, obesity, etc.). Persons who engage in physical activity are 30 to 40% less likely to develop cancer, particularly colon and

breast cancer and are 20% less likely to suffer fractures caused by osteoporosis. Regular physical activity also has a positive impact in relation to the aforementioned diseases in terms of secondary and tertiary prevention.

Methods of Analysis and Parameters

It is difficult to record the methods used to measure physical activity which is always prone to errors. As a rule, people are asked about their participation in physical activity in writing and verbally (type of sport, frequency and intensity of physical activity). However, this method is always dependent on the interviewer's subjective rating; observations and video monitoring are more objective, but they depend to an even greater extent on the situation being observed. This explains why measuring methods that record the fitness parameters are more objective, such as those used, for instance, within the framework of ergonomics (bike, treadmill, relating to specific types of sport). They included the maximum oxygen intake (peakVO2) once the maximum level of exertion has been reached (VO2max is the maximum value that can be reached, even if the level of exertion is increased once a plateau is reached) as well as the maximum wattage. These values are always measured against a person's weight. Additional rating variables are the maximum running speed (usually in m/sec) as well as the so-called ► metabolic equivalents (METS). Metabolic equivalents are the factor by which the oxygen intake at rest is increased by certain physical activity. METS can also be converted into kilocalories (factor 1.2). Exertion of less than 3 METS (or 4 kilocalories = 15 kilojoules consumption per minute) is considered to be low, between 3 and 6 METS (4 and 7 kilocalories or 15 to 29 kilojoules) as moderate physical activity and over 6 METS (7 kilocalories; 29 kilojoules) as ► vigorous physical activity. ► pedometers and ► accelometers are frequently used to determine calorie consumption and/or METS. The so-called BORG scale represents one possibility of quantifying a persons' rate of perceived exertion. The so-called rate of perceived exertion or RPE scores begins with very, very light = 7 and ends at 19 = very, very hard. The intensity perceived by the subject at a certain level of exertion is indicated as an average as the heart rate divided by 10. Anyone who perceives the activity to be "easy" or 11 has an average heart rate of 110.

An average exertion of between 3 and 6 METS corresponds more or less to an ergonomic exertion of 75 to 100 watts. Intensive physical activity refers to a rate of perceived exertion of 15 or more, a metabolic equivalent of more than 6 MET or a thermogenesis of more than 29 KJ/min and 7 kcal/min. If the person engages in this level of physical activity on a regular basis, this is equivalent to five days of moderate or mild activity or several days of intensive exertion.

Cross-References

► Epidemiology
► Public Health
► WHO

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Physical Development

► Physical Maturation

Physical, Environmental, and Social Aspects of Disasters

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Definition

Specification of consequences of disasters in the physical, environmental, and social domains.

Basic Characteristics

The consequences of a disaster (► hazards, natural; ► hazards, technological) fall into categories of physical, environmental, and socio-economic damage.

After a major disaster, such as an earthquake, many buildings are damaged (e. g. totally ruined or deprived of windows, roofs, and walls) or rendered unsafe, hence uninhabitable. Settlements and towns may turn into a sea of rubble, large dumping sites with disordered remnants of infrastructure and human belongings, and human bodies (or parts thereof). Utilities are typically discontinued. There may be no electricity, gas, telephone, or safe water, and food supplies can be spoiled. There is often severe damage to infrastructure, including public buildings, health care buildings, clinics and hospitals, schools, and post offices, etc. Transport infrastructure may also be damaged, disabled, or destroyed: roads, railways (and railway stations), bridges, airports, and vehicles – cars, trains, and planes. Levees and irrigation channels may be damaged, affecting large croplands, and agriculture and horticulture farms themselves. There can be vast damage to industrial installations, commercial buildings, and to personal property.

The environment can be contaminated by floating chemicals, e. g. fuel oil, animal carcasses, and other toxic debris. Water pollution may accompany both floods (flush of agricultural chemicals to rivers and lakes, causing fish kill) and droughts (little water available for dilution under low water stage and discharge situation).

Socio-economic impacts can be represented by several indices. The principal two classes of indices are the number of fatalities and the aggregate economic damage.

Consequences of disasters can be divided into direct ones (caused directly by disasters) and indirect ones, which may occur over a longer period of time (e. g. health effects emerging years after a nuclear accident). Detection of changes in the time series of health-related indices and attribution of the changes (e. g. to a disastrous event) are very difficult. Even identification of "disaster-related deaths" (additional or excess deaths) in a region devastated by a disaster causes considerable methodological problems.

Disasters kill and wound people and ruin their livelihoods and life perspectives. There is a lot of disaster-related suffering (e. g. due to loss of loved ones, disaster-related starvation, being wounded), morbidity (e. g. infectious diseases), hardship, stress, and feelings of helplessness and humiliation. The accustomed sense of security disappears. Some people's only remaining possessions are the clothes on their backs. Survivors leave their communities for the relative safety of displacement camps.

Since disasters ruin the domiciles of many of those evacuated, the problem of homelessness arises. Disasters paralyze social systems. Many businesses are damaged to different extents, and all are closed in the immediate aftermath. There is a temporary loss of many jobs, some of which may disappear permanently. Yet, reconstruction creates an emerging opportunity for employment, economic growth, and better disaster preparedness.

In the disaster aftermath (► Disaster aftermath), a new image of the community emerges from the disaster. Municipalities that functioned very well in normal conditions may fail completely after disasters strike. Urban areas in the developed world may temporarily lose their modern infrastructure and may be downgraded below the level of rural Third World communities.

Typical conveniences such as immediate repair of a damaged power line, mail delivery, or a functioning public phone or automatic teller machine become difficult to access. House repair services cannot meet the demand; hence, some residents may endure life without a roof or a cooked meal for months.

In some cases, disasters may lead to mobilization of dangerous chemicals from storage or remobilization of chemicals already present in the environment, e. g. pesticides. Hazards may be greater when industrial or agricultural land adjoining residential land is affected. Increases in population density and accelerating industrial development in areas subject to natural disasters increase the probability of future disasters and the potential for mass human exposure to hazardous materials released during disasters.

Cross-References

► Disaster Aftermath
► Hazards, Natural
► Hazards, Technological

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Physical Fitness

Definition

Sub-category of a person's global fitness which is determined by exertion and effort processes involved in certain sporting activities. Fitness is also determined by mental, emotional and psychosocial factors.

Physical Maturation

Synonyms

Physical development

Definition

Physiological changes, such as increase in height and weight, pubertal and sexual maturation, changes in body composition (the quantity and distribution of fat and muscle), and changes in circulatory and respiratory systems (which lead to increased strength and tolerance for exercise), occur between 9 and 16 years of age. The growth spurt occurs about 2 years earlier in girls compared with boys.

Physical or Mental Impairment

► Disability

Physical and Social/Cultural Environments

► Setting

Physical Therapy

Definition

Physical therapy is a branch of rehabilitative care that uses specially designed exercises and equipment to help patients develop, restore, and preserve their physical function. Physical therapy is characterized by the examination, treatment, and instruction of the patient

to detect, evaluate, prevent, correct, mitigate, and minimize physical disability, movement dysfunction, bodily dysfunction, and pain from injury, disease, and other physical or mental conditions. Physical therapists usually work with patients from all ages, including infants born with musculoskeletal birth defects, adults suffering from the after-effects of injury, and elderly post-stroke patients.

Physiological Functions

Definition

Body functions and systems (including psychological functions).

Cross-References

► Body Function

Phytoremediation

Definition

Phytoremediation describes the treatment of polluted soils or other environmental problems through the use of plants able to contain, degrade, or eliminate metals, pesticides, solvents, explosives, and crude oil and its derivatives. Phytoremediation comprises efficient, inexpensive, and non-environmentally disruptive processes like phytoextraction—uptake and concentration of substances into the plant biomass; phytostabilization—reduction of the mobility of substances in the soil; phytotransformation—(phytostabilization, phytodegradation) chemical modification of substances; phytostimulation—enhancement of soil microbial activity for degradation (rhizosphere degradation); and phytovolatilization—release of less polluting substances into the air. Phytoextraction (or phytoaccumulation) uses plants to remove contaminants from soils or sediments and turn them into harvestable plant biomass. The plants also absorb contaminants and store them in the root biomass, so the growth/harvest cycle must usually be repeated through several crops to achieve a significant cleanup. Examples of phytoextraction from soils are cleanup of arsenic and uranium using sunflowers, cadmium and zinc using Alpine Pennycress, and lead using Indian Mustard, Ragweed or Poplar trees. Evidence shows that the metals in hyper-accumulating plants give them protection from various bacteria, fungi, and/or insects. In the case of organic pollutants, such as pesticides, explosives, solvents, industrial chemicals, and other xenobiotic substances, certain plants, such as Cannas, render these substances less toxic. The limitations of phytoremediation include applicability only on the surface and depth occupied by the roots, the long-term commitment required due to slow growth, and possible bioaccumulation of contaminants, which then pass into the food chain.

Phytotherapy

► Herbalism

Pian

► YAWS

Pica in Adults

► Eating Disorders
► Psychogenic Loss of Appetite

Piggy-Back Analysis

Definition

A piggy-back trial is an economic analysis, in most cases an economic evaluation study, which is embedded in a clinical trial. Additional economic cost and outcome data are collected and analyzed, but the trial itself is designed according to clinical issues.

Pigmy Peoples (Central and Western Africa)

► Indigenous Health – Africa

Ping Pong Disease

► Ping-Pong Infection
► Trichomoniasis

Ping-Pong Effect

Synonyms

Re-infection

Definition

The phenomenon in which sexual partners re-infect each other with the same sexually transmitted disease (STD). First, an individual who has the STD infects his or her partner. The partner may then re-infect the individual, after the individual has been cured from that particular STD. Individuals and their partners may or may not be aware that they have an STD, since symptoms are not always present. To prevent the ping-pong effect, both partners should be treated for STDs simultaneously.

Ping-Pong Infection

Synonyms

Ping Pong effect; Reinfection in sexually transmitted diseases; Reinfection in social diseases; Reinfection in veneral diseases

Definition

In all cases of sexually transmitted diseases, which can be treated medicinally, it is recommended that all sexual partners be treated. This recommendation is given due to the fact that the partners, most probably, will be infected as well. As sexually transmitted diseases do not give immunity, a new infection is possible at any time. Without consequent therapy, a recurrent infection from one partner to the other can easily take place.

Pinworm Infection

► Enterobiasis

Placebo

Definition

A placebo is a dose that looks like the medicine being tested but, in fact, contains no medical ingredients. It is given in ► clinical trials to a control group in order to have some sort of comparison for the medicine being tested.

Placebo Controlled

Definition

Placebo controlled describes a method of research in which an inactive substance (a placebo) is given to one group of participants, while the active treatment (usually a drug or vaccine) that is being tested is given to another group. A placebo is a medicine without any inherent pertinent pharmacological activity, but which is effective only by virtue of the factor of suggestion attendant upon its administration. The results obtained in the two groups are then compared to see if the investigational treatment is more efficacious than the placebo.

Placebo Effect

Definition

A placebo effect is the psychological effect that a medical treatment can have on patients. The perceived effects of placebo are usually but not always beneficial. They are due to the power of suggestion.

Plague Sepsis

Synonyms

Septic course of infection with Yersinia pestis; Black Death sepsis

Definition

Plague sepsis is caused by the hematogenic spread of *Yersinia pestis*. The onset of the disease is characterized by high fever and shivering fits. Without treatment the course is lethal within 36 hours.

Planned Behavior Theory

Synonyms

Theory of health behaviors

Definition

The theory of planned behavior is an extension of the theory of reasoned action. Both models may be considered as information processing models. It is hypothesized that behavioral decisions are based on careful evaluation of all available information. The theory of planned behavior introduces the concept of compatibility. This is based on the assumption that each attitude and behavior has elements of action, target, context and time. The congruence between attitudes and behavior is assumed to be greatest if both have the same level these elements.

Plant Doctor

► Company Doctor

Plant Physician

► Company Doctor

Plaque

► Dental Plaque

Plasmodia

Synonyms

Germs that cause malaria; Malaria causing parasites

Definition

Plasmodia are single-celled eukaryotes of the class Sporozoea, which cause malaria. They depend on the biosphere of the *Anopheles* mosquito. For their cycle of development they need warm temperatures. Among the more than 120 species of plasmodia, 4 are transmitted to humans and can cause malaria: *Plasmodium ovale* (causing malaria tertiana), *Plasmodium vivax* (malaria tertiana), *Plasmodium malariae* (malaria quartana) and *Plasmodium falciparum* (malaria tropica). Depending on the species, the incubation period varies between 7 and 24 days. While *Plasmodium ovale* is primarily found in West Africa, the other species appear in all regions endemic for malaria. With an incidence of >95%, *Plasmodium vivax* is the predominant species in Central America, parts of South America, and the southeastern countries of Africa. The percentage of *Plasmodium falciparum* varies considerably in different regions; it is the predominant species in Haiti, the Dominican Republic, Africa and Papua New Guinea.

Plasticity

Synonyms

Multilineage potential

Definition

By definition, stem cells can differentiate into various cell lineages. This property is termed plasticity or multilineage potential. For instance ASC derived from the bone marrow are able to differentiate into parenchymal cells of different organs, like hepatocytes.

Plastic Surgery

Definition

Plastic surgery is the branch of surgery that covers the reduction of scarring or disfigurement that may be the result of accidents, birth defects, or treatment for diseases. Many plastic surgeons also offer cosmetic surgery, which is unrelated to medical conditions and has been a growing field in developed countries in recent years.

Pleasant Taste

Synonyms

Enjoyment of food

Definition

The enjoyment of food is a sensual experience associated with eating. Enjoyment is connected with seeing, hearing, tasting, smelling and touching and assumes a certain sensory perception.

Pluripotency

► Multipotency

Pneumococcal Vaccination

Synonyms

Pneumococcal immunization

Definition

In 1977 the first pneumococcal ► vaccine was licensed, containing 14 serotypes. For children aged 2–23 months, the pneumococcal conjugate vaccination (PCV) is recommended, which recognizes seven forms of the capsule (heptavalent). Starting from the third month of age three inoculations are given at intervals of at least four weeks (preferably at 2, 4 and 6 months of age). A fourth dose in the series should be applied at the age of at least 12 months. From two years of age, the pneumococcal polysaccharide vaccination (PPV), which recognizes 23 forms of the capsule, can be used. Its protective efficacy reaches 60–70%. Pneumococcal vaccination is recommended for people facing a high risk of serious pneumococcal disease. Such groups include persons with HIV-infection, chronic organ failure, sickle-cell disease, splenectomized patients, and the elderly population, particularly those living in institutions. Booster vaccination should be given every six years. Contraindications for the pneumococcal immunization are acute illness, including febrile illness, a known allergy to any component of the vaccine or an allergic reaction to a previous dose of pneumococcal vaccine.

Pneumoconioses

Definition

According to the ILO definition, this is the accumulation of dust in the lungs and the tissue reactions to its presence. For the purpose of this definition, 'dust' is an aerosol composed of solid inanimate particles. In American literature pneumoconiosis has been defined as lung disease resulting from the chronic inhalation of inorganic dust. The pneumoconioses make up a class of respiratory diseases attributed solely to occupational exposures. They include the major fibrotic lung diseases such as asbestosis, coal workers' pneumoconiosis, and silicosis as well as rarer interstitial diseases such as siderosis and berylliosis. Some authors include byssinosis in this category, though it differs substantially in its pathology and clinical manifestations.

Pneumonia

Definition

Pneumonia is an inflammation of the lung caused by infection with bacteria, viruses, and other organisms. Pneumonia that is contracted within the hospital is called hospital or nosocomial pneumonia. The most important risk factor for hospital pneumonia appears to be mechanical ventilation and tracheal intubation. Pneumonia is the most common infection in intensive care units. Gram-negative bacteria and staphylococci are the predominant causes of hospital pneumonia.

Podiatrists

Synonyms

Chiropodist

Definition

A podiatrist is a physician specialized in assessment and treatment of diseases of the foot, ankle, and in some cases lower extremities like the knee and leg. The treatment methods might be conservative or via surgery. Potential subspecialties are reconstructive foot and ankle surgery, diabetic foot and wound care, rheumatology, gerontology, and sports medicine.

Poisson Distribution

Poisson distribution is a probability distribution of the number of random events occurring over a fixed period of time or fixed space. The probability function is given by:

$$P(X = x) = \frac{e^{-\lambda}}{x!}\lambda^x,$$

where x is number of random event, e is approximately 2.72, λ is the mean frequency of random events in a fixed period of time or fixed space. The occurrence of an event over any fixed period of time or fixed space is independent on the occurrence of an event over any other period of time or space. The Poisson distribution depends on one parameter, λ. This value is identical to the mean and the variance of Poisson distribution.

Poisson distribution is often used to describe probability models for a number of discrete events which are considered as rare for a given period of time or space. For example, a number of errors in a medical record, a number of phone calls in an emergency unit, or the number of bacterial colonies in a certain area. Poisson distribution can be used to approximate the binomial distribution when the number of observations is great and the probability of the event of interest is small, for example, congenital malformation.

Police Powers

Synonyms

Danger defense powers

Definition

Police powers denote the constitutional powers of states deriving from the people that are designed to avert dangers and to defend the population from harm as well as from violations of law and order. Based on the police powers, the state and its institutions are entitled to take measures to safeguard and promote the public's health and to protect the legal and social order.

Policy

Definition

A policy is a plan of action to guide decisions and actions. The term may apply to government, private sector organizations and groups, and individuals. The policy process includes the identification of different alternatives, such as programs or spending priorities, and choosing among them on the basis of the impact they will have. Policies can be understood as political, management, financial, and administrative mechanisms arranged to reach explicit goals.

Policy Analysis

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Definition

Policy analysis is the systematic evaluation of alternative means of achieving social goals. It is frequently deployed in the public sector but is equally applicable to other kinds of organizations, like the healthcare system. Policy analysis refers to the analysis of existing or prospective policies with the intention of improving social welfare. Policy analysis is methodologically diverse using both qualitative (► qualitative research) and ► quantitative research methods, including ► case studies, ► surveys, ► statistical analysis, and ► model building, among others.

Basic Characteristics

In the context of this definition, health technology assessment (HTA) has been defined as "a form of ► policy research that systematically examines the short- and long-term consequences (in terms of health and resource use) of the application of a health technology, a set of related technologies or an technology related issue" (Henshall et al. 1997). HTA focuses on policies, especially policies related to regulation, quality, and payment for care. The target is to develop assessments useful for health policy makers and policymaking. Different groups in health care systems may require health policies and HTA (Banta, Oortwijn 1999):

- Research and Development
- ► Regulation of pharmaceuticals and equipment
- Regulation of numbers and location of services
- Payment for services
- Quality assurance
- Education and training of providers
- Consumer education
- Implications

These topics are differently weighted in the particular health care systems of different countries. In Germany, for example, HTA plays an important role when deciding on the payment for services, whereas it is de facto irrelevant for decisions on pharmaceuticals prepared

by the ► IQWiG (the German institute for quality and economic viability in the healthcare system). However, in the UK, the opposite is true regarding decisions by the ► NICE (National Institute for Health and Clinical Excellence).

All the assessment reports mentioned intend to allow the transfer of knowledge produced in scientific research to the decision-making process. HTA collects and analyzes evidence from research in a systematic and reproducible way, to make it accessible and usable for decision-making purposes.

Policy Question

At the origin of an assessment, there is a decision to be made. Decision-makers have to pose a policy question and this is then transformed into the correct research questions by the commissioners. Formulating research questions is a crucial part of the assessment; they transpose the original decision-making problem, the policy question, into questions that can be answered by evaluating scientific evidence. Different factors of the health care system concerned with defining the policy question can be involved in the assessment, like politicians, health care providers, hospital managers, etc.

HTA in Decision-Making Processes of Health Care Institutions in Germany

The development of the German HTA system and the corresponding HTA law began in the year 2000. In 2004, the law on the modernization of statutory health insurance established two new institutions, the Federal Joint Committee (G-BA) and the IQWIG. They are the most important institutions for the assessment of health services in the German Health Care System. Beside these political institutions, other associations like the medical review board of the SHI, hospital owners, or private health insurers use HTA as a basis for decision-making. However, like in any other country, problems in the identification of appropriate HTA authors without ► conflicts of interests exist.

Output of Health Technology Assessment

HTA can provide input into the decision-making process of the health system. It can be applied to assess the potential consequences of medical interventions, organizational interventions, and even of health care reforms. HTA can show decision makers the potential effects on health and the consequences for the health system, as well as those for the economy and the society into which a technology is to be introduced or excluded (Velasco-Garrido, Busse 2005).

Cross-References

► Case Control Studies
► Conflicts of Interests
► IQWiG
► Model Building
► NICE
► Policy Research
► Qualitative Research
► Quantitative Research
► Regulation of Pharmaceuticals (Drug Regulation)
► Statistical Analysis
► Surveys (Statistical)

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Policy Networks

Definition

The concept of policy networks is based on clusters of actors, each with an interest, or 'stake' in a given policy sector and the capacity to help determine policy success or failure. It has been developed and refined as a way to try to describe, explain and predict the outcomes of policy-making.

Policy Research

Definition

Policy research means research and education on issues of government, politics, economics, and social welfare.

Policy relevant research should facilitate public dialog to assist policymakers in understanding the impacts of public policies and programs.

Polio

Synonyms

Poliomyelitis; Infantile paralysis; Cripple disease; Heine-Medin disease

Cross-References

► Infectious Diseases in Pediatrics

Poliomyelitis

Synonyms

Polio; Infantile paralysis; Cripple disease; Heine-Medin disease

Definition

Poliomyelitis, which is caused by the poliovirus, can be transmitted fecal-orally as a smear infection, by droplets as an aerosol infection or by contaminated articles. Up to 95% of the infections are asymptomatic, but the infected person sheds the virus in feces and thus can transmit the disease to other individuals. The symptomatic course is similar to a flu-like infection, but sometimes the meninges (meningitis) are involved. In 0.1% infected persons, mostly in children younger than five years of age, polio takes a paralytic course. Usually, flaccid paralysis involves the legs. The onset is sudden, sometimes within a few hours – the child, who had been healthy the evening before, shows the typical "morning paralysis." In most cases, paralyses vanish within one year, but damage may be long term causing permanent invalidity. Poliomyelitis may cause uneven growth of the extremeties. Paralysis can be lethal in up to 20% of cases. The virus can be detected in stool, pharyngeal secretions and cerebrospinal fluid. The most important preventive measure is active poliomyelitis-vaccination (► immunization, active). A worldwide eradication of poliomyelitis is possible (► surveillance and outbreak management of infectious diseases). This is due to two facts: humans are the only reservoir for polioviruses (monkeys are possible transmitters, but this can be neglected), and, the virus cannot survive outside the human organism for any length of time.

Polio Vaccination

Synonyms

Polio immunization; Poliomyelitis vaccination; Poliomyelitis immunization

Definition

In 1955, an inactivated poliomyelitis ► vaccine (IPV) was developed and introduced, followed in 1962 by an oral vaccine with weakened viruses (OPV). The effectiveness of the vaccination is almost 100%. In rare cases after oral vaccination, a "vaccine-associated paralytic poliomyelitis" (VAPP) may develop, which is observed as flaccid paralysis. For this reason, IPV has become the treatment of preference. From the third month of age, basic immunization is generally implemented three times as part of the 6-fold vaccination, or twice when no pertussis component is involved, at intervals of at least 4 weeks, followed by a further vaccination after 4–12 months. Booster vaccinations should be given every 10 years thereafter. Contraindications for the polio vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccine.

Politics

Definition

The word politics stems from the Greek word Polis, referring to Town or Community. Political science is partly involved in the humanities field with well-established political structures and political content with political processes.

Politics has been defined in many ways. In general, politics is a process by which groups make decisions. Although the term is generally applied to behavior within governments, politics is observed in all human group interactions, including corporate, academic, and religious institutions.

Polity

Definition

Polity is usually a general term that refers to the political organization of a group. It is used to describe a loosely organized society such as a tribe or community, but can mean any political group including a government or empire, corporation or academy.

Polluted Water

► Contaminated Drinking Water

Pollution

Synonyms

Contamination; Toxic waste

Definition

Pollution is the release of chemical, physical, biological or radioactive contaminants into the environment. Principal forms of pollution include: air pollution, water pollution, radioactive contamination, noise pollution and light pollution. It is undesirable that the natural environment should be contaminated with harmful substances as a consequence of human activities.

Pollution Prevention Hierarchy

Definition

Pollution prevention is efforts that reduce or eliminate the toxicity of wastes. The Pollution Prevention Act of 1990 set up a hierarchy of preferred approaches to protecting the environment. First and foremost, pollution should be prevented at the source whenever feasible. If waste streams cannot be prevented, they should be reused, recycled, or treated. Disposal should be the last resort.

Polymorphisms

Synonyms

Genetic variants; DNA variants

Definition

In genetics, a polymorphism is any genetic unit which exists in several different common forms or variants, called alleles, across different members of a species. One classic definition of polymorphism, put forth by British ecological geneticist E.B. Ford, is "the occurrence in the same habitat of two or more forms of a trait in such frequencies that the rarer cannot be maintained by recurrent mutation alone." Therefore, a unit of the genome which is known to vary must meet a minimum minor allele frequency in a population to be defined as polymorphic. One criterion proposed to define polymorphism is that any genetic unit with two alleles must have a minimum minor allele frequency of 1% to be considered polymorphic in a given population. The majority of identified polymorphisms are non-functional. Portions of the genome that are highly conserved and do not appear to vary are called monomorphic. In humans, several different types of polymorphisms exist, such as ► single nucleotide polymorphisms (SNPs), ► short tandem repeats (STRs), variable number tandem repeats (VNTRs), and even mobile elements like short interspersed nuclear elements (SINEs), the most common of which in the human genome is the Alu repeat.

Polypharmacy

Synonyms

Polypragmasy

Definition

The use of multiple drugs by the same patient is denoted as polypharmacy. However, there is no general accepted definition of how many medications have to be taken simultaneously. Often, at least five drugs used simultaneously are referred as polypharmacy. Especially the elderly use more medications than any other age group. Polypharmacy has been associated with ► adverse drug reactions, medication errors and increased risk of hospitalization.

Polypragmasy

► Polypharmacy

Population

Definition

A population is a collection of like objects. Demographers and population health scientists refer to populations as a collection of people who share important characteristics; often these are people living at the same time within defined geographic boundaries. Populations are frequently delineated further into subgroups, (e. g. regional, age, sex, or ethnic groups) in order to understand important health patterns or differentials. A population – like the population of Europe – can also be conceptualized as existing over long periods of historical time. In this sense, we can study historical population trends and we can project population trends forward to understand the consequences of current mortality, fertility, and migration levels for this future hypothetical population.

The overall total of subjects used to derive a sample; can be people, hospitals, data, or events. The sample should give results that represent the entire population. It can be a target group – the group from which a study population was chosen, or a study group – the group chosen for research. Often, population is also used to designate all the inhabitants of a country or a region when viewed altogether. The more precise term implies a group of values or forms of a variable of interest within a baseline statistical group.

Population (or universe, or target population) is any finite or hypothetical collection of observational units (persons, things, or measurement values) for which there is an interest at a particular time. In general, the different numerical characteristics of the population are of interest. We get them in the form of parameter – information on statistical characteristics about populations. The population on which we are seeking information is called the target population. The population to be sampled is called the sampled population.

Cross-References

► Nation

Population Age Distribution

Synonyms

Age composition of population

Definition

The ► population age distribution measures the proportionate contribution of each age group to the overall population. Where mortality and fertility are high, a large percentage the population will be concentrated in young ages (more than 40 percent are under age 15 in Africa). Where fertility and mortality are low, then the population will be concentrated in older ages (20 percent of the population is 65 or older in Japan). Changes in the population age distribution (e. g. population aging) reflect historical shifts in the mortality, fertility, or migration patterns.

Population Aging

Definition

Population aging is the demographic process by which older persons become a proportionally larger share of the total population.

► Population aging is a function of two distinct yet interconnected demographic processes. A decline in the rate of mortality in childhood and early adulthood increases the number of people who survive to old age, while reductions in the ► fertility rate lead to an increase in the relative proportion of older people in the population. Population aging is now a demographic reality in both high and low-income nations. Population aging is fundamentally a mark of human success in reducing undesired fertility, improving living conditions and curbing the risks of premature death through innovations in public health and medical treatment. However, it also presents a challenge for societies and governments that must reconsider and restructure their health and human service systems to accommodate a new profile of need.

Population Attributable Risk (PAR)

Synonyms

Attributable risk proportion

Definition

Population attributable risk (*PAR*) is the proportion of the incidence of a disease in the population (exposed

and unexposed) that is due to exposure. It is the incidence of a disease in the population that would be eliminated if exposure were eliminated.
The PAR is calculated by subtracting the incidence in the unexposed from the incidence in the total population (exposed and unexposed).
PAR is usually expressed as a percentage. The *PAR%* is calculated by dividing the population attributable risk (PAR) by the incidence in the total population and then multiplying the product by 100 to obtain a percentage.
PAR measures the potential impact of control measures in a population, and is relevant to decisions in public health.
In order to calculate PAR, the prevalence of exposure in the study population must be known or estimated (PAR = AR × prevalence of exposure to ► risk factor in the population).

Cross-References

► Attributable Risk Fraction
► Attributable Risk Proportion

Population-Based Services

Definition

Population-based services are ► health services targeted at populations of patients with specific diseases or disorders (e. g. patients with asthma or diabetes). Population-based services are based on the concept that health care can be better administered if patients are examined as a population, as well as being considered as specific cases.

Population Characteristics (Demographics)

Definition

Population characteristics include race, age, gender, income, location of residence, mobility, socioeconomic status, religion, educational attainment, ownership (home, car, etc.) employment status, marital status, language, and location of residence and even life cycles (fertility, mortality, migration). Demographics are primarily used in social science research, especially in economic research.

Population Genetics

Synonyms

Genetic epidemiology

Definition

Traits which are inherited from the transmission of genes in families following Mendel's laws of heredity. A science which deals with the study of the genetic composition and characteristics of populations. Population genetics involves the study of ► allele frequencies within a population and the attempt to explain the given distributions through the forces of natural selection, genetic drift, mutation and population expansion, contraction and migration.

Cross-References

► Genetic Epidemiology

Population Genetics and Human Health

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Definition

Population genetics involves the study of ► allele frequencies within a population and the attempt to explain the given distributions through the forces of ► natural selection, genetic drift, mutation and population expansion, contraction and migration.

Basic Characteristics

Variability and Selection

The initial requirement for any ► population genetics based study is the ability to characterize and quantify the level of genetic diversity either within a population or between populations. The characterization

of diversity was initially performed at a phenotypic level, since this was the level at which genetic variation could be easily observed. The discovery of micro- and mini-satellites, coupled with advances with DNA sequencing has allowed variability to be assayed at the genotypic level. The progression of these technologies to a high throughput easily attainable technology has allowed ever increasing amounts of ► single nucleotide polymorphisms (SNPs) and micro-satellites to be analyzed, producing genome wide maps of sequence variability at a population level.

Numerous loci in the human ► genome have been shown to be under the influence of ► positive selection (where the frequency of a novel allele increases within the population due to the selective advantage it provides). Many of these have direct roles in human health through processes such as host-parasite interactions, recombination rates, fertility, salt-sensitive hypertension and sensitivity to prescribed drugs (Carlson et al. 2005; Voight et al. 2006). Therefore the identification of novel loci under apparent selection offers the potential to highlight genes of significance to human health for subsequent molecular and epidemiological investigation.

The Neutral Theory of Evolution and Frequency Based Analyses for Detection of Selection

► Frequency based analyses of selection make use of the ► neutral theory of evolution, which states that changes in allele frequency within a population occur through stochastic events not related to the organisms fitness (genetic drift). The ability to model these processes allows the expected distribution of allele frequencies for a locus to be predicted under neutrality in a panmictic (non segregated) population of constant size. Investigators can therefore compare the predicted and observed allele frequencies to detect deviations most likely caused by natural selection. Analyses to detect non neutral patterns of allele frequencies which have so far been applied to human genomic sequences include: The Hardy Weinberg equation, Tajima's D test, Fu and Li's D and F tests, the McDonald and Kreitman test, the Ewen Watterson test on observed homozygousity, Fay and Wu's H statistic and Weir and Cockram's FST.

The Tajima's D test compares the level of allelic diversity at a locus calculated from two different indices: the average pair wise diversity ($\Theta\pi$) and the number of segregating sites (ΘS). Under neutrality both will result in roughly the same estimate of diversity. However, where balancing selection (a form of positive selection) operates it will tend to increase the frequency of mutations to intermediate levels. This will increase the estimate of $\Theta\pi$ without affecting ΘS (seen as positive Tajima's D values). This is the case for Chemokine Receptor 5 (CCR5), which encodes a receptor used as an invasion ligand by HIV-1. Polymorphisms within CCR5 have been associated with reduced susceptibility to HIV-1 and significantly positive D values are seen in non-African populations, showing that these polymorphisms are at higher frequencies than would be expected under neutrality. Interestingly the apparent age of the CCR5 mutations predates the emergence of HIV-1 and a more ancient pathogen may have shaped allelic diversity at this locus (Bamshad et al. 2002).

The balancing selection apparent on CCR5 mutations prevents any single allele going to fixation in the population (possibly due to a deleterious effect of reduced chemokine activity in those alleles selected for reduced pathogen susceptibility). Positive selection that is directional (rather than balancing) will tend to drive novel alleles to fixation. This results in a decrease in allelic diversity (such that ΘS will tend to be greater than $\Theta\pi$) resulting in negative Tajima's D values. An example of this is seeb at the *LCT* locus, which encodes the enzyme lactase-phlorizin hydrolase (required for the digestion of lactose) and shows strongly negative D values in European populations (Carlson et al. 2005). It is postulated that the force for positive directional selection at this locus was produced by the introduction of diary lactose into human diets following the domestication of livestock (Bersaglieri et al. 2004).

Whilst the functional importance of CCR5 and LCT had already been identified before population genetics were performed on these loci, the ability to perform genome wide scans of polymorphism has identified numerous additional loci that show non neutral patterns of distribution for future bio-informatic, molecular and epidemiological characterization (Carlson et al. 2005). Increasingly complex models can take into account factors such as population changes and background ► negative selection (known to have shaped the genetic landscape of the human genome) resulting in an increased sensitivity and robustness of these analyses (Reed et al. 2005).

Haplotype Based Analyses

In addition to the frequency of SNPs within a population, the analysis of ► haplotype structure (measured by linkage disequilibrium – the non-random association of polymorphism within the genome) can also provide evidence of natural selection. Recombination through meiosis will tend to break down linkage disequilibrium, however, when a single polymorphism is driven to fixation quickly enough to minimize this effect the surrounding polymorphisms (termed hitch hikers) in the genetic locality will also be driven to fixation. This process homogenizes haplotype structure (evident as linkage disequilibrium) until it is broken down by recombination and new mutation. Evidence of ► selective sweeps are seen around many loci in the human genome, including *LCT* (Bersaglieri et al. 2004). Linkage disequilibrium also has the ability to identify loci under recent balancing selection such as *G6PD* (Glucose-6-phosphate dehydrogenase) and B-globin that may not be detectable by any standard nucleotide diversity test (Saunders et al. 2005). As with genome wide analysis of Tajima's D, the ability to analyze whole genomes has allowed population wide linkage disequilibrium studies to be performed. Such studies highlighted many genes under apparent selection, including genes known to be associated with disease risk such as *DPP10* (encoding dipeptidyl peptidase 10, associated with asthma susceptibility) and *COL4A3* (encoding the alpha3 chain of collagen type IV, associated with Alport syndrome) and numerous candidates for future characterization (Nielsen et al. 2005; Voight et al. 2006).

Important Human Pathogens Can also Be Investigated by Population Genetics

It is important to note that the populations under study need not be composed of human beings in order to identify genes of direct importance to human health. For many pathogens the strongest driving forces for balancing selection and directional selection will be the host immune response and chemotherapeutic drugs. The study of major human pathogens at the population genetics level has provided important information concerning the genetic determinants of virulence/pathogenicity, epidemiology and emergence of drug resistance in these organisms.

The human malaria parasite *Plasmodium falciparum* is a major cause of mortality in the developing world and widespread drug resistance is severely limiting the effectiveness of many front line antimalarial chemotherapies. The drug Fansidar contains two active ingredients: sulphadoxine and pyrimethamine. Pyrimethamine inhibits the parasite enzyme dihydrofolate reductase (DHFR), but amino acid substitutions at four key residues in DHFR alter the conformation of the active sites of this enzyme resulting in differing levels of drug resistance. Researchers have shown a large scale selective sweep around the *dhfr* locus in the genomes of parasites in southeast Asia and southeast Africa (Pearce et al. 2005). Comparing the sequence haplotype flanking different *dhfr* alleles in samples taken across a number of southeast Asian countries showed that each resistance allele shared a common flanking sequence haplotype indicating shared ancestry and the occurence of a stepwise accumulation of point mutations in the gene (Nair et al. 2003). In addition, in southeast Africa the *dhfr* allele present which confers the highest resistance to pyrimethamine was shown to have originated not in Africa but in southeast Asia, indicating that resistance alleles in *dhfr* arise very infrequently but can migrate rapidly to spread drug resistance (Roper et al. 2004). These population genetics studies show that like many emerging human pathogens, drug resistant malaria has to be considered on a global scale when designing intervention and treatment policies.

The Future of High Throughput Sequence Analysis and Population Genetics?

The future of High Throughput Sequence Analysis and Population Genetics. New developments in sequencing technology are resulting in higher throughput and lower cost applications for generating SNP data. These developments are coupled with the rapid development of statistical frameworks and computing technology to allow the analysis of larger, more complex datasets. The result of this will undoubtably be an increase in the number of genomes from humans and pathogens to be sequenced for signatures of selection. The ability of bioinformatics to rapidly analyse loci of interest to determine putative functionality will allow these techniques to play an ever increasing role in helping researchers to understand (and therefore counteract) the genetic basis of human diseases.

Cross-References

- ▶ Allele
- ▶ Frequency Based Analyses of Selection
- ▶ Genome
- ▶ Haplotype Structure
- ▶ Natural Selection
- ▶ Negative Selection
- ▶ Neutral Theory of Evolution
- ▶ Population Genetics
- ▶ Positive Selection
- ▶ Selective Sweep
- ▶ Single Nucleotide Polymorphism (SNP)

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Population Mean Value

Synonyms

Confidence interval

Definition

Population mean value is an interval within which the population parameter is expected to lie with a given degree of certainty (95% or 99%). In strict terms the confidence interval is a range of values that is likely to cover the true but unknown population value. The confidence intervals for means can be derived by adding and subtracts 1.96 (95%) or 2.575 (99%) times the standard error from mean. The confidence interval is based on the concept of repetition of the study under consideration. Thus if the study were to be repeated 100 times, of the 100 resulting 95% confidence intervals, we would except 95 of these to include the population parameter. In deriving confidence intervals for rates and ratios assumptions have to be made about these distributions. If rates and ratios are not within normal distribution, it is preferable to consider the standard error of the logarithm of the rate.

Population Nadir

Definition

Population nadir denotes the lowest number of certain population members in defined time and on defined territory. It usually refers to Indigenous populations in regions where the number of indigenous inhabitants drastically decreased due to illness, or repressive behavior of colonizers.

Population (Prevention) Strategy

Definition

Population strategies represent prevention approaches that target the whole population or large subgroups of it. This strategy rests on the observation that many risk factors and risk behaviors (e. g. blood pressure, smoking) exhibit a continuum of severity and associated risk for disease. Therefore the greatest benefit to the community will be achieved by shifting the whole distri-

bution curve (e. g. lower the blood pressure across the whole population), even if this may offer only little benefit to each participating individual ("prevention paradox"). Population strategies are used where there is mass exposure to risk, even if that risk is at a low level. Examples for this approach are the iodinization of household salt, the compulsory use of car seat belts or increasing tax on tobacco products.

Population Related Death Number

Synonyms

Mortality

Definition

Population related death number refers to the quality of being mortal. It measures the rate of death from a disease within a given population (e. g. cancer mortality rate) or the number of expected deaths in a population or population group (e. g. infant mortality) for a given time period. Statistical mortality rates based on historical data are represented in so-called mortality tables and are usually broken down by age and gender.

Cross-References

► Mortality

Population at Risk

Definition

In ► epidemiology, the population at risk is the part of the total population who would be counted as cases if they had the disease being studied.

Population Trends and Family Health

► Demographic Perspectives on Family Health

Positive Income Elasticity

► Superior Good

Positive Predictive Value

► Screening

Positive Selection

Definition

The process by which advantageous ► alleles are increased in frequency in the gene pool due to an increase in the fitness of an organism which carries them in its ► genome. Positive selection can be directional or balancing in nature. Directional selection will tend to drive a single allele to fixation, thereby removing all other alleles from the gene pool. Balancing selection will increase the frequency of a ► polymorphism to an intermediate frequency, but not to fixation due to some deleterious effect of the polymorphism which "balances" the advantageous effect it confers. An example of balancing selection is found in heterozygous advantage: The allele *HbS*, offers increased resistance to ► malaria in humans who are heterozygous for this allele (*HbSA*) compared to those homozygous for the normal version of the allele (*HbAA*). *HbS* has been selected for in populations exposed to the human malaria parasites (most probably *Plasmodium falciparum*), however, humans who are homozygous for this allele (*HbSS*) suffer from a lethal disease known as sickle cell anemia and often die before reaching reproductive age, thereby preventing the HbS allele reaching fixation. By contrast, null mutations in the Duffy receptor (required for invasion of red blood cells by the malaria parasite *Plasmodium vivax*) have no apparent fitness cost, and thus directional selection has driven these to fixation in West Africa.

Possible Case

Definition

A case classified as probable in an outbreak usually has fewer of the typical clinical features of the disease than a probable case.

Postcode Lottery

► Postcode Prescribing

Postcode Prescribing

Synonyms

Postcode lottery

Definition

The term postcode prescribing refers to regional variations of prescription patterns. As a consequence of postcode prescribing, access to therapeutic procedures and pharmaceuticals depends on place of residence instead of other criteria such as clinical effectiveness or ► cost–effectiveness.

Post-Coital Contraception

► Emergency Contraception

Postexposition Prophylaxis

Synonyms

Postexposure prophylaxis

Definition

Post exposition prophylaxis is the administration of specific ► antibodies against a particular pathogen the individual is not immune to. The aim of this post exposure measure is to prevent the infected person from becoming ill. To be successful, it is important to give the immune globulins as soon as possible after the contact with the pathogens.

Postexposition Prophylaxis (PEP) in HIV-Infection

Synonyms

Postexposure prophylaxis in HIV-infection; Prophylactic measures following HIV-exposition

Definition

After contact with potentially infectious material, various measures are indicated. On the one hand, there are general procedures, like disinfection or squeezing out the wound after a needle stitch injury; on the other hand, a specific antiviral therapy may be necessary for some weeks. Medicinal postexposure prophylaxis has to be started within 48 hours. Directly after contact with contaminated material, infection can only be ruled out by identification of the virus itself (by PCR). As antibodies are not present at that point in time, the HIV-test will be negative. Nevertheless, in the case of professional exposition, the individual might need proof that his or her HIV-status was negative at the time of the accident as evidence in a possible lawsuit.

Postexposure Prophylaxis

► Post Exposition Prophylaxis

Postexposure Prophylaxis in HIV-Infection

► Postexposition Prophylaxis (PEP) in HIV-Infection

Post Hoc Test

► Fisher LSD

Postmarketing Investigation of Drugs

Definition

Postmarketing investigation of the effects of a drug is undertaken at the stage when the drug is generally available on the market. It includes an active postmarketing surveillance system, which is essential for registration of any drug adverse effects. Besides that, evaluation of these effects is possible through several types of observational epidemiological studies, especially ► case-control studies.

Post Primary Tuberculosis

Synonyms

Reactivation tuberculosis; Adult tuberculosis

Definition

Post primary tuberculosis is the reactivation of old foci with a following outbreak of the disease. Primarily, the lungs are concerned; other organs become involved less frequently. In most cases, the reason for the reactivation is a decline in the status of personal health, especially an impairment of the immune system.

Post-traumatic Stress Disorder (PTSD)

Definition

Psychological damage that develops after a traumatic experience as a delayed reaction to the trauma.
PTSD arises as a delayed or protracted response to a stressful event or situation (of either brief or long duration) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive ► distress in almost anyone. Predisposing factors, such as personality traits (e. g. compulsive, asthenic) or previous history of neurotic illness, may lower the threshold for the development of the syndrome or aggravate its course, but they are neither necessary nor sufficient to explain its occurrence. Typical features include episodes of repeated reliving of the trauma in intrusive memories ("flashbacks"), dreams or nightmares, occurring against the persisting background of a sense of "numbness" and emotional blunting, detachment from other people, unresponsiveness to surroundings, anhedonia, and avoidance of activities and situations reminiscent of the trauma. There is usually a state of autonomic hyperarousal with hypervigilance, an enhanced startle reaction, and insomnia. Anxiety and depression are commonly associated with the above symptoms and signs, and suicidal ideation is also common. The onset follows the trauma with a latency period that may range from a few weeks to months. The course is fluctuating but recovery can be expected in the majority of cases.

Potable Water

Synonyms

Drinking water

Definition

Potable water is water intended for human consumption and others domestic purposes including personal hygiene, which must be safe without any significant risk to health over a lifetime of consumption.

Cross-References

► Drinking Water

Pott's Disease

► Morbus Koch (Koch's Disease)

Poverty Line

Synonyms

Poverty threshold

Definition

Worldwide the definition and calculation of poverty lines are controversial. The World Bank fixes the *absolute (extreme) poverty line* at 1 US-Dollar per person per day. According to this criterion, the poverty line is an income limit and below this limit the purchase of vitally necessary resources is no longer possible for an individual; such an individual is then classified as poor. *Relative poverty (risk) lines* however refer to a statistical standard for a society (e. g. the average or mean income). Thus, since 2001 the Member States of the EU have classified an individual with less than 60% of the average of an equivalent net monthly income as poor, i. e. a per capita-income modified according to relevant necessity aspects. This applies to a single-person household or to the senior person of a large household. In order to avoid any confusion or distorted interpretation, the top and the bottom 10% of the income are not taken into account. In Germany, the relative poverty line was at 856 EURO/month/person in 2004. The poverty lines

are fixed in concordance with standard political criteria as they cannot be proved or justified without prejudice.

Poverty Threshold

► Poverty Line

Power

Definition

The power is the probability of detecting a treatment effect of a given magnitude when a treatment effect of at least that magnitude truly exists. For a true treatment effect of a given magnitude, power is the probability of avoiding type-II-error, and is generally defined as $(1-\beta)$, where β is the probability of a type-II-error (false-negative). In hypothesis testing, β is the probability of concluding incorrectly that an intervention is not effective when it has true effect.

Power Analysis

Synonyms

Statistical power analysis; Sample size estimation

Definition

Performing power analysis and sample size estimation is an important aspect of experimental design. Software for Power Analysis is a comprehensive, general purpose tool of computer programs aiding the planning of research studies so that the sample size is appropriate for the objectives of the study. It also provides a wide variety of tools for analyzing all aspects of statistical power and sample size calculation. In some power analysis software programs, a number of graphical and analytical tools are available to enable precise evaluation of the factors affecting power and sample size in many of the most commonly encountered statistical analyses. This information can be crucial to the design of a study that is cost-effective and scientifically useful.

PPP

► Public-Private Partnership
► Purchasing Power Parity

Pragmatic Aspect of the Information

Definition

The pragmatic aspect of the information refers to the value of the information, the media that carries it, the resolution and precision that it was written with, and the quantity in which it was produced, transferred and received.

Pragmatic Trial

Definition

In contrast to controlled explanatory clinical trials, which aim to maximize the internal validity by rigorous control of all variables except the intervention, pragmatic trials seek to maximize external validity and to achieve a large degree of generalizability of the results. Elements that distinguish pragmatic trials from controlled clinical trials are, for example, wider inclusion and exclusion criteria and a less strict blinding of patients or physicians.

Prayer-Singers

► Indigenous Health Care Services

Preadmission Review

Definition

In the context of ► managed care, a preadmission review is the practice of reviewing claims for ► inpatient admission before the patient enters the hospital. The objective is to assure in advance that the admission is medically necessary. If there is no preadmission review carried out or it is not accepted by the insurer, the insurer can, depending upon contract provisions, deny or pay reduced benefits for the admission.

Prebiotics

Definition

Prebiotics are special indigestible substances which enhance the growth of bifiobacteria and possibly oth-

er microorganisms. They lead to a positive health effect in the intestine.

Precautionary Principle

Definition

The precautionary principle implies that when an activity raises a reasonable suspicion of causing harm to the environment or human health, though there is no scientific evidence, precautionary measures should be taken just as if proofs of its damage actually existed.

Precede-Proceed Model

Definition

The precede–proceed health promotion planning model proposes a clear understanding of the social, epidemiological, behavioral, environmental, educational, organizational, administrative, and policy aspects of a problem area during the needs assessment or planning stage; for evaluation, there is a distinction between process evaluation, impact evaluation and outcome evaluation. Precede (Acronym for Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation) outlines a diagnostic planning process to assist in the development of targeted and focused public health programs. Proceed (Acronym for Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development) guides the implementation and evaluation of the programs designed using precede.

Preciseness

Synonyms

Accuracy

Definition

Accuracy is the extent to which a measurement or an estimate based on measurements agrees with the true value. Accuracy is distinguished from precision, because a measurement can represent a true value without details. For example a temperature of 37.5 °C is accurate, but is not precise if a more refined thermometer registers a temperature of 37.543 °C.

Precision

Definition

Precision is the quality of being sharply defined. One measure of precision is the number of distinguishable alternatives from which a measurement was selected, sometimes indicated by the number of significant digits in the measurement. If it is expressed numerically, person's height could be stated to the nearest millimeter. Precision does not imply ► accuracy. A measurement can be precise but inaccurate. For example a faulty thermometer records the body temperature to be 36.67 °C when it is 37.10 °C.

In statistics, precision is defined as the inverse of the variance of a measurement or estimate.

Precision refers to the consistency of repeated results. Minor differences among repeated measures means that the measurement of precision is larger. Precision is quantified by ► measures of dispersion (variance, ► standard deviation, coefficient of variation) and ► confidence intervals. These measures are called imprecision measures, as higher variation means less precision. High precision is necessary for high ► accuracy, but the reverse does not hold. Despite high precision and low variability of results, ► accuracy may be low because of significant systematic error.

In statistical estimations, precision is the variation of an estimate of the true population value (parameter value) which is measured by the standard error of estimate.

Precision Attachment

Definition

An interlocking device, one component of which is fixed to an abutment or abutments (matrix), and the other (patrix) is integrated into a removable dental prosthesis in order to retain it.

Preclinical Phase of Disease

Synonyms

Presymptomatic phase of disease

Definition

The natural history of disease consists of preclinical and clinical phases of disease. The period from the pathologic onset of disease to the development of the first symptoms and/or signs of disease is the preclinical phase. During the preclinical stage of disease, it is possible to detect the disease by using available ► screening tests. The period in which the symptoms develop is the clinical phase of disease.

Prediction

Definition

A prediction is a rigorous (often quantitative) statement forecasting what will happen under specific conditions. Statistical regression models are frequently used to both describe the behavior of something, and predict its future behavior. Prediction methods based on objective mathematical and statistical calculations are called quantitative prediction methods, while methods based on expert opinions are called qualitative prediction methods. The first group includes, from the simplest methods to the most complicated, the Box–Jenkins methodology, fuzzy logic and neural networks, etc. The second group includes, for example, the Delphi method.

Predictive Toxicology

Definition

Predictive toxicology can use genomics, ► proteomics or ► metabolomics information from known toxicants to predict the toxicological class of an unknown agent. Genomics assays and single nucleotide ► polymorphisms can also be integrated to generate predictive models that are used to predict toxicological responses to specific agents. Prevention of environmentally-induced cancers is a health issue of unquestionable importance. Obtaining empirical evidence from animal-model based bioassays is costly and extremely time-intensive. This has resulted in an urgent need for carcinogenicity models that could generate reliable toxicity predictions for chemicals. These models would also enable low cost identification of hazardous chemicals and refine and reduce the reliance on the use of large number of laboratory animals.

Predictive Value

Definition

Predictive value describes the prognostic power of a test result and depends on ► penetrance and frequency of the disease. It is defined as the portion of clinically affected persons among all individuals tested positive for the ► mutation (positive predictive value) or the portion of non-affected (healthy) persons among all individuals tested negative for the mutation, respectively (negative predictive value).

Predictive Value Positive of a Surveillance System

Definition

Predictive value positive (PVP) is defined as the proportion of persons identified as case-patients who actually have the condition being monitored through the surveillance system. Calculating the PVP requires confirmation of all cases.

A low PVP means that non-cases are being investigated and there may be false positive reports of epidemics. This can lead to costly investigations and unnecessary interventions. On the other hand, a surveillance system with high PVP leads to less unnecessary and inappropriate expenditure of resources.

Sensitivity and PVP are inversely related. The balance between high sensitivity (assuring that almost all cases are identified) and high PVP (few false positive are identified) must be based on the level of importance accorded to identifying all cases (e. g. for rabies, or spinal cord injuries).

Pre-Eclampsia

Definition

Pre-eclampsia is one of the most common serious medical complications during pregnancy that is defined by the presence of the following symptoms: hypertension (high blood pressure of more than 140/90 taken at 2 time points 6 hours apart), presence of proteinuria (protein levels of 300 mg or more in urine) and edema (swelling, especially of hands and feet). It is incurable and has serious consequences for the health of the mother and baby and the only treatment is delivery of the baby, which depending on the gestational age, could have severe health consequences for the baby. The presence of hypertension without proteinuria is referred to as pregnancy induced hypertension.

Pre-Employment Health Examinations

Definition

Pre-employment health examinations are carried out prior to employment if the job entails health hazards or if it involves special health requirements. In most countries there are legal regulations on the provision of such health examinations in situations where workers are exposed to specific hazardous substances or physical agents involving special risk.

Preferred Risk Selection

Synonyms

Cherry-picking; Cream-skimming

Definition

Traditionally the term refers to selection that occurs because health insurers prefer low-risk enrollees to high-risk enrollees within the same risk group. Preferred risk selection may occur even if health insurers are required to accept all enrollees.

Pregnancy

Synonyms

Maternity; Gestation

Definition

Pregnancy is the state of carrying a developing embryo or fetus within the female body. This condition can be indicated by positive results on an over-the-counter urine test, and confirmed through a blood test, ultrasound, detection of fetal heartbeat, or an X-ray. Pregnancy lasts for about nine months, measured from the date of the woman's last menstrual period. It is conventionally divided into three trimesters, each roughly three months long.

Cross-References

► Gravidity

Pregnancy Loss

► Abortion

Pre-Implantory Blastocysts

Synonyms

Morula

Definition

A fertilized oocyte, termed zygote, starts to divide and proliferate, thereby giving rise to a blastocyst. A blastocyst is an early embryo not yet implanted into the uterus, containing 8 to 32 cells. At day five to six of embryogenesis, the blastocyst adheres to the mucosa of the uterus and penetrates in the second week of pregnancy. After implantation, the primitive cells differentiate into the trophoblast and embryoblast, the latter giving rise to the organism. ESC are isolated from blastocysts which have not yet adhered to the uterus' mucosa. ESC are omnipotent, being able to give rise to cells from embryo- and trophoblast.

Prejudice

Synonyms

Favoritism; Inclination; One-sidedness; Bias

Definition

There may be systematic underestimation or overestimation of the true value of an attribute bias. For example, prejudice in questionnaire data may occur from a variety of other factors, including choice of words, sentence structure, and the sequence of questions.
It represents either human choices or any other factors beside the treatments being tested that affect a study's results. Clinical trials use many methods to avoid bias, because biased results may be missleading.
Prejudice is basically an affective and cognitive response. It leads to social ► discrimination, the behavioral reaction. Prejudice yields emotional responses (e. g., fear) to stigmatized groups and involves a generally negative component.

Preliminary Injunction

Synonyms

Provisional injunction; Interim injunction

Definition

The term depicts a preliminary but nevertheless binding court order, which is regularly issued in urgent matters. With preliminary injunctions, courts order, prohibit, or allow acts or conditions that are relevant in the particular case in order to assure a claim or right for the time being until a regular court judgment of the lawsuit has been given.

Premolar

Definition

The premolars – eight in all – are located in pairs on each side of the upper and lower jaw, behind the canines and in front of the molars.

Pre-placement Health Examinations

Definition

Pre-placement health examinations are carried out when work tasks or working conditions essentially change; after periods of illness affecting the employee's work ability; when an employee may have deficient work capacity; when an employee is to be transferred to a high-risk place. These kinds of medical examinations are similar to pre-employment health examinations, but not exactly the same. In most countries there are legal regulations on the provision of such health examinations.

Preponderance

Synonyms

Prevalence

Definition

The ponderance of a disease is defined as the total number of cases of a given disease in a specified population at a specified time. It also may be defines as the ratio of the number of cases of a disease present in a statistical population at a specified time and the number of individuals in the population at that specified time.

Cross-References

► Prevalence

P

Prepsychotic Schizophrenia

► Schizotypal Disorder

Presbyacusis

Definition

Presbyacusis is hearing loss in elderly people. It is the most common cause for hearing loss in people over 55. The hearing loss comes on gradually, often over several years. Loss of hearing sensitivity due to aging occurs mainly at the higher audiometric frequencies and is bilateral and usually symmetrical. An affected person has difficulty using the telephone or following a conversation in a group. Presbyacusis is caused by a degeneration of nerve hair cells in the cochlea as a part of the aging process. The severity of hearing loss varies from person to person of the same age but most people do not go completely deaf.

Presence of Microorganisms

Synonyms

Colonization of microorganisms

Definition

Colonization is a term used to denote the presence of microorganisms in certain regions of the body which do not cause the symptoms of an infectious disease. Such colonization, does not require systemic antibiotic therapy. However, when multiresistant germs are present, elimination might be useful in order to avoid spread of the pathogens to hospital staff or other patients.

Preservation of Food

Synonyms

Conservation of food

Definition

Various physical and chemical methods can be used to lengthen the shelf life of food. These methods can prevent the foodstuff from rotting due to the influence of light, humidity, chemical reactions or microorganisms (bacteria, fungi). Physical methods include thermic treatment (like cooling, freezing, pasteurization and sterilization), withdrawal of water by drying or freeze-drying as well as radiant exposure (UV light, electron radiation, X-ray, gamma radiation). Chemical methods of preservation are smoking, salting, pickling, leavening and the addition of conserving agents. An alcoholic content of > 14% has a conserving effect as well. Among other things, sorbic acid (E200) and its salts (potassium sorbate E202), benzoic acid (E210) and sulphites (E221–E228) are compounds used as food preservatives.

Presumptive Therapy of Malaria

► Self-Therapy of Malaria

Presymptomatic Phase of Disease

► Preclinical Phase of Disease

Preterm Delivery (PTD)

Synonyms

Premature birth

Definition

Preterm delivery is the birth of an infant before 37 weeks gestation, occurring in about 10% of births.

Prevalence

Synonyms

Disease frequency, measures

Definition

Prevalence is used in ► epidemiology. It refers to the total number of people affected by a certain condition at a given point in time. It can be given as a total number, or as a percentage (referred to the total population), or as a ratio referred to 1,000/10,000/100,000 (e. g. the prevalence in town of lung cancer is 478 patients, which is equal to. It encompasses the number of all new and old cases of this disease.

Prevention

► Health Campaigns

Prevention and Health Promotion

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Introduction

Most health professionals as well as medical professionals will have formed their own opinions about the meaning and pretensions of prevention and health pro-

motion. There is some confusion about the precise interpretation of these two interrelated concepts since they can have a multitude of meanings and underlying philosophies. This chapter intends to clarify these conceptual uncertainties.

Accordingly, this chapter aims to discuss the input that human behavior has on health and illness. More particularly, the authors of each essay will consider how health might be promoted and disease prevented by the cautious application of health strategies in different settings.

First, prevention and health promotion are basically understood as two different public health science strategies. Prevention is essentially a medical action that deals with the individual or risk groups as well as the observance of physical health. In contrast with this, health promotion is concerned with the whole population in its daily life and not only selected individuals or groups (von Troschke 2004).

The differences between those two concepts have been worked out comprehensively by Badura (1992): Health promotion and prevention stand for two completely different conceptions of health care policy. The term prevention derives from the social hygienic discussion of the 19th century, at a time when, due to industrialization and urbanization, social problems were large, the medical treatment of diseases was still underdeveloped, and the detection and containment of contagious diseases was considered as predominant. In contrast with prevention, the idea of health promotion is still very new and was introduced to the discussion on health policy and science issues by the European World Health Organization (WHO) office and Aaron Antonovsky, an Israeli sociologist and stress researcher.

Health promotion aims to increase the means of self-determination for all people and their state of health in order to enable them to strengthen their health situation [Ottawa Charta 1986]. The WHO definition clearly places its emphasis on the term self-determination; it also focuses on self-reliance as well as self-help of individuals and groups, and participation and political influence (...). In that context, the emphasis is placed on the promotion of health – the salutogenetic approach in contrast to the pathogenetic approach of prevention research (...). The idea of health promotion is unspecific, whereas the idea of prevention is health specific, i. e. oriented on the International Classification of Diseases (ICD). Prevention starts with well-defined medical end-points and works back to identify possible risk factors.

Health promotion applies to living conditions of human beings. The point is to activate biological, mental, and social resistibility and safety factors as well as to set up living conditions that allow positive thoughts and feelings and which permit an optimal amount of physical strain and relief.

To summarize in only one sentence: prevention can be seen as reduction of risks whereas health promotion can be seen as increase of resources (Waller 2006).

Prevention

The most well known prevention act in public health in the past can be illustrated by the persistent effort of Dr John Snow (1813–1858) to determine how cholera was spread and the statistical mapping methods he initiated. Snow is a legendary figure in the history of public health, epidemiology, and anesthesiology.

The background for the public health act of Snow was the Asiatic cholera epidemic in the summer of 1854 in England. Whenever cholera broke out, nothing whatsoever was done to contain it, and it rampaged through industrial cities leaving tens of thousands dead. Snow had recently published a report speculating that it was spread by contaminated water – an idea that was dismissed by the authorities and the rest of the medical profession.

The number of fatal attacks and the death rate in Soho (the surrounding area of Broad Street) was more than double that for the rest of London. That it did not rise even higher was thanks only to JSnow. His previous research had convinced him that cholera, which, as he had noted, "always commences with disturbances of the functions of the alimentary canal", was spread by a poison passed from victim to victim through sewage-tainted water.

He patrolled the district, interviewing the families of the victims. His research led him to a pump on the corner of Broad Street and Cambridge Street, at the epicenter of the epidemic. "I found", he wrote afterwards, "that nearly all the deaths had taken place within a short distance of the pump". Snow took a sample of water from the pump, and, as he was convinced that this was the source of infection, he took his findings to the Board of Guardians of St. James's Parish, in whose parish the pump fell. Though they were reluctant to believe him,

Prevention and Health Promotion, Figure 1 The Broad Street Pump (Source: English, 1990)

they agreed to remove the pump handle as an experiment. When they did so, the spread of cholera dramatically stopped (Summers 1989).

Even though the findings of Snow were not accepted as a reason for the cholera epidemic (because of different unsolved deaths), his intervention to avoid further spread of cholera was the first documented public health act in (disease) prevention.

Prevention may be divided into several subdisciplines. In this field, we will take a close look at: ► prevention primary, ► prevention, secondary, ► prevention, tertiary, and ► prevention, starting points, as well as ► intervention concepts in prevention and ► intervention strategies in prevention.

Primary Prevention

Primary prevention (► prevention, primary) is a health management strategy that aims at prevention of the onset of clinical risk factors or even preclinical changes (US Preventive Services Task Force 1996). Primary prevention encompasses measures to reduce risk behavior or risk factors for disease (e. g. action on smoking to prevent lung cancer and coronary heart disease) and to reduce the risk of acquiring a pathogen (e. g. immunizations).

Measures of primary prevention can act on several levels: individual behavior on one hand and wider socioecological conditions on the other. The latter form the context for individual behavior and encompass important determinants of health. Traditionally health education is one of the main instruments of the behavioral approach. Regarding the target group of prevention measures, a population strategy targeting the whole population or large subgroups of it and a high risk strategy in which efforts are focused on those deemed most likely to develop disease can be distinguished.

Against a background of increasing demand for evidence-based practice, this lack of evidence may put primary prevention at a disadvantage in resource allocation decisions. The development of quality management and good quality criteria for primary prevention interventions are one attempt to address this issue.

Secondary Prevention

Secondary prevention (► prevention, secondary) is a health management strategy that aims at the identification and treatment of asymptomatic persons who have already developed risk factors or preclinical disease but in whom the condition has not become clinically apparent (US Preventive Services Task Force 1996). Secondary prevention aims at the early detection and treatment of a condition with superior cure rates compared with the treatment of clinically apparent cases.

Secondary prevention relies on early and reliable identification of cases, and swift, effective, and acceptable treatment. Regarding the identification of cases, two strategies need to be distinguished: screening and case finding. While screening is the testing of a population or population subgroup within a program, case finding relates to the identification of cases within routine systems of health care delivery.

Although great progress has been made towards the identification of meaningful measures of secondary prevention, their implementation frequently fails in practice. Causes can be attributed to the patient (the target person), the provider, and the payer (the health care system).

Tertiary Prevention

Tertiary prevention (► prevention, tertiary) is a healthcare strategy that aims to prevent the progression of disease, to alleviate symptoms, and to prevent subsequent disability after initial clinical diagnosis. Tertiary prevention may simply be the treatment of an already diag-

nosed health condition and thus overlaps with medical care. Aims of tertiary prevention vary with the status of the health condition. The outcome of acute illness or injury depends not only on the provision of appropriate medical and surgical care, but also on the early recognition of patients' needs with respect to functioning. The main characteristic of tertiary prevention is the coordinated, multidisciplinary team approach for evaluation and intervention. Typically, this team consists of physicians, nurses, physical therapists, occupational therapists, speech therapists, clinical psychologists, social workers, and others. Patient and family/caregivers are involved as closely as possible in decision making and planning.

Starting Points of Prevention

Starting points for prevention are basic ideas for preventive efforts. They form the foundation for the development of the concept and the strategy of a preventive program or intervention. Numerous starting points for preventive initiatives exist. They can be classified according to different criteria, e. g. according to the risks, diseases, and/or conditions tackled (priorities); the individuals or populations addressed (target groups); or according to the theory underpinning the initiative and general strategies chosen (theoretical concept).

Focusing on risks to health or significant health issues and diseases is an effective starting point for prevention. With regard to the target group, there are two starting points for preventive efforts. The first is to seek to reduce risks in the entire population regardless of each individual's level of risk and potential benefits (population-based strategy). The second is to focus the intervention on the people likely to benefit, or benefit most, from it (individual-based or high-risk strategy).

Different psychological, sociological, and socio-ecological theories and models have emerged within recent decades that can serve as starting points for designing a preventive intervention. The classic preventive intervention aims to change individual health behavior and can draw upon several different change theories. With the development and worldwide acceptance of the health promotion concept since the 1980s, the role of environmental support for actions and conditions of living has gained increasing importance in the field of prevention.

Intervention Concepts

An intervention concept is a scheme for the different elements and activities that are required to achieve the intended outcome of a program. A concept is usually developed in the beginning of a health promotion and prevention activity, and it maps out detailed steps that have to be taken to design, implement, and evaluate a prevention program. A concept usually encompasses the whole program cycle: analysis, strategy, implementation, evaluation, and sustainability.

Several frameworks for a systematic planning process in prevention and health promotion have been developed since the 1980s. The models for intervention concepts are procedural resources that map the path from recognition of a need or problem to the identification of a solution. They are designed to enhance quality management of health promotion and prevention programs, but cannot provide off the shelf solutions.

Intervention Strategies

In health promotion and prevention activities, strategies are a set of decisions and actions that determine the long-term performance of an intervention. An intervention strategy is usually an umbrella plan encompassing a number of smaller plans and elements targeted at a defined population in order to prevent a specific health problem. An intervention's strategy aims to reach a target group in order to initiate and effect changes in their ideas and preventive behavior. As health literacy is a necessary condition for preventive behavior, health education and information form an essential part of almost any preventive intervention. Communication of health-related facts and promotion of the intended preventive behavior are thus important strategic aspects of an intervention.

In health promotion and prevention, the process of establishing a system's ability to perform or produce desired outcomes is known as "capacity-building". Therefore, in addition to mapping out strategies in order to reach the target group, planners of an intervention also need to build the necessary infrastructure and problem-solving capabilities.

Health Promotion

The concept of health promotion is not clearly defined: it has a variety of meanings and is thus used to describe

a number of different activities. In the beginning of the 1980s, as "health promotion" acquired wider prevalence, several different individuals and organizations provided their own definitions. The term was selectively interpreted, and as a result of this, every stakeholder set up their own agendas, philosophies, and constructions of reality. In general, health promotion is described as a process or an activity directed towards enabling people to take action. Correspondingly, health promotion is not something that is done *on* or *to* people; it is done *with* people, either as individuals or as groups (Nutbeam 2001). For this purpose, behavioral health approaches are used with individuals in relation to personal health behavior and in relation to compliance with health care interventions. Lalonde (1974) described in the "Health Field Concept" that health behavior is obviously one of the key determinants of health and disease. This simple model of a health territory characterizes four main inputs to individual health:

- Lifestyle and behavior
- Health, social, and other service provision
- Socio-economic and physical environment
- Biological processes.

Three of these inputs are involved in health promotion. Health promotion advertises health in the quest of influencing lifestyle, health services, and, furthermore, the environment. Apart from some passing consideration for genetic counseling, the 'inherited' aspects of health receive little attention (Tones 2003).

In the context of the determination of health, health promotion comprises actions directed toward changing both the determinants within the more immediate control of individuals, such as individual health behaviors, and those outside the immediate control of individuals, such as social, economic, and environmental conditions that influence health.

As well as prevention, health promotion may be divided into several other subdisciplines. To explain the nature and demands of health promotion more specifically, the ► Ottawa charta will be considered closely as the fundamental description of the term "health promotion". Contemplation of ► health goals, the ► actors and models of health promotion, and the ► fields of action of health promotion will be continuously discussed. Besides this, the principles of ► health education, ► motivation, and ► sustainability will be described. To have a complete view of health promotion, it is necessary to present the ► models of evaluation, the ► settings, and the ► target groups.

Ottawa Charta

The core elements, aims, and goals, as well as the principles of health promotion were first summarized in the Ottawa Charta in November 1986 at the 1st International Conference on Health Promotion in Ottawa, held by the Canadian Public Health Association in collaboration with the WHO. It was directed as a basic program for governmental and non-governmental actors. Essential terms of health promotion were first defined and characterized in this Charta.

The development of the Ottawa Charta was based on a resolution of the World Health Assembly in Geneva in 1977. The assembly aimed at enabling health for all in order to allow all citizens to have the possibility of leading a productive and social life. This goal became a general goal, "Health for all", in the declaration of the International Conference on Primary Health Care and is still considered a primary goal. The Charta was translated into many languages and disseminated widely in the 1980s.

Further differentiation of the above-mentioned terms on health promotion took place at the successor conferences in Adelaide (Australia) in 1986 and Sundsvall (Sweden) in 1991, at the 4th International Conference on Health Promotion (New Players for a New Era: Leading Health Promotion into the 21st Century) in Jakarta in 1997, at the 5th International Conference on Health Promotion (Health Promotion: Bridging the Equity Gap) held in Mexico City in 2000, and the 6th International Conference on Health Promotion (Bangkok-Charta for Health promotion in a globalized world) held in Bangkok in 2006.

Health Promotion – Fields of Action

The Ottawa Charta is the key document in health promotion and it describes both fields of action in health promotion and basic strategies of health promotion. These basic strategies are advocated to create essential conditions for health in general, enabling all people to achieve their full health potential and mediating between the different interests of society in the pursuit of health. These strategies are supported by five priority action areas as outlined in the Ottawa Charta for health promotion:

- to build healthy public policy,
- create supportive environments,
- strengthen community action,
- develop personal skills, and
- reorient health services.

According to the understanding of the WHO, health promotion describes the concepts of analyzing and increasing the resources and potential for health on all policy and social levels. This led to identification of the above-mentioned five important fields of action in health promotion. The fields of action were also confirmed at the 4th International Conference on Health Promotion, which took place in Jakarta in 1997, 11 years after the Ottawa conference. Furthermore, most elements and terms of the Ottawa Charta, like health policies, were added. In particular, the contents of the Ottawa Charta were developed into new priorities in the following fields:

- promote social responsibility for health,
- increase investments for health development,
- expand partnerships for health promotion,
- increase community capacity and empower the individual, and
- secure an infrastructure for health promotion.

Health Goals

Health goals arose in the reorientation of health policy with new aims in health promotion and disease prevention in the mid 1970s. Health goals are general statements of intent and aspiration, intended to reflect the values of the community in general, and the health sector in particular, regarding a healthy society. The achievement of health goals is supported by using health targets to define a change in the health status of a population that can be reasonably expected within a defined time period. On the basis of firm evidence, health goals are used for creating recommendations and cataloging measures to be undertaken in special sectors and population groups.

The WHO advocated the development of health goals and adopted its first worldwide program of health goals at the conference of Alma Ata. This program was followed by the European program with the title "Health for all 2000" in 1984. It encompassed 38 health goals amongst other general goals like "for better health" or "for promoting healthy life styles". It was also agreed to measure the attainment of health goals regularly and to publish the results of these measurements. Therefore, 65 indicators were developed for measurement purposes. In the course of time, health goals underwent further development in 1991; after that, the program was transferred into the health goal program "Health for all in 21st century – health 21".

Actors of Health Promotion

The conception and implementation of the complex aim "health promotion" demands the collaborative work of many actors, not only those in the medical field but also representatives from numerous societal sectors. Acting on the creation of health promotion is the responsibility of political decision markers at both national and international levels. This acting includes regulations and measures by law as well as sustainable funding for continuous and long-term support of flexible mediating and advising structures in health promotion. Actors come from governmental and non-governmental sectors, the education and welfare system, and the work environment as well as the health care system.

Models of Health Promotion

Models or theories in health promotion are systematically built and validated constructs with clearly defined and interconnected concepts covering a wide range of phenomena related to health behaviors or health conditions. The best-known and most often applied health promoting models have four different orientations: the first, from the 1930s–1950s, examined health behaviors and behavior changes by focusing solely on the individual and her/his characteristics. While these theories substantially contributed to the understanding of human health practices, the attention to and the inclusion of the broader environmental and socio-economic context led to a second generation of theories that focus also on the influence and competence of a community, or "setting", in which individuals live, work, play, and learn. These theories might also include the individual as one focus of intervention, but they additionally address issues beyond the control of the individual, such as the increased availability of supporting devices (e. g. provision of condoms free of charge or a health center in the neighborhood).

A third group of theories clusters around raising awareness and transmitting knowledge through communication and action-motivation. Here, the targets might

be individuals, (risk) groups, communities, or even whole nations, addressed by mass communication campaigns or social marketing strategies (e. g. BZgA's HIV-prevention campaign "Mach's mit"). A fourth group of theories focuses on the analysis of organizational structures and structural change mechanisms and their health impact by means of general policy or "healthy public policy" development (Nutbeam and Harris 2004).

Many projects have been conducted successfully without theory – solely based on experience or intuition. However, the likelihood of success and effectiveness has been proven to be higher when the conceptualization had been theory-led.

Health Education

Health education plays a significant role in health promotion and represents one principle of the implementation of intervention strategies of primary, secondary, and tertiary prevention. Health education deals with mediating health information that influences social, economic, or environmental related determinants of healthy lifestyles and health promoting behavior. The regional European office of the WHO aims to strengthen knowledge and experience of individuals on health and illness and the organism and its functions, as well as disease prevention. It emphasizes strengthening of knowledge and experience of individuals regarding the utilization of health services and understanding of the functions of these services. The objective of these efforts is to give the individuals responsibility for their health and the ability to use the offerings of health care systems. Furthermore, the idea of health education is based on the principle of human rights, allowing people to gather complete information in the field of health and illness.

Motivation

In psychology, motivation refers to the initiation, direction, intensity, and persistence of behavior, as well as being the desire and willingness to do something. Motivation in the sense of health promotion and disease prevention means the willingness of individuals to participate in health promotion interventions and to implement the recommendations of health promotion in daily life. Motivation is an essential element required for individuals to follow the suggestions of health promotion campaigns. Motivation for participating in and implementation of health promotion issues is generated by health education.

Sustainability

The term was originally applied to natural resource situations in a long-term perspective. In general, sustainability represents the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs (Brundtland Commission). Today, it applies to many disciplines, including economic development, the environment, food production, energy, and social organization.

Sustainability refers to doing something while considering the long-term consequences. Today's decisions are made under consideration of sustaining activities into the long-term future. Sustainable development includes two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Sustainable development does not focus solely on environmental issues. More broadly, sustainable development policies encompass three general policy areas: economics, the environment, and society. It incorporates many elements, and all sectors, including the health sector, which must contribute to achieve sustainable development. Human beings are at the center of sustainable development. Sustainable development refers to the use of resources, direction of investments, orientation of technological development, and institutional development in ways that ensure current development and use of resources do not compromise the health and well-being of future generations. In the context of health promotion and disease prevention, sustainability is considered to be the realization of sustainable health through development of a healthy environment and the support of health-conscious decisions of individuals. The current health program of the WHO is "Health 21" and is connected with the program on sustainable development of "agenda 21". Health promotion intervention can be classified as sustainable if effects are achieved after the project's end and developed processes have a continued and lasting effect.

Models of Evaluation

In terms of health promotion, evaluation contributes to both consideration of a project's course (implementation of empowerment or participation) and results at the end of the project. It depicts a basic element of quality assurance and contributes to the success and the sustainability of a health promotion intervention. Evaluation is therefore an essential part of each intervention. Surveillance of goal attainment, formulation of reachable and observable goals, definition of target groups, documentation, legitimization, and improvement of the project's course are fundamental elements of evaluation. Evaluation helps in the understanding of the causes of success or failure of a project and gives valuable contributions to strengthen the interventions idea. Planning of an intervention and evaluation of a project are closely connected. Essentially, evaluation is using diverse methodology approaches that include qualitative methods and quantitative methods (e. g. case studies, survey research, statistical analysis, and model building). It is estimated that more than 100 approaches for evaluation measures exist. The principal approaches are outlined in the essay on evaluation models.

Settings

Settings are places or social conditions in which humans spend a huge part of their lives and which have a great influence on their health. Working conditions, leisure areas, and schools depict typical settings for individuals. The concept of health promotion that is described in the Ottawa Charta emphasized the importance of settings in which interventions are carried out. Moreover, the Ottawa Charta demanded the creation of health promoting settings in one of its area of activity, "create supportive environments". Regarding health promoting activities, the setting also describes a well-defined social environment that is needed for analyzing, defining, and implementing health promotion interventions. In this context, individuals belong to various settings and are influenced by various settings. The setting approach in primary prevention and health promotion, which was first put forward by the WHO (WHO 1986), denotes a systemic intervention that aims to change structures and processes in a setting, rendering it more conducive to health. The formulation of the setting approach was an important step in the development of health promotion activities. Examples of settings are numerous and there are widespread programs and interventions, mainly initiated by the WHO.

Target Group

Target groups are an important element of all health education and information measures in health promotion and disease prevention. A clear and well thought-out definition of the group at which an intervention is targeted is an important condition for formulating realistic objectives and for reaching those objectives as well as for reaching the group itself. Strategies and measures have to correspond to the lifestyles of the target groups if lasting individual or structural changes are to be achieved.

If the health behavior and living conditions of target groups will be changed and improved sustainably in settings, strategies have to be geared to the way of life of the target groups. Settings also have to be defined in this context. Target-group orientated work is regarded as standard in health promotion activities since a lack of it is associated with an undifferentiated and inefficient appeal of the intervention to all people. In order to evaluate the attainability of target groups, projects in the field of health promotion are characterized with respect to the participants and recipients.

P

Summary

The term "health" means, in its plain form, the absence of disease. In the first definition, the WHO outlined health as the state of complete physical, emotional, and social well-being, not merely the absence of disease or infirmity. In further definitions, this was extended and additional fundamental terms were integrated: intellectual, environmental, and spiritual health. The well-balanced interplay of all named components is finally established on the principle of self-responsibility.

Health promotion and prevention provide the pathway or process to achieve this balance. As the introduction explained, a pointed and clear distinction between (disease) prevention and health promotion should be made. Disease prevention focuses on protecting as many people as possible from all consequences of a threat to health. In contrast, health promotion consists of the development of lifestyle habits that healthy individuals and communities can adopt to preserve and increase their state of well-being. The final aim is to optimize the health status.

Cross-References

- ► Intervention Concepts in Prevention
- ► Intervention Strategies in Prevention
- ► Prevention, Primary
- ► Prevention, Secondary
- ► Prevention, Starting-Points
- ► Prevention, Tertiary

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Prevention of Insect Stitches

► Prophylaxis of Insect Bites

Prevention of Mental Disorders

Definition

Prevention of mental disorders has as its target the reduction of symptoms, incidence, prevalence, recurrence of mental disorders, or the risk condition for a mental illness, preventing or delaying recurrences and also decreasing the impact of illness in the affected person, their families and the society and ultimately of mental disorders. It uses mental health promotion strategies as one of the means to achieve these goals. Prevention of mental disorders can be considered as one of the aims and outcomes of a broader mental health promotion strategy.

Prevention of Occupational Diseases

Definition

Prevention of ► occupational diseases includes policies and actions to eliminate or reduce occupational ► risk factors, thus reducing or eliminating occupational diseases and injuries, work-related diseases and premature deaths. Several levels of prevention are defined. **Primordial prevention** includes elimination of any predisposing risk factor, for example substitution of asbestos with another less harmful substance in the production process. **Primary prevention** includes protection from exposure to an occupational factor, e. g. enclosed machinery that does not allow spread of solvents or use of adequate protective equipment. **Secondary prevention** includes the use of screening tests, for example detection of early signs of occupational exposures and symptoms during the preventive check-ups. **Tertiary prevention** includes interventions aimed at slowing the progress of already established occupational or ► work-related disease.

Coping with the demands of prevention is difficult without appropriate legislation and regulation and a centrally directed articulation of the process and work instructions.

Prevention of Oral Diseases

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Synonyms

Prophylaxis

Definition

In dentistry, prevention is any activity by which an individual avoids the development of an ► oral disease or condition (primary prevention), diagnoses oral diseases at an early stage or prevents its reoccurance (secondary prevention), and improves or maintains a person's functional status (tertiary prevention).

Prevention can be directed to all individuals (i. e. the whole population), sections of the population (for example school children), or the individual patient. Prevention can include measures for all people independent of their individual risk (mass prevention) or measures only for high risk groups.

Basic Characteristics

Background

Oral diseases are the most prevalent noncommunicable chronic diseases (NCDs). From a dental public health point of view the following oral diseases are relevant: ► dental caries, ► periodontal diseases, dental trauma and oral cancer, because these diseases are linked to common, preventable (modifiable) and lifestyle related risk factors (e. g. unhealthy diet, tobacco use, risky lifestyle; Daly 2002). The burden of oral diseases for the individual patient (pain, limited functioning and appearance) and the society (treatment costs) is substantial. It is therefore beyond dispute to prevent these conditions.

The majority of oral diseases do not cause life-threatening conditions. It was therefore difficult in the past to implement dental prevention in the health care system. Current research has shown that oral diseases have a considerable impact on oral health related quality of life. In the western world, the loss of teeth (caused by caries, periodontal diseases, dental trauma or other reasons) has a wide range of psycho-social consequences for the affected individuals (eg. problems with finding a job or partner). This is also the case for subjects with severe orthodontic problems or oral cancer with their disfiguring consequences. This made it easier to establish measures for the prevention of oral diseases.

Measures of Primary Prevention

Primary prevention focuses on maintaining good habits. The most important measures of primary prevention for oral diseases are:

- tooth brushing based on the practical experience that ► plaque-free teeth do not or less frequently develop caries or periodontal diseases. The positive effect of tooth brushing for oral health is evidence-based.
- use of fluorides. There are more than 10 systematic reviews/meta-analyses in the *Cochrane Library* (The Cochrane Collaboration) about the caries-preventive effect of fluoridation. Fluorides can be given as topical (tooth paste, varnish, mouth rinses) and/or systemic preparations (tablets, salt, water). Current research has shown that the caries-preventive effect of fluoride is mainly attributed to the effects on demineralization/ remineralization at the tooth oral fluids interface (ten Cate 1999).
- healthy diet. The relationship between sugar-rich diet and oral health is well-known. All programs to improve diet (i. e. to reduce fat or sugar) automatically help to improve oral heath.
- ► fissure sealants in children and teenagers in order to prevent the development of dental caries in pits and fissures of ► permanent teeth.
- consultations for pregnant women to improve the knowledge regarding oral health of their children.
- safety precautions to reduce the risk of dental and maxillofacial trauma or to reduce the resulting sequelae: using seat-belts in cars, gum-shields in dangerous sport, Dentosafe® (boxes for shortterm storage of fully avulsed teeth) in ambulances and first-aid kits etc.
- campaigns against tobacco and alcohol consumption to reduce the risk of oral cancer.

Measures of Secondary Prevention

Screening, early detection, and early treatment of oral diseases are the most important focus areas of secondary prevention:

- yearly dental check up in the dental office or in the dental public health service (this allows to screen the population for early stages of oral diseases: white spots, bleeding gum, precancerous changes of oral mucosa etc.),
- special diagnostic and therapeutic procedures in risk groups and prescription of tailored preventive mea-

sures for example in subjects with juvenile progressive periodontal diseases or immunosupressed patients,
- treatment of early disease stages (for example treatment of baby teeth caries to prevent caries development in the permanent dentition, sealants and preventive fillings in dark-colored pits and fissures to prevent more extended tooth decay),
- treatment of malpositions of teeth for example to reduce the risk of dental trauma in protruded front teeth.
- early treatment of dental trauma because prognosis depends on time between accident and treatment.

Measures of Tertiary Prevention

Tertiary prevention includes all measures for oral rehabilitation. This includes fillings of decayed teeth, the treatment of periodontal diseases, the replacement of lost teeth (► dentures, implants), and the complex treatment of oral cancer. The recall period for the patient depends on the individual risk situation and the disease progress.

Limitations of Dental Prevention

Even optimal prevention cannot completely avoid the development of oral diseases. Only the extent and severity of these diseases can be reduced. In addition to specific risk factors like bad oral hygiene, sugar-rich diet, no fluoridation or heavy smoking further factors are included in the etiology of oral diseases (systemic illnesses, habits). Tooth loss caused by diabetes mellitus associated periodontitis can serve as an example. Other examples are tooth decay caused by parafunctional habits (bruxism), nutritional disorders (bulimia) or genetics (amelogenesis imperfecta). However, the major part of oral diseases is lifestyle-related. Furthermore, prevention has to be free of any risks for the individual to reach a wide acceptance of preventive measures (for example avoidance of dental fluorosis by supervised use of systemic fluoridation).

Implications for the Health Care System

Effective dental prevention requires sufficient structural and political conditions:
- political support for a "healthy environment",
- wide acceptance of preventive measures in the society,
- sufficient financial and personnel resources,
- cooperation between all members of the health care system (dentists, dental public health service, health insurances etc.),
- more competences in the dental education to prevent oral diseases (Plasschaert 2004)
- implementation of dentist's knowledge in the educational system,
- implementation of an incentive scheme within the dental care system focusing on preventing instead of treating oral diseases.

Conclusion

In most of the cases prevention of oral diseases does not lengthen life, but improves oral health related quality of life for large parts of the population and may reduce socially determined inequalities. Finally, it should be born in mind that prevention of oral diseases always has a positive effect on general health and vice versa all measures to improve general health also improve oral conditions.

Cross-References

► Complete Removable Dental Prosthesis
► Dental Caries
► Dental Plaque
► Dental Sealant
► Fissure Sealing
► Oral Diseases
► Periodontal Diseases
► Permanent Teeth

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Prevention Paradox

Definition

Primary prevention involves two strategies that are often complementary. It can focus on the whole population with the aim to reduce average risk of particular disease (population strategy), or on people at high risk as a result of particular exposure (the high-risk individual strategy). The major advantage of the population strategy is that it does not require identification of the high-risk group and its main disadvantage is that it offers little benefit to individuals because their absolute risks of disease are quite low. In other words a preventive measure that brings large benefits to the community but may offer little to most participating persons. This phenomenon is known as prevention paradox.

For example, most people will wear seat-belts while driving for their entire life without being involved in a crash. The widespread wearing of seat-belts has produced benefits to many societies but little benefit to most individuals.

Prevention, Primary

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Definition

Primary prevention is the health management strategy that aims at the prevention of the onset of clinical risk factors or even preclinical changes (U.S. Preventive Services Task Force 1996). The term prevention is derived from the latin verb "praevenire" which means "coming before". It denotes that something is effectively done *before* a targeted condition has evolved. Primary prevention encompasses measures to reduce risk behavior or risk factors for disease (e. g. action on smoking to prevent lung cancer and coronary heart disease) and to reduce the risk for acquiring a pathogen, respectively (e. g. immunizations). In contrast, secondary prevention (► prevention, secondary) aims at the identification and treatment of asymptomatic persons who have already developed risk factors or preclinical disease but in whom the condition has not yet become clinically apparent. Tertiary prevention (► prevention, tertiary) refers to an intervention that aims to mitigate health consequences of a clinical disease (Commission on Chronic Illness 1957). Primary prevention can include elements of, but is distinct from ► health promotion, which is "the process of enabling people to increase control over, and to improve, their health" (WHO 1986). The latter process, which is characterized by ► participation and ► empowerment, ► advocacy, ► enablement and ► mediation is not restricted to a specific phase of the health or disease history.

Basic Characteristics

Value of Primary Prevention

The particular value of primary in contrast to secondary and tertiary prevention lies in the reduction of risk exposure leading to a reduction of the number of episodes of ill health over time and extension of the healthy life span. There are a number of examples of successful primary prevention, e. g. immunization programs, breast feeding or child safety car seats in childhood, regular physical activity and bicycle helmets in the general population, and pneumococcal vaccine or avoidance of excess sun in high risk populations (U.S. Preventive Services Task Force 1996). For clinicians and the general population primary prevention often appears as an abstract concept because it is directed towards a healthy population. More difficulties are encountered if the potential value of a primary intervention has to be balanced against the interests of other societal or economic sectors, including even the health sector: successful primary prevention may be detrimental to the economic interests of e. g. the tobacco or alcohol industry and the distributors of their products.

Key Concepts of Primary Prevention

Behavioral Versus Contextual Approach Measures of primary prevention can act on several levels: the individual behavior on one hand and the wider socio-ecological conditions on the other. The latter form the context for individual behavior and encompass important determinants of health. Some primary prevention measures also intervene on the individual biomedical level, for example immunizations. Traditionally ► health education is one of the main instruments of the behavioral

approach (e. g. a safe sex media campaign aiming to change individual risk behaviors regarding HIV/AIDS), whilst policy and legislative measures aiming to reduce risks in the living environment belong to the mainstays of the contextual approach (e. g. smoke protection laws creating smoke free public places; introduction of compulsory car seat belts).

Population Versus High Risk Strategy Regarding the target group of prevention measures, a ► population strategy targeting the whole population or large subgroups of it (e. g. all sexually active persons) and a ► high risk strategy in which efforts are focused on those deemed most likely to develop disease, can be distinguished. The population strategy rests on the observation that many risk factors and risk behaviors (e. g. blood pressure, smoking) exhibit a continuum of severity and associated risk and that the greatest benefit to the community will be achieved by shifting the whole curve (e. g. lower the blood pressure across the whole population), even if this may offer only little benefit to each participating individual ("prevention paradox") (Rose 1992). Issues with the high risk strategy are the need to (easily) identify the target group and develop interventions which are tailored to that particular group. The high risk strategy falls mainly in the domain of secondary prevention (screening).

Setting Approach A ► setting is a confined social system with a certain set of conditions for and influences on health and the opportunity to shape these conditions for a better health. The setting approach in primary prevention and health promotion, which was first put forward by the WHO (WHO 1986), denotes a systemic intervention that aims to change structures and processes in a setting rendering it more conducive to health. This approach accounts for the contextual nature of individual behavior, is non-discriminatory (all individuals in a setting are reached) and has great potential for a sustainable change in health related outcomes through action on setting innate determinants of health. Examples of settings include kindergartens, schools, workplaces, hospitals, prisons, neighborhoods and communities.

Primary Prevention and Health Promotion

Health promotion as a process can be found both within and outside the confines of primary prevention. According to a World Health Organization definition, health promotion is "the planned and managed process of encouraging and assisting improvement in the health of a population as distinct from the provision of health care services" (WHO 1998). Health promotion overlaps and complements prevention strategies aiming at the sole reduction of risk factors. It has been suggested that the risk-reduction context of prevention relates to both a reduction of risk factors and a strengthening of resources, while the context of the health promotion process is predominantly resource-oriented (Rosenbrock 2004). While health promotion is said to encompass wide if not all domains of life, disease prevention frequently is regarded as emanating from the health sector only and dealing with risk factors and risk behavior. It is important therefore to realize that disease prevention and health promotion are complementary activities towards the public health goal of "ensuring conditions in which people can be healthy" (Institute of Medicine 1988).

Limitations and Challenges

The quest of primary prevention coexists and may be in conflict with issues of personal choice and preferences on an individual level, cultural stereotypes, industrial interests, political power or democratic decision making to name but a few on a larger level. The building up of an evidence-base, in particular for complex contextual interventions with a long time horizon (for potential benefits as well as damage), represents an ongoing methodological challenge. Against a background of increasing demand for evidence-based practice, this lack of evidence may put primary prevention at a disadvantage in resource allocation decisions. The development of quality management and good quality criteria for primary prevention interventions are one attempt to address this issue. Although some primary prevention measures can be worthwhile in monetary terms (e. g. small pox eradication), others are not or may never be able to prove it, making the economic argument for primary prevention a dangerous one to embark on. Despite the sometimes large costs and uncertain cost-effectiveness, prevention is a primary public health obligation because it prevents suffering and improves quality of life (Rose 1992).

Sustainable Primary Prevention

Despite their profound impact and its great successes, primary prevention activities are also subject to disappointment. Health gain in populations requires health promotion and disease prevention activities over years and decades. Evidence-based activities at the base of health promoting policies across sectors which shape the social and physical environment in which people live are potentially sustainable (Smith et al. 2006). Consistent with this analysis, the Institute of Medicine has issued recommendations (Institute of Medicine 2002) which include:

- Overhaul of the Public Health Infrastructure and competency building within and outside the Public Health services
- Focus on sustainable change by support of ongoing community engagement
- Recognition of communication as a critical core competency including dialogue with the mass media
- Development of a research agenda and build up of an evidence-base that will guide policy making
- Inclusion of age-appropriate preventive services into insurance plans

Cross-References

- ▶ Advocacy
- ▶ Empowerment
- ▶ Enablement/Enabling
- ▶ Health Education
- ▶ Health Promotion
- ▶ High Risk (Prevention) Strategy
- ▶ Mediation
- ▶ Participation
- ▶ Population (Prevention) Strategy
- ▶ Prevention, Secondary
- ▶ Prevention, Tertiary
- ▶ Setting

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Prevention, Secondary

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Synonyms

Early detection and treatment of diseases

Definition

Secondary prevention is the health management strategy that aims at the identification and treatment of asymptomatic persons who have already developed risk factors or preclinical disease but in whom the condition has not become clinically apparent (U.S. Preventive Services Task Force 1996). The term prevention is derived from the latin verb "praevenire" which means "coming before". Its meaning is that something is effectively done *before* a disease state evolves in order to make this disease state impossible or less likely. Whereas *primary* prevention refers to an intervention before clinical risk factors or preclinical changes have evolved, and tertiary prevention refers to an intervention that aims to mitigate health consequences of a clinical disease, *secondary* prevention aims at the *early detection and treatment* of a condition with superior cure rates compared to the treatment of clinically apparent cases (Commission on Chronic Illness 1957). Because of difficulties in the diagnosis of mental disorders, the Institute of Medicine redefined prevention for the *mental*

health field and suggests the terms prevention, treatment, and maintenance instead for its core activities (Institute of Medicine 1994). In this terminology, prevention is restricted to the classical concept of primary prevention, while secondary prevention is part of the activities treatment and maintenance and relates both to the index condition and co-occurring disorders.

Basic Characteristics

Value of Secondary Prevention

There are a number of examples of successful secondary prevention, e. g. in early childhood screening for inborn metabolic errors, vision and hearing screening in the general population and especially in high risk populations hemoglobin measurement, HIV and tuberculosis testing (U.S. Preventive Services Task Force 1996). Generally clinicians and the general population find it easier to understand the value of secondary prevention than that of primary prevention. This is easily understood as secondary prevention is a less abstract concept and requires many of the skills that clinicians are trained for (and people are used to): screening, diagnostic work-up and therapeutic interventions. More difficulties are encountered if the potential value of a secondary intervention at the individual level of preclinical disease has to be balanced against its value at a population level with a mix of healthy and diseased persons. This affects the context and biometrical properties of screening tests, questions of efficacy and effectiveness and the allocation of resources under conditions of restraint. An example is the discussion on which inborn errors of metabolism should be included in screening programs for newborns: while many conditions could easily be tested for, only some can be treated and hence are meaningful for secondary prevention. Care must be taken not to put clinical enthusiasm over the best interest of the patient or parent and their rights to know, but also not to know.

Key Elements of Secondary Prevention

Secondary prevention relies on early and reliable identification of cases, and swift, effective and acceptable treatment. Regarding the identification of cases two strategies need to be distinguished: screening and case finding. While ► screening is the testing of a population or population subgroup within a program, ► case finding relates to the identification of cases within routine systems of health care delivery, e. g. during a visit at the doctor's office for some related or unrelated cause. Classical criteria for meaningful screening programs have been formulated by Wilson and Jungner (1968), see Table 1. These have been extended to account for developments in both science (e. g. genetic testing) and society (e. g. consumer movement) (Goel 2001; UK National Screening Committee 2003). These extensions include that

- all the cost-effective primary prevention interventions should have been implemented as far as practicable,
- if screening is for a mutation the program should be acceptable to people identified as carriers and to other family members,
- there should be a plan for managing and monitoring the screening programme and also an agreed set of quality assurance standards,
- all other options for managing the condition should have been considered (e. g. improving treatment, providing other services), to ensure that no more cost

Prevention, Secondary, Table 1 Wilson and Jungner criteria for screening programs (1968)

Knowledge of disease:	• The condition should be important.
	• There must be a recognizable latent or early symptomatic stage.
	• Natural course of condition, including development from latent to declared disease, should be adequately understood.
Knowledge of test:	• Suitable test or examination.
	• Test acceptable to population.
	• Case finding should be continuous (not just a "once and for all" project).
Treatment for disease:	• Accepted treatment for patients with recognized disease.
	• Facilities for diagnosis and treatment available.
	• Agreed policy concerning whom to treat as patients.
Cost considerations:	• Costs of case finding (including diagnosis and treatment of patients diagnosed) economically balanced in relation to possible expenditures on medical care as whole.

effective intervention could be introduced or current interventions increased within the resources available,
- evidence-based information, explaining the consequences of testing, investigation and treatment, should be made available to potential participants to assist them in making an informed choice,
- the benefit from the screening programme should outweigh the physical and psychological harm (caused by the test, diagnostic procedures and treatment).

Efficacy, Effectiveness, Side Effects

► Efficacy relates to the positive effects of prevention programs that have been reported from studies, while ► effectiveness tries to make a statement to its performance in routine care. Evidence bases have been developed in the context of the evidence-based medicine movement (EBM) and health technology assessment (HTA reports), e. g. by the ► Cochrane Collaboration (see www.cochrane.org), the National Institute for Health and Clinical Excellence in the UK (► NICE, www.nice.org.uk) or the U.S. Agency for Health care Research and Quality (► AHRQ, www.ahrq.gov).

► Cost-effectiveness is an important aspect of the economic evaluation of secondary prevention. To this purpose, the effectiveness of prevention programs is weighed against expenses and potential savings (Wildner 2001; Drummond et al. 2005).

Screening can contribute to the reduction of the risk of developing a disease, it cannot guarantee however protection. Moreover, adverse events of an inevitable minimum of false positive and false negative results have been reported (Brett 2001). Psychological side effects of false-positive rates of programs of secondary prevention deserve careful consideration. In order to contribute to the evidence base, the development of a culture of documentation and evaluation as part of secondary preventive service delivery is essential.

Barriers to Service Delivery

Although great progress has been made towards the identification of meaningful measures of secondary prevention, their implementation frequently fails in practice. Causes can be found at the side of the patient resp. target persons, the provider, and the payer resp. the health care system. Examples are to little or inadequately framed information of the target group (e. g. inadequate language for migrant populations), counterproductive activities or myths within the target group (e. g. inadequate perception of the risk of side effects), inadequate reimbursement and fragmentation of health services (e. g. losses of clinical important information), neglect of socially disadvantaged groups (e. g. losses to follow-up), refusal to build necessary structures (e. g. screening capacities) and deficits in medical training with respect to preventive services (e. g. prioritization of treatment).

Recommendations for Clinical Preventive Services

The U.S. Preventive Services Task Force has reflected on its experience with successful secondary prevention within clinical service delivery. Their principal findings are (www.ahrq.gov/clinic/cpsix.htm):
- Interventions that address patients' personal health practices (behavior) are vitally important.
- The clinician and patient should share decision-making.
- Clinicians should be selective in ordering tests and providing preventive services.
- Clinicians must take every opportunity to deliver preventive services, especially to persons with limited access to care.
- For some health problems, community-level interventions may be more effective than clinical preventive services.

Cross-References

► AHRQ
► Case Finding
► Cochrane Collaboration
► Cost-Effectiveness
► Effectiveness
► Efficacy
► NICE
► Screening

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Prevention, Starting-Points

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Definition

Starting points for prevention are basic ideas for preventive efforts. They form the foundation for the development of the concept and the ► strategy of a preventive program or intervention. Starting points encompass general elementary decisions:

- what health issue the intervention should concentrate on,
- what group or community the intervention should target,
- what basic theory or model the intervention should draw on.

Basic Characteristics

Before a preventive initiative is planned and developed, some elementary decisions on the character of the intervention have to be made. These decisions constitute the general starting points. Numerous starting points for preventive initiatives exist. They can be classified according to different criteria, e. g. according to the risks, diseases and/or conditions tackled (priorities), the individuals or populations addressed (target groups), or according to the theoretical underpinning and general strategies chosen (theoretical concept).

Setting Priorities: Risks to Health, Diseases and Conditions to be Prevented

Focusing on risks to health or significant health issues and diseases is an effective starting point for prevention. Epidemiology can provide the rationale and quantitative basis for decisions on preventive interventions in individuals and communities.

In general, priority should be given to controlling those risks that are well known, common, substantial and wide-spread, and for which effective and acceptable risk reduction strategies are available. When considering efforts in secondary prevention, e. g. ► screening tests, different criteria apply to the condition sought and the screening test used. For example, there should be an accepted treatment or useful intervention for patients with the disease, there should be a latent or early symptomatic stage, facilities for diagnosis and treatment should be available etc.

The leading risk factors for developed countries are tobacco consumption, high blood pressure, alcohol consumption, high cholesterol, overweight and obesity, low fruit and vegetable intake, physical inactivity, illicit drugs and unsafe sex. This evidence, however, should be only one input to the decision about the priority of an intervention. For regional approaches, a needs assessment in the target population can identify special local concerns and risks which are more important than general public health data.

For example, the starting point for the comprehensive UK Government action plan “Saving Lives: Our Healthier Nation”, which was launched in 1998 and outlined the strategy to improve the nation’s general health, was to concentrate on fighting the four “main killers”. These biggest killers were defined as cancer, coronary heart disease and stroke, accidents, and mental illness. All of the Government’s policies, strategies and interventions developed for “Our Healthier Nation” draw on these four conditions that have been identified as a starting point for the action plan.

Defining the Target Groups

With regard to the ► target group, there are two starting points for preventive efforts. The first is to seek to reduce risks in the entire population regardless of

each individual's level of risk and potential benefits (*population-based strategy*). The second is to focus the intervention on the people likely to benefit, or benefit most, from it (*individual-based* or *high-risk strategy*).

The *population-based approach* aims to make healthy behaviors or cancer screening behaviors a social norm, or to reduce exposures, and thus lower the risk in the entire population. Population-wide prevention applies to everyone, is usually easy to put into practice, and mostly consists of health education or legislation. Examples are the promotion of seat-belt use or increased consumption of fruit and vegetables.

With the *high-risk approach*, a target group that benefits most of the intervention is selected. For example, one approach to promoting colorectal cancer screening can be to primarily educate and motivate people who are at higher risk to develop colorectal cancer, i. e. individuals aged 50 years or older, or with a family history of colorectal cancer. Preventive measures for high-risk individuals are usually more specific and complex and sometimes require additional support and guidance. Focusing on people who are more likely to benefit has a significant impact on the health of a nation only when there are large numbers of them.

Individual-based efforts that can be performed by a clinician in a practice or hospital setting are also referred to as *"clinical prevention"*. Clinical prevention is aimed at individual patients and patient groups, and includes screening, counseling, ► immunization, and ► chemoprevention.

A key challenge is finding the right balance between population-wide and high-risk approaches. Combinations of these two starting points are likely to be the best ways of improving health in many cases. For example, a high-risk strategy for melanoma prevention might seek to identify target individuals with three or more risk factors (number of moles, blond or auburn hair, and a family history of skin cancer) by asking primary health care professionals to provide special advice to those persons. Simultaneously, a population-wide strategy using ► mass media communication would aim to make sun protection a social norm, so that the whole population is less exposed to risk.

Choosing a Theoretical Underpinning

Different psychological, sociological, and socio-ecological theories and models have emerged within the last decades that can serve as starting points to design a preventive intervention. The classic preventive intervention aims to change individual health behavior, and can draw upon several different change theories. With the development and worldwide acceptance of the health promotion concept since the 1980s, the role of environmental supports for actions and conditions of living has gained increasing importance also in the field of prevention.

Approaches to Behavior Change Theoretical background of most models that explain individual behavior is the assumption that health behavior depends on voluntary intentions, and that changing knowledge, attitudes, beliefs, and social norms can help to change intentions and behaviors. Three of the theories most commonly cited in prevention literature and most often used as starting point for interventions are outlined below: the Health Belief Model, the Stages of Change, and the Social Cognitive Theory.

The *Health Belief Model* attempts to explain and predict health behaviors by focusing on the attitudes and beliefs of individuals. It was developed in the 1950s by Becker et al. to explain the lack of public participation in prevention and screening programs. They assumed that people feared diseases, and that health actions were motivated in relation to the degree of fear (perceived threat) and expected fear-reduction potential of actions and behavior (perceived benefits), as long as that potential outweighed practical and psychological obstacles to taking action (perceived barriers). Since then, the model has been adapted to explore a variety of health behaviors, including screening and sexual risk behaviors. A preventive intervention based on the Health Belief Model model needs to target the individual's perception of the levels of susceptibility and seriousness, and must also provide incentives to take action and provide a clear course of action to acceptable costs.

The *Stages of Change Theory*, developed by the psychologists Prochaska and DiClemente in 1982, conceptualizes the process of change as entailing five stages:

1. precontemplation (no intention to change behavior in the foreseeable future),
2. contemplation (awareness of a problem and seriously thinking about overcoming it),
3. preparation for action (intention to take action in the next month, history of failed action in the past year),

4. action (modification of behavior, experiences, or environment in order to overcome the problems),
5. maintenance (preventing relapse and consolidating the gains attained during action).

The rationale behind "staging" people is to tailor preventive efforts to a person's needs at his/her particular point in the change process. A variety of health-related behaviors have been explored in populations using the Stages of Change Theory, and the theory has been applied in the development of countless preventive interventions, such as smoking cessation, weight control efforts and mammography screening. For example, the American Centers for Disease Control and Prevention suggest the model as a starting point for HIV/AIDS counseling at clinics, so the counseling provided will be based on the client's particular stage.

The *Social CognitiveTheory* was launched by Bandura in 1986. According to this theory, a person's individual reality and behavior is formed by the interaction of the environment and his or her cognitions. A key construct of the theory is the concept of *self-efficacy*. Self-efficacy refers to the confidence in one's ability to behave in such a way as to produce a desirable outcome. A person with a high level of self-efficacy expects to succeed and will persevere in an activity until the task is completed. A person with low self-efficacy anticipates failure and is less likely to persist in challenging activities. Self-efficacy develops as a result of a person's history of achievement, from observations of successes and failures of others, from the persuasion of others, and from one's own physiological state (such as nervousness or anxiety). Bandura's theory has been extremely fruitful in developing techniques for promoting behavior change, and has been applied to a wide range of health problems, e. g. alcohol abuse or ► immunizations. Focusing on self-efficacy can be an effective starting point for preventive actions. Smoking cessation, for example, has been one of the most common health-related behaviors that self-efficacy has been linked to. The concept is also used in lifeskills training, especially for social and refusal skills in children and adolescents with regard to drugs.

Approaches to Context and Environmental Change

Over recent decades, evidence of the need to tackle the wider environmental and social issues that shape individual choices but are beyond individuals' control has emerged. This socio-ecological vision of individual change has been embraced by health promotion for two decades since the ► Ottawa charter, and it has influenced preventive efforts as well. The starting point of interventions based on this vision would be to focus on creating supportive environments for health, by changing context and structure in order to facilitate preventive behavior.

For example, providing health insurance coverage for breast cancer screening, improving access to screening facilities, and reducing waiting times for mammographies are structural changes that can positively influence utilization of ► screening tests. In terms of the prevention of childhood overweight and obesity, changing the school settings in ways that make the consumption of unhealthy and fatty food more difficult for the students can be very effective, e. g. by removing vending machines, preparing healthy breakfast in class, or modifying the canteen menu. Classical environmental approaches with positive preventive effects are reducing the exposition to environmental risk factors, e. g. by improving air and water quality, food safety and safety in traffic.

Cross-References

► Chemoprevention
► Health Strategy
► Immunization, Passive
► Mass Media
► Ottawa Charter
► Screening
► Target Group

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Prevention, Tertiary

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Synonyms

Rehabilitation; Treatment; Care

Definition

Tertiary prevention is a healthcare strategy that aims to prevent the progression of disease, to alleviate symptoms and to prevent subsequent disability after initial clinical diagnosis. After an acute event tertiary prevention interventions aim to reduce the risk of subsequent events, to prevent complications, and to avoid negative consequences. In chronic disease, interventions are designed to ease the consequences, such as preventing the occurrence of skin lesions in bed-bound persons. Tertiary prevention in fatal disease aims at the alleviation of symptoms. This definition, however, is not as clear cut as it seems. In particular, the distinction from secondary prevention is controversially discussed, e. g. in cardiology. To avoid further ambiguity several authors have recommended the redefinition of the terminology or even to cease using the term tertiary prevention. Moreover, tertiary prevention may simply be the treatment of an already diagnosed health condition and thus overlaps with ► medical care.

Basic Characteristics

Tertiary Prevention and the Concept of Functioning, Disability and Health

Tertiary prevention targets the consequences of a health condition and in particular aims at the maintenance or reestablishment of ► functioning and the minimization of ► disability. An internationally accepted framework and common terminology for the understanding of functioning and disability has been provided by the World Health Organisation (WHO) with its ► international classification of functioning, disability and health (ICF) (World Health Organization 2001). According to the ICF, functioning is an umbrella term encompassing ► body functions and ► body structures as well as ► activities and ► participation in society. Loss of functioning and therefore onset of disability occurs when an individual is impaired in body functions and structures, limited in carrying out activities such as carrying objects, or restricted in social participation such as having a job. Functioning and disability are influenced not only by the health condition, but also by ► environmental factors such as technologies or societal attitudes, and ► personal factors such as coping styles or health related behavior. Functioning and disability are universal experiences, i. e. everyone may experience disability at a certain point in his or her life e. g. due to a health condition or with aging. Moreover, two individuals of the same age with the same health condition can substantially differ in their level of functioning, depending on degrees of bodily impairment, activity limitations and participation restrictions as well as the influence of environmental and personal factors (Stucki 2005). Thus, tertiary prevention aims at the functioning of an individual in the context of his or her environment in conjunction with personal factors.

Value and Timing of Tertiary Prevention Interventions

The goals of tertiary prevention vary with the status of the health condition. The outcome of acute illness or injury depends not only on the provision of appropriate

medical and surgical care, but also on the early recognition of patients' needs with respect to functioning. Patient groups such as the elderly, people with a chronic condition and people already experiencing disability may even have an increased risk of additional loss in functioning. The goals of tertiary preventive intervention in the acute situation are to maintain and restore functioning, to prevent disability and to avoid the need for long-term care (Stucki, Stier-Jarmer et al. 2005). To give an example, patients in the acute hospital may be encouraged to regain mobility with the help of walking aides, or to participate in exercises in order to enhance muscle strength.

In chronic conditions, tertiary prevention strategies are to be applied as early as possible in order to halt progression of the disease process, to maintain or to minimize the loss in functioning, to facilitate recovery and to promote independence. The ultimate goal is to prevent disability becoming permanent (Pope and Tarlov 1991).

In health conditions with potentially fatal prognoses such as cancer or progressive neurological disease, medical and rehabilitative management may not lead to recovery. However, tertiary prevention is nevertheless of major importance to alleviate symptoms and to enhance participation and quality of life. To give an example, progressive muscular degradation in amyotrophic lateral sclerosis leads to irreversible respiratory failure. Appropriate tertiary preventive interventions aim at the support of respiratory function and prevention of pneumonia.

Main Issues of Tertiary Prevention

Symptom Control An acute and chronic health condition entails a wide array of primary and secondary symptoms and complications on the level of body structures and functions. In spinal cord injury, for example, lesions are associated with various dysfunctions of the nervous system and metabolic changes which in turn may cause e. g. urinary tract infections, respiratory infections, osteoporosis and insulin resistance (Biering-Sorensen, Scheuringer et al. 2006). These symptoms are often perilous and exert negative effects on functioning, including participation and quality of life. Thus, tertiary prevention tries to understand how these symptoms are affected by and affect other biomedical and psychosocial factors, and how they can be reduced or controlled.

Health Maintenance Despite the good survival prospects of certain acute diseases or injuries, health maintenance may require a significant effort. In spinal cord injury, for example, premature death is associated with level and severity of injury as well as with secondary complications and ► co-morbidity like diabetes mellitus and cardiac disease, but also with unhealthy lifestyles like smoking or physical inactivity, and poor economic status and participation (Krause, Devivo et al. 2004). To give another example, there is substantial evidence that increased mortality in patients with acquired brain injury persists even after the main event has been survived (Shavelle, Strauss et al. 2001).

Participation Human functioning and disability can be described as experiences of people with a health condition in the context of their resources, e. g. their personal abilities to cope with disease, and in the interaction with the environment (Stucki 2005). Against this background, participation is the societal aspect of functioning (World Health Organization 2001). Participation is a basic need of people with a health condition and of major importance to society. Tertiary prevention in chronic disease therefore ultimately aims at the maintenance or restoration of participation in major life areas, such as intimate relationships or work. In doing so, tertiary prevention strategies not only address the disease process but equally provide a facilitating environment and try to develop the performance of individuals in the interaction with their environment. Appropriate means, e. g. to support employability, may include the use of specially designed devices or the provision of adequate transport services.

Key Elements of Tertiary Prevention and Recommendations for Service Delivery

The main characteristic of tertiary prevention is the coordinated, ► multidisciplinary team approach for evaluation and intervention. Typically, this team consists of physicians, nurses, physical therapists, occupational therapists, speech therapists, clinical psychologists, social workers, and others. Patient and family/caregivers are to be involved as closely as possible in decision making and planning.

Recent clinical practice guidelines, e. g. for early post-acute and post-acute stroke care, emphasize the following essential key points (Duncan, Zorowitz et al. 2005):

- early assessment and intervention
- standardized evaluations
- ► evidence-based interventions grounded on functioning goals
- care provided by an experienced ► rehabilitation team
- patient, family and caregiver as part of the rehabilitation team
- patient and family education
- utilization of community resources for community reintegration
- ongoing medical management of ► risk factors and co-morbidities

Effectiveness of Tertiary Prevention

The ► effectiveness of tertiary prevention is assessed by human functioning and rehabilitation research. Since tertiary prevention interventions are extremely multifaceted, research aims not only towards single intervention products and procedures but also on the efficacy, effectiveness and efficiency of intervention programs and policies including health services organization, plus delivery and financing (Brandt and Pope 1997). There is a large body of evidence for the effectiveness of timely tertiary prevention. Appropriate rehabilitation management decreases mortality, dependency and hospitalization rates. Protocols to standardize tertiary preventive measures and follow-up (► disease management) have been developed for many chronic conditions. There are numerous groups who review the literature on medical treatment in order to advise clinicians on the optimal way to treat chronic conditions.

Barriers to Service Delivery

Although there is no doubt about the potential efficacy and effectiveness of tertiary prevention, its implementation often fails in clinical practice. This may have several underlying causes. Firstly, reimbursement systems are mainly based on diagnosis, not on functioning, resulting in inadequate funding of services aimed at the prevention of disability. Secondly, health care delivery is fragmented with little collaboration between the different service providers. Thirdly, the relative effectiveness of different interventions is often unclear, making it difficult to decide on those which are most appropriate. As interventions are typically a team effort of several health professional groups and related professions aiming at a multitude of functioning aspects, difficulties occur regarding the agreement upon the selection of ► outcome measures as well as the planning and realization of ► randomized controlled trials and ► observational studies.

Cross-References

► Activity
► Body Function
► Body Structure
► Co-morbidity
► Disability
► Disease Management
► Effectiveness
► Environmental Factors
► Evidence-Based
► Functioning
► International Classificationof Functioning, Disability and Health (ICF)
► Medical Care
► Multidisciplinary
► Observational Studies
► Outcome Measure
► Participation
► Personal Factors
► Randomized Controlled Trials
► Rehabilitation
► Risk Factor

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Preventive Medicine

► Health Care
► Public Health

Preventive Screening

► Disease Screening Practices

Preventive Services

Definition

Preventive services constitute the core of ► health services. They include primary prevention services (counseling and immunization), which are interventions undertaken before the onset of disease; secondary prevention services, such as screening tests and examinations for early detection, eradication and control of diseases; and tertiary prevention services, which involve treatment and counseling (rehabilitation) for symptomatic diseases to prevent progression and development of complications.

Primaquine

Definition

Primaquine is derived from the alkaloids of the bark of the South American cinchona tree (quinine and quinidine). In cases of infections with *Plasmodia ovale* and *P. vivax*, parasites can remain dormant in the liver (so-called 'hypnozoites'). As primaquine impairs the cellular function of the parasites, this substance should be administered to prevent relapses. Treatment lasts for 14 days. Side effects are gastrointestinal symptoms, like a loss of appetite, nausea, vomiting or stomach ache. Prior to the administration of primaquine, a deficiency of glucose-6-phosphat-dehydrogenase has to be excluded, as hemolysis would otherwise occur.

Primary Care

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Synonyms

General practice

Definition

There is no single definition of primary care. In general, it can be described as the provision of integrated, comprehensive, and accessible health care services by physicians who are responsible for addressing the majority of an individual's health care needs that are not performed on an emergency basis. Except for emergencies, the primary care practitioner is the enrollee's first point of contact with the health care system and develops a partnership with his or her patients in the context of the community and the family.

Basic Characteristics

History and Context of Primary Care

One of the key institutions that influenced thinking about primary care was the World Health Organization (WHO). Although primary care was already mentioned in several publications, especially in the Anglo-American countries, the definition that was developed by the WHO at the International Conference on Primary Health Care in 1978 enhanced interest in primary care on an international level. Yet, the definition was not interpreted similarly by each country due to differences in industrialization, philosophy of government, health

care services, and wealth. Thus, one key issue around primary care in those days was the fact that it was considered differently throughout the world. In different studies, primary care was interpreted as, for example, "whatever a certain group of health care providers did", "a set of activities", "a level of care or setting", "a set of attributes", or "an organizational strategy". This resulted in a refined definition by the Institute of Medicine of the United States, which is close to the definition stated above. This refined definition clearly stated primary care as a function to which health care professionals contribute by using their expertise and skills. The objectives of primary health care are to achieve a high quality of care and desired ► health outcome, to ensure high levels of patient satisfaction, and to use the resources efficiently. As many countries are facing increasing health care costs, primary care is seen as one key element for an affordable, effective, and sustainable health care system. Within managed care, the focus was put on the cost containment element of primary care, with the primary care physician acting as a gatekeeper. This gatekeeper role sometimes contradicts with the objectives of establishing trusting relationships with patients and balancing between the best interests of patients and the best interests of those working in the health care system.

Primary Care Delivery

Different forms of primary care delivery evolved depending on the health care system and other contextual factors in the respective country. In general, health care systems can be differentiated into systems that are based on primary care, and systems and that are often more hospital based. In many of the primary care based systems, like in the UK or the Netherlands, the primary care physician, in most cases a ► general practitioner, is in a gate-keeping role as he or she can refer the patient to the ► secondary care system of specialists and hospitals. This is different in pluralistic systems like Germany and France where access to general practitioners and medical specialists exists in parallel, although this is about to change in the German statutory health system where ~ 90% of Germans are health insured.

The provision of primary care is performed by physicians who are educated and trained for delivering comprehensive first contact and continuing care for persons with any undiagnosed sign or symptom. The responsibilities of primary care physicians include health promotion, disease prevention, health maintenance, counseling, patient education, and diagnosis and treatment of acute and chronic illnesses in various health care settings. The primary care physician often collaborates with other health professionals and utilizes consultation or referral whenever appropriate. The primary care physician is a generalist physician or general practitioner who is based in the community as opposed to the hospital in most countries. However, in the recent past there has been a tendency towards offering more primary care oriented responses at emergency departments as well. This is driven by the fact that a large number of patients attend hospital emergency departments with minor injuries and conditions that would have been suited to the capabilities and facilities of a primary care setup.

Primary care physicians often work in partnerships of different sizes and have a different number of employees to provide clinical and non-clinical support. The size and composition of those general practice partnerships differs significantly between countries. In the UK, only around 10% of practices are single-handed practices, whereas in the Netherlands, around 54% are solo practitioners. Reasons for the increase of larger teams instead of solo practice are a desired improvement in quality in combination with constraining costs by utilizing ► economies of scale and ► economies of scope.

Public Health Elements Within Primary Care

As primary care physicians are often located in the community or—when based in the hospital—at least have to remain connected with the community, they can play a vital role in addressing some of the future health problems. Some examples for those future health issues that are currently the focus of public health efforts are the aging society, the resulting burden of ► degenerative diseases, high-risk behavior of many individuals, unhealthy habits, high rates of population growth, and increasing poverty in large parts of the world. Public health aims at preventing diseases, prolonging life, and promoting health in the society. Traditionally, the primary care physician's perspective is restricted to the care of his or her individual patients and there is a focus on medical interventions and care of the sick, with prevention playing only a minor role. To bridge the gap

between primary health care and public health, across-the-board cooperation seems inevitable. This could produce better results and more value for the individual as well as for the community. As general practitioners also live in the area where they have their practice in many cases, they also get insights about the community from their patients. This qualitative information, in combination with the patients' registration data, could be used by public health doctors for their epidemiological research and health care planning. By collecting and assessing community information received from different general practitioners, the public health doctors could also support the primary care physicians.

Conclusion

Due to differing health care systems across the world and the different evolutionary stages of these systems, each country has a distinct setup of primary care and faces different challenges within this context. As primary care is one key element of each health care system, it is usually affected by all major policy changes within the health care system. However, there are also overarching topics that apply on an international level. Modern health care systems aim at being safe, effective, efficient, patient-centered, and equitable. As primary care is an essential part of each health care system, those objectives are most relevant for primary care. To improve primary care further, it has to be developed and enhanced to be an integral part of each health care system, especially when they are still evolving.

Cross-References

- ► Degenerative Diseases
- ► Economies of Scale
- ► Economies of Scope
- ► General Practitioner
- ► Health Outcomes
- ► Secondary Care

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Primary Care Case Management (PCCM) (U.S.)

Definition

In the US, Primary Care Case management (PCCM) is the most prevalent form of running ► medicaid ► disease management programs that lies between traditional ► fee-for-service payment of providers and risk-based managed care of ► health maintenance organizations (HMOs). Under PCCM, patients choose a Primary Care Provider (PCP) who coordinates their health care services, provides preventive health care services and acts as a gatekeeper to expensive specialty services. They include among others primary care physicians, clinics and group practices. PCPs are generally paid on a fee-for-service basis and receive compensation for their case management tasks. Medicaid offers PCPs professional education programs, medical treatment guidelines and other support systems.

Primary Care Information System

Definition

A primary care information system is an ► information system for processing ► data, information and knowledge in the context of primary health care. Primary

care systems are used for keeping electronic patient records, organization of administration, financial activities, reporting, statistics, and research. They have been developed in countries with strong primary health care systems, such as the Netherlands, Great Britain and Scandinavian countries.

Primary Care Physician

► General Practitioner

Primary Complex of Tuberculosis

Synonyms

Tubercle

Definition

Within 6 weeks of infection a so-called primary complex of tuberculosis develops as an infection of the site of entry and local lymph nodes. As these inflammatory foci are surrounded by the cells of the body's defense mechanism (macrophages), rounded nodules ("tubercles") appear. Within the tissues calcifications develop and can be seen on X-ray. Inside these encapsulated areas mycobacteria can remain dormant for several years.

Primary Dental Care

Definition

Primary dental care is provided by dentists or dental auxiliaries who have the first contact with a patient demanding dental treatment or care. These first contacts occur in a dentist's office, in dental clinics, public dental services, dental wards of the hospitals, in universities or in home visits. About 90% of the demands for dental treatment can be met by the primary care provider. These include treatment of acute and chronic oral illnesses, preventive care and oral health education for all ages and both sexes.

Primary Dentition

Definition

The primary dentition comprises 20 milk (baby) teeth, which are replaced by 32 permanent teeth.

Primary Health Care

Synonyms

Universally accessible care

Definition

Primary health care is concept of health care that was introduced after an international conference in Alma Ata in 1978 organized by the World Health Organization and the UNICEF.

The Alma Ata conference defined primary health care as follows:

"Primary health care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-determination".

WHO member countries accepted primary health care as the key to achieve the goal of "Health for all".

Basic principles of primary health care include equitable distribution, community participation, intersectoral cooperation and appropriate technology. Health services must be accessible to all irrespective of their ability to pay and regardless of place they live (urban, rural). Community must participate in planning, implementation and maintenance of health services. Cooperation with other sectors such as agriculture, food, industry, education, communication is needed for successful provision of health services. Appropriate technology means primarily technology that is scientifically approved, affordable and adaptable to local needs.

Primary Patient Data

Definition

Primary patient data are those obtained from the original data source – all documentation in the patient's

health record, as well as hospital reports, daily ward census etc. Primary data are usually detailed, poorly structured, incomplete and inaccurate.

Primary Research

Definition

In primary research, data are collected specifically for the study at hand. Data can be obtained by the investigator either observing the subject or phenomenon being studied or communicating directly or indirectly with the subject.

Primitive

► Indigenous

Principal

► Employer

Principal Component Analysis

Definition

A statistic dimensionality reduction technique that chooses new coordinate systems for the data so that the first axis will have the largest variance, the second axis the second largest, to capture the greatest variance in the model with the fewest axes. This is used in gene expression analysis to determine which characteristics of gene expression are important to divide genes into significant groups.

Principal component analysis is an advanced statistical method for examining the relationships among a set of variables without identifying a specific response variable. It explains as much variability (expressed by their correlation or covariances) as possible in terms of a few linear combinations (principal components) of the variables. This technique is often used when there are large numbers of variables, and there is a need to reduce them to a smaller number of variable combinations by combining similar variables (ones that contain much the same information). It is a linear dimensionality reduction technique, which identifies orthogonal directions of maximum variance in the original data, and projects the data into a lower-dimensionality space formed of a sub-set of the highest-variance components. Principal component analysis of qualitative data is a synonym for correspondence analysis.

Principle of Equal Treatment

► Equality

Principle of Equivalence

Definition

The principle of equivalence is employed in private ► health insurances to calculate the premiums. Each person insured contributes according to his or her individual risk profile determined by age, sex and ► health status. The premium is in this sense equivalent to the individual risk situation. In contrast to the principle of equivalence, there is the ► principle of solidarity employed by social insurances. Contributions in social insurances represent the same percentage of the income and all contributors receive the same provisions of health care.

Principle of Fair Treatment

Synonyms

Equity

Definition

The principle of fair treatment is about "fairness". Fairness and being equal are not necessarily the same things. Inequality can be fair if there are differences in need, or differences in contribution, effort or deserve. Scarcity is – the same as for efficiency – the reason why equity is interesting. If resources were not scarce, it would be fair for people to consume as much as they want or need of any particular commodity, including health care. However, because of scarcity, we have to judge what a fair allocation might be.

Equity is the principle of being fair to all persons, with reference to a defined and recognized set of values.

Cross-References

► Equity

Principles of Genetics

► Genetic Principles and Genetic Variations

Principle of Solidarity

Definition

The principle of solidarity is employed in social ► health insurances to calculate the contributions of the insured. Each person insured pays the same percentage of its income into the health insurance; children and unemployed family members are typically free of any contribution. The principle of solidarity balances the different economic situations of its members as they all receive the same kind of treatment. This principle is the major point of difference between social health insurances and private health insurances. Private health insurers calculate their premiums according to the ► principle of equivalence taking into account only the individual risk situation without considering any economic aspects.

Privacy

Synonyms

Confidentiality; Data protection; Private sphere protection

Definition

Privacy refers to the right of the individual to do certain things without anyone seeing or interfering. In a public health context, it refers to the right of the individual to control the disclosure of personal information. In many countries it is now regulated by specific laws. It is based on the principle of ► autonomy and it is meant to protect the individual's right over his own personal information. In public health practice it brings about ethical conflicts when such information would be needed for programs aimed at protecting the common good.

Privacy is a human right of individuals and aims to protect their personal sphere. The Universal Declaration of Human Rights states, "no one shall be subjected to arbitrary interference with his privacy". The privacy right allows a person to control, limit or exclude others from access to his private personal sphere and to information about this sphere.

Privacy Rights

Definition

Privacy rights in health care describe the right of each patient that all information concerning his health is kept confidential by all providers of health care. In most countries providers of health care, i. e. physicians, laboratories, etc, are not allowed to disclose medical information to a third party unless the patient has explicitly granted access. Privacy rights protect patients against discrimination on the grounds of certain medical conditions in the workplace or in other areas of society.

Private Health Insurance

Synonyms

Voluntary health insurance

Definition

Private health insurance calculates actuarially fair premiums. Three functions of private health insurance can be distinguished: alternative, supplementary, and complementary or double-cover private health insurance. In many countries, private health insurance is regulated heavily in order to avoid problems of ► adverse selection and to obtain comprehensive coverage. In these cases, the borderline between private health insurance and ► social health insurance becomes blurred.

Private Health Insurance, Alternative

Definition

Private health insurance schemes may be the only system of coverage available for some part of the population. Private health insurance thus performs the function of an alternative to ► social health insurance.

Private Health Insurance, Complementary

Synonyms

Double-cover private health insurance

Definition

Individuals who are entitled to benefits elsewhere may purchase complementary private health insurance that covers at least partly the same benefits.

Private Health Insurance, Supplementary

Definition

Supplementary private health insurance schemes offer coverage for services not covered or not completely covered elsewhere.

Private Law

Synonyms

Civil law

Definition

Private law consists of the legal rules that govern the individual rights and legal relationships between legal subjects on the assumption of a co-equal interrelation. Private law typically governs the relationship between two individuals when concluding a contract (e. g., a purchase agreement). In addition, private law is also applicable if an administrative agency enters into a legal relationship with individuals and other private subjects on the premise of a co-equal relationship (e. g., agreement on the purchase of office materials). As particular areas, private law includes the law of obligations (which includes contracts and tort law), the law of property, the law of succession and family law.

Private Sphere Protection

► Privacy

Probability

Definition

Probability is the measure of how likely an event is – a quantitative description of the likely occurrence of a particular event. Probability is conventionally expressed on a scale of zero to one. A rare event has a probability close to zero. A very common event has a probability close to one. The classical definition of probability states that probability is shared equally between all the possible outcomes and works well for situations with only a finite number of equally likely outcomes. Frequentists defines that the probability of an event is its relative frequency over time. This implies that the probability can be determined only by repeated trials in which the observed result converges to the underlying probability in the long run. Subjectivists, also known as *Bayesians*, give the notion of probability a subjective status by regarding it as a measure of the degree of belief of the individual assessing the uncertainty of a particular situation. In biostatistics, the term probability is most frequently used to describe the likelihood that an event will or will not happen, the degree of certainty regarding the relationship of two or more variables and the level of confidence that what you think is real actually is real.

Probable Case

Definition

A case classified as probable in an outbreak usually has the typical clinical features of the disease but does not have laboratory confirmation.

Probiotics

Definition

Probiotics are defined as living microorganisms which, if present in sufficient amounts in the intestine, have a positive effect.

Problem Behavior

Definition

A set of co-occurring behaviors in adolescence that is associated with a common set of precursors and a common set of later life outcomes. The problem behaviors include substance use (alcohol, tobacco, marijuana, and other drug use), risky sexual behavior (early adolescent sexual initiation, multiple sexual partners, non-condom use), problems at school (e. g. truancy, school drop-out, fighting), and problems in the community (e. g. gun violence, gang participation).

Process Evaluation

► Formative Evaluation

Prodromal Schizophrenia

► Schizotypal Disorder

Product Evaluation

► Summative Evaluation

Professional Care Giving

Definition

When treatment or care for a medical, psychological or other problem is provided by a paid professional (e. g. physician, nurses, therapist, social worker) versus a family member.

Professional Ethics

Definition

Professional ethics is concerned with the ethical dimensions of a specific profession, including the development of a code of conduct for the health professionals themselves. More and more, the professional ethics of different countries conform to universally accepted values.

Prognosis

Definition

It is generally accepted that prognosis can be regarded as a set of outcomes and their associated probabilities following the occurrence of some defining event or diagnosis that can be a symptom, sign, test result or disease. Prognostic factors are those which are associated with outcomes, and come in many varieties, such as clinical signs, symptoms, test results, medications, demographic factors, or lifestyle behaviors. For acute diseases, prognosis is usually expressed as a case fatality ratio and for chronic diseases, as a probability of survival.

Program Evaluation

► Summative Evaluation

Program Planning

► Intervention Concepts in Prevention

Projections

► Prospects for the Future

Prolonged or Preterm Rupture of Membranes (PROM)

Definition

Premature (before 37 weeks) or prolonged rupture of membranes refers to cases where the amniotic membranes of a pregnant women rupture before labor contractions begin.

Promotion of Mental Health

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Definition

Activities of mental health promotion imply the creation of individual, social and environmental living conditions that enable optimal psychological and psychophysiological development. Such initiatives involve individuals in the process of achieving positive mental health, enhancing quality of life and narrowing the gap in health expectancy between countries and groups.

Basic Characteristics

Introduction

Mental disorders are highly prevalent, their treatment is expensive and the lost quality of life of their sufferers is enormous. Hence, successful ► prevention of mental disorders is urgently required. Recent reports focusing on prevention research (e. g., WHO 2004) showed a strong endorsement of the need for continued exploration of the interface between

- potentially modifiable biological and psychosocial risk and protective factors,
- outcome prevention research focused on risk reduction, and
- broader collaboration among scientific disciplines and the dissemination of existing approaches.

Risk Factors and Protective Factors

Prevention of mental ill health and promotion of mental health address individual, family, community, and social determinants of mental health by reducing risk factors and strengthening protective factors. For children and adolescents schools are crucial settings for prevention procedures, accordingly for adults workplaces, because people spent large parts of their time in those places. Brown and Sturgeon (2005) named different risk factors as well as protective factors that are relevant in mental health (see Table 1).

Noteworthingly, showing different risk factors has not automatically and directly, the consequence of suffering from a mental illness during lifetime. Risk factors also can indirectly influence the environmental circumstances of their sufferers and, so, advantage the onset of a mental disorder.

Taking all identified risk factors into account, there are biological, emotional, behavioral, cognitive, interpersonal or related to the family context determinants that have an impact on mental health. This impact might be stronger during sensitive periods across the life span (e. g. early childhood, see Tables 2 and 3).

Prevention Strategies and Prevention Research

► Universal prevention strategies (i. e. macro strategies) can improve mental health and reduce the risk of mental disorders. There are some successful major macrostrategies, for example, improving nutrition (most successful was the combination of improving nutrition with counseling and psychosocial care); improving housing; improving access to education (low levels of education tend to be more prevalent in women, especially in South Asia and sub-Saharan Africa), reducing economic insecurity; strengthening community networks (e. g. Community that Cares, CtC programs, which have been successfully implemented in several hundred communities of the USA); multimodal school programs (e. g., Seattle Social Development Project); and reducing the harm from addictive substances (tax increases can reduce the incidence and prevalence of nicotin and alcohol abuse and of related medical illness, e. g., liver disease) (WHO 2004).

However, universal strategies need much more resources and are often less effective than selective and indicated prevention programs. Therefore, recent programs focused mainly on ► selective prevention or ► indicated prevention. The NHI recommends that attention be paid to smaller, focused, and intensive longitudinal prevention studies, informed by basic research. For selective prevention, a target population (showing a higher risk for mental disorders than the average) has to be identified. The home-visiting-program (i. e., two-year period of home visits by trained nurses) represents a very successful selective prevention program. Impoverished adolescents pregnant for the first time were the target population at risk. Randomized controlled trials showed benefits for the newborns in reducing low birth weight (increase of up to 400 grams), a 75% reduction in preterm delivery, more than a two-fold reduction in emergency visits and a significant reduction in child abuse among unmarried teens. Both children (higher IQ scores than control group, less likely to have problems with alcohol or drugs at the age of 15 years) and their mothers (e. g., increased employment) did benefit from the intervention. Families were better off financially. Last, the reduced government's costs for such families com-

Risk factors	Protective factors
Access to drugs and alcohol	Empowerment
Displacement	Ethnic minorities integration
Isolation and alienation	Positive interpersonal interactions
Lack of education, transport, housing	Social participation
Neighborhood disorganization	Social responsibility and tolerance
Peer rejection	Social services
Poor social circumstances	Social support and community networks
Poor nutrition	
Poverty	
Racial injustice and discrimination	
Social disadvantage	
Urbanization	
Violence and delinquency	
War	
Work stress	
Unemployment	

Promotion of Mental Health, Prevention of Mental Illness, Table 1 Risk factors and protective factors in mental health

Promotion of Mental Health, Prevention of Mental Illness, Table 2 Risk factors for mental health

Biological	Low birth weight, perinatal complications, neurochemical imbalance, physical illness or organic handicaps, sensory disabilities
Emotional	Low self-esteem, emotional immaturity and dyscontrol
Cognitive and behavioral	Academic failure, scholastic demoralization, reading disability, attention deficits, poor work skills
Interpersonal	Social incompetence, loneliness, isolation, communication deviance
Related to the family and environment	Parental mental illness (incl. substance abuse); child abuse and neglect; early pregnancies; family conflict or family disorganization; low socioeconomic status; exposure to aggression, violence, and trauma; personal loss-bereavement

Promotion of Mental Health, Prevention of Mental Illness, Table 3 Protective factors for mental health

Psychological constitution	Autonomy, feelings of security, literacy, intelligence
Emotional skills	Problem-solving skills, sufficient stress management, adaptability, pro-social-behavior
Related to the family and environment	Social support of family and friends, good parenting, early cognitive stimulation, positive parent-child-interaction, social and conflict management skills, socioemotional growth

pensated for the program's cost (Brown and Sturgeon 2005). However, the translation of this very successful program did not work. Olds et al. (1999) tried to replicate the program using paraprofessionals (instead of trained nurses) in a large effectiveness trial but found less dramatic and less significant results. The authors pointed out that the nurses have to be the key to the effort of the program. Another successful program was "First step", a school multimodal program for children at risk (Walker et al. 1998).

The difference between selective prevention programs and indicative prevention is fluent. Existing studies often do not use standardized instruments to distinguish between subclinical and clinical symptoms, as Durlac and Wells in an analysis of 130 studies showed. The authors found out that behavioral and cognitive-behavior programs for children with subclinical disorders (i. e., target group for indicative prevention) appear as effective as psychotherapy for children with established problems (i. e., secondary prevention) and more effective than attempts to prevent adolescent smoking, alcohol use, and delinquency (i. e., universal prevention).

To optimize prevention research, a new emphasis is needed on prevention effectiveness trials, prevention services, and costeffectiveness of preventive strategies. Research on relapse prevention and naturally occurring prevention is of high importance as well.

Cross-References

- ► Indicated Prevention of Mental Disorders
- ► Prevention of Mental Disorders
- ► Selective Prevention of Mental Disorders
- ► Universal Prevention of Mental Disorders

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Promotion of Oral Health

► Oral Health Promotion

Propagated Outbreak

► Person-to-Person Transmission Outbreak

Prophylactic Measures Following HIV-Exposition

► Postexposition Prophylaxis (PEP) in HIV-Infection

Prophylactic Therapy of Malaria

► Malaria Chemoprophylaxis

Prophylaxis of Insect Bites

Synonyms

Prevention of insect bites; Prophylaxis of insect stitches; Prevention of insect stitches

Definition

To avoid insect bites, covering clothing should be worn, that means, longs trousers, long sleeves, socks and closed shoes. Light colors should be preferred as mosquitoes are attracted by dark colors. In areas at risk of insect bites, exposed and uncovered parts of the body should be treated with repellents (diethyltoluamid, DEET). As many mosquito species are night-active, going out of doors cannot be recommended in the evening and at night. In tropical regions people should sleep under a mosquito net, the protective effect of which can be increased by an impregnation with 1% permethrin. It is important that the mosquito net does not have any holes, it should be kept close and the entrance parts should overlap sufficiently in order to prevent the insects from entering. As mosquitoes can also bite through the net, it must not rest directly on the skin. The net has to be carefully tucked under the mattress to avoid it slipping out due to movements during sleep.

Cross-References

- ► Tropical Diseases and Travel Medicine

Prophylaxis of Oral Diseases

► Prevention of Oral Diseases

Proportion

Definition

A proportion is the ► ratio of the absolute frequency (x) of a unit of observation that possesses a certain

specific characteristic (belonging to a specific category or class interval) and the total number (n) of units of observations: $p = x/n$. This relative frequency can be expressed as a percentage: $p(\%) = x/n \cdot 100$. A proportion is a type of ratio in which the numerator is a component of the denominator. Proportions can be interpreted as the equivalent of ► probability, because one of the definitions of probability (empirical probability) is based on relative frequencies. Proportion, like probability, always has values between zero and one.

Proportion of Agreement

Definition

Proportion of ► agreement represents the simple proportion of an identical measurement made by two or more raters or measurement procedures for categorical data, such as diagnosis. In contrast to ► kappa coefficient, simple proportion of agreement can be misleading because it does not take into consideration the amount of inter-rater agreement expected by chance.

Proportional Hazard Regression

► Cox Proportional Hazards Regression

Proportional Mortality Ratio (PMR)

Definition

Ratio calculated in a method analogous to that for SMR but when, in each age group, the population size is replaced by the number of all-cause deaths. Thus, the rates are replaced by the proportions of all deaths due to the cause of interest.

Propositus = Client

► Consulter in Genetic Counseling

Prospective Budgets

Definition

Prospective budgets are a method of financing hospitals based on historical spending. According to historic budgets and the specific functions of a hospital, prospective budgets are annually established to reimburse hospitals for the treatment of their patients. Prospective budgets do generally not incorporate incentives for the hospital to spend less than the budget fixed before. Under the persisting financial constraints in the hospital sector, many countries changed during the last 20 years their financing method for hospitals towards ► per-case payments based on ► Diagnosis Related Groups (DRGs).

Prospects for the Future

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P

Synonyms

Projections

Definition

Projections of future developments

Basic Characteristics

The human and material damage caused by many disasters can be reduced if adequate measures are taken (► disaster response; ► mitigation strategies; ► recovery strategies). Alone, extension of the temporal horizon of forecasts of extreme events (e. g. floods and droughts); improvements in their accuracy and reliability; and progress in warning, its dissemination and penetration, and response to warnings (► health warning systems) could save many lives and considerably reduce human suffering and material damage. Changes in the risk of natural disasters (► hazards, natural) depend on the population, economic growth and the quality of the preparedness system.

However, humankind will never be free of natural disasters generated by extreme geophysical (climatic, hydrological, seismological, volcanic) events and disasters caused by man (► hazards, technological). Potentially, the most disastrous event could be collapse of a large man-made infrastructure object, such as a large dam break, jeopardizing people living downstream. In some areas, population density in the vicinity of the river downstream from large dams is high (including large cities).

The September 11 tragedy (opening a new, post-9/11 era in security precautions) unveiled the possibility of emergence of new man-made disasters – "innovative" and inhuman acts of violence, aimed at massive killing, where maximizing the number of anonymous fatalities is the terrorists' target. This was also the terrorists' objective behind the use of the deadly sarin nerve gas in the Tokyo subway, and the bombs in the Madrid and London transportation systems.

Possible causes of hypothetical future disasters are: a gigantic asteroid colliding with the planet Earth, a mega-tsunami (the record consequences of the tragic event of 26 December 2004 are not the absolute limit and can be exceeded), and global climate change, which – in the long-term – may severely and adversely affect the life support system in many areas. Climate change itself can indeed generate a disaster. Ultimate changes due to the finite Sun's lifetime are expected but not in the time scale of human perception (of the order of billions of years). Changes in solar activity and in parameters of the trajectory of Earth's movement around the Sun generate climate changes at large time scales (e. g., many thousands of millennia – like glaciation periods). In the past, sudden climate change, e. g. induced by the fall of a large meteorite or strong volcano eruption, caused severe effects such as extinction of the dinosaurs or – more recently – hunger during and after "the year without summer" (1816), respectively.

There is an increasing body of evidence regarding the ongoing planetary climate change (global warming) that is attributable to human activities, such as the rising emission of ► greenhouse gases (carbon dioxide, methane, nitrous oxide, etc) leading to buildup of greenhouse gases in the atmosphere and enhancement of the ► greenhouse effect, and land-use changes (e. g. deforestation in tropical areas). The global climate system has been driven out of the stable, natural variability mode. Consequently, every single year from the period 1997–2006 made it to the list of ten warmest years globally in the global instrumental temperature observation records, which date back to 1860. Future warming depends on scenarios of socio-economic development and on the mitigation policy (curbing the greenhouse gas emissions). Projected temperature changes differ regionally, being model- and scenario-specific, with a global mean temperature for 2100 predicted to be 1.0 to 6.3°C higher than 1980–1999. Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) defines international policy efforts in terms of avoidance of a level of greenhouse gas concentrations beyond which there is "dangerous interference with the climate system".

There have been ongoing changes in other climate-related variables, such as precipitation (growth in some areas, decreases in other areas of the Globe), river flow, glacier extent, and sea level. The area of the Globe's surface with very wet or very dry status has been increasing and the water cycle has accelerated. Various extreme events are expected to change in magnitude and/or frequency and location with global warming. In some cases, significant trends have been observed in recent decades.

In many areas, an increase in intense precipitation has been observed, which can be translated into increased flood hazard. Even stronger changes are projected for the future.

The Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report identified five "reasons for concern" about climate change, whose seriousness increases with global warming (Table 1).

Any regional increases in climate extremes (storms, floods, cyclones, droughts, etc.) associated with climate change are likely to cause physical damage, population displacement, and adverse effects on food production and freshwater availability and quality. Adverse health effects would increase, particularly the risks of infectious disease epidemics in developing countries. Already at present, diarrheal diseases attributable to unsafe water and lack of basic sanitation cause numerous (nearly 2 million) deaths a year worldwide. The projected increase in frequency and severity of droughts would exacerbate the situation. Malnutrition affects every third human, dwarfing most other diseases. The increased risk of extreme events caused by climate change is likely to worsen the situation and exert an adverse human health impact.

Prospects for the Future, Table 1 Reasons for concern related to projected climate change

Reason for Concern	Specification
Unique and Threatened Systems	Warming harms several such systems, in particular coral reefs, glaciers, and polar ecosystems, some of which are already adversely affected by the temperature increase to date.
Extreme Events	The frequency and magnitude of many extreme climate-related events (e. g., heat waves, intense precipitation, and tropical cyclones) are likely to increase.
Distribution of Impacts	Developing countries are more vulnerable to climate change than developed countries. Even a small warming has negative impacts on some regions (many developing countries), while large warming would have negative impacts on most regions.
Aggregate Impacts	Due to a small warming, most people of the Globe are likely to be adversely affected. For large warming, the impacts are likely to be negative in all metrics.
Large-Scale Singularities	Climate change may trigger large-scale singularities, such as deglaciation of the Greenland ice sheets and the West Antarctica Ice Sheet (WAIS), and slowdown of thermohaline circulation.

The 2003 European heat wave killed many thousands of people, showing that even developed countries may not be adequately prepared to cope with extreme heat. There were 10 days with temperatures over 35°C in Paris, and mortality in the time period from 1 to 20 August increased by 55%, as compared with earlier years. Occurrence of a heat wave as extreme as the one in Europe in August 2003 would be unlikely in the absence of anthropogenic climate change. An individual extreme event, such as extreme flood or heat wave, cannot be directly attributed to climate change. However, the probability of an extreme event of a given intensity (magnitude) is likely to increase in the future. Hence, these excess deaths, caused by heat wave, can be linked to climate change. An increase in the frequency or intensity of heat waves in the future, warming, climate will increase the heat-caused risk of mortality and morbidity, particularly in older age groups (sick people, lonely people) and among the urban poor.

Potentially disastrous effects can be caused by transmission of infectious diseases. Despite modern health care, a re-emergence of ► tuberculosis has been observed and there is ubiquitous occurrence of the ► HIV/AIDS pandemic. Even if the consequences so far have not been disastrous, recent emergence of avian influenza (virus H5N1) and Severe Acute Respiratory Syndrome (► SARS), with confirmed cases of infections (and deaths), quarantine, and material losses, have raised considerable concern. Globalization and human mobility in the global village have led to connectivity between remote regions and continents at unprecedented levels. While in the past, the incubation period (between exposure to a pathogen and the development of disease symptoms) was substantially shorter than a long-distance journey, now, with contemporary air speeds, travel times are shorter. If H5N1 mutates into a virus that can be transmitted among humans, it can be disseminated worldwide with potentially ravaging effects, leaving no place on Earth potentially safe from emerging infectious disease.

Cross-References

► Disaster Response
► Hazards, Natural
► Hazards, Technological
► Health Warning Systems
► HIV/AIDS
► Mitigation Strategies
► Recovery Strategies
► SARS
► Tuberculosis

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Protease-Inhibitors (PI)

Synonyms

Drugs to treat AIDS; AIDS-therapeutics; Anti-HIV medications; Antiretroviral medications

Definition

Protease-inhibitors (PI) interfere with the production of infectious viral particles. Due to their short plasma half-life they have to be taken thrice daily. By combination with ritonavir (RTV, Norvir™) the plasma half-life can be lengthened, which is why ritonavir is called a "booster". Ritonavir is only licensed as a booster. Available protease-inhibitors are nelfinavir (NFV, VIRACEPT®), amprenavir (APV, Agenerase®), indinavir (IDV, CRIXIVAN®), saquinavir (SQV, FORTOVASE®, INVIRASE®), lopinavir/ritonavir (LPV/RTV-booster, Kaletra®), atazanavir (ATV, REYATAZ®), fosamprenavir (FPV, Telzir®) and tipranavir/r (TPV, Aptivirus®). Long-term treatment with protease-inhibitors has a negative influence on fat metabolism.

Protection Motivation Theory

Definition

Protection motivation theory has originally been proposed to provide conceptual clarity to the understanding of fear appeals. Later the theory has been extended to a more general theory of persuasive communication, with an emphasis on the cognitive processes mediating behavioral change. It describes coping with health threat as the result of two appraisal processes: a process of threat appraisal and a process of coping appraisal, in which the behavioral options to diminish the threat are evaluated. The appraisal of the health threat and the appraisal of the coping responses may result in the intention to perform adaptive responses (protection motivation) or may lead to maladaptive responses i. e. not participating in breast cancer screening.

Protein Folding Problem

Definition

The prediction of the tertiary three-dimensional structure of a protein from the primary sequence of amino acids in a protein. This unsolved problem derived its complexity from the large number of possible configurations each bond angle can have.

Proteome

Definition

Two possible definitions. The complete proteome is the complete set of proteins that can be produced by one or a group of cells. This is more related to the static characteristic of genome. The cellular proteome is the set of proteins that is present in the cell at a specific time point under a specific environmental condition. This is more related to the dynamic nature of the ► transcriptome.

Proteomics

Definition

Proteomics is the collective study of protein products. Proteomics also includes the study of the structure and

function of proteins, including the way proteins function and interact. Using high throughput technologies, such as PAGE followed by mass spectrometry, thousands of proteins can be resolved and identified in a single experiment.

Protozoa

Synonyms

Single-celled eukaryotes; Unicellular organisms

Cross-References

► Zoonotic and Parasitic Infections

Provider

Definition

The term provider refers to a hospital, licensed health care professional, or group of hospitals of health care professionals that provide health care services to patients. Providers may also include medical supply firms and vendors of durable medical equipment.

Provider Fatigue

Definition

The daily demands of critical care nursing, including psychosocial stressors, heavy patient workloads, and noxious sensory stimuli make healthcare staff particularly vulnerable to fatigue, and subsequently to accidents and errors. The study of health care provider fatigue is therefore of crucial importance to the promotion of safe patient care environments.

Providing

► Social/Emotional Support

Providing of Dental Care/Oral Health Care

► Delivery of Dental Care

Provisional Injunction

► Preliminary Injunction

Provision of Dental Care/Oral Health Care

► Delivery of Dental Care

Pruritus

► Itching

Pseudo-Croup

► Spasmodic Croup

Pseudoneurotic Schizophrenia

► Schizotypal Disorder

Pseudopsychopathic Schizophrenia

► Schizotypal Disorder

Pseudorubella

► Erythema subitum

Psychiatric Sociology

► Social Psychiatry

Psychiatry

Definition

Psychiatry is the medical specialty that addresses the prevention, diagnosis, and treatment of mental illness and substance use disorders. There is usually extensive training required after medical school to become

a psychiatrist, especially for further sub-specializations like adolescent psychiatry, geriatric psychiatry, forensic psychiatry, psychopharmacology, or psychoanalysis. The psychiatrist is in most cases the best-qualified physician to differentiate between physical and psychological causes of both mental and physical distress.

Psychoeducational Intervention

Definition

A psychoeducational intervention is an intervention, often for families with a chronic illness or disabled member, which provides education, skills training and emotional support for individuals and/or family members.

Psychogenic Loss of Appetite

Synonyms

Pica in adults

Definition

Psychogenic loss of appetite is characterized by a loss of appetite due to stressful events.

Cross-References

► Eating Disorders

Psychogenic Overeating

► Eating Disorders
► Overeating Associated with Other Psychological Disturbances

Psychogenic Vomiting

► Eating Disorders
► Vomiting Associated with Other Psychological Disturbances

Psychological Distress and Palliative Care

Synonyms

Spiritual concerns

Definition

Alleviation of psychological distress in patients receiving end stage care is the key to effective palliative care; a safe way has to be found to address the individual's physical and/or psychological problems. While some patients want to explore their psychological or spiritual problems, some do not, so it is essential to determine patients', partners' and families' wishes regarding this type of help. Alleviating psychological distress is complex in end stage care as hospice and palliative care requires interdisciplinary teams consisting of physicians, registered nurses, hospice chaplains, social workers, physiotherapists, occupational therapists, complimentary therapists, volunteers and, most importantly, the family. Furthermore, home health care aides, volunteers from the community, housekeepers, family members and volunteers, are crucial to the palliative care system. Anyone of the members of this extensive team, let alone the patient, may find themselves under severe emotional and physical stress whilst being involved in palliative care.

Psychoneuroimmunology

Synonyms

Neuro-endocrine immune-network

Definition

Psychoneuroimmunology studies the interaction of behavioral, neural, and endocrine factors and the functioning of the immune system. The premise is that a patient's mental state influences diseases and healing. The term psychoneuroimmunology was coined by Robert Ader, a researcher in the Department of Psychiatry at the University of Rochester Medical Center in Rochester, New York. In the 1970s, studies by Ader and other researchers opened up new understandings of how experiences such as stress and anxiety can affect a person's immune system.

Psychosis

Synonyms

Psychotic disorders; Dementia praecox; Auditory hallucinations; Thought disturbances; Distorted thinking

Definition

A cluster of psychotic phenomena that occur during or following psychoactive substance use but that are not explained on the basis of ► acute intoxication alone and do not form part of a ► withdrawal state. Psychotic disorders are characterized by hallucinations (typically auditory, but often in more than one sensory modality), perceptual distortions, delusions (often of a paranoid or persecutory nature), psychomotor disturbances (excitement or stupor), and an abnormal affect, which may range from intense fear to ecstasy. The sensorium is usually clear but some degree of clouding of consciousness, though not severe confusion, may be present.

Cross-References

► Substance Induced Disorders

Cross-References

► Psychotic Disorders

Psychosocial Development

Synonyms

Psychosocial maturation; Psychosocial transition

Definition

Psychosocial development includes the ability of the adolescent to seek and/or gain social acceptance and integration from peers and adults.

Psychosocial Maturation

► Psychosocial Development

Psychosocial Transition

► Psychosocial Development

Psychosocial Work Environment

Definition

A psychosocial environment is defined as the socio-structural range of opportunities that is available to an individual person to meet his or her needs of well-being, productivity, and positive self-experience, in particular self-efficacy and self-esteem. With respect to work, this environment concerns central features such as fair employment conditions, skill and career development, adequate demands, and safety measures. Theoretical models are being developed to identify health-promoting or health-adverse components of a psychosocial work environment. Widely tested examples are the demand-control model and the effort-reward imbalance model.

Psychostimulants

Synonyms

Stimulants

Definition

Stimulants are psychotropics which enhance brain activity and in turn increase alertness, attention and energy. Historically, psychostimulants were used to treat a variety of ailments (e. g. asthma, obesity). Now, they are prescribed for the treatment of only a few diseases, especially narcolepsy and attention deficit hyperactivity disorder. Drugs such as caffeine and amphetamines belong to this category, too.

Psychotic Disorders

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Synonyms

Dementia praecox; Auditory hallucinations; Thought disturbances; Distorted thinking; Psychosis

Definition

► Schizophrenia, ► schizotypal disorder, and persistent ► delusional disorders are classified, according to ICD-10, as schizophrenic or psychotic disorders. The psychotic disorders are characterized in general by fundamental and characteristic distortions of thinking and perception, and affects that are inappropriate or blunted. Clear consciousness and intellectual capacity are usually maintained although certain cognitive deficits may evolve over the course of time. The most important psychopathological phenomena include "positive symptoms", for example, thought insertion or withdrawal; delusional perception and delusions of control; influence or passivity; hearing internal, hallucinatory voices commenting or discussing the patient in the third person; assigning unusual significance or meaning to normal events or holding fixed false personal beliefs (► delusions); and "negative symptoms" (i. e., reduction in the range and intensity of emotional expression, poverty of speech, and reduction, difficulty, or inability to initiate and persist in goal-directed behavior). ► Schizoaffective disorders are characterized by both schizophrenic and affective symptoms.

Basic Characteristics

Introduction

The German psychiatrist Emil Kraepelin was the first person to catalog the symptoms of schizophrenia in the late 19th century (Andreasen 1997). Initially, Kraepelin named schizophrenia "dementia praecox". Eugen Bleuler introduced the term schizophrenia in 1911. Multiple interactions are involved in the causation of schizophrenia. Genetic risk factors (the risk of schizophrenia in first-degree relatives of people with schizophrenia is 10%) interact with environmental exposures (e. g., fetal hypoxia, obstetric complications, season of birth [individuals born in the winter half-year are significantly more often affected by schizophrenias than individuals born in the summer half-year], stress in daily life, cannabis use). There is still a discussion over whether the use of cannabis increases the risk of schizophrenias or, vice versa, if the use of cannabis is an attempt to therapy the first symptoms of schizophrenic disorders. Early onset of illness, family history of schizophrenic disorders, and prominent negative symptoms are suggestive of poor prognosis, whereas an acute stress-related onset of schizophrenias, higher social class, better premorbid social development, and no history of cannabis use are associated with a better course of the illness (Kelly et al. 2001). The onset of psychosis is associated with increased risk of suicidal behavioral or aggression.

Epidemiology

The lifetime prevalence rate of schizophrenic disorders is estimated to be about 1 percent (e. g., Jablensky 1995). According to Wittchen and Jacobi (2005), the 12-month-prevalence of psychotic disorders in European countries is 2.6% (women: 2.5%, men: 2.6%). Hallucinatory and delusional symptoms, especially, ► illusions, show a much higher prevalence in the general population than manifest psychotic disorders (10–15%, Johns and van Os 2001).

Pathophysiology/Etiology

Schizophrenia affects men and woman with equal frequency. Up to date research has failed to uncover any definite causes. Psychological theories attribute unfavorable social and emotional experiences (i. e. double-bind/expressed emotion); biological theories prefer to see schizophrenia as a physical disease of the nervous system. Schizophrenia may be associated with chemical defects or physical abnormality of the brain.

Consequences

Onset of psychotic disorders typically occurs during young adulthood, although earlier and later onset does occur as well. Onset may be abrupt or gradual, but most people experience some early signs, such as increasing social withdrawal, loss of interest, unusual behavior, or decreases in functioning prior to the beginning of active positive symptoms. The course of psychotic disorders can be continuous, episodic with progressive or stable deficit, or there can be one or more episodes with complete or incomplete remission. However, full recovery is unusual. According to the World Health Report (2001), schizophrenia causes a high degree of disability and is listed as one of the leading causes of lost disability adjusted life years (DALYs). Early onset of schizophrenic disorders (i. e., prior to 25 years of age) is associated with more gradual development of symptoms, more prominent negative symptoms, and more neuropsychological problems (Basso et al. 1997;

Symonds et al. 1997). Patients with schizophrenia have lower rates of employment, marriage, and independent living than other people. Patients suffering from schizophrenias have a 10% risk of suicide. Psychotic disorders are often associated with comorbid substance use disorders. The burden of psychotic disorders affects not only patients but also their families. Distress and changes in the relationship between family members and the psychotic patient during acute phases of illness are a particular burden on relatives (Lauber et al. 2003).

Treatment

Although some patients with psychotic disorders can be treated as outpatients, acutely disorganized psychotic people frequently need hospitalization in order to be stabilized. In the acute stage, a person suffering from a psychotic disorder is treated with antipsychotic medication. Antipsychotics are used to diminish the positive symptoms of schizophrenia and help organize the person's thinking and, therefore, his/her behavior. Antipsychotics do not change the patient's personality. Antipsychotic maintenance medications have repeatedly been shown to prevent relapses. Novel antipsychotic medications are associated with fewer extrapyramidal adverse effects and are probably more effective in treating the negative symptoms and cognitive impairment of schizophrenia than conventional antipsychotic agents are. Antipsychotics may be associated with weight gain, thus, nutritional counseling and increased physical activity can be helpful for the patients and increase their compliance.

Patient education is another important part of treatment. It includes teaching about the importance of medication compliance, abstinence from alcohol and other drugs of abuse, and the recognition of early signs of a decompensation (e. g., insomnia or increased irritability). Psychosocial interventions help patients and their families to cope with the illness and reduce relapse rates (i. e. expressed emotion concept). Rehabilitation can support the reintegration of patients into the community.

Many types of psychotherapy, including individual, group, and family therapy, may be used at some point in the illness to help support the person suffering from a psychotic disorder.

Cross-References

- ▶ Delusion
- ▶ Delusional Disorder
- ▶ Hallucination
- ▶ Illusion
- ▶ Schizoaffective Disorder
- ▶ Schizophrenia
- ▶ Schizotypal Disorder

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Pubertal Maturation

Synonyms

Sexual maturation; Sexual maturity

Definition

Pubertal maturation describes physical development to the state when sexual reproduction first becomes possible (sexual maturity). This includes further development of reproductive organs and development of secondary sexual characteristics such as breast development in girls, genital development in boys, and pubic hair in both.

Pubic Lice

Synonyms

Pediculosis pubis

Definition

Most frequently, pubic lice are transmitted during sexual intercourse; infection is also possible if clothing, towels or bedlinen are shared. Pubic lice primarily live in pubic hair, but they can also be found in the hair of the armpit or the head, in beards, eyebrows or eyelashes. The parasites, which feed on blood, are specific to humans; outside their hosts they usually die within 24 hours. At the site of the bite, little blue-gray spots and strong itching occur. Due to scratching, inflammation of the skin and bacterial superinfection can ensue. To cure the infection, local treatment is necessary, using lindane, pyrethrum or permethrin. Clothing and bedlinen should be washed at a temperature of at least 60°C. Lice, eggs and nymphs can be killed by freezing or by keeping clothing or other articles in plastic bags for a couple of days.

Cross-References

► Sexually Transmitted Diseases

Publication Bias

Definition

Publication bias is the tendency on the parts of investigators, reviewers, and editors to submit or accept manuscripts for publication based on the direction or strength of the study findings. Publication bias is the tendency to produce results that appear significant, because negative or near neutral results are almost never published. Prevention of publication bias is important both from the scientific perspective (complete dissemination of knowledge), and from the perspective of those who combine results from a number of similar studies (► Meta-Analysis). If treatment decisions are based on the published literature, then the literature must include all available data that is of acceptable quality.

Public e-Health

Definition

Public ► e-health is the use of the ► Internet by public health organizations and departments to provide ► public health services. Public health services have a great role in health promotion and prevention, adoption of healthy life styles, prevention of non-communicable diseases, and environmental protection, etc.

Public Health

Synonyms

Preventive medicine; Community medicine; Hygiene

Definition

Public health is field of medicine and hygiene dealing with the prevention of disease and the promotion of health. It encompasses different fields primarily epidemiology, hygiene, biostatistics and social medicine. Public health is one of the efforts organized by society to protect, promote, and restore the people's health, the goals being to reduce the amount of disease, premature death, and disease-produced discomfort and disability in the population. It is the combination of sciences, skills, and beliefs that is directed to the maintenance and improvement of the health of all the people through collective or social actions. Public health is thus a social institution, a discipline, and a practice.

Public Health Advocacy

► Advocacy

Public Health Agencies

► Public Health Departments

Public Health Dentistry

► Outline of Dental Public Health

Public Health Departments

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Synonyms

Public health agencies

Definitions

Public health is the art of applying science in the context of politics in order to reduce inequalities in health while ensuring the best health for the greatest number (WHO 1998). A more specific definition is that public health is the organization and analysis of medical knowledge in such a way that it may be utilized by society in the making of decisions regarding health related questions (Forsetlund 2001).

Public health departments are organizational units within the public health infrastructure that perform public health goals. Public health departments are dependent upon public funding and are delegated public authority by a government body to provide preventive functions. These characteristics are crucial to the definition of public health agencies, since they distinguish them from private organizations that may perform similar health promotion and prevention functions.

Basic Characteristics

Public Health Infrastructure and Functions

The ► infrastructure of public health is the underlying foundation that supports the planning, delivery, and evaluation of public health activities and practices. The three components of basic public health infrastructure are: 1) the workforce (► workforce in public health) – professionals and public health agencies, 2) information and data systems – systems that monitor disease and enable efficient communication among public and private health organizations, the media, and the public, and 3) the organizational capacity – the consortium of local and state public health departments and private partners (CDC 2001).

The main function of public health is to address the determinants of health in a community, protect a population's health, and treat disease (WHO 2003a).

Since ► functions of public health represent public goods, it is in the best interest of governments to ensure the provision of these essential functions, not necessarily implementing and financing them on the state level, but providing an approach for intersectorial action with other public health partners.

Public health practitioners collaborate with other members of the health team and with several other professional groups in the community, and thus hold an important position in the local decision-making process. The evidence-based health care approach implies that decisions should be based on a systematic appraisal of the best available evidence, combined with an assessment of existing resources and values in society.

In 1988, the Institute of Medicine suggested three core functions for public health:

1. surveillance functions (► public health surveillance) that detect and monitor disease and injury patterns (assessment – figuring out what the important health problems are),
2. developing policies that promote health, and prevent disease and disability (policy development – deciding what to do),
3. ensuring that data-driven interventions address the health issues identified through assessment activities (assurance – doing it well, or making sure someone else does it well).

These core functions were further delineated into more specific essential services (► essential public health services; ► public health services; ► health information) (Institute of Medicine 1988).

Public Health Law

The recognition that public health protection requires the positive intervention of the law is not new. Even the earliest known civilizations founded their public health activities, such as enforcing sanitation codes, regulating the food supply, and caring for the sick, on some kind of law – either religious beliefs or civil authorities. Even today, public health departments depend on the laws that establish their offices, provide their authority, and support them financially (Goodman et al. 2003). It is impossible to deny the fact that law is essential to public health, because it is a tool of

social ordering, which in turn affects the well-being of individuals and communities (► law in public health; ► ethics).

The relationship between public health and law is certainly interdependent. Law can be a powerful mechanism for changing the course of public health. It is expected that strict legislations on smoking and cigarette marketing will lead to a decrease in the incidence of smoking-related diseases and thus support public health in many populations. However, law can create barriers to public health, such as in cases where the law protects the interest of industries and places economic interests above health. On the other hand, law depends on public health. Since public health is among the most ancient of all administrative agencies, its policy was used as a model for the organization and development of many bureaucratic organizations and administrative law.

Public health law can be seen as the authority and responsibility of the government to prevent disease and promote the population's health, at the same time respecting the rights of the person's privacy and property, as well as the rights of all groups in the society (Gostin 2000). Public health authorities traditionally have a variety of powers to regulate persons, professionals, and businesses in order to safeguard the common good in a well-regulated society:

a. Regulation of persons – in order to prevent transmission of communicable diseases, public health authorities have the power to compel individuals to submit to testing or medical examination, especially in certain occupations, such as food handlers, nurses, or teachers. Compulsory immunization or isolation and quarantine of persons with infectious diseases are other examples of public health policies that put public health above individual autonomy and privacy.
b. Regulation of professions and businesses – public health authorities have the power to control licensure for a profession, occupation, or business of choice, thus limiting the person's liberty and the use of his property, while at the same time protecting public interests for health, safety, and welfare. Similarly, public health laws may prohibit public facilities that pose a significant threat to health, such as factories producing air pollution, activities emitting excessive noise, and wastes contaminating water or soil (Goodman et al. 2003).

Current Operational Problems in Public Health Departments

Public health departments use information collected from surveys and reports collected within a community. Some diseases are regularly reported to public health departments, such as the occurrence of infectious diseases, cancer, cardiovascular diseases, diabetes, injuries, etc.; while health related issues (smoking patterns, alcohol consumption, physical exercise, dietary habits, etc.) are collected by conducting national health surveys. Public health departments use these sets of information for the production of statistical information on the health status of the community, which in turn is used by the government to assist in formulating, monitoring, and evaluating health politics in the provision of health care services (WHO 2003b).

Public health departments are facing various barriers in their work, which can be summarized as:

- Problems with workforce – lack of formal training of public health professionals. These individual skills are described as ► core public health competencies, and ► core legal public health competencies;
- Financial problems – limited or unstable funding due to low priority among policy makers in general;
- Problems with information technology – limited use of advanced technology such as electronic information systems and telecommunication;
- Organizational problems – lack of knowledge and organizational capacity to respond to public health threats, e. g. ecological changes, bioterrorism attacks;
- Problems with ► data quality – incomplete and inaccurate data collection, lack of standards for reporting statistical data, and dysfunctional reporting procedures (US Department of Health and Human Services 1997; WHO 2003b; Baker et al. 2005).

Challenges for the Future

Many public health authorities suggest that some changes in public health priorities must be made in order to meet the health challenges we are facing at present:

1. Institutional changes – strengthening the governmental public health infrastructure that forms the backbone of the public health system is of prime importance. Furthermore, a rational health system organized toward primary health care must be insti-

tutionalized, and systems of accountability must be developed to assure the quality and availability of public health services. New intersectoral partnerships are needed, and communication within the public health system must be established (e. g., among all levels of the governmental public health infrastructure and between public health professionals and community members). Public health departments must engage more health professionals, who need to be well educated and properly trained in this field.

2. Adopting a population health approach that considers the multiple determinants of health: elimination of health disparities (better access to health care), focusing on longer lifetime and healthy lifestyles, fighting non-communicable diseases through intervention regarding risk factors, protection of the environment, and preparedness to respond to emerging infectious threats such as new diseases, bioterrorist attacks, and resistance to antibiotics. Public health must promote good mental health in communities; and help to reduce violence in society through interventions in schools, workplaces, and communities, and the use of mass media (Koplan 2000; Institute of Medicine 2002; Kirch 2004).

Conclusion

We are living in a period of major transitions in the health of populations. On one hand, accelerated economic growth and technological advances have enhanced health and life expectancy in many populations. On the other hand, the erosion of social and environmental conditions has led to impairment of the health of many populations. The scope of contemporary public health must therefore encompass a reduction in social and health inequalities and strive for health-sustaining environments. The goal to make people live longer and healthier than before should be used as a base point for establishment of a modern public health system. Further research is required to focus on the needs of policy and practice in order to make public health services more effective in providing health to the community.

Cross-References

- ▶ Core Legal Public Health Competencies
- ▶ Core Public Health Competencies
- ▶ Data Quality
- ▶ Essential Public Health Services
- ▶ Ethics
- ▶ Functions of Public Health
- ▶ Health Information
- ▶ Infrastructure of Public Health
- ▶ Law in Public Health
- ▶ Local Health Departments
- ▶ Local Public Health Agency (LPHA)
- ▶ Public Health Informatics
- ▶ Public Health Services
- ▶ Public Health Surveillance
- ▶ Workforce in Public Health

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Public Health Genetics

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Introduction

For centuries humans have known that heredity affects health (Adams 1886). In the 1850s Gregor Mendel systematically studied the genetic transmission of observable traits in sweet peas and described different modes of inheritance for traits as the product of the transmission of ► alleles from parent to offspring (Mendel 1866). Based on Mendel's experiments the distinction between genotype and ► phenotype was established. Several decades later, ► deoxyribonucleic acid (DNA) was characterized as the medium in which ► genetic information is encoded. The development of recombinant DNA technologies in the early 1970s facilitated studies on the functionality and structure of genetic information. The Human Genome Project (HGP) was initiated in 1986 to map the human ► genome to the nucleotide level and has attained 99% completion by 2003. The HGP has sequenced approximately three billion base pairs and identified approximately 30,000 genes (The National Human Genome Sequencing Consortium 2003).

Except for monozygotic twins, each person's genome is unique. The International HapMap Project is an initiative to identify genetic similarities and differences in human beings. Its goal is to identify genes that affect health, disease, and individual responses to medications and environmental factors. The initiative started in October 2002 and already contained information on about six million ► single nucleotide polymorphisms (SNPs) in March 2006 (The International HapMap Consortium 2003).

This short historical overview highlights that genetics is among the most rapidly emerging fields in science. Whereas genetics is the study of single genes and their effects, genomics is the study of the functions and interactions of all the genes in the genome. The science of genomics, which was established about 15 years ago, applies not only to monogenetic conditions, most of which are rare, but also to common disorders, which typically are caused by interactions of multiple genes and environmental factors (Guttmacher 2002). For decades, genetics played a large role in the health of few individual patients, but was less important at the general population level. Today, we are about to enter a transition period in which specific genetic knowledge is becoming critical to the delivery of effective health care for everyone. Therefore, every public health professional will soon need to understand the concept of genetic variability, its interactions with the environment, and its implications for patient care and population health.

We are about to enter an era in which the individual patient's genome will help determine the optimal approach to medical care (Guttmacher 2002). In key public health tasks and disciplines, such as prevention, risk assessment, ► epidemiology, and environmental health issues related to genetics, already play a central role and are likely to gain even more impact in the near future.

In the following key aspects of the discipline of public health genetics will be outlined. More detailed information on these issues is provided in the corresponding essays.

Genetic Principles

DNA is the basic molecule in which genetic information is encoded. Individual DNA units, or nucleotides, consist of one of four nucleic acids [Adenine (A), Cytosine (C), Thymine (T), or Guanine (G)] bound to a molecule of the ringed sugar 2′-deoxyribose. These nucleotides are in turn bound to one another by covalent bonds between phosphate groups attached to the 5′ and 3′ positions of the ribose sugar backbone, and form a strand, going from 5′ to 3′. Each nucleic acid has an affinity for another nucleic acid (A for T, G for C, and vice versa), and aligns with another strand which has a 'reverse complement' of the sequence of the first strand. This double-strand relaxes to a low-energy state wherein the DNA coils and forms a double-helix.

Genes are sections of functional units of double-helical DNA strands. Alternative forms of a gene are termed alleles. Individuals who possess two different alleles of a particular gene (one inherited from each parent) are

called heterozygote, whereas homozygote refers to having two identical alleles of a particular gene.

Long continuous DNA strands are referred to as ► chromosomes. Chromosomes contain hundreds to thousands of genes plus non-functional DNA sequences. The human genome consists of 22 unique autosomal chromosomes plus two X chromosomes in females and one copy each of an X and Y chromosome in males, respectively. Somatic cells are termed diploid, because they have two homologue copies of each chromosome (46 chromosomes). Germ cells are termed haploid as they only have one copy of each chromosome.

Each cell undergoes a cellular cycle of DNA and cell duplication. Within each cellular cycle the whole DNA is duplicated (replication), transcribed into single-stranded ribonucleic acid (RNA) (► transcription), and translated into polypeptide chains (► translation). At the end of each cellular cycle each diploid somatic cell divides into two diploid daughter cells (► mitosis). In somatic cells identical copies of the chromosomes are made before cell division. In germ cells, however, DNA sequences are exchanged along the arms of homologous chromosomes (recombination, crossing-over). The division of germ cells (► meiosis) consists of two sets of cell division: firstly, the diploid cell gives rise to two diploid daughter cells, secondly, the two diploid daughter cells each produce two haploid daughter cells with only one copy of a homologous chromosome in each cell. ► genetic principles and genetic variations.

Genetic Variations

It is a basic genetic principle that cells use DNA to encode RNA, and RNA to encode proteins. Thus, errors in any of the processes with which DNA and/or RNA is involved may alter the type, functionality, and/or the amount of protein products produced by cells.

Large-scale alterations such as chromosomal abnormalities are rare. Chromosomal abnormalities usually cause severe diseases or are lethal. Potential causes include non-disjunction (the failure of chromosomes to separate during cell division), or anaphase lagging (the loss of chromosomes during cell division). The resulting chromosomal number abnormalities affect all genes on the affected chromosomes, and thus can lead to multi-symptom syndromes, such as Down's syndrome (Trisomy-21). Other chromosomal abnormalities can include chromosomal rearrangements such as translocations, large-scale insertions and deletions, or inversions of chromosomal arms. These changes can result in errors of ► recombination.

Smaller-scale variations include local changes to the genomic sequence such as ► polymorphisms and ► mutations. Polymorphisms are common variants of particular segments of DNA. Mutations are by definition infrequent, and can often be redefined to be polymorphisms if they achieve sufficient frequency in the population. Small-scale variations are much more frequent than chromosomal abnormalities. They may have a protective or a pathologic role in the expression of diseases. The former variations are referred to as gain-of-function mutations. However, as approximately 95% of DNA is noncoding, mutations at most points in the genome are unlikely to have any effect (silent mutation).

Single nucleotide polymorphisms (SNPs) are variations where a single nucleotide in the genome may differ from individual to individual. Single changes in the nucleic acid at a particular position may have effects on zero or one amino acid encoded, whereas SNP insertion/deletion polymorphisms may shift the entire sequence of amino acids encoded by the DNA radically by changing the frame of reference in which the coding information is read.

Monogenic diseases are caused by a mutation in a single gene. However, it has to be considered that a mutation in a recent generation can either have been passed down to an individual, or can have occurred during the lifetime of the affected individual. Somatic cell mutations, due to errors in replication or DNA alterations by external stimuli, can be lethal and preclude transmission by affecting individuals' reproductive health; similarly, germline transmissions may affect a person's offspring without affecting the individual himself.

Genetic defects may be inherited defects or accidentally created changes arising from cells that are aging or are exposed to environmental factors such as radiation, chemicals, and some toxic pollutants. ► genetic principles and genetic variations.

Molecular Technologies to Detect Genetic Variations

A basic understanding of molecular techniques is necessary to envision potential applications of genetics and genomics in public health. Since the develop-

ment of recombinant DNA technologies in the early 1970s molecular technologies have quickly emerged as a central field of biomedical research. Polymerase chain reaction (PCR) and related technologies facilitate studies on both the functionality and the structure of DNA.

PCR was developed in the 1980s by Kary B. Mullis, who was awarded the 1993 Nobel Prize in chemistry for his work. PCR is an in vitro technique for amplifying defined DNA sequences by separating the DNA into two strands and incubating it with oligonucleotide primers and DNA polymerase. It can copy a specific sequence of DNA up to one billion times. Advantages of this universally applicable method are its robustness, specificity, and sensitivity. Slightest traces of DNA can be detected and made available for diagnostic purposes. Restriction Fragment Length Polymorphism (RFLP) is a common technique to recognize and cut DNA specifically at a defined sequence of nucleotides. Applications for RFLP include the detection of known SNPs and mutations. As a result of mutations restriction sites may either be lost or additional restriction sites may emerge. Thus, in the case of a mutation, the length of the DNA fragments produced will differ from the wild type fragments. Other popular methods to detect known SNPs, mutations, and/or polymorphisms include 5′ nuclease assay and melting curve analysis. In contrast to RFLP, the latter methods may not only be used for detection of certain mutations but also for allelic differentiation.

► DNA microarrays (DNA chip technology) allow the simultaneous analysis of many known DNA alterations such as heterozygous base-pair polymorphisms or mutations, insertions, and deletions (Strachan 2004). Dideoxynucleotide sequencing is an elaborated method to detect unknown mutations. DNA sequencing enabled initiatives like the HGP; the basic principle being sequencing DNA after amplification by PCR. This technique utilizes DNA polymerase, the four deoxynucleotide-triphosphates (dNTPs) and fluorescing dideoxynucleotide-triphospates (ddNTPs). The ddNTPs compete with dNTP and terminate DNA chain elongation. Gel electrophoresis can be used to separate the fragments by size and the base at the end of each fragment can be identified by laser light stimulation. After combining the fragment sizes the DNA sequence can be read digitally (Strachan 2004). ► molecular technologies to detect genetic variations

Bioinformatics

In response to the ascertainment of huge amounts of biological data, computer scientists and biologists collaborated in creating a new discipline named ► bioinformatics. Besides modern molecular technologies elaborated computational tools and algorithms facilitated the genomic revolution. The main aims of bioinformatics include: acquisition, storage, and management of large-scale biologic data; development of algorithms and computational tools to analyze and classify the data; integration of the data to make conclusions and predictions. Within the last decades huge databases have been established for proteomic, genomic, phylogenetic, chemical, structural, phenotypical, functional, ontological, and transcriptomic information.

In sequence analysis, bioinformatics is applied to execute the alignment and comparison of DNA sequences. In transcriptomics, another new discipline, computational tools are used to measure gene expression on a large-scale. A large set of different algorithms has been developed to analyze these expression data.

With the availability of large amounts of information at all levels, biological research is no longer confined to experimental methods based on single genes. The new challenge is to consolidate, integrate, evaluate, and obtain data from established sources to generate hypotheses or produce a set of targets that can then be validated and investigated using experimental methods. With more available computation resources and data, researcher can now start to think of genes and proteins in relation to a vast network of interactions within the genome and think more in terms of pathways and systems. Just like biotechnological advances such as PCR have revolutionized biology, future biological research will be intimately involved with bioinformatics databases, tools, and analyses.

Genetic Epidemiology

► Genetic epidemiology may be defined as the study of the joint action of genetic and environmental factors in disease causation and their patterns of inheritance in families (Thomas 2004). Like all other disciplines contributing to public health genetics, the field of genetic epidemiology is still quite young. It came up in the second half of the 20th century evolving from the disciplines of epidemiology and (population) genetics. Whereas genetics dismisses the environment

as noise and epidemiology dismisses genes as an unnecessary and unfamiliar complication, genetic epidemiology treats both as legitimate contributors to disease (Thomas 2004).

Until the 1970s, etiological studies of human disease were carried out in terms of latent ► genotypes through statistical analysis of family data. Investigations pertaining to the genetic basis of human diseases have been confined to simple Mendelian diseases which, for the most part, did not involve environmental effects.

As emphasis shifted from Mendelian to complex disorders such as coronary heart disease, hypertension, and diabetes, population geneticists faced new challenges because familial effects were no longer entirely genetic. Within the past decades elaborated methods of data analysis have been developed to identify genes involved in specific conditions, their variation within the population and across populations, and their interaction with each other and with environmental factors. Principle study types include aggregation analysis, segregation analysis, linkage analysis, and association analysis.

Aggregation studies frequently are the first step if a genetic etiology of a disease is hypothesized. Aggregation studies explore whether the disease (phenotype) tends to be observed in families more than would be expected by chance alone. Appropriate designs for aggregation studies include case-control comparison, migrant studies, twin studies, and adoption studies.

The next step is to determine whether the pattern of disease among relatives is compatible with their genotype. Segregation studies examine how alleles at a gene segregate from parents to children. Studies of the families of a population-based sample of cases are appropriate for this purpose.

If a genetic etiology appears likely due to the result of aggregation and segregation studies, linkage analysis is frequently the next step in determining the causal gene(s). Linkage analysis examines whether a trait locus and a genetic marker co-segregate within families. Usually, blood samples are collected from informative members of multiple case families and genotyped for markers at known locations. Beginning with a widely spaced array of markers scattered over the whole genome, the region of the presumably causal gene is further narrowed down. This process is frequently termed genome scan.

Frequently, the linked region contains many potentially relevant genes for the disease under study. Association studies are used to compare the genotypes between cases and controls and thus to test hypotheses about whether certain genes are actually associated with disease occurrence. However, even if a certain gene appears to be associated with the disease under investigation, the observed association is not necessarily causal (Thomas 2004).

The same genes may express differently in different environments and the environmental effect may vary with the person's genotype; this is known as gene-environment interaction. In industrialized societies most conditions with high prevalence, e. g. obesity, chronic heart disease, ► diabetes mellitus type II, cancer, atopic eczema, and depression have a ► multifactorial etiology, i. e. are caused by interactions of multiple genes and environmental factors. Genetic variations in multifactorial disorders may have a protective or a pathologic role in the expression of diseases (Guttmacher 2002).

In the field of genetic epidemiology different study designs have been applied to test interactive effects like gene–environment interaction. Partial-collection designs (e. g. case-only, partial case–control, case–parent trio studies) have been suggested to efficiently study hypotheses regarding gene–environment interaction. However, common problems in genetic epidemiology studies, including gene–environment correlation in the population, population mixture, and genotyping error, may reduce the validity of partial-collection designs. Therefore, the case–control design appears to be the best choice to study gene-environment interaction (Liu et al. 2004).

Population Genetics and Human Health

The human genome is made up of approximately three billion nucleotides that code for all the macromolecules necessary for human life. ► Population genetics involves the study of allele frequencies within a population and the attempt to explain the given distributions through the forces of ► natural selection, genetic drift, mutation and population expansion, contraction, and migration. The requirement for any population genetics based study is the ability to characterize and quantify the level of genetic diversity. The progression of DNA sequencing to a high throughput easily attainable technology has allowed ever increasing amounts of SNPs and micro-satellites to be analyzed,

producing genome wide maps of sequence variability at a population level.

The principle of evolution is positive selection. Therefore, the identification of novel loci under apparent selection offers the potential to highlight genes of significance to human health for subsequent molecular and epidemiological investigation.

In frequency based analysis, observed patterns of allele frequencies in a population are compared with predicted frequencies under the ► neutral theory of evolution, which states that changes in allele frequency within a population exclusively occur through stochastic events. For example, polymorphisms within chemokine receptor 5 (CCR5), which encodes a receptor used as an invasion ligand by HIV-1 are associated with reduced ► susceptibility to HIV-1. In non-African populations, these polymorphisms are at higher frequencies than would be expected under neutrality. Interestingly, the apparent age of the CCR5 mutations predates the emergence of HIV-1 and a more ancient pathogen may have shaped allelic diversity at this locus (Bamshad 2002).

It is important to note that the populations under study need not be composed of human beings in order to identify genes of direct importance to human health. For many pathogens the strongest driving forces for selection are the host immune response and chemotherapeutic drugs. The study of major human pathogens at the population genetics level has provided important information concerning the genetic determinants of virulence/pathogenicity, epidemiology, and emergence of drug resistance in these organisms.

With the increase in high throughput and decrease in costs potentially offered by new sequencing platforms, coupled with the rapid development of statistical frameworks to analyze these results the future offers a greater potential to screen the human and pathogen genome for signatures of selection. With the rapid bioinformatics analysis of loci under apparent selection these approaches will offer an increasingly powerful molecular tool box to complement other approaches such as molecular epidemiology that attempt to understand the genetic basis of human disease. ► population genetics and human health

Genetic Susceptibility of the Individual

The genetic make-up of an organism determines the individual irritability to environmental factors and thus the risk of certain diseases. Genetic variants may lead to an increased or decreased susceptibility to external factors. It is these genetic variations that have made evolution possible.

Because of the contribution of multiple genetic factors in most conditions, some of which have major effects and others have modulatory effects, the identification of susceptibility genes is frequently complex. For example, the genetic basis of type 2 diabetes is quite a complex, which may evolve into different outcomes of the disease. Atherosclerosis and retinopathy, for instance, are complications of type 2 diabetes that arise from different genes. Environmental factors, such as nutrition and physical inactivity contribute to the disease complexity and consequences like obesity and insulin resistance. Another important example where genetic susceptibility determines the individual risk of disease after a defined exposure is lung cancer from cigarette smoking. One of the cellular processes explaining the inter-individual difference in risk of lung cancer from smoking is DNA repair capacity. Genetic susceptibility also determines the individual's risk to experience harm caused by chronic low-level exposures like air/water pollutants or radiation.

Markers of disease susceptibility are now being increasingly used in the assessment of risk factors among individuals and populations. Detailed knowledge of biomarkers for disease susceptibility may have high relevance for public health, as it may enhance effective primary prevention programs among particularly vulnerable subgroups. Susceptibility markers can be grouped into three categories (Suk 2002):

- Chemical alterations by enzymes leading to a decrease or an increase in the ability of the chemical to interact with DNA, RNA or proteins.
- Genetic differences of DNA repair capacity secondary to environmental insult.
- Pre-existing hereditary defects.

Some diseases have common genetic determinants. For example, the apolipoprotein E epsilon-4 (APO E-e4) genotype is associated with an increased risk for both Alzheimer's disease and coronary heart disease (Rienzo 2005).

Genetic susceptibility to ► asthma is attributable to multiple genes interacting with one another and the environment. Present findings indicate that genes near a major locus regulating serum IgE levels on chromosome 5q cause susceptibility to asthma (Bleecker et al.

1997). People with this kind of gene are also more susceptible to the effects of ozone and other air pollutants. In the future, early ► genetic susceptibility testing might serve as a major public health tool to avoid diseases and dramatically prevent morbidity and mortality.

Pharmacogenomics and Toxicogenomics

Pharmacogenomics and toxicogenomics are related fields applying new evidence from ongoing human genome sequencing initiatives.

Although the terms ► pharmacogenetics and ► pharmacogenomics are frequently used as synonyms, there are by definition distinct differences.

Pharmacogenetics focuses primarily on the role of genetic variation in drug response. In the 1950s it has been shown that hemolytic reactions after use of certain drugs (e. g. the antimalarial agent primaquine) are associated with mutations in the enzyme glucose-6-phosphate dehydrogenase. A variety of other monogenetic pharmacogenetic traits have been described since then.

Pharmacogenomics expands upon this definition to investigate the whole genome and its products, both RNA and proteins. Currently, most pharmacogenomic studies focus on identifying individualized drug therapy strategies for prevalent conditions. But pharmacogenomic endpoints additionally have the potential to provide tailored intervention targets for primary prevention programs.

Using cancer as an example of the disease model, pharmacogenomic based tests can be used as markers to predict drug response, to screen for disease susceptibility, and as markers of prognosis. Gene polymorphisms that are associated with reduced DNA repair capacity like the nucleotide excision repair (NER) polymorphism have been shown to increase the risk of tumor recurrence and to decrease overall survival (Spitz et al. 2005). Additionally, enhanced response to platinum-based chemotherapy has been observed in individuals carrying the NER polymorphism (Rosell et al. 2003). In the near future, strategies to identify subjects most likely to benefit from certain (chemotherapeutic) agents might help to improve survival and quality of life in individual patients and also to reduce adverse drug reactions and associated economic burden.

A high proportion of the pharmacogenomic tests that have already been approved is relevant for cancer treatment. However, it has to be considered that many immunosuppressive and immunomodulatory drugs are not only applied in patients with cancer, but also in many highly prevalent chronic inflammatory and autoimmune disorders. Therefore, not only patients suffering from cancer will benefit from the pharmacogenomic tests in question. The lower the thiopurine methyltransferase (TPMT) activity the higher is the risk of developing severe myelotoxicity if receiving conventional doses of 6-mercaptopurine or its prodrug azathioprine (Huang et al. 2006). In both children with acute lymphoblastic leukemia and patients with atopic dermatitis individual dosing regimens of 6-mercaptopurine respectively azathioprine based on the *TPMT* genotype significantly improved drug safety without compromising efficacy.

The science of ► toxicogenomics aims to understand causal relationships between various gene products and biological effects of environmental toxicants. Toxicogenomic research combines gene, transcript, protein, and metabolite profiling with conventional toxicology. Recent advances in biotechnology and high-throughput genomic technologies have facilitated the rapid emergence of the field of toxicogenomics. According to Waters and Fostel (2004) the main goals of toxicogenomic research are:

- to understand the relationship between environmental stress and disease susceptibility;
- to identify markers of disease and exposure to toxic substances; and
- to elucidate the molecular mechanisms of toxicity.

Another important goal of toxicogenomics is the identification and discovery of safer drugs in a quicker, more cost-effective manner. Toxicogenomics could contribute to early prediction of the toxic nature of compounds, avoiding animal tests and time-consuming pre-clinical trials.

Toxicogenomics also aims to increase the global understanding of cellular mechanisms of toxicity and disease causation. In order to achieve this aim, structures of networks including protein–protein, protein–DNA, and transcriptional regulatory mechanisms will need to be determined under a variety of different conditions to better understand cellular responses to stress.

Genetic Testing, Screening and Counseling

► Genetic testing and counseling are among the most important applications of genetic knowledge for the public's health.

Until recently, medical genetics involved the study and treatment of rare monogenetic disorders. The public health component of genetics was limited to newborn screening programs for the early detection and treatment of a small number of conditions. Parallel to the rapidly growing knowledge in molecular genetics, individual genetic testing and ► genetic counseling are increasingly integrated into health service delivery.

Prenatal diagnosis may involve non-invasive and invasive methods. Particularly in Europe, ultrasonic examination is routinely performed in each pregnancy. Abnormal fetal growth as well as several birth defects can be detected by ultrasound. Additionally, α-fetoprotein, chorionic gonadotropin, and unesterified estriol (triple-marker screening) may be measured in the blood of pregnant women to assess the risk of several fetal malformations including neural tube defects, Down's syndrome, and others. Problems may arise from high rates of false-positives and false-negatives. If an increased risk for a fetal malformation is detected invasive tests like amniocentesis and chorionic villus sampling are recommended. Other reasons for invasive prenatal diagnosis are advanced maternal age, chromosomal aberration or neural tube defect in a previous child, balanced translocation in a parent, and monogenetic hereditary disease in a parent (Vogel and Motulsky 2002).

In general, screening involves the study of a large proportion of a population for the presence of a certain disease or predisposition. Tests for untreatable and treatable diseases should not be combined. Screening is recommended if prevention and/or effective treatment are available. ► Genetic screening of children should only be considered if effective treatment or preventions during childhood are available. Neonatal screening of newborns for phenylketonuria is a good example. Profound mental retardation caused by accumulation of phenylalanine can be effectively prevented by phenylalanine restrictive diet. Most European countries and the US have introduced neonatal screening for phenylketonuria. There is an ongoing discussion on whether or not a population based screening for hemochromatosis is recommendable (Aretz et al. 2006). Cystic fibrosis testing of newborns has not shown to significantly affect the course of the disease and is therefore currently not recommended (Vogel and Motulsky 2002).

Heterozygote testing in clinically healthy individuals may be indicated in the case of positive family history of a severe and not adequately treatable recessive disorder with onset in early childhood. Examples for such disorders are β-thalassemia and Tay–Sachs disease.

Recessive disorders manifest in homozygotes, whereas heterozygote carriers are usually clinically not affected. If both parents are heterozygote for the same condition the disease risk for their children is 25%. The disease risk for sons of heterozygote mothers for a X-chromosomal recessive disorder is 50%. Fathers cannot pass the X-chromosomal recessive mutation on to sons, but any daughter will be at least a carrier of the mutation. If an autosomal recessive disease manifests in a child, its parents usually are both carriers. Genetic testing is therefore not necessary to determine the disease risk of their future children, but is indicated for family members of the child's parents. Heterozygote testing without adequate genetic counseling is ethically not acceptable (Aretz et al. 2006).

In populations with high prevalence of severe recessive conditions heterozygote screening may be useful. Heterozygote screening involves genetic testing of the whole population or a population subgroup irrespective of family history. Among Ashkenazi Jews, 3 to 5 percent of the population are heterozygotes for the autosomal recessive Tay–Sachs disease. In the US and Israel heterozygote screening prior to and during pregnancy led to a rapid reduction in the prevalence of Tay–Sachs disease among Ashkenazi Jews. Heterozygote screening also effectively reduced the prevalence of β-thalassemia in the islands of Sardinia and Cyprus (Vogel and Motulsky 2002).

Like heterozygote testing predictive testing is usually performed in clinically unaffected family members of patients with severe monogenetic disorders. The goal is to identify mutations in persons at risk for severe genetic diseases with late onset.

Huntington's disease and other treatment resistant neuro-degenerative diseases are typical disorders that are subject to predictive testing. Knowledge of an increased risk of a severe, untreatable disease in later life interferes with the most private issues (e. g. family planning). Any person has the right to decide about whether to know or not to know their own genetic constitution. Therefore, predictive testing should always be voluntary, only performed after informed consent, and limited to adults (Aretz et al. 2006).

To date, molecular genetic diagnosis has limited clinical relevance for complex genetic disorders. Howev-

er, in the near future extended genetic screening not only for monogenic, but also for multi-factorial conditions may be both technically possible and recommendable.

A clear indication is required for any genetic test. Nevertheless, several commercial laboratories have recently made genetic tests available to the general public. Primarily in the US, but also elsewhere, the results of these tests are sometimes provided directly to the patient without professional clinical and genetic counseling. Genetic counseling is critically important to guarantee responsible application of genetic knowledge in clinical practice; it is, therefore, an essential component of all prenatal and predictive diagnostic procedures, otherwise, significant confusion and misuse of genetic tests may result.

Common reasons for genetic counseling include possible genetic disorder in a close relative, advanced parental age, consanguinity, multiple pregnancy loss, stillbirth, infertility, distinctive features diagnosed before birth, possible mutagenic and/or teratogenic exposure.

Adequate genetic counseling should provide information on the nature of the disorder, the probability of getting the condition and/or passing it on, and measures available for prevention and treatment. The genetic counselor has to be sensitive to potential psychological aspects raised by the genetic problems. Allowing the client to make an autonomous, but informed decision is a basic principle of genetic counseling. This characteristic is frequently referred to as the ► non-directiveness of genetic counseling (Baker et al. 1998).

Possible Therapeutic Applications: Gene Therapy, Stem Cell Therapy

Gene therapy involves the transfer of one or more genes or nucleic acid elements to a patient in order to counteract a naturally occurring deficiency in gene function. Whereas traditionally only monogenic conditions were amenable to ► gene therapy, complex genetic diseases recently also became subject to this therapeutic method. However, study results were mixed: in a subset of patients genetic defects could be effectively treated, in others, serious adverse events including insertional effects such as malignancy were observed (Hacein-Bey-Abina et al. 2003). The challenge of gene therapy will be to find the optimal tools to introduce disease-modifying genes and to attain adequate levels of long-term gene expression. There are significant public health implications for human gene therapy, since many common diseases including cancer, depression, Alzheimer's disease, and diabetes have a strong genetic component which may be modified or treated by gene transfer.

Stem cells are characterized by their ability for long-term self-renewal and their multilineage potential. Two main categories are distinguished: embryonic and adult stem cells. In many countries, stem cell research is a priority area for multidisciplinary funding. Stem cell research provides new insights in genetic, molecular, and cellular events during early development, e. g. chromosomal abnormalities. Transplant therapy is a field in which stem cell therapy might help to improve medical care. It is also hoped that stem cells may be used in novel treatments for Parkinson's disease, multiple sclerosis, and other chronic degenerative conditions. Additionally, stem cells represent a very useful model to test candidate therapeutic drugs, extending information from animal model testing. Although stem cell therapy does not play an important role in current public health practice, it is possible that it will gain significant impact on the health of the general population in the future. ► stem cell research and therapy

Ethical and Legal Considerations

The intersection of public health and genetics is a domain that is particularly complex from an ethical and legislative perspective. Genetic information is inherently individuating, as it describes individual risk, potential, and even identity. Genetic information implicates the most intimate kinds of family and reproductive relationships and decisions. It has an impact not only on social stigma, but also personal self-esteem. Disclosure of associations between race and genetics may also adversely affect the self-perception and definition of ethnic groups and communities.

Due to its particular ethical sensitivity, policies and programs in the area of public health genetics must be especially careful to adhere to ethical guidelines. ► ethical framework for public health genetics

Potential conflicts may arise between the rights and interests of individuals and the health and interests of society. Therefore, certain legislative, administrative, and ethical issues must be considered when plan-

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ning for and developing policies regarding public health genetics.

Legislation and administrative regulations emphasize the importance of an individual's right to specific, written informed consent prior to genetic testing. To allow patients to make informed decisions, they are entitled to explanations of the nature and scope of the information to be gathered, the meaning of positive test results, the underlying disease, and any appreciable risks involved in the testing or activities following a positive result. Some public health initiatives involving genetic data, such as mandatory newborn screening programs, are justified by public health officials without consent through legal principles allowing the state to protect the health of children. ► legal issues in public health genetics

Together with the increasing ability to identify and store individual genetic information concerns about the privacy of identifiable data have been raised. Unauthorized uses or disclosures of genetic information can lead to discrimination through insurers, employers, government agencies, and others. Therefore, personal identifiers should be carefully protected in databases of genetic information.

Both, in Europe and the US, anti-discrimination laws attempt to limit stigmatization of individuals on genetic bases. However, public health officials conducting surveillance also have legitimate claims to access an individual's genetic data. Such communal needs for individual genetic information are supported by normative principles of beneficence or justice, but can impinge the privacy rights of individuals. Effectuating an appropriate balance between respecting individual interests and communal public health is particularly critical when concerning genetic data (Hodge 2004).

The current state of public understanding of the significance of genetics is poor. Misunderstanding about purported genetic determinism evokes the danger of serious social stigma and discrimination against particular individuals or groups.

Within the past years, individual privacy and anti-discrimination concerns relating to genetic testing have led many states in the US and elsewhere to adopt genetic-specific privacy and anti-discrimination laws. This legal trend is often referred to as ► genetic exceptionalism. Laws treat genetic information differently from other personally identifiable health information and typically establish heightened protections. The premise underlying genetic exceptionalism is that genetic information needs special protections, as it frequently identifies increased risks of future diseases in otherwise healthy individuals.

Irrespectively of their socio-economic position individuals should have equal access to genetic services. Otherwise the described scientific and technological advances will produce a system of genetic benefit for some and genetic disenfranchisement for others. In addition, it is a public health responsibility to contribute to increasing the genetic literacy of the population and to increase the social acceptance and equal rights of those with impairments and disabilities.

Public health is not immune to social or racial prejudice. It may mistake the individual who suffers from (genetic) disease for a ► vector responsible for the spread of this disease. Its mission to rid society of disease can be misconstrued as a mission of eliminating the genetic factors contributing to disease from the population (negative eugenics). It may also mistake its mission of promoting human health and welfare for the task of enhancing the traits and biological properties of individuals and populations (positive eugenics). Fortunately, forced sterilization and euthanasia are almost unthinkable today. Improvement of human individuals by manipulation of normal germ cells meets with many ethical problems. The purpose of public health genetics is not the genetic improvement of humans (eugenics). Therefore, public health must be aware particularly of subtle methods and inducements (financial, social, and cultural) that might be associated with future goals of public health genetics. Here the safeguards of autonomy, freedom of choice, informed consent, and nondirective genetic counseling are important hallmarks of ethical public health programs.

Summary

Public health genetics involves the application of genetics, genomics, and biotechnology to improve the public's health and to prevent disease.

The mapping and sequencing of the human genome has already begun to transform medical practice, and it promises greatly increased insight into the causes and potential prevention and treatment of many conditions of significant public health importance.

To date, most practical applications of molecular genetics relate to monogenetic disorders. However, in the

near future extended genetic testing and screening for multi-factorial conditions may be both technically possible and recommendable. Additionally, genetic susceptibility testing might serve as a major public health tool to avoid diseases and dramatically prevent morbidity and mortality. This would help to further improve the public health significance of the discipline.

Genetic knowledge is currently used to develop effective individualized therapies for prevalent disorders. The development of a vast array of new genetic tests appears to offer a precise, objective approach to identifying individuals at risk for certain diseases, thereby permitting earlier and better-targeted interventions. This may greatly enhance the knowledge base of public health beyond the level of epidemiological studies based on phenotype and the presence of symptomatic disease alone.

Due to its particular ethical sensitivity, policies and programs in the area of public health genetics have to strictly adhere to ethical guidelines.

Cross-References

- ▶ Allele
- ▶ Bioinformatics
- ▶ Bronchial Asthma
- ▶ Chromosome
- ▶ Deoxyribonucleic Acid (DNA)
- ▶ Diabetes mellitus
- ▶ DNA Microarray
- ▶ Epidemiology
- ▶ Ethical Framework for Public Health Genetics
- ▶ Gene Therapy
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- ▶ Genetic Exceptionalism
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- ▶ Mitosis
- ▶ Molecular Technologies to Detect Genetic Variations
- ▶ Multifactorial
- ▶ Mutation
- ▶ Natural Selection
- ▶ Neutral Theory of Evolution
- ▶ Non-Directiveness of Genetic Counseling
- ▶ Pharmacogenetics
- ▶ Pharmacogenomics
- ▶ Phenotype
- ▶ Polymorphisms
- ▶ Population Genetics
- ▶ Population Genetics and Human Health
- ▶ Recombination
- ▶ Single Nucleotide Polymorphism (SNP)
- ▶ Stem Cell Research and Therapy
- ▶ Susceptibility
- ▶ Toxicogenomics
- ▶ Transcription
- ▶ Translation
- ▶ Vector

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Public Health Informatics

Definition

Public health informatics is defined as the systematic application of information and computer science and technology to public health practice, research, and learning. The scope of public health informatics includes the conceptualization, design, deployment, refinement, maintenance, and evaluation of communication, surveillance, information, and learning systems relevant to public health. Public health informatics requires application of knowledge from information science, computer science, management, organizational theory, psychology, communications, political science, and law. Knowledge from epidemiology, toxicology, and statistics is of prime importance.

Public Health Information System (PHIS)

Definition

The public health information system is a branch of ► health information system that deals with ► data, information and knowledge from the perspective of the population. Its purpose is continuous monitoring of public health events, planning and surveillance of public health programs, financing and management in public health and health research.

Public Health Interventions

► Public Health Programs

Public Health Law

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Introduction

Law makes public health possible. Law is of vital importance for public health theory and practice. The analysis of the interrelationship between law and public health documents that the theory and practice of public health significantly relies on law (Parmet 2007). Therefore, leading scholars characterize the interrelation between law and public health as strong. As such, Frank Grad states that "the field of public health is firmly grounded in law" (Grad 1990); Wendy Parmet describes the fact that even historically law has been the "chief tool of public health" (Parmet 2007) and Lawrence Gostin regards law as "a very important tool

in furthering the public's health" (Gostin 2000a). Similarly, law is highly valued as "fundamental to the practice of public health" (Lopez and Frieden 2007), "indispensable to the public's health" (Moulton et al. 2002), or "vital to public health" (Gostin et al. 2007) or for its "central role in contemporary public health" (Moulton et al. 2007). This synopsis and the subsequent essays aim to enlighten the reasons for law's importance to the theory and practice of public health and to highlight a few practice areas covered by public health law.

Most of the milestone accomplishments of public health and many successes against public health threats were obtained through the impact of law. In 1999, the Centers for Disease Control and Prevention (CDC) in Atlanta, USA, published a list of ten great public health achievements in the 20th century in the United States (CDC 1999), which included:

1. Safer workplaces
2. Control of infectious diseases
3. Motor vehicle safety
4. Family planning
5. Fluoridation of drinking water
6. Safer and healthier foods
7. Healthier mothers and babies
8. Vaccination
9. Recognition of tobacco use as a health hazard
10. Decline in deaths from coronary heart diseases and stroke.

Law has contributed significantly to all of these milestone achievements (Moulton et al. 2002). For example, the legal provisions providing for occupational health and safety at the workplace and allowing agencies to set safety standards for workplaces and impose obligations of employers have laid the basis for the aforementioned achievement "safer workplaces". This is also true for the laws that provide for worker's compensation after occupational injuries and illnesses and, particularly, for those laws that have created, funded and authorized occupational safety agencies.

Further, the great public health achievement "control of infectious diseases" relies heavily on law. The numerous laws dealing with the control, detection and treatment of infectious diseases – one of the oldest practice areas of public health and public health law – have provided public health practitioners with legal authorities to enforce community protection measures like isolations, quarantines and mandatory vaccinations. In addition, these laws have assured the funding of these costly activities and the engaged public health agencies. Therefore, the "control of infectious diseases" would not have been achievable without law and the corresponding legal means.

Regarding the great public health achievement "motor vehicle safety", no public health officer would seriously doubt that obligatory seat belt use in cars, mandatory helmet use for motorcyclists and criminal laws sanctioning drunk driving have substantially contributed to motor vehicle safety. Additionally, law contributed to this achievement by assuring higher vehicle safety standards, imposing regular technical check-ups and enforcing speed limits (*See* Moulton et al. 2007 for further remarks on the role of law in the ten achievements presented by the CDC).

Law and Public Health Authority

As a tool of public health, law is complementary to the scientific tools of public health, like epidemiology and statistics. These form the scientific-analytical part of public health, known as "public health analysis" (Hall 2003). In addition, public health practice has a legal-regulatory part encompassing the regulatory infrastructure as well as the legal authorities. The latter are referred to as "public health authority" (Hall 2003). Public health law focuses and supports the legal-regulatory branch of public health practice. Both "public health analysis" and "public health authority" are indispensable for the pursuit of public health activities.

The importance of law in public health practice results from the legal means (► public health law, legal means) necessary for safeguarding the public's health. Public health actions need sufficient legal authorization as they regularly affect or infringe individuals' rights and freedoms. Public health practice must operate in legally sensitive territories as demonstrated by the following examples:

- The protection of the public from infectious diseases regularly necessitates measures against individuals like the above-mentioned mandatory isolation or quarantine. Such actions can be directed against the infected person as well as potentially infected contact persons. However, isolations, quarantines or compulsory examinations and compulsory treatments of an individual encroach on the individual's basic rights to bodily integrity, freedom of movement, freedom of assembly and freedom of profes-

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sion, among others. Such encroachments of individual rights by the public health department, however, are not allowed if there is no sufficient legal authorization. Without such legal authorization, public health departments would be prohibited to undertake these protection measures even if medically justified. Therefore, the grant of legal authority to restrict personal rights by public health actions enables the departments to carry out such effective conduct.

- After suspicion of an outbreak of avian influenza A (subtype H5N1) on a number of farms, the health department considered the order of a local quarantine around the affected farms. In such constellations in Germany, controversies arose with respect to the legal authorization of these measures. Arguments regarding human rights violations as well as economic arguments with respect to the consequences of such actions to the touristy image of the affected regions were made. Therefore, in addition to the affected farmers, the tourism industry also complained about the violation of their interests and argued against the public health measures. This example also enlightens the legal explosiveness of public health measures that can be directly or indirectly tangent to a broad range of personal and economic rights and interests. Again, the encroachment of such rights and interests by public health departments is only allowed if there is sufficient legal authorization. Otherwise, the public health department may become liable for damages vis-à-vis the affected persons and companies based on the allegation of unauthorized conduct.
- Public health practice depends on the existence and functioning of administrative agencies, which include federal regulatory agencies, state and municipal health departments and scientific agencies, as well as the police. The creation and financial funding of such agencies need a legal basis. Such agencies can only be created and funded by virtue of a legal authorization. Therefore, law is also necessary to institute the organizational infrastructure of public health.

The three examples should have additionally highlighted the interdependency and close relationship between public health operations and law. Law grants powers to the states and governments and distributes these powers among the state institutions. Law grants authorities to the legislator, the government and the courts. Based on these underlying authorities, the state is entitled to institute specific public health agencies and to fund them with financial resources, thus to spend the taxpayers' money for these purposes. Law also bestows these agencies with coercive powers vis-à-vis citizens, companies and the community to pursue their public health mission. As such, law authorizes public health agencies and their officers to infringe private rights and to invade private spheres if they deem necessary to assure the population's health. As in many jurisdictions, such infringements of private rights by state agencies can only take place when explicitly legally authorized. Law makes these public health actions possible. Overall, law is essential for both the establishment of the institutional public health infrastructure and for its effective functioning (Gostin 2000a). In addition to such a direct type of public health practice, the range of legal means (► public health law, legal means) within public health law also encompasses a variety of tools with indirect positive effects on the public's health as well as tools that do not involve an official public health agency (e. g., ► tort law and public health, ► criminal law and public health).

In the following, the legal basics, characteristics and some specialized working fields of public health law will be discussed. In addition, the functioning and legal means of public health law will be depicted. Prior to this, it is necessary to attempt to define public health law.

Definition of Public Health Law

At the beginning of the 20th century, public health law was defined as

"that branch of jurisprudence which treats of the application of common and statutory law to the principle of hygiene and sanitary science" (Tobey 1926).

The definition of public health law can be accentuated from the legal scientist's or the practitioners's perspective. On the other hand, public health law has always been a branch of law with a practical root that grew through practical application. Accordingly, the definitions of public health law vary in their emphasis depending on the perspective considered. From the academic scholar's perspective, public health law is defined as

"the study of the legal powers and duties of the state, in collaboration with its partners, to assure the conditions for people to be healthy (e. g., to identify, prevent, and ameliorate risks to the health in the population) and the limitation on the power of the state to constrain the autonomy, privacy, liberty, proprietary, or other legally protected interests of individuals for the common good. The prime objective of public health law is to pursue the highest possible level of physical and mental health in the population, consistent with the values of social justice" (Gostin 2007).

From a rather practical viewpoint, public health laws are defined as

"any laws that have significant consequences for the health of defined populations" (Moulton et al. 2007).

The latter definition focuses primarily on the practical impact of the respective laws and all-embracingly includes all legal provisions with significant practical impact on the public's health. Despite their varying perspectives, the three definitions cited above pursue the same idea of public health law and its practical function. With a focus on its legal objectives, the common features and legal characteristics of public health law can be summarized in the following definition of the term:

Public health law is the sum of all legal rules which directly or indirectly aim to safeguard or promote the population's health. These rules may arise from statutory law, administrative regulations and acts, customary law, case-law and common-law. Public health law also includes laws which provide for the establishment and funding of corresponding administrative agencies.

In addition to the features mentioned in the definitions above, this definition highlights some characteristics in order to facilitate the understanding of the legal context; these are explained in the following:

- As with the definitions above, this definition articulates that the population's health is the target of public health law. In this respect, public health law is substantially different from medical law. Unlike public health law, medical law does not target the population's interest but the individual patient's health outcome (see below).
- Public health law can be subdivided into the group of legal rules that establish the administrative agency infrastructure and a second group of legal rules which equip the public health practitioners with the necessary operational legal means to safeguard and promote the community's health.
- The definition in this synopsis also stresses the fact that public health laws may unfold public health effects either *directly* or *indirectly*. Based on their mechanisms and teleology, in the following sections primary public health laws (intending direct effects) and secondary public health laws (indirect effects) will be differentiated.
- This definition documents that public health law comprises codified (written) law, judge-made case-law as well as unwritten customary laws. All of these sources of legal rules formed the ► legal basis of public health and still play significant roles in the practice of public health.

Constitutional Basis of Public Health Law

With respect to the sources of public health, a differentiation seems appropriate between "foundational public health laws", which form the ► legal basis of public health practices, and "operational public health laws", which supply public health practice with legal means (► public health law, legal means).

The foundations of public health practice as well as public health laws regularly lay in the national constitutions. To understand this legal context, the following simplified connection may be helpful: According to the principles of self-defense, each individual has the right to protect himself from harm to his health. Correspondingly, as the population is formed by the sum of individuals, the population also has the immanent right to protect itself from threats to its health, i. e. the population's health. The population thus has the right to protect itself from harm to its health. In addition, the population has – as each individual has – the right to take measures to promote its health. In democratic nations, the populations delegate these rights through their constitution to the state powers. Therefore, all state powers derive from the population. In a nutshell, this is the constitutional base of a country's foundational legal public health powers.

In summary, public health activities and correspondingly public health laws are rooted in the population's natural right to protect itself from harm to its health. This right, as well as the population's right to promote its

health, is delegated via the constitution to the state. The constitution distributes this authorization among several state institutions and authorizes

- The parliament to legislate the laws ("law-making power");
- The government to execute the laws ("law-executing power"); and
- The courts to judicially review, interpret and enforce the laws.

The state is empowered as the guardian of the common welfare and the rights of the individuals. All these powers derive from the population as the people. As mandated by the people, the state has the power to protect the population from harm as well as to promote its health and well-being. The main part of these powers is (in many jurisdictions) denominated as the "police powers" or "the danger defense powers" (in German speaking jurisdictions "*Gefahrenabwehrrecht"*). Based on this legal background of public health and by virtue of the constitutionally granted powers and authority, the state has to take all necessary measures to protect the public's health.

In summary, all constitutional powers derive from the people. These powers are distributed among the legislative power ("law-maker"), the executive power ("law-executor"), and the judiciary power ("law reviewer, interpreter and enforcer"). These three powers play relevant roles in the realm of public health.

Primary Public Health Laws

The foundational source of public health laws is the constitution. In addition to constitutional law, public health laws encompass numerous laws that should be regarded as operational public health laws. They provide for the scope, limits, administrative infrastructure and the legal means in a particular field of public health. Thus, *primary public health laws* are such legal rules that have a direct impact on the population's health by intending direct outcomes on the population's health. Depending on the various fields of public health practice, such laws *inter alia* include ► infectious diseases control laws, occupational safety laws (► labor and occupational safety laws), sanitation and hygiene laws and environmental health laws (e. g., air pollution prevention or clean water laws). Some of these primary public health laws are presented in separate essays in this encyclopedia.

Secondary Public Health Laws

In contrast to primary public health laws, *secondary public health laws* focus primarily on objectives other than population health outcomes. However, pursuit of these goals influences public health relevant behavior and, thus, indirectly affects public health outcomes. As an example of such secondary public health laws, tort law should be noted. Tort law *inter alia* encompasses medical malpractice and product liability law, which have intersections with each other. Tort law primarily intends to attribute legal responsibilities for the compensation of damages due to tortious acts (► tort law and public health). However, the risk of being convicted relative to damage payments deters individuals as well as companies and influences safety related behavior (McClurg et al. 2007). Tort law may also be applicable against the state if public health officers act unlawfully and, in doing so, violate personal or property rights (state liability). In addition, tort law develops doctrines for consumer information and advertising; both indirectly affect public health (e. g., rules for patient's informed consent). Tort law is elucidated in an explicit essay in this encyclopedia. Another legal area that influences human behavior and has indirect effects on the population's health is criminal law (► criminal law and public health). This legal field also falls under the scope of the secondary public health laws. As with tort law, criminal laws may apply against public health practitioners when they exceed their authorities and excessively encroach individual rights. The nature, functioning and specifics of criminal law are the subjects of a separate essay.

Nature of Public Health Law

Public health law is not medical law. These fields of law must not be confused and mixed up. As mentioned above, medicine and medical law focus on the health of the individual patient whereas public health and public health law focus on the health of the whole population. Medical law is patient-centered whereas public health law is population-centered. In the realm of medical law, typical subjects include medical malpractice, patient-informed-consent or delivery of medical services (*See* also Gostin and Jacobson 2006). Medical law is substantially targeted on the Latin principle "*salus aegrotii suprema lex*", what translates to "the health of the patient is the highest law". In recent years,

this command is being rivaled by the principle "*voluntas aegrotii suprema lex*", which asserts that "the will of the patient is the highest law". The latter has led to patient-informed-consent rules in many jurisdictions (*See* Koyuncu 2006; Koyuncu 2004). For public health, this sentence has to be "*salus populi suprema lex*", emphasizing that "the health of the population is the highest law". Against this background, it goes without saying that public health law is concerned about other legal issues than medical law and needs different legal means to overcome public health threats. In summary, despite certain overlaps and similarities, public health law and medical law are two distinct legal disciplines with different scopes. Medical law focuses on the legal side of individual patient care whereas public health law focuses on the legal aspects of population-oriented public health practice.

With respect to its nature, public health law is regarded as a part of administrative law (Gostin et al. 2007; Grad 1990). As administrative law (▶ administrative law and public health) itself is part of public law, public health law necessarily is a part of public law (Reynolds 1995). Public law is one of the three main legal branches. The other two are formed by private law and criminal law. Within public law, administrative law and enforcement is one major legal field supplementing other public law fields like, for example, constitutional law, tax law or social law. Some of the characteristics of administrative law and enforcement will be presented in a separate essay on this legal field. Therein, the principles of administrative law, the role of the administrative agencies as well as the role of the courts in the practice of administrative law will be elucidated.

Despite its attribution to administrative law, public health law is not precluded from using private law or criminal law elements. Agencies may – and regularly do – enter contractual agreements with private persons and companies and, by this means, involve private entities in the provision of public health services. On the other hand, agencies may request criminal prosecution if their administrative investigations indicate criminal offenses. Therefore, it is important to understand that the branches of law do not act in complete isolation. The opposite is the case. The actors of the different legal branches influence each other in manifold ways and to a certain extent share their tools.

Public health actions can also be grounded in other legal areas than administrative law. As such, *tax law* is widely used to influence individual or corporate behavior in the interest of public health. States may impose additional taxes on behavior that they want to eliminate and vice versa. In addition, *commerce and trade law* provide influential means for assuring and promoting the public's health. Particularly, these legal areas provide for the control and limitation of the flow of potentially harmful goods and products within a country and into a country from outside. *Social insurance laws* also have significant relevance to the public's health. They build the legal fundament for the financing and provision of health insurances as well as for the supply of health care services for the community.

It is also noteworthy that public health law is a *dynamic field of law*. Interrelated with public health, the law must cope with different and continually changing public health challenges. The public health threats of today are not the same as those 100 years ago (e. g., bioterrorism, chronic diseases, behavior-induced health risks). The subject of contemporary public health practice in the 21st century includes many additional tasks when compared with the realm of public health at the beginning of the 20th century (e. g., health information and promotion). Public health law must take on these new challenges and provide the public health practitioner with sufficient legal infrastructure as well as appropriate legal means to intervene when necessary.

In conjunction with its dynamic nature, it is important to understand that public health and, thus, public health law are "*highly political*" fields (Gostin 2000a). This is because public health practice has to protect and promote the population's health and well-being as the core goods of a society. To achieve this, public health practice may come with personal restrictions. Public health measures can significantly affect human rights. As such, if public health officers order a quarantine or the isolation of an individual because of an infectious disease or if they revoke the license of a health professional or order the market recall of a pharmaceutical, they restrict personal and corporate rights. Such personal restrictions are subject to political debate. Such aspects, including the accompanying ethical and cultural bearings, must be discussed on the political level, for example in the forefront of a legislation proposal.

Public health laws could be qualified as *population-centered risk-management laws* . Like other risk-management subjects, public health laws also provide mechanisms to prevent, detect, assess, mitigate and elimi-

nate risks to the public health. The legal means provided by public health law cover the range from incentives for voluntary behavior up to severe compulsory measures against individuals, objects and businesses. The range of legal means (► public health law, legal means) provided by public health law will be presented in an essay where the restrictive intensity of some public health instruments will be highlighted. Traditionally linked with the character as a legal area to avert dangers ("police powers"), public health pursues an interventionist approach (Gostin 2000a) therefore public health law has to provide practitioners with sufficient intervention means.

In conclusion, the legal characteristics and nature of public health law may be summarized as follows:

- Public health law is mainly a part of administrative law which itself is part of public law. However, public health law is interrelated with and influenced by other legal fields.
- Public health law is not the same as medical law. These legal areas must not be confused. Medical law is patient-centered whereas public health law is population-centered.
- Public health laws are *population-centered risk-management laws*.
- Public health law is a highly political field.
- Public health law is a very dynamic field of law.

In this sense, public health law has to accompany the far-reaching and dynamic scope of public health practice and provide it with the legal-regulatory infrastructure as well as the necessary legal means for interventions.

Mechanisms of Public Health Law

The mechanisms and functioning of public health law are based on the interplay of four kinds of legal rules that represent primary or secondary public health laws. As such, the mechanisms of public health law are based on

- Constitutional granting of legal power and authority to the government and its administrative agencies;
- Primary public health laws which create, fund and regulate the infrastructure of public health practice – "infrastructural" public health laws (*See* also Gerberding et al. 2003);
- Primary public health laws which provide for the legal authorization and legal means for public health activities to eliminate public health threats – "interventionist" public health laws (Gerberding et al. 2003; Gostin 2000a);
- Secondary public health laws which influence behavior without direct public health interventions (e. g., tax law, criminal law, tort law, commerce law, trade law).

These categories of law have different scopes and mechanisms. However, in public health practice they are interwoven and have to interplay to protect and promote the population's health. One of the core functions of public health laws is to arrange the legal relationships between the involved persons and administration entities (Childress et al. 2002). This includes the attribution and delineation of competencies, responsibilities and missions within the administration (i. e., the government and the public health agencies). It also comprises the clarification of the interrelationships between the population, the public health agencies and the individuals/legal entities posing health threats. Such clarifications are made by grant of circumscribed authorities to the public health agencies in the scope of their legal mission to act in the interest of the population. In doing so, they encroach the individual's sphere (*See* Gostin et al. 2007, with further explications).

In effect, the mechanisms of public health laws particularly include instruments to:

- Fund health promotion and education activities;
- Fund, promote and enforce prevention measures (e. g., vaccination);
- Promote voluntary healthy behavior by providing incentives (e. g., by tax law);
- Prohibit harmful behavior and promote healthy behavior by sanctioning harmful behavior (e. g., seat belt laws, criminal law);
- Coercively mitigate and eliminate health threats (e. g., by compulsory isolation and quarantine);
- Set standards and rules that provide legal guidance (e. g., technical rules, air pollution or noise level standards).

It becomes clear that law provides for *individual case-related means* as well as for *abstract general legal means* like standards or prohibitions. One advantage of the latter tools and their mechanism in pursuing public health goals is that they become effective and binding for the whole population. They are broader in their reach.

Codified public health laws provide guidance for public health practitioners and the public. Particularly, practitioners are relieved from the burden of resolving ethical conflicts, which they are regularly exposed to in daily practice (Bernheim et al. 2007). Many legal provisions are the result of the prior process of parliamentary weighing and ► legal balancing of conflicting rights that include ethical considerations. As noted above, public health and public health law are very political fields.

Additionally, public health laws set forth the procedural steps and the substantive criteria of the decision-making process before an intrusive public health action can be enforced. As typical for administrative law, public health agencies must take into account a number of procedural (formal) requisites which are legally instituted to protect the individual's rights vis-à-vis the state. In addition, codified public health laws as well as their judiciary interpretation by court decisions urge the public health practitioner to undergo a substantive process of weighing and balancing the protected good (population's health) and the rights they infringe with their public health actions. These procedural and substantive requirements for the public health agencies are part of the administrative decision-making process and, all together, they ensure an adequate legal balancing of conflicting rights.

Law as Limit to Public Health Practice

Law not only enables public health practice it also limits public health actions. The reason for this constellation is grounded in the fact that law is not only protecting the population's health interests but also the interests of those persons who impose risks to the public. The human rights (► human rights and public health) of the latter persons protect them from governmental intrusions into their personal sphere and are not be dispensed even if they cause a public health threat. It is up to laws to protect these persons from public health measures that are excessive or lack the necessary legal balancing. Therefore, law is not always "necessarily an ally" of public health (Parmet 2007).

By protecting human rights (which are regularly implemented in national constitutions or bills of rights), law can impede public health agencies and ensure that public health officers respect the rights of the endangering individuals (or other endangering legal entities like companies). Thus, law endows public health agencies with authority to restrict personal rights in the interest of the community and – at the same time – law guarantees the protection of these rights. As Lawrence Gostin put it, with respect to public health powers, the constitution "acts as a fountain and a levee" at the same time because it "originates the flow of powers to preserve the public health, and it curbs that power to protect individual freedoms" (Gostin 2000b). Therefore, public health law indeed has to mediate and navigate between two "separate ends" where one stands for the population's interest in a functioning public health practice assuring its safety and the other end represents the individual's human right to be "treated non-instrumentally" (Bloche 2003).

Law enables and limits public health at the same time. The relationship between individuals, the public and public health administration is complex and it is a burden of public health law to govern these complex relationships.

Particular Fields of Public Health Law

As with public health, public health laws have a far reach. They must govern all areas of life where public health risks may result. As such risks are multifaceted and may arise from individual conduct, objects, the environment, corporate conduct as well as state activities, the starting points for public health protection are manifold. Public health laws must cover this multitude of causes of public health risks. Therefore, the scope and range of public health laws is as manifold as the risks they aim to prevent and mitigate. In the following, a list of some public health laws exemplifies the broad range of this legal field:

- Public Health Services Laws;
- ► Labor and Occupational Safety Law;
- Anti-Discrimination Laws;
- Youth and Child Protection Laws;
- Mother Protection Laws;
- Family Protection Laws;
- Laws Protecting Disabled;
- ► Infectious Diseases Control Law;
- Quarantine and Isolation Laws;
- Vaccination Laws;
- ► Environmental Law and Public Health;
- Clean Drinking Water Laws;
- Air Pollution Prevention Laws;

- Surveillance and Data Collection Laws;
- Traffic Safety Laws;
- Zoning and Planning Laws;
- Laws for the ► Legal Regulation of Professions;
- Laws for the Regulation of Businesses (► Legal Regulation of Professions, Businesses and Products);
- Laws for the Regulation of Products (► Legal Regulation of Professions, Businesses and Products)
- General Product Safety Laws;
- Food Laws;
- Drug Safety Laws;
- Chemicals Laws;
- Pharmaceuticals Laws;
- Medical Devices Laws;
- Motor Vehicle Laws;
- Genetically Modified Substances Laws;
- Toxic and Hazardous Substances Laws;
- Waste Disposal Laws;
- Urgent Safety and Emergency Laws;
- Rescue Laws;
- Mentally Ill Persons Laws;
- Social Security Laws;
- Health Insurance Laws;
- Organ Transplant Laws;
- Health Promotion Laws;
- Prevention Laws.

This non-exhaustive list provides an insight into the heterogeneity and far-reaching scope of public health law. Several subsequent essays will further address some of these public health law fields. As such, one essay will highlight the particulars and methods of the legal regulation of professions, businesses and products. It will particularly demonstrate the measures and means of the legal regulation of professions (e. g., registration, licenses, regulatory supervision). It is noteworthy that this area of public health not only involves health professionals but also numerous further professions that may impact the population's health. For public health, the legal regulation of businesses and products is as important as the regulation of professions. This section of legal regulation not only encompasses health products as the range of product risks to the public health by far extends purely health-related products. Several specialized public health authorities are established for the legal regulation of professions, businesses and products. Among these, the food and drug regulatory agencies may be highlighted.

- Infectious Disease Control Laws
  Governmental activities to control and combat infectious diseases build on the "oldest field of public health" (Grad 1990). Correspondingly, the infectious diseases control laws are probably the oldest field of public health law. Many of the earliest public health interventions relate to the control of infectious diseases. Infectious diseases control laws encompass the legal rules that aim at the prevention, detection and abatement of infectious diseases and the health risks resulting from such diseases. These laws regulate a central field of public health law. Many of the earliest public health interventions relate to the control of infectious diseases. Infectious diseases are still a major concern of contemporary public health practice. All jurisdictions have taken measures to combat infectious diseases and prevent epidemics. Constitutions in some countries (e. g., in Germany) even grant explicit authorization to control and abate communicable diseases. As with all other branches of public health law, infectious disease control laws have certain characteristics that need further explication.
  Infectious diseases control laws have always been and will remain a major part of public health laws. Contemporary infectious diseases control laws increasingly focus on disease prevention in addition to the traditional public health actions, which are aimed at the combat and treatment of infectious diseases. Contemporary infectious diseases control faces new challenges from new pathogens and new disease mechanisms (e. g., SARS, HIV, avian influenza-virus, Ebola-virus). Particularly, recent suspected cases of avian influenza have led to controversies in some jurisdictions; thus, if a statute allows the agency to impose a cordon sanitaire and to a certain extent a quarantine on a farm or other area in order to control avian influenza, this needs legal grounding and justification.
- Labor and Occupational Safety Laws
  Occupational safety is one of the oldest areas and still a central practice area of public health practice. Law is essential for this section of public health. Labor and occupational safety laws comprise the legal rules that govern three aspects. Labor law regulates the legal relationship between employers and employees (including worker unions) with respect to the employment, including the corresponding rights

and duties resulting therefrom. Occupational safety laws encompass the body of law that provides for both the safety and health of employees at the workplace and the compensation of employees in cases of work induced injuries and diseases.

- Environmental Law
  Public health practice has always been strongly linked with environmental legislation. Environmental law can be defined as those legal rules that aim at the protection and development of the environment and its compartments as well as the protection of the public health from harm, risks and nuisances arising from the environment and the human-made interaction with the environment. Environmental laws can be differentiated into "environmental protection laws" (protection of the environment and its compartments as natural habitats) and "environmental health laws". Environmental health laws are aimed at the protection of human health from risks arising from the environment. This approach includes those "human-made" risks that developed as a result of interactions between human beings and the environment (e. g., air and water pollution). The environmental health laws should be attributed to the body of public health law. The practice and legal means of environmental health law are significantly different from those in other areas of public health law.
- Public Health Related Information and Communication (► public health law, information and communication)
  The heading "information and communication" in the realm of public health law encompasses several distinct topics. Three shall be depicted here. First, the surveillance, data collection and evaluation of information by public health agencies. Second, the information of the population on health aspects by the public health administration (e. g., health promotion campaigns, public health warnings). Third, the regulation of the information practices and contents provided by commercial companies with respect to their products and services (regulation of commercial speech). Both information and communication play crucial roles in contemporary public health. However, in all three branches, critical legal questions are raised which deserve attention in public health practice. The importance as well as the legal relevance of "information and communication" in public health practice is continuously increasing and deserves particular legal attention.

Future of Public Health Law

The future of public health law is linked with the development of public health. The scope, contents, challenges and measures of public health have undergone an alteration and diversification process even though not all public health threats are new and many of the challenges of the previous century remain up-to-date. However, today's public health practice faces some new threats and new tasks that need legal undercoating.

First, public health law in the 21st century faces new threats. These include public health concerns caused by:

- New infectious diseases (e. g., SARS, avian influenza);
- Worldwide globalization and increased mobility and travel, which facilitates the spread of (old and new) communicable diseases;
- New technologies and new products with unknown risk potential (e. g., mobile phone radiation, nanotechnology, genetically modified organisms);
- Environmental threats with yet unknown dimensions (e. g., climate change, hurricanes, flood disasters and other extreme weather events, *See* Kirch et al. 2005;
- Chronic diseases (Moulton et al. 2007);
- Terrorist attacks, including bioterrorism (e. g., anthrax attacks);
- Lifestyle and unhealthy behavior (Moulton et al. 2007). Particularly, obesity has been described as "the new frontier of public health law" (Mello et al. 2006).

Law has to provide public health practice with sufficient legal authorities, infrastructure elements and legal means to cope with the new threats. Some of the new threats (e. g., terrorism) have already led to national and international discussions on the legal limits of newly introduced public health protection measures in light of the human rights they intrude. In Germany, a recent law allowing the shooting down of a hijacked aircraft was repealed by the Constitutional Court. The Court held that the law was in breach of the German constitution as allowing the aircraft to be shot down violates the basic rights of the passengers. A deeper discussion of this judgment would go beyond the scope of this synopsis. In conclusion, the Court forbids the legislator to bal-

ance the public's safety against the lives of the passengers (Bundesverfassungsgericht 2006). Legal balancing must not charge lives against the public's health. Such discussions about the limits of legal measures in answer to new public health threats are ongoing in many countries. They will also shape the public health laws of the 21st century.

Second, in addition to new public health threats, contemporary public health has to take on new tasks and deliver new public health services, which need sufficient legal coverage:

- To cope with the new lifestyle and behavior-induced public health threats, activities of public health are shifting towards information and education and, thus, towards health promotion. These health promotion activities are also targeted to support patients with chronic diseases. The classical police powers activities of public health agencies no longer stand alone for public health practice. Nowadays, public health practice has to influence behavior at an earlier stage and prevention is increasingly emphasized (*See* Kirch et al. 2008; Kirch and Badura 2006, with pertinent contributions). For these new activities, states need to create and fund appropriate public health infrastructures.
- The new public health tasks will necessitate the inclusion of private service providers in the supply of such new public health services as health promotion activities. Public health law must provide for the legal embodiment of the arrangements between administrative bodies and private entities. This will lead to a co-existence of administrative law and private law elements in the provision of public health services.
- Public health practice methodologically has new scientific possibilities with new prospects. Among others, the potentials of public health genetics and stem cell research raise legal and ethical concerns that will be subject of future public health law.
- Public health is increasingly becoming subject to health policy and becomes involved in the provision of health care for the population and the corresponding securing of health insurances (Grad 1990; Schütte and Walter 2008). A form of co-existence between public health law and social (insurance) law will emerge. Connectedly, public health law will have to handle questions of financing adequate health care and will need to become familiar with the appending new methods (e. g., evidence-based-medicine, health technology assessments).
- Many of the new public health threats increase the need for international public health cooperations. Therefore, the importance of international organizations will increase (e. g., WHO, UNEP, WTO). However, such activities in the sense of a "global public health" (Fidler and Cetron 2007) will necessitate sufficient legal authorization and funding so that international public health laws will become necessary even though today's public health law already encompasses international legal rules.

The new public health threats as well as the new range of activities of public health practice will challenge public health law. These developments will extend the classic scope of public health law. In addition, the new global public health threats will speed up the globalization of public health law.

Conclusion

Law is an essential element and one of the most powerful tools of public health practice. This synopsis underscored the importance of law in public health practice and outlined the nature, means and mechanisms of public health law. Law will continue to play a central role in public health as it creates and funds the infrastructural fundaments of public health practice and provides it with the necessary operational legal means.

In addition, law will keep playing a central role in public health practice as it also limits the reach of public health measures and protects the (personal and property) rights of community members who are affected by public health actions. Therefore, the careful legal balancing of conflicting rights must remain a basic element of all actors in the realm of public health.

Even though not all public health challenges of the 21st century are new, public health is a dynamic field facing new threats, subjects, obligations and methods. Likewise, the field of public health law is dynamic too, as both are interrelated. Therefore, public health and law are characterized as "sibling fields that develop in close interrelation with each other" (Moulton et al. 2007). Probably, in this century "law will make at least as great a contribution to the public's health as it did in the century just ended" (Moulton et al. 2007).

Public health law is not only relevant for lawyers but also for public health practitioners. As law authorizes

and limits their actions, they should understand the role of law as well as how law is made, enforced and interpreted. This can enable them to use legal means in a more targeted way and influence the development of public health policy and public health law (Grad 1990). In many jurisdictions around the world and from various perspectives, there is a "renewed interest in public health law" (Coker and Martin 2006). Particularly but not only in the United States, public health law is widely recognized as a core element of public health practice and has become subject to the curricula of a number of law schools (Goodman et al. 2002). Many aspects of public health law and their interrelation with public health and medical practice are discussed in numerous articles and need further elaboration. The subject and discussion of public health law is transcending borders into other countries, which will help to strengthen the legal basis of public health practice. Law will remain indispensable and vital to public health and continue to make public health possible.

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Public Health Law, Information and Communication

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Synonyms

Health information and education; Health promotion

Definition

In the field of public health law, "information and communication" encompasses numerous topics. Most of them can be attributed to three major subjects. *First*, surveillance, data collection and evaluation of information by public health agencies. *Second*, the public health administration informing the population on health aspects (e. g., health promotion campaigns, public health warnings). *Third*, the regulation of commercial information practices and contents provided by companies and professionals with respect to their products and services (regulation of commercial speech).

Basic Characteristics

Many aspects of public health law are discussable under the title "information and communication". Most of them can be aggregated under three major subtitles, which will be further elucidated in the following.

Surveillance, Data Collection and Evaluation

Public health practice needs information. Information is essential for the theory and functioning of public health. Risk reduction measures undertaken by public health agencies must be grounded on sufficient and carefully evaluated information. This, however, raises the need to gather information on present or potential public health risks and developments. Therefore, surveillance and information gathering are fundamental to the functioning of public health and, thus, core activities of public health agencies. Such activities include surveillance of infectious diseases by gathering information from doctors and laboratories. Regularly, doctors have mandatory reporting obligations with respect to certain diseases. The collection of safety-relevant information on pharmaceuticals by imposing mandatory notification and reporting obligations on pharmaceutical companies (pharmacovigilance) is another example of a regulatory information collection activity. Such health information is "indispensable for virtually all public health activities" (Gostin 2000).

Public health surveillance and information gathering are also necessary for the subsequent assessment of the effectiveness of public health risk reduction measures that have been undertaken and for gathering follow-up information. Information collection is also an element of regulatory supervision of industries, workplace safety, product marketing and professional conduct. Information enables efficient regulatory supervision by the administration and government. The surveillance and information gathering activities of public health agencies raise some legal questions:

- As the data collected by the public health administration regularly contains sensitive information on individuals and companies (e. g., status of infections, product related information), its collection is a bur-

den on the ► privacy rights of the individuals as well as the commercial rights of the companies (e. g., intellectual property rights).

- The data collection procedure is associated with restrictions of professional and commercial rights: Medical doctors who must report to agencies as well as companies (product surveillance) and employers (workplace safety) are affected in their freedom to conduct their profession and business. Therefore, the imposition of such mandatory reporting obligations must be balanced with these conflicting rights of the professionals and companies.
- The mandatory reporting and notification obligations of physicians or other health professionals lead to an infringement of the ► confidentiality between the physicians and their patients. This confidentiality within the physician-patient-relationship is a necessary and legally protected good. Therefore, public health agencies have to be aware of the burden they cause with surveillance activities in such sensitive relationships.
- In light of the sensitivity of the data, administrative agencies must ensure safe, confidential and secure handling of the obtained information. With respect to these data, the administration must ensure data security and protect privacy rights (e. g., the information about an existing HIV-infection of a person). The protection of sensitive information is the state's mirrored duty in contrast to the right to collect these data.
- Any disclosure of such information must be based on rational and public health related reasons. Public health officers who fail to ensure security and confidentiality violate the rights of persons and companies. These officials are at risk of being sentenced to criminal culpability and tort liability and of paying damages to the affected persons and companies.

Like most public health activities, surveillance and data evaluation practices also generate legal conflicts that need to be balanced with the material importance of the information for the protection and promotion of public health.

Health Communication and Promotion

Public health agencies not only collect but also use obtained information to protect the population from health threats. Regulatory agencies evaluate information to assess health risks resulting from products and techniques. As a consequence of detected risks, agencies issue warnings and public health advice and, in this vein, inform and warn the public about health threats. Additionally, public information includes recommendations on healthy behavior. Drug regulatory agencies make intensive use of their competencies to inform and warn the public about health risks of pharmaceuticals and medical devices (*See* the webpages of the FDA, EMEA or BfArM). Public warnings by state agencies about product risks are effective tools in regulatory supervision.

The information and communication activities, thus, the "government speech" (Gostin 2000) comprise more than product-related warnings. The government and its agencies also warn and inform about upcoming or present health risks resulting from natural disasters or infectious diseases. As an early example, in the 14th century in Europe, the local administration informed the population about the right behavior in cases of plague, and about how to prevent plague. In the "*Pestschriften*" (a German term that translates to "the Plague Writings"), the administration provided, among others, instructions to avert the risks of an epidemic (Schumacher and Meyn 1992). Such health information and education campaigns are even more relevant in contemporary public health.

Another growing field of public health practice is *health promotion*. These activities conducted by agencies (or in cooperation with specialized private institutes) cover a wide range of health topics. By this means, the government intends to influence behavior. These activities pursue health education goals. Examples of health promotion activities include campaigns for safer sex in order to prevent sexually transmitted diseases. Other health promotion campaigns educate on nutrition aspects and try to prevent drunk driving. Furthermore, the reduction of tobacco smoking was significantly promoted by the anti-smoking campaigns of public health agencies (CDC 1999). There are numerous other examples, including regular vaccination campaigns. Overall, health promotion campaigns influence individual behavior by convincing, persuading, motivating and creating awareness of the upsides and downsides of a behavior. Today, many public health concerns result from individual behavior and lifestyle, and health promotion will remain a useful tool of public health practice (Reynolds 1995).

As public health agencies are also involved in the supply of health services and the securing of health insurances, their activities also include the analysis and communication of the quality of care and cost-benefit-ratios of medicinal products and medical treatments. For the latter, many countries have established particular agencies that are in charge of cost-benefit-assessments and health-technology-assessments. Among these institutions, the "National Institute of Clinical Excellence" (NICE) in the United Kingdom is a prominent example. Agencies inform the public about the quality and other features of medical treatments and supply recommendations and therapy guidelines. These communication activities continue to play an important role in contemporary public health. Their importance will probably increase as new communication means (e. g., internet, e-mail) enable agencies to reach out more effectively to the general public.

Legal concerns arising from public health agencies' communication and health promotion activities are manifold. As such, health-related communication by the government influences consumer behavior with respect to several types of products (e. g., food, dietary products). These activities interfere with the economic rights of manufacturers and product distributors. Similar concerns arise with respect to public health advisories issued by the administration that warn the public against certain products. Here again, a relevant interference with economic, professional and personal rights of health professionals and product manufacturers cannot be excluded. Overall, public health agencies need sufficient authorizations to conduct such information campaigns. Despite legal authorization, public health agencies must carefully balance all personal and economic rights that might be impacted by their health communication activities. If agencies conduct such activities wrongfully, they may be liable to companies, health professionals and other individuals (► state liability).

Regulation of Commercial Information

As a third branch of "information and communication", public health law comprises the regulation of information, communication and advertising of companies and service providers (including health professionals). This regulation of commercial speech is part of the legal regulation of professions, businesses and products. Commercial speech is characterized as the provision of information that directly or indirectly aims to support the marketing and sale of products or services. Therefore, courts also refer to the fact that commercial speech proposes a commercial transaction, which means that this type of communication and information is aimed at sales promotion or merchandising. The public health regulation of commercial speech has several starting points as such communication may endanger the public health in different ways when left unregulated:

- *First*, in most jurisdictions, commercial speech with wrong, inaccurate or misleading information is prohibited.
- *Second*, states may prohibit certain content in commercial communication. Accordingly, laws in many countries limit advertising, information or product-related commercial communication for a number of products. Among these, tobacco, alcohol and pharmaceuticals are prominent examples.
- *Third*, commercial speech may be restricted with respect to the type of content, addressees or the media used. In Europe, commercial information to consumers for marketing of prescription drugs is prohibited whereas it is allowed vis-à-vis health professionals. In addition, the content and channels of such commercial speech is regulated. In this alternative, public health regulates when, how, where, with whom and with which content commercial speech is allowed (*See* Gostin 2000, with a case study on tobacco advertising in the U.S.).
- Public health regulation of commercially motivated communication also includes "compelled commercial speech" (Gostin and Jacobson 2006). Here, governments force industries to provide the consumers with specific information on product ingredients or risks. Again, the pharmaceutical industry is a good example. When placed on the market, drugs must be labeled with certain information. They must be marketed with a package leaflet containing particular information including unfavorable product information, which must also be disclosed (e. g., side effects, interactions). Additionally, companies must disclose safety-relevant information obtained during the marketing to authorities and the public (*See* Koyuncu 2006, for pharmaceutical information). Similar compelled communication measures exist for other goods (e. g., food, chemicals). In addition to consumer products, occupational safety laws prescribe that workers need to be informed about

the risks of the substances processed at work. Here, public health laws function as so-called "right-to-know laws" (Judson et al. 2006). They grant workers a right to know the risks of substances and materials they handle. These rights-to-know are analog to the informed-consent-rules in medical law where the patient has the right to know the risks of a medical treatment or medicinal product (Koyuncu 2006).

Regulation of commercial speech has different manifestations among which some were highlighted above. Public health law allows different stages of commercial freedom and restricts some types of commercial communication. These regulation measures are part of the regulation of professions, businesses and products.

Both information and communication play crucial roles in contemporary public health. However, in all three branches highlighted above, critical legal questions are raised that deserve attention. The importance as well as legal relevance of "information and communication" in public health practice is increasing.

Cross-References

- ▶ Epidemiology
- ▶ Health Campaigns
- ▶ Health Information
- ▶ Health Policy
- ▶ Health Promotion
- ▶ Health Technology Assessment (HTA)
- ▶ Infectious Diseases
- ▶ Labor and Occupational Safety Law
- ▶ Legal Balancing of Conflicting Rights
- ▶ Legal Regulation of Professions, Businesses, and Products
- ▶ Public Health Genetics
- ▶ Public Health Law, Legal Means

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Public Health Law, Legal Means

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Synonyms

Legal tools of public health; Legal instruments of public health

Definitions

Legal means of public health encompass the instruments applied in public health practice that are provided by law. In contrast to the legal means, public health practice also applies scientific means rooted in epidemiology, medicine, microbiology, and statistics, among others. The range of legal means includes legal rules legislated by parliaments as well as individual administrative orders to protect and promote the public's health.

Basic Characteristics

The legal means of public health can be differentiated depending on the actor who uses them (e. g., the government, legislator, courts, or private entities and individuals). On the other hand, the legal means can be differentiated depending on the addressee of the means (e. g., individuals, companies, objects, the general public). In the following, some of the means are presented.

Legal Means Depending on Public Health Actors

All state powers as well as individuals and private entities are involved in the assurance and promotion of public health. Based on the assigned legal powers, the legal means of the actors differ remarkably.

The *legislator* (i. e., parliaments/congress) particularly uses the following means:

- Enacting statutes assuring and promoting public health purposes;

- Enacting statutes defining public health terms (e. g., definition of "emergency", "natural catastrophes")
- Enacting statutes providing for policy objectives;
- Enacting statutes with indirect effect on public health (e. g., tax law, criminal law);
- Enacting statutes establishing procedural rights within public health administration;
- Granting legal authorization to the government;
- Granting funds to the government for public health policies and actions;
- Creating, funding and defining the mission of public health agencies;
- Enacting statutes governing the competencies and relations between agencies.

The *administration* (i. e., government and administrative agencies) as the key actor of public health practice has the most legal means at its disposal. The administrative agencies are part of the government. All together form the state administration. As legal means, they may, among others:

- Promulgate regulations;
- Issue ordinances (e. g., air pollution ordinances, zoning ordinances);
- Create administrative agencies;
- Set standards and guidelines (e. g., air pollution, noise level thresholds);
- Supervise authorities;
- Carry out surveillance and data collection;
- Release and enforce administrative acts;
- Perform administrative physical acts;
- Release public information, including health promotion campaigns;
- Mandate private entities to supply public health services;
- Carry out public health litigation, including obtaining court injunctions;
- Impose civil sanctions;
- Impose administrative fines;
- Initiate criminal investigations.

In addition to the administrative agencies, the military may effectively contribute to the public's health, which is regularly the case in emergencies and natural disasters (*See* Matthews et al. 2007).

The *court system and judges* also have specific legal means in the realm of public health. Courts are increasingly involved in public health matters. It was noted that since the 1970s, litigation has been increasingly used to pursue public health goals and that this new type of "Public Health Litigation" to promote public health outcomes is particularly used by individuals and non-governmental organizations (Parmet and Daynard 2000; Teret 1986). The court's function is to judge legal disputes and provide guidance by reviewing, interpreting, and enforcing laws. As a result, courts release judgments, intermediate and ▶ preliminary injunctions, and impose penalties. In doing so, they establish case law as well as legal doctrines, particularly where no codified laws exist. In addition to such case-related work, courts influence legislatures and policies. As commentators note, numerous policies of contemporary public health are the result of an "interactive dialog between courts and the legislatures" (Parmet and Daynard 2000). The court's powers and influence avenues must not be underestimated.

Other actors in public health practice include individuals, private entities (e. g., companies), and other institutions (e. g., non-governmental organizations, international organizations). These actors may also make use of specific legal means to pursue public health objectives. As a basic legal tool, individuals and organizations may apply for administrative agency actions against public health threats. Further, public health litigation has already been mentioned and can be a powerful instrument. For example, in Germany, an individual obtained a judgment of the Federal Administrative Court against the local administration, which ruled that in that particular case the administration had to take public health measures against significantly elevated air pollution with micro dust in a particular area. The administration initially refused such actions. Individuals can also influence public health relevant developments by private law litigation against companies, state authorities, and medical service providers. As such, product liability litigation has influenced the product safety level as well as the manufacturers' duties (information, instruction, record-keeping) and safety relevant behaviors (McClurg et al. 2007; Parmet and Daynard 2000; Gostin 2000). Medical malpractice litigation improved the patient's legal status vis–à–vis medical doctors (Koyuncu 2007; Koyuncu 2006a). This has not only produced deterrent effects but also enhanced the development of patient empowerment and contributed to the public's health (Koyuncu 2006b). Similarly, pharmaceutical product liability litigation led to the establishment of information and instruction obligations of drug manufacturers (Koyuncu 2004).

Legal Means and Their Mechanisms

The legal means can also be subdivided with respect to their mechanisms. As such, the following means can be differentiated, where the degree of coercion through the administration is a further criterion:

- Legal means to inform, educate, and induce voluntary healthy behavior of individuals and legal entities (e. g., health promotion, standard setting);
- Legal means to influence behavior and sanction misconduct (e. g., criminal laws, tort liability) and to provide incentives for voluntary healthy behavior (tax law);
- Legal means to supply public health services (e. g., health insurances);
- Legal means enabling the intrusion of individual privacy (e. g., surveillance);
- Legal means to impose preconditions for the conduct of certain activities and businesses (e. g., licenses) and regulation of such conduct (e. g., mandatory notifications);
- Coercive measures without affecting bodily integrity (e. g., isolation, destruction of objects, closure of businesses or buildings);
- Coercive measures with bodily integrity affection (e. g., compulsory medical examination, vaccination, and treatment).

These legal means can be further differentiated with respect to their targets. The set of tools provided by public health law can be subdivided depending on the target of the action, which can be (1) persons, (2) objects, (3) companies and businesses, and (4) the general public. Public health can ensure and promote the population's health by starting at different points and targets and by applying different levels of coercion. The legal tool to combat a public health risk must always be selected on a case-by-case basis. Therefore, the following lists present a selection of means provided by law and which stand for a wider spectrum of potential legal means.

Legal Means Against Persons

These legal means regularly entail personal restrictions but not necessarily, as many of them also intend to influence behavior and induce voluntary healthy behavior. However, many public health means provided by law allow coercive actions and, thus, substantially affect personal rights:

- Information and health promotion campaigns;
- Provision of health services;
- Provision of social/health insurances;
- Providing incentives for healthy behavior (e. g., tax law);
- Surveillance and data collection, including inquiries and questionnaires;
- Registration of persons;
- Regulation of professions (e. g., licensures, permits, prior notification);
- Mandatory professional obligations (e. g., mandatory reporting of infectious diseases);
- Conditions, restrictions of professional speech, and advertising;
- Revocation of licenses and ban from professions or businesses;
- Mandatory use of private property and administrative condemnation of private property;
- Isolation, quarantine, and cordon sanitaire;
- Compulsory commitment and hospitalization;
- Compulsory examination and medical treatment;
- Civil sanctions and tort liability;
- Administrative fines and penalties;
- Criminal prosecution and punishment.

This non-exhaustive list demonstrates that to a certain extent personal restrictions are an inevitable part of public health practice. Therefore, particular emphasis is necessary on the legal balancing of conflicting rights prior to the selection of the means of practice in a particular case. Public health officers must understand that each act causing a personal restriction may lead to personal criminal culpability of the public health officer and cause the liability of the administration if the order was issued without sufficient legal balancing.

Legal Means Against Objects

Many public health threats are related to objects. Therefore, several public health actions target objects. These include:

- Legal regulation of products and regulatory supervision;
- Surveillance (e. g., reporting duties, inspections, inquiries, questionnaires);
- Trade restrictions (e. g., an ► embargo);
- Product-related public health advisories, public product warnings, and recalls;

- Restriction of access and prohibition of the use of products/goods;
- Closure of buildings, streets, tunnels, bridges, etc.;
- Inspections (in criminal law: searches), takings, and seizures;
- Administrative condemnation and destruction of objects.

Legal Means Against Companies and Businesses

A considerable part of public health practice includes the regulation of businesses and products. Among these businesses, health-related product manufacturers and service providers (e. g., pharmaceutical companies, medical device producers, hospitals) as well as businesses with a less direct connection to the public's health (e. g., motor vehicle producers, construction business) have to be regulated. Legal means with respect to these targets include:

- Restriction of the access and conduct of businesses;
- Legal regulation and regulatory supervision of the business and workplaces (e. g., licenses, permits, prior notification/registration);
- Occupational safety measures;
- Surveillance (e. g., reporting, inspections, inquiries, hearings, questionnaires);
- Restrictions of advertising and marketing of certain products (e. g., alcohol, tobacco, pharmaceuticals) and recall orders for products;
- Trade restrictions and embargos;
- Suspense and revocation of licenses and prohibition and closure of businesses;
- Administrative sanctions and criminal prosecution and punishment including forfeit of gain;
- Tort liability and civil sanctions.

Legal Means Targeting the General Public

Public health practice additionally applies a set of tools that is rather addressed to the general public. These measures effectuate through influencing voluntary behavior, prescribing behavior, and defining state-of-the-art standards, thresholds, and prohibitions with subsequent sanctioning. These instruments also intend to influence, develop, and form social norms (Bernheim et al. 2007) and, thus, induce and promote healthier behavior. Among them, regulations, ordinances, and guidance documents governing particular fields as well as the setting of standards (e. g., air pollution thresholds, workplace safety standards) must be noted. Particularly, nuisance abatement is a crucial public health action (Gostin and Jacobson 2006) in addition to zoning and planning activities with respect to land use, construction, and traffic. Furthermore, health information, education, and health promotion campaigns conducted by the public health administration are directed to the general public. The latter include statistics and other publications of public health agencies. As the basis for such publications, public health agencies must be entitled to conduct their own research; this includes public funding of the research activities.

In summary, law provides the public health practice and state powers with a broad range and a flexible set of legal means. The acting public health officer will have to select the applicable legal means on a case-by-case basis as the legitimacy and admissibility of the tools always depend on the result of the case-specific legal balancing of the conflicting rights. Many of the legal means presented above will be further discussed in the essays regarding the field of public health law and the corresponding specialized public health fields in this encyclopedia.

Cross-References

- ▶ Administrative Law and Public Health
- ▶ Criminal Law and Public Health
- ▶ Environmental Law and Public Health
- ▶ Infectious Diseases
- ▶ Infectious Diseases Control Law
- ▶ Labor and Occupational Safety Law
- ▶ Legal Balancing of Conflicting Rights
- ▶ Legal Regulation of Professions, Businesses, and Products
- ▶ Occupational and Environmental Health
- ▶ Tort Law and Public Health

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Public Health Legal Rules

Definition

Public health law is the sum of all legal rules that directly or indirectly aim to safeguard or promote the population's health. These rules may arise from statutory law, administrative regulations and acts, customary law, case-law and common-law. Public health law also includes laws which provide for the establishment and funding of corresponding administrative agencies.

Public Health Programs

Synonyms

Public health interventions; Public health system

Definition

Governmental or other collective efforts to prevent disease, prolong life, and promote physical and mental health among the population as a whole. These programs primarily emphasize the prevention of disease and the promotion of health-enhancing resources such as screening programs for early detection of disease, immunizations, monitoring of health standards, and health education.

Public Health Services

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Definition

Public health services are services, goods or facilities provided to promote and improve the ► health status of populations in a country, region or community as distinct from personal health care services improving the health status of an individual. Public health services are designed to prevent diseases, to promote, protect and improve health by means of preventive medicine, health education, control of ► communicable diseases, sanitary measures, and protection against ► environmental hazards. The organization and scope of public health services depends on the country-specific concept of public health, its health care system as well as on the available financial resources.

Basis Characteristics

The Concept of Public Health

The concept of public health emphasizes the health needs of a population as a whole. Goals of public health are the prevention of disease, the reduction of the amount of disease and of health inequalities, and the reduction of premature death, disability and discomfort in the population.

To assess the health status and health trends in a population, basic sciences such as ► epidemiology and ► vital statistics are applied. Epidemiology is used to identify causes and calculate risks to health; vital statistics help to assess the conditions influencing health. Other sciences such as ► toxicology and ► microbiology are used to assess chemical and biological risks in the environment. Even social sciences are increasingly impor-

tant as social factors and behavioral aspects also contribute to the risk of diseases, premature death or disability.

The effort put into public health services, institutions and programs to fulfill specific public health goals determines the design and scope of public health services in a country.

Organization and Scope of Public Health Services Throughout the World

In most industrialized nations with well developed health care systems, public health services are organized on a three-level basis: national, regional and local levels.

- National public health services are typically in charge of collecting national health statistics in order to set, monitor and maintain health standards and to promote good health. They also support and perform research on diseases relevant to public health.
- Regional public health services are mainly responsible for larger health protection activities such as providing safe water and food supplies as well as early detection of diseases. They may also provide health care for certain groups such as the chronic mentally ill.
- Local public health services in cities or communities deal with various public health services on a more personal level, for example, health education and health control in schools, immunization programs, advice in mother-child care as well as health care for the elderly and long-term sick. As local health services are close to the people they also investigate and control epidemics and other communicable diseases such as those transmitted sexually.

On an international level, there is an exchange of information between national public health services in order to control diseases of international importance. Under the guardianship of the World Health Organization (WHO), national public health services collaborate in the field of major ► epidemic diseases and set standards for protection against environmental hazards.

In most developing countries, public health services are weak due to several factors: lack of responsibility for public health in the government; weak leadership and vested interests; lack of investment in health and lack of infrastructure to deliver health services as well as poor training and career structures. Since its creation in 1948, the WHO, as the United Nation's specialized agency for health, mainly concentrates its efforts on the promotion of health in developing countries. Through various programs, the WHO Regional Offices try to help these countries to strengthen their public health workforce as well as their public health education and research by developing training programs, building partnerships and mobilizing new health funds. Despite WHO efforts over the years, the organization, scope and quality standards of public health services in developing countries are far behind the services provided in well developed industrial nations (see country example of the United States).

Country Example: Public Health Services in the United States

The system of public health services in the United States serves as an example for all industrialized high-income nations with well developed health systems which organize their public health services in a similar way. In the United States, the principal agency for public health is the US Department of Health and Human Services. It covers a wide spectrum of services provided at the local level by state or county agencies, or through private sector grantees. Its global mission is to promote physical and mental health and prevent diseases, injury and disability in all communities of the country. The Department's programs are administered by the following 11 operating divisions, including 8 agencies in the US Public Health Service and 3 Human Services Agencies.

Public Health Service Agencies:

1. National Institutes of Health (NIH) is a medical research organization, conducting extensive research nationwide in neurology, cancer, diabetes, heart diseases and AIDS
2. Food and Drug Administration (FDA) assures the safety of foods and cosmetics, and the safety and efficacy of pharmaceuticals, biological products, and medical devices
3. Centers for Disease Control and Prevention (CDC) provide a system of health surveillance to monitor and prevent disease outbreaks (including ► bioterrorism), implement disease prevention strategies, immunization services, workplace safety, and environmental disease prevention

4. Agency for Toxic Substances and Disease Registry as part of CDC helps prevent exposure to hazardous substances from waste sites and develops toxicological profiles of chemicals at these sites
5. Indian Health Service (HIS) provides health services for American Indians and Alaska Natives living in Federally recognized tribes
6. Health Resources and Services Administration (HRSA) provides access to essential health care services for people having a low income, being uninsured or who live in rural areas or urban neighborhoods where health care is scarce
7. Substance Abuse and Mental Health Services Administration (SAMHSA) works to improve the quality and availability of substance abuse prevention, addiction treatment and mental health services
8. Agency for Healthcare Research and Quality (AHRQ) supports research on health care systems, health care quality and cost issues, access to health care, effectiveness of medical treatments and quality of care (► health care quality).

Human Service Agencies:

1. Centers for Medicare & Medicaid Services (CMS) administers the Medicare and Medicaid programs, which provide health care for the elderly and disabled (► medicare) and for low-income persons including children (► medicaid)
2. Administration for Children and Families (ACF) is responsible for programs that promote the economic and social well-being of children, families and communities
3. Administration on Aging (AoA) supports a nationwide aging network, providing services to the elderly, such as home delivered meals, transportation and at-home services to enable them to remain independent

Cross-References

► Bioterrorism
► Communicable Diseases
► Environmental Hazards
► Epidemic Diseases
► Epidemiology
► Health Care Quality
► Health Status
► Medicaid
► Medicare
► Microbiology
► Toxicology
► Vital Statistics

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Public Health Surveillance

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Synonyms

Surveillance; Epidemiologic surveillance; Health monitoring; Continuous control

Definition

According to the ► Centers for Disease Control and Prevention (CDC), "public health surveillance is the ongoing systematic collection, analysis, and interpretation of outcome-specific data essential to the planning, implementation, and ► evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. Outcomes may include disease, injury, and disability, as well as risk factors, vector exposures, environmental hazards, or other exposures. The final link of the surveillance chain is the application of these data to prevent and

control human disease and injury" (Thacker and Birkhead 2002).

Surveillance of ► drinking water quality is a continuous process of public health assessment and review of the safe quality and quantity, accessibility, coverage and continuity of drinking water supplies.

Surveillance can be distinguished from ► monitoring by the fact that it is continuous and ongoing, whereas monitoring is intermittent or episodic (Last 2001).

Basic Characteristics

Historical Background

Surveillance concepts in public health practice were first used to monitor contacts of persons with serious communicable diseases, such as bubonic plague and smallpox, in order to detect early symptoms and prompt isolation. Two prominent names in the development of public health surveillance activities in the 19th century were Lemuel Shattuck and William Far. In the middle of the 20th century, Alexander Langmuir and his colleagues began to broaden the concept of surveillance. They emphasized rapid collection and analysis of data on a particular disease. The 1968 World Health Assembly focused on national and global surveillance of communicable diseases, applying the term to the diseases themselves rather than to the monitoring of individuals with disease. It also addressed the application of the concept of surveillance to public health problems other than communicable disease, such as leukemia, congenital malformations, injuries, behavioral risk factors, etc. (Thacker 2000).

Purposes of Surveillance

Public health surveillance is a management tool and the cornerstone for public health practice. It provides the scientific and factual database that is essential for informed decision-making, conduction of public health prevention and control programs, evaluation of public health efforts, and allocation of resources. There are many uses of surveillance. The most important are:

- estimation of the health status of populations,
- portrayal of the natural history of disease,
- detection of epidemics,
- testing of hypotheses,
- evaluation of control and prevention measures,
- monitoring of changes in infectious agents,
- detection of changes in health practice,
- designing and planning public health programs, and
- planning and conducting research (Thacker 2000).

The overall purpose of surveillance is to prevent disease, disability, and death, thereby improving public health.

Elements of Surveillance Systems

Case Definition Explicit case definition is at the core of a surveillance system. It should be as clear and as simple as possible. When the definitions apply to diseases, they generally combine laboratory criteria with clinical manifestations. For some diseases, definitions may be stratified by the levels of confirmation (e. g., confirmed and possible cases). During an epidemic investigation, when laboratory data are often not available, the case definition is usually broad (Thacker and Birkhead 2002).

Population Under Surveillance All surveillance systems target specific populations, which may range from individuals at specific institutions (e. g., schools, hospitals) to residents of nations.

Types of Surveillance

Active surveillance is a system employing staff members to contact health care providers or the population (by telephone calls or visits to physicians) regularly in order to seek information about health conditions. Active surveillance provides the most accurate and timely information, but it is expensive.

Passive surveillance means that the organization conducting the surveillance does not contact potential reporters but rather leaves the initiative for reporting to others. Passive surveillance is relatively inexpensive, but data quality and timeliness are difficult to control.

Population-based surveillance systems include ► notifiable disease reporting systems and systems based on the use of vital statistics, which register almost all births and deaths and provide information on the causes of deaths.

Laboratory-Based Surveillance Using diagnostic laboratories as the basis for surveillance can be highly effective for some diseases. The future in food borne disease surveillance is in laboratory-based surveillance. A collaborative World Health Organization (WHO)

program – Global Salm-Surv – promotes the international use of Salmonella serotyping.

Sentinel Surveillance Surveillance for ► sentinel events can be used to identify situations where public health investigation or intervention is required. An example of sentinel surveillance is networks of private physicians reporting cases of influenza.

Syndromic Surveillance Syndromic surveillance uses case definitions that are based entirely on clinical features without any clinical or laboratory diagnosis (e. g., collecting the number of cases of diarrhea rather than cases of cholera). It can detect potential disease outbreaks quickly and can provide useful tools to assist in outbreak investigation.

Evaluation of Surveillance System

Evaluation of public health surveillance systems should be performed regularly to assess the following:

- the public health importance of the health event;
- the usefulness and cost of the surveillance system;
- the characteristics of the surveillance system that contribute directly to its ability to meet its specific objectives, such as simplicity, flexibility, acceptability, ► sensitivity, ► predictive value positive, ► representativeness, and ► timeliness (Romaguera et al. 2000).

The Future of Public Health Surveillance

The vision of the future of surveillance assumes transformation of surveillance from dusty archives of data collected after-the-fact to meaningful measures that provide accountability for health status or that deliver timely early warnings for outbreaks of serious diseases. Realization of this future vision of surveillance requires information technology that is already feasible, the political will to develop and coordinate the needed systems and standards, as well as the removal of the financial and logistical barriers to broadband Internet access (Nsubuga et al. 2006).

In a time when we are confronted with SARS and avian influenza, the need to integrate global surveillance networks is unquestionable. The global infectious disease surveillance network that has been adopted by the WHO links regional, national, and international networks of laboratories and medical centers. Government centers of excellence, such as the CDC, together with military networks, Internet discussion sites (for example ProMed), and collaborative WHO programs such as the WHO Global Salm-Surv, also supplement the reporting networks. The Global Outbreak Alert and Response Network has more than 120 partners around the world. One of the most important aspects of the new ► International Health Regulations (IHR 2005) is the establishment of a global surveillance system for public health emergencies of international concern (Nsubuga et al. 2006).

Conclusion

Public health surveillance is an essential tool for estimating the health status and behavior of populations, and is useful for measuring both the need for interventions and the effects of interventions. The key objective of surveillance is to provide information to guide intervention.

Cross-References

► Centers for Disease Control and Prevention (CDC)
► Evaluation
► International Health Regulations
► Monitoring
► Notifiable Disease
► Predictive Value Positive of a Surveillance System
► Representativeness of a Surveillance System
► Sensitivity of a Surveillance System
► Sentinel Events
► Timeliness of a Surveillance System

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Public Health System

► Public Health Programs

Public Law

Definition

Public law is the body of law that governs the relationships between private subjects (individuals and private legal entities) and the state with its institutions. This includes the relationships between individuals and the legislative powers, the judiciary powers and the executive powers (i. e., the state administration). Subdivisions of public law include constitutional law, court procedure laws and administrative law. Public health law is a branch of administrative law and, thus, a part of public law.

Publicly-Financed Health Systems

Synonyms

Health care system; Governmental health care

Definition

The health care delivery and payment system financed by a government, which includes all the actors, institutions and resources that government employs to promote access, quality, affordability, and value of health care.

Public Mental Health

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Introduction

According to the World Health Organization (WHO), mental health is a state of well-being in which the individual realizes his or her own abilities, can cope with the normal ► stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community. Tudor (1996) described mental health as multifaceted with six dimensions: affective, behavioral, cognitive, spiritual, socio-political, and psychological. The Mental Health Foundation stated that an individual with good mental health is defined as one who can

- Develop emotionally, creatively, intellectual, and spiritually;
- Initiate, develop and sustain mutually satisfying personal relationships;
- Face problems, resolve them and learn from them;
- Be confident and assertive;
- Be aware of others and empathize with them;
- Use and enjoy solitude;
- Play and have fun;
- Laugh, both at themselves and at the world. (http://www.mentalhealth.org.uk)

Mental health is broadly defined. It includes vastly different beliefs about human natures and how to relief mental suffering. The determinants of mental health occur at three main levels- the individual, the group and the environment. Mental health and mental illness are not two different poles on a single continuum. Mental disorders are one of a number of possible obstacles to the individual's utilization of inner strengths and resources (other obstacles are, for example, physical illness, poverty or negative social circumstances). Public mental health is public health in relation to mental health and mental disorders. The Diagnostical and Statistical Manual of mental disorders (DSM-IV; APA 1994) defines a mental disorder as a clinically significant behavioral or psychological syndrome or pattern that occurs in an individual and that is associated with present distress or disability with a significantly increased risk of suffering, death, personal disability, or an important loss of freedom. The DSM-IV's definition seems quite broad, for example, it suggests that a mental disorder must be a manifestation of a behavioral *or* biological *or* psychological dysfunction. Psychological disorders can be episodic, chronic or recurrent. They cover a broad range of conditions. ► Substance use disorders (e. g., alcohol dependence, illicit substance dependence), ► psychotic disorders (e. g., schizophrenia), ► affective disorders (e. g. major depression, dysthymia, bipolar I and II disorder), ► anxiety disorders (e. g. panic disorder, agoraphobia,

generalized anxiety disorder, social phobia, obsessive-compulsive disorder), ► somatoform disorders (e. g., somatization disorder, pain disorder, hypochondriasis) and ► eating disorders (e. g. anorexia nervosa, bulimia nervosa) are "major mental disorders" and show a high public health relevance. Mental disorders are common diseases. Over 80 million people of all ages in the EU are estimated to suffer from mental disorders. At any time, one adult in six suffers from mental problems of varying severity. Despite being common mental disorders are underdiagnosed by doctors. Mental health is fundamental to overall health. Mental disorders typically have adverse effects on school and academic career, somatic health, and social functioning. According to Murray and Lopez (1996), the burden of mental illness has been seriously underestimated by traditional approaches that focus on mortality rates as the primary measure of adverse health outcomes. Projections used in The *Global Burden of Disease* show that psychiatric and neurological conditions could increase their share of the total global burden of disease from 10.5% in 1990 to 15% in 2020. Mental disorders are real. People with mental disorders are not just thinking that they are ill, people with mental disorders are as disabled as people suffering from coronary heart disease or cancer in terms of lost productivity (e. g., disability days) and premature death (e. g., caused by suicide, the affects of associated risk factors, and comorbidity). Mental disorders are associated with total costs of over 290 billion Euros. Those costs are related to diagnostic assessment and treatment but mainly to indirect costs (Andlin-Sobocki et al. 2005). There is a strong need for economic research in mental health (► mental health economics). As research has improved our ability to diagnose and treat mental disorders, the recognition of mental disorders should be improved as well. However, probably less than half of individuals suffering from frequent mental illnesses are recognized in primary care settings. And, even if mental disorders are recognized, only about half of affected patients get effective treatment. The earlier a mental disorder is diagnosed and treated, the higher the changes for achieving recovery. Non-treatment, however, supports chronicity and comorbidity of mental disorders.

Mental health problems can be both a cause and a consequence of social exclusion. Common mental disorders are significantly more frequent in socially disadvantaged populations (e. g., people with low education or unemployment). Mental illness can lead to social stigmatization. Stigma in relation to mental illness (► stigma of mental disorders) contributes negatively to social inclusion and equality. Moreover, a stigma deters treatment significantly. Mental health problems are an important contributor to the burden of disease and can cause significant loss of quality of life (by e. g. causing disability and increasing social exclusion and mortality), hence, mental health problems are of major importance to all societies and to all age groups worldwide. Mental health and psychiatry research in the enlarged European Union varies. Especially in the new central and eastern European member states (Hungary, Estonia, Poland, the Czech Republic, Slovenia, Latvia, Lithuania, and Slovakia), the publication rate in the psychiatric field (i. e. an indicator of scientific research) is low. As Marusic (2004) stated, the low number of internationally recognized psychiatric publications might reflect the restricted mental health research in these countries which is mainly a result of the small economic capacity. Inspite of their small populations, Ireland (publication rate in the year 2000: 22.18 per 10^6 inhabitants), Finland (10.24 per 10^6 inhabitants), Denmark (7.18 per 10^6 inhabitants), and Sweden (6.09 per 10^6 inhabitants) show the most psychiatric research publications in the European Union, whereas Italy (0.68), Poland (0.36), Portugal (0.29), and Slovakia (0.19) show the lowest rate.

Prevalence, Severity, and Treatment of Mental Disorders

For examining and comparing the prevalence of mental disorders in different countries, the use of the same diagnostic instrument is an important factor. In epidemiological surveys, the lack of common methods is the fundamental problem. Of course, the advantages and disadvantages of the different instruments can be argued, but unless agreement is reached on a very few standardized and validated instruments, comparisons will be impossible. Moreover, for comparison, age groups targeted, sampling methods, interviewing techniques, methods and categories of analysis, and presentation of results need to be standardized. In 1988, Robins et al. published the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) which was more elaborated than other

Public Mental Health, Table 1 Twelve-Month Prevalence of World Mental Health Composite International Diagnostic Interview DSM-IV disorders

	95% Confidence interval				
	Anxiety disorders*	Mood disorders	Impulse-Control disorders	Substance abuse	Any mental disorder
Belgium	6.9 [4.5–9.4]	6.2 [4.8–7.6]	1.0 [0.3–1.8]	1.2 [0.6–1.9]	12.0 [9.6–14.3]
France	12.0 [9.8–14.2]	8.5 [6.4–10.6]	1.4 [0.7–2.0]	0.7 [0.3–1.2]	18.4 [15.3–21.4]
Germany	6.2 [4.7–7.6]	3.6 [2.8–4.3]	0.3 [0.1–0.6]	1.1 [0.4–1.7]	9.1 [7.3–10-8]
Italy	5.8 [4.5–7.1]	3.8 [3.1–4.5]	0.3 [0.1–0.5]	0.1 [0.0–0.2]	8.2 [6.7–9.7]
Netherlands	8.8 [6.6–11.0]	6.9 [4.1–9.7]	1.3 [0.4–2.2]	3.0 [0.7–5.2]	14.9 [12.2–17.6]
Spain	5.9 [4.5–7.3]	4.9 [4.0–5.8]	0.5 [0.2–0.8]	0.3 [0.0–0.5]	9.2 [7.8–10.6]
Ukraine	7.1 [5.6–8.6]	9.1 [7.3–10.9]	3.2 [2.2–4.0]	6.4 [4.8–8.1]	20.5 [17.7–23.2]
USA	18.2 [16.9–19.5]	9.6 [8.8–10.4]	6.8 [5.9–7.8]	3.8 [3.2–4.5]	26.4 [24.7–28.0]

* anxiety disorders include agoraphobia, generalized anxiety disorder, obsessive compulsive disorder, panic disorder, posttraumatic stress disorder, social phobia, and specific phobia; mood disorders include bipolar I and II disorders, dysthymia, and major depressive disorder; impulse control disorders include bulimia, intermittent explosive disorder, and reported persistence in the last 12 months of symptoms of 3 child- and adolescent disorders (attention deficit hyperactivity disorder, conduct disorder,and oppositional-defiant disorder); Substance disorders include alcohol or drug abuse or dependence.

interviews used before. The CIDI shows the prevalence of mental disorders (with the exception of disorders of personality and behavior) but includes also detailed questions about disorders severity, impairment, and treatment. There are explicit algorithms for International Statistical Classification of Diseases, 10th Revision (ICD-10) and Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnoses (APA 1994). Many cross-national psychiatric surveys using the CIDI were carried out in the following years. As a limitation of those surveys, most of them were carried out in developed countries, making it impossible to assess generalizability of results. WHO established the World Mental Health (WMH) Survey Consortium in 1998 which coordinated the implementation of surveys in 28 countries, including less-developed countries.

Table 1 displays the twelve month prevalence rates of mental disorders in seven European countries and in the United States (WHO-WMH 2004).

In all but one European countries (i. e., Ukraine) and in the USA ► anxiety disorders are most common (12 months prevalence rates between 5.8% in Italy and 12.0% in France), followed by ► affective disorders (12 months prevalence rates between 3.6% in Germany and 9.6% in the USA). Overall prevalence rates of mental disorders vary widely, from 8.2% in Italy to 20.5% in the Ukraine and 26.4% in the United States.

As an example, it can be seen in Table 2 that mental disorders affect a substantial proportion of the population during their whole lifespan (lifetime prevalence of mental disorders in the German population = 43%). German lifetime prevalence rates of The German National Health Interview and Examination Survey (GHS-MHS; Jacobi 2002) show a strong concordance with other lifetime prevalence studies (e. g. Kessler et al. 1994).

However, it is also important to recognize that many mental disorders are mild and often self-limiting, i. e. people suffering from mild mental disorders usually do not need treatment. Therefore, in the WMH surveys each mental disorder was classified in different severity grades (“mild”, “moderate” or “serious”, for details s. WMH Consortium 2004). Mild mental disorders are significantly more frequent than moderate and serious mental disorders (Table 3).

Patients suffering from serious mental disorders show higher probability for receiving treatment than patients with moderate mental disorders. A significant proportion of individuals with mental disorders do not seek professional help. The help-seeking behavior of patients with mental disorders varies and it is unclear why some patients with mental disorders seek help and others do not. The severity of mental disorder is proposed as one possible reason. Table 4 displays the association between mental disorders severity and the probability of treatment. Treatment was assessed by seeing

Public Mental Health, Table 2 Lifetime prevalences of mental disorders in the German Population (GHS-MHS; N = 4181)

Disorders (DSM-IV)	total		male	female
	N	%	%	%
Any mental disorder due to general medical condition	94	2.3	1.8	2.7
Any substance disorder[1]	414	9.9	15.6	4.2
Any mood disorder[2]	779	18.6	12.3	
Any unipolar depression	716	17.1	11.1	23.3
Any bipolar disorder	42	1.0	0.8	1.2
Panic disorder	162	3.9	2.2	5.5
Any somatoform disorder[3]	678	16.2	10.3	22.2
Any eating disorder[4]	33	0.8	0.3	1.3
Possible psychotic disorder[5]				

[1] abuse or dependence (without nicotine)
[2] Major depressive disorder, dysthymic disorder, Bipolar I Disorders, Bipolar II Disorders, single hypomanic episode
[3] Somatization Disorder, Undifferentiated Somatization Disorder, Somatic Symptom Index SSI4,6, Hypochondriasis, Pain Disorder
[4] Anorexia Nervosa, Atypical Anorexia Nervosa, Bulimia Nervosa, Atypical Bulimia Nervosa
[5] screening for Schizophrenia and other psychotic disorders without further differential diagnosis

Public Mental Health, Table 3 Twelve-Month Prevalence of World Mental Health Composite International Diagnostic Interview by severity across countries

	95% Confidence interval		
Country	serious	moderate	mild
Belgium	2.4 [1.2–3.5]	3.3 [2.2–4.4]	6.4 [5.0–7.7]
France	2.7 [1.1–4.3]	6.1 [4.8–7.4]	9.7 [7.3–12.1]
Germany	1.2 [0.6–1.7]	3.3 [2.3–4.3]	4.5 [3.2–5.9]
Italy	1.0 [0.4–1.7]	2.9 [2.0–3.8]	4.3 [3.1–5.5]
Netherlands	2.3 [1.1–3.5]	3.7 [2.5–4.9]	8.8 [6.1–11.5
Spain	1.0 [0.7–1.3]	2.9 [2.0–3.7]	5.3 [4.0–6.7]
Ukraine	4.8 [4.0–5.6]	7.4 [5.8–8.9]	8.2 [6.4–10.1]
USA	7.7 [7.0–8.4]	9.4 [8.5–10.3]	9.2 [8.1–10.3]

a professional (i. e. mental health professionals, general medical professionals, religious counselors, and traditional healers) either as an inpatient or outpatient for problems with emotions, nerves, mental health, or use of alcohol or drugs.

However, it is notable that a remarkable proportion of people with even serious mental disorders do not receive treatment (36% in Spain—80% in the Ukraine were untreated). The way to treatment is for people with mental disorders much longer than for people with somatic diseases. It is easy to imagine that individuals with mental disorders, for example major depression, who may be fatigue, who may have sleeping problems, who may have guilty conscience, are not able to seek treatment, especially if they experience barriers to care. In depressed patients individual judgments about the current distress (e. g., feeling hopelessness, self-criticism) and social support (particularly living with a partner) seem to predict more the help seeking behavior than somatic manifestations (e. g., sleep disorders, tension). The non-treatment-seekingbehavior of people with mental disorders is the main barrier to diagnosis and treatment. Other barriers may be the unawareness of health care providers, non sufficient treatment options, inadequate mental health care in the region, antiquated family beliefs about mental illness, the stigma related to mental disorders, and the fear of possible side effects of psychopharmacological treatment. Despite more openness about mental disorders in the media within the last decade, skeptical views about psychopharmacotherapy still prevail. One reason for this negative view can be attributed to fears associated with psychoactive medication: most people believe psychoactive drugs to be addictive and that they change one's personality. Accordingly, the most favored treatment of mental disorders, in the eyes of the public, is psychotherapy. However, particularly in serious mental disorders, not psychotherapy but psychopharmacological treatment has to be the first-choice-treatment. Thus, to realize the patient's basic beliefs about best treatment, to improve compliance to treatment, and to do psychoeducation should be major issues of health care professionals' work (e. g., primary care physicians, psychiatrists, psychotherapists).

Because of the lack of valid EU-wide information about the prevalence of mental disorders, the total burden of mental disorders in the EU is unknown, as well as the total direct and indirect costs. Most individuals suffering from one mental disorder show comorbid another mental disorder, hence, it is not possible just to add up prevalence rates and estimate the costs and unmet needs of the affected persons (due to comorbidity thus adding up prevalences would lead to overestimation of mental disorders prevalence). Wittchen and Jacobi compared 27 epidemiological studies on mental disor-

Public Mental Health, Table 4 Association of Twelve-Month Prevalence of World Mental Health Composite International Diagnostic Interview/DSM-IV, Disorder Severity with health care treatment

	Disorder severity					
Country	**serious**	**moderate**	**mild**	**none**	**total**	**Chi-square test**
Belgium	53.9 [25.2–82.5]	50.0 [35.8–64.2]	28.2 [14.9–41.4]	7.2 [4.2–10.1]	11.0 [7.6–14.4]	68.0*
France	63.3 [38.6–88.1]	35.7 [21.4–49.9]	22.3 [15.8–28.9]	7.8 [5.7–10.0]	12.4 [10.2–14.6]	29.7*
Germany	49.7 [26.6–72.8]	30.5 [18.5–42.5]	27.9 [14.5–41.3]	5.4 [3.5–7.2]	7.8 [6.0–9.5]	37.9*
Italy	**	30.5 [19.3–41.7]	18.9 [11.3–26.6]	2.4 [1.6–3.2]	4.5 [3.6–5.5]	64.2*
Netherlands	50.2 [29.5–70.8]	35.0 [15.7–54.2]	26.5 [15.6–37.4]	6.9 [4.4–9.4]	10.7 [8.1–13.2]	46.6*
Spain	64.5 [49.2–79.7]	37.9 [26.8–49.0]	35.2 [23.8–46.6]	4.0 [3.1–5.0]	7.3 [6.2–8.4]	152.1*
Ukraine	19.7 [13.9–25.6]	17.1 [9.7–24.4]	7.1 [1.2–13.0]	2.6 [1.5–3.8]	4.9 [3.5–6.3]	42.8*
USA	42.3 [48.5–56.1]	34.1 [30.9–37.4]	22.5 [19.0–26.1]	8.1 [7.1–9.2]	15.3 [14.1–16.5]	278.4*

* $p < 0.05$

** the results were not reported because of sparsa data (< 30 respondents at the severity level of the survey)

Public Mental Health, Table 5 12-months prevalence of mental disorders by sex in the community (age 18–65) for EU countries, Iceland, Norway, and Switzerland

Diagnosis (DSM-IV)	Women %	Men %	Total %
Substance dependence	1.3	5.6	3.4
Psychotic disorders	2.5	2.6	2.6
Affective disorders	12.2	6.1	9.1
Anxiety disorders	16.3	7.8	12.0
Somatoform disorders	15.0	7.1	11.0
Eating disorders	0.5	0.2	0.3
Any mental disorder	33.2	21.7	27.4

ders conducted in European regions (EU countries, Iceland, Norway, and Switzerland). For inclusion, those studies had to use a population based approach (i. e. community based sample). The following table displays median 12-months prevalence rates of mental disorders in the EU (for details of the statistical procedure and the results, s. Wittchen and Jacobi 2005). Anxiety disorders, somatoform disorders, and affective disorders are most frequent mental disorders. About one in three women and one in five men fulfills diagnostic criteria of a mental disorder in a twelve months period.

As mentioned above, there is a substantial degree of comorbidity. Among the individuals with at least on mental disorder, 68% have only one diagnosis, almost 20% have two, and 14% have more than two 12-month diagnoses of mental disorders.

Women and Mental Health

Women suffer significantly more often from mental disorders than men (exception: substance abuse disorders, i. e. opposite relationship, and psychotic disorders, i. e. similar estimates in both men and women, s. Table 5). Estimated median major depression rates for women, for example, are twice as high as compared for those to men. According to Murray and Lopez (1996) unipolar depression will be the second most important cause of disability burden in the world by the year 2020. As women in many countries are approximately twice as likely as men to experience depression, any significant reduction in the overrepresentation of women who are depressed would make an important contribution to lessening the global burden of disease. Since suffering from mental disorders seems to be more "female" than "male", it is still controversial whether gender differences in depressive disorders are real or an artefact. Three main issues are discussed that might affect not real but artificial gender differences in rates of depression:

- The definition of caseness and measurement procedures. Females show a tendency to report more criterion symptoms associated to depression compared to men. However, findings available from population based surveys suggest that this does not account entirely for those significant gender differences in prevalence rates of depression.
- Recall bias. Women might recall more past depressive episodes compared to males. Although there is

evidence for the instability of recall of depressive episodes in both men and women over time, the gender difference is not entirely responsible for the gender differences in rate of depression.
- Mortality rates. There are suggestions that the relation between depression and premature death is more pronounced in males what might contribute to higher prevalence rates of depressive disorders in women. Two population based epidemiologic surveys show a significantly increased mortality risk in men.

Assuming that different prevalence rates are real, there are some determinants that might influence the higher mental disorder rates in women:
- Women are confronted with more devaluation and discrimination than men.
- Men show a better material well being compared to women.
- Women make less decisions about their lives than men.
- Women show more frequent a low socioeconomic status compared to men. Socioeconomic status and social class, respectively, are negatively associated with the prevalence of mental disorders.

Otherwise, there are factors which are protective against depression. In particular, having sufficient autonomy to exercise some sense of control in response to severe events reduces the likelihood of depression developing. Access to adequate material resources is also needed to underpin the possibility of making choices when confronted with severe life events. All of those protective factors seem to be more pronounced in men.

One of the most consistent findings of epidemiological research is the relationship between low socioeconomic status or social class and increased rates of mortality and morbidity. A more than a two-fold increase in risk has typically been found for those in the lowest social class compared with the highest, for psychological as well as physical morbidity. Previous research has documented the relationship between various objective measures of rank and the increased likelihood of depression and anxiety. Low educational status, unemployment or low employment status, homelessness and insecure housing tenure, inadequate income and poor social support including unsatisfactory interactions with neighbors and relatives have all been found to be associated with increased rates of depression and anxiety and often interact with one another in reciprocal relationships. In this context, it has to be mentioned that single mothers show a notably lower socioeconomic status and income situation as well as lower social support than married mothers. The proportion of single mothers in western countries is large and continuously growing. Recent studies found increased psychological distress of single mothers and their children. However, the US National Comorbidity Survey determined that separated or divorced mothers were more likely to experience psychiatric disorders (e. g., depression, dysthymia, general anxiety disorder) compared to both never married and married mothers. This finding suggest that being a single mother per se is not associated with a higher risk of mental disorders. Single mothers are a heterogeneous group, hence, single marital status groups should be studied separately. There is some evidence that the social factors involved in recovery or restitution may differ from those implicated in the onset of depression and anxiety. Thus, the relationship between low socioeconomic status and a high prevalence of psychiatric disorders has been subject to two quite different explanations. Individuals with mental disorders, or with other personal characteristics predisposing towards mental disorders might be selected down into lower socioeconomic groups. The second explanation asserts that the relationship explained in terms of the greater environmental and psychological adversity accompanies lower socioeconomic status and, in turn, produces high levels of depression. Evidence related to the second view is clearly more congruent with a social view of health. Yet good quality evidence on this relationship for women remains variety of reasons. One general difficulty has been the lessening of research attention paid to social, structural analyses of psychological disorders.

Mental Health Indicators

Carrying out population based surveys for the examination of population mental health is very elaborately. Macro indicators collected routinely from institutional sources such as the World Health Organization (WHO) European Regional Office for Europe (www.who.dk) or the Organization for Economic Co-Operation and Development can provide a synthetic description of mental health status.

The rate of deaths from suicide is a routinely collected public mental health indicator. Suicide rates and life satisfaction, as well as happiness, are inverse associated. According to WHO estimates for the year 2020,

approximately 1.5 million people will die from suicide worldwide. The suicide rates differ in the European countries but it has to be recognized that worldwide the highest suicide rates for both men and women are found in Europe, more particularly in Eastern Europe (i. e. Estonia, Latvia, Lithuania). Those high rates underline the need for developing a sufficient mental health care system in the Eastern European Member States. The annual rate of suicide in the Mediterranean countries and Ireland is, for females, below the EU mean (i. e., 5.2 per 100 000) (compare Chisti et al. 2003). Suicide rates in men are consistently higher than in women (ratio: 3.6 : 1 in 1995). Previous research has produced evidence that suicides are more likely early in the course of certain severe mental illnesses and that persons who have required hospitalization for severe mood disorders have a substantially increased lifetime risk of suicide compared to individuals with less severe illnesses. Yet, only a minority of persons with those mental or substance use disorders seek professional help. The literature suggests that up to two-thirds of those who die by suicide are not receiving mental health or substance abuse treatment at the time of their death and that half had never seen a mental health professional. Suicide rates increase with age (e. g., suicide rate in men aged 15–24 years = 19.2 per 100,000; suicide rate in men aged 65–74 years = 41.5 per 100,000). Older people have the highest rates of suicide in most countries, but, in absolute numbers, young people are significantly more often dying from suicide than elderly people. Worldwide, 55% of suicides (N = about 900,000 deaths from suicide) are committed by people < 45 years. Last, the prevalence of a religion in a country determinates suicide rates. Atheist countries show significantly higher suicide rates than religious countries (e. g., the total suicide rate in China is 25.6, whereas the total suicide rate in Italy is around 10 per 100,000 population).

Alcohol consumption in a population and/or in special age groups (e. g. in teenagers) is another important public mental health indicator. Use of alcohol is common in European countries, particularly in the Czech Republic, Denmark, Ireland, Malta, and the United Kingdom. The proportion of alcohol consuming students, for example, in central and eastern Europe (i. e., Lithuania, Poland, Slovenia, and Slovakia) did clearly increase in the last decades. Drinking by Norwegian teenagers did also increase. The highest frequency of alcohol consumption was reported for Denmark, where 59% of the respondents reported drinking alcohol on at least 40 occasions. Students in Denmark reported highest rates of drunkenness, followed by teenagers in Finland, Ireland, and the United Kingdom, with nearly one in four teenagers indicating that they had been drunk at least 20 times. Boys reported much more frequently that they had been drunk than girls. Binge drinking (defined as having five or more alcoholic drinks) was most common in Luxembourg, the Czech Republic, Ireland, Germany, and Croatia. There is a tendency found that teenagers follow adult drinking patterns with greater overall alcohol consumption in southern Europe (e. g., Spain, Italy, France), but more binge drinking in northern Europe. Table 6 shows the alcohol consump-

Public Mental Health, Table 6 Pure alcohol consumption (100%) in liters per capita in Europe, age 15+

	1970	1980	2003	Rank
Belgium	12.62	14.25	10.86	11th
Croatia	…	…	12.34	5th
Czech Republic	14.1	16.03	16.15	2nd
Denmark	9.65	11.67	12.08	7th
Finland	5.84	7.94	9.31	15th
France	23.23	20.14	12.25	6th
Germany	15.52	16.45	12.66	4th
Greece	…	13.22	8.99	16th
Ireland	7.03	9.58	13.47	3rd
Italy	21.22	17.86	10.45	12th
Lithuania	…	…	10.44	13th
Luxembourg	16.04	16.3	18	1st
Netherlands	7.61	11.69	9.56	14th
Norway	4.87	6.22	6.03	20th
Poland	7.59	11.53	8.15	17th
Portugal	14.43	14.91	11.13	10th
Spain	16.11	18.57	11.70	8th
Sweden	7.94	7.77	6.88	18th
Ukraine	…	…	6.10	19th
United Kingdom	8.5	10.81	11.37	9th
European Region	…	10.07	8.78	
EU	…	15.28	11.31	
EU members before May 2004	…	15.66	11.43	
EU members since May 2004	…	…	10.67	

tion in selected European countries. The majority of nations who were high consumer between 1970 and 1980 (e. g. France, Spain, Italy), showed a progressively decreased consumption until 2003, with the exception of Luxembourg. On the other hand most of the "low consumer" nations in 1970 (e. g. Finland, Norway) showed a progressive increase until 2003, with the exception of Sweden (decreasing trend). Ireland and Finland had the highest increase in alcohol consumption (1980–2003).

The rate of alcohol-related deaths is an important macro indicator as well. Finland (139.0 alcohol-related deaths per 100,000 inhabitants), France (132.2), Germany (97.1) and Ireland (88.5) showed the highest rates in alcohol-related deaths in 2000. Other (macro) mental health indicators are, for example, the rate of psychiatric hospital beds per 100,000 inhabitants, the incidence and prevalence of mental disorders, the number of mental patients staying in hospitals, the number of cigarettes consumed per person per year, and the incidence of alcohol psychosis (for more information s. European health for all database: http://data.euro.who.int/hfadb/).

Evidence Based Practice and Continuity of Care in Mental Illness

According to Sackett et al. (1996), evidence based medicine is the conscientious, explicit, and judicious use of the current best evidence in making decisions about the care of individual patients. For questions about medical therapy, the best source of evidence is the randomized controlled trial (RCT), which provides experimental findings as does no other study design. However, while the placebo effect in somatic diseases is about 30%, it varies in depressive disorders in randomized controlled trials between 30–50%. An analysis of 75 double-blind trials in major depressive disorder (published 1981–2000) showed a substantial response to placebo (average: 30%, range 12 to 52%, Walsh et al. 2002). Evidence based mental health adheres to the same principles as evidence based medicine (EBM). However, it is almost impossible to define what the best evidence of mental health practice is. In contrast to somatic diseases, as for example an appendicitis, no health care professional can predict, how long a depressed patient, even with evidence based treatment, will suffer from his actual depressive episode. There is still too little knowledge about how specific treatments affect specific mental disorders. Particularly assuming that a mental disorders diagnosis is specific and, therefore, needs a specific treatment, is nearly impossible on the ground that comorbidities are the rule and conditions overlap. Persons with mental disorders need a variety of treatments and treatment settings, depending on their illness and the phase of their illness. In the beginning of mental disorders, a valid diagnosis of a health care professional and, better, mental health care professional, respectively, is most relevant. Despite widespread initiatives to improve the management of mental disorders (e. g., depression) in primary care, it appears that the links between primary care and mental health care management, as well as the use of evidence based approaches to managing patients are rare and ineffective. During increased symptomatology (e. g. during first manifestation of a psychotic disorder or other acuteness of mental illness) patients may need the structure and also enhanced protection of a hospital (e. g., due to possible dangerousness to others or self). The continuity of care is for people with serious and persistent mental illness (e. g. schizophrenia) of particular importance, because their illnesses usually show many different stages. Giving continuity of care is one step in the process of implementing managed care strategies. The implementation of managed care can control costs but also correct traditional delivery system problems, such as inappropriate matching to level of care, barriers to receiving care, as well as poor quality of care. About one third of individuals with schizophrenias is chronically ill. During better times they may be able to live with their families and even to work without support. Family work is an integral part of care for those patients. Mentally ill persons and their families are confronted with many emotional and socioeconomic challenges and some specific economic and social costs. Those costs are, for example, lost production from premature deaths caused by suicide or from inability to work or from family members caring for the mentally ill person. Thus families caring for a mentally ill person have higher direct and indirect financial costs. Moreover, often they may show diminished quality of life and a high emotional burden. All individuals with mental disorders but especially those with serious and persistent mental illness need a continuum of care that includes, psychosocial rehabilitation, (hospital) day treatment, crisis intervention, psy-

cho-educational approaches, the assistance of a case manager and/or a legal guardian and others. Not only during different stages of mental illness but also in different stages of life, a continuum of care is of high importance, (e. g. for adolescents during transitioning into adulthood). Severely and persistently mentally ill persons (► social psychiatry) have been a target population for public mental health services. The level of severity is a major determinant of treatment utilization and cost. The main goal of psychiatric reform in the late 1970's has been closure of large asylums and a shift of service provision towards community settings. Without doubt, deinstitutionalization has been a revolutionary success story but the classical paradigm of social psychiatry postulating that dehospitalization automatically generates social integration has proven to be wrong. Large psychiatric institutions (e. g. state hospitals) had also fulfilled essential functions beyond treatment for people suffering from severe mental illness. For many of those patients, asylums were "places where one is safe and secure". A comprehensive network of community services should result in declining rates of psychiatric admission (including compulsory admission) and in reduction of cost. Implementing services that support recovery mainly outside of hospital settings are innovations of the managed care system, for example, diversions of psychiatric hospitalization, hospital day treatment, outreach and prevention services, special services addressing the unique needs of children, adolescents, and their families. But despite such successful implemented services, there will probably always be a need for some "asylum" placements, particularly for people with serious and persistent mental illness. The Substance Abuse and Mental Health Services Administration (SAMHSA) and its Center for Mental Health Services (CMHS) have determined that there are six evidence-based practices in community mental health that are proven effective. These are: 1) Programs for illness magement and recovery (e. g., learning facts about the stress-vulnerability model, reducing relapses, coping with stress), 2) programs for assertive community treatment (i. e., helping people stay out of the hospital and to develop skills for living in the community), 3) family psychoeducation (i. e., involves a partnership among consumers, families and supporters, and practitioners), 4) supported employment (i. e. a well-defined approach to helping people with mental illnesses find and keep competitive employment within their communities), 5) skills development (in managing aspects of mental illness), 6) integrated treatment for people with co-occurring mental illness and substance use disorders (for details s. http://www.mentalhealth.samhsa.gov/cmhs).

Independently of the patient's age, the treatment of an existing mental disorder is both secondary prevention of the existing mental disorder (e. g. relapse) and primary prevention of another new mental disorder (e. g. an existing major depression increases the risk for comorbidity of anxiety disorders). As most mental disorders develop in adolescence and early adulthood, prevention must start as soon as possible. Children and adolescents (► mental health in children and adolescents) should be a special target population for prevention programs. If childhood problems were not sufficiently well addressed, affected children will not be able to benefit fully from the education available. Programs that enhance the quality of the relation between psychosocial and cognitive development of infants on the one hand and their interaction with their parents, on the other hand, can improve substantially the emotional, social, cognitive and physical development of children. Particularly in children, *systems of care* are important (i. e. mental health, education, child welfare, juvenile justice, and other agencies work together to ensure that children and adolescents with mental, emotional, and behavioral problems and their families have access to the services and supports they need to succeed). Schools are a crucial social institution for the education of children in preparation for life and they need to be more involved in a broader educational role fostering healthy social and emotional development of pupils. There seems to be a large gap between the mental health needs of youth and effective programs to meet those needs. All young people experience challenges (e. g., leaving home, starting to work, studying, having children) that might cause a higher vulnerability and risk for mental disorders. Due to those challenges young people do not typically identify mental health as a high priority. Youth unemployment is another significant issue. In this area, mental health promotion strategies seek to improve employment opportunities, for example, through programs to create jobs, provide vocational training, and social and job seeking skills. As mentioned before, mental health interventions are more effective, the earlier they start. However, broad based approaches that address problems

before they begin are very expensive. Hence, most prevention programs are secondary interventions (i. e., targeting "at risk" people) or tertiary care (i. e., assessing and treating people with more serious mental problems). Many treatment programs for young people are geared to children and adolescents with a pattern of problem behavior as a result of longstanding emotional disturbance. It should be a goal to change the start of health promotion programs towards an earlier time.

Summary

As it could be shown, the promotion of mental health and the prevention of psychological disorders is of great importance for various reasons. Mental health programs have and should have, respectively, several objectives:

- Collection of good quality data on mental health (e. g. studies on the prevalence of mental disorders and of therapy, and studies that allow the derivation of mental disorder specific criterias of diagnostical and treatment options). Although in Europe a diversity of national prevalence studies exists (i. e., studies in single countries or regions), a direct comparison of data and estimating of European prevalence rates is still difficult (e. g. due to different methods or different approaches). The underlying samples of nationwide representative examinations should be so large that the heterogeneity of the population with respect to its life situation and probable mental health problems is sufficiently represented. There is, moreover, a strong need for epidemiologic studies in children and adolescents as well as for studies in older adults (► mental health in older adults). Research efforts should aim mainly Europe-wide representative examinations carried out at regular intervals (e. g., every 10 years). Finally, descriptive studies are missing informing about recognition and treatment of mental disorders in the various European health care systems.
- Reduction of inequities within the European Union (e. g. between new memberstates and old memberstates).
- Assessment of needs for development of the mental health care system of Eastern Europe.
- Supporting of evidenced based mental health (although it is more difficult to define what evidenced based means than in somatic diseases) and giving persons suffering from mental illness access to treatment (it seems impossible to deliver care to everybody but the implementation of diagnostic and treatment algorithms could help to find the best therapy for each patient).
- ► Promotion of mental health and prevention of mental illness (both promotion and prevention should start as soon as possible, i. e. in children and adolescents and in persons at risk, respectively, and continue during the whole life span).
- Integration of persons with mental illness, especially those with persistent and severe mental illness, into society.

Cross-References

► Affective Disorders
► Anxiety Disorders
► Eating Disorders
► Mental Health in Children and Adolescents
► Mental Health Economics
► Mental Health in Older Adults
► Promotion of Mental Health
► Psychotic Disorders
► Social Psychiatry
► Somatoform Disorders
► Stigma of Mental Disorders
► Stress
► Substance Use Disorders

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Public-Private Partnership

Synonyms

PPP

Definition

The term public-private partnership stands for a focused and circumscribed type of contractual relationship between a public institution (e. g., government, administration agency) and a private organization. Public-private partnerships are entered into with respect to the realization of a particular project or the supply of particular services. Services subject to public-private partnerships include public health services vis-à-vis the population.

A variation of privatization in which elements of a service (usually run solely by the public sector) are provided through a partnership between the government and one or more private sector companies. Usually entered into via a long-term contract, the private sector typically provides the infrastructure for delivery of a particular governmental service. But, the government remains at least partial responsibility for the delivery of the service.

Public Stigma

Definition

Public stigma is the reaction of the general population for example towards people with mental illness. Three different public stigma components can be distinguished: ► prejudice, ► discrimination, and ► stereotypes.

Pulp

Definition

The inner structure of a tooth is the pulp, formed by connective tissue containing nerves and blood vessels. The pulp is subdivided into a coronal and root pulp.

Purchasing Power Parity

Synonyms

Currency conversion rates

Definition

The term Purchasing Power Parity refers to currency conversion rates that convert to a common currency – mostly US$ – and equalize the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion.

Purification

Synonyms

Self-cleaning of the soil

Definition

Purification is the process of cleaning the soil of foreign elements or pollutants, i. e. to render the soil back

to a pure state. Self-cleaning of the soil is influenced by characteristics like mechanical structure, physical and chemical characteristics of the soil, and type and quantity of microflora, flora and fauna. The most important factor is the main constituent of waste substratum in the soil. Natural-borne ground microbes and saprophytes perform decomposition of proteins to nitrogen and simple compounds. Some plants, in symbiosis with bacteria, can fix nitrogen compounds into glutamate. Decomposition of large quantities of cellulotic and other carbohydrate biomass is influenced by cellulolitic bacteria and fungi. In the case of low oxygen concentration, decomposition is directed into humification, and if oxygen is lacking, putrefaction caused by anaerobic bacteria occurs. If such is the case, malodorous gas is released.

Purifying Selection

► Negative Selection

p Value

Synonyms

Significance probability

Definition

The p value gives the probability that the null hypothesis is correct; therefore, if it is a small value (like < 0.05), the null hypothesis is rejected. More technically, it is the probability that the observed data or more extreme outcome would have occurred by chance, i. e., departure from the null hypothesis when the null hypothesis is true. However small, a p value does not indicate the size of an effect. A p value > 0.05 does not necessarily mean lack of association. It does so only if there is enough power to detect an association. Most statistical insignificance is due to lack of power to detect an association (poor experimental design).

Cross-References

► Statistical vs. Clinical Significance

Qualitative Overview

Synonyms

Narrative synthesis

Definition

A qualitative overview is research that concentrates on the investigation of definitions, concepts, and issues, often performed through interview unrestricted by structure, and reported in terms of words or descriptions. Key elements of the qualitative approach for assessing ► effectiveness include consideration of the following characteristics: people who were part of the study intervention delivered, setting where the technology was applied, and other modifying factors such as personal skills, environmental factors that may influence compliance, nature of the outcome measures used, their relative importance and robustness, and their comparability. It should include the total number of research reports, studies, and independent samples that contributed to tests of comparison or relationships (descriptive statistics). Effect size estimates should be calculated if the studies contained the necessary data, but the effect sizes should not be combined statistically.

Qualitative Research

Definition

Qualitative research involves exploratory studies (to explore an unknown sector, identify the main dimensions of a problem, draw assumptions, or understand motivations) or operational studies based on in-depth analysis of interviewee responses (in a group or individually), typically in "focus groups". It most often deals with a restricted sample of individuals that does not necessarily need to be representative. It may be the preliminary phase of a quantitative study or stand-alone research.

Quality

Definition

Quality refers to the inherent or distinctive characteristics or properties of a person, object, process or other thing. Such characteristics or properties may set a person or thing apart from other persons or things, or may denote some degree of achievement or excellence.

Quality-Adjusted Life Years (QALY)

Definition

In cost-utility analyses in the field of health economics, a recurring problem is to find an appropriate way of expressing and quantifying the health-related effects of medical interventions. The QALY concept was developed in health economics as an important standard measure for describing the outcome of medical interventions in a manner allowing comparability. QALYs, or "quality-adjusted life years", basically constitute a pragmatic approach to description of the health-related effects of medical interventions and assessment of the efficacy of a given therapy, in terms both of quality (improvement of the patient's quality of life) and of quantity (prolongation of life). Both effects are combined in QALYs, life expectancy being weighted by a factor q, a standardized quality index in which 1 represents perfect health and 0 death. The QALY concept also permits comparison of different interventions:

QALY tables set out the comparative cost of various interventions per incremental QALY thereby obtained. Quality-adjusted life years (QALY) are ► outcome measures of cost-utility analysis (► value, human life – utilities). QALYs are constructed by estimating the remaining lifetime weighted according to a health-related quality of life score. Thus, a defined time period spent with a higher quality of life represents more QALYs gained compared with the same period spent with a low quality of life. The QALY is seen as a measure that represents the outcome from a patient's perspective. The QALY construct makes it possible to compare health care interventions that mainly affect survival with interventions that improve the health-related quality of life.

Quality Assurance

Definition

► Quality assurance (QA) is defined as part of ► quality management that is directed to assure demands on reaching quality. QA covers all activities from design, development, production, installation, servicing to documentation. It introduced the saying "fit for purpose and do it right the first time." It includes the regulation of the quality of raw materials, assemblies, products and components; services related to production; and management, production, and inspection processes. The term of quality assurance is an important term and is used for comparing the reality (instantaneous value) and the must have value of a measurement.

Quality of Care

Synonyms

Health care quality

Definition

There are several definitions for quality of care. One of the most cited definitions was formulated by the Institute of Medicine in the 1990s. It defines quality of care as "The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge". Unlike other definitions, this definition includes both the technical perspectives of quality and the individual perspective of the patient, by referring to the desired outcome. Quality of care is often categorized into the three dimensions structure, process, and outcome. The structural elements refer to the quality of the facilities and the environment where the health care services are delivered (e. g. buildings, equipment, and skill level of health care professionals). The process quality refers to the correctness and appropriateness of the treatment that is provided. The overarching dimension is the quality of the health care outcomes like improvement of health, patient satisfaction, and reduced pain. The quality of health outcome can be operationalized by calculating and comparing complication rates, mortality rates, or readmission rates, for example.

Quality of Health Indicators

Definition

Quality of health indicators are measured by several criteria: validity, objectivity, sensitivity, specificity, relevance for health policy, and cost-effectiveness, etc. In order to achieve this, an ► indicator must be simple and understandable, data needed for each indicator must be easily obtainable through routine health services, and data collection and processing must follow ethical principles.

Quality of Life

Synonyms

Health-related quality of life (HRQOL); HRQL

Definition

Although the term quality of life is widely used in the public health context, there is still no commonly accepted definition. In the research and clinical area, quality of life often stands for anything except death and mortality rates. Others see quality of life as an overarching concept that covers all aspects of a person's life, which includes, amongst others, physical health, psychological well-being, social well-being, financial well-being, family relationships, friendships, work, and

leisure. Other approaches focus on the social and psychological aspects of quality of life and contrast it with ► quality of care. The quality of life that is supposed to be affected by health care intervention is often defined as health-related quality of life. Quality of life can be interpreted as the ultimate marker of success for both preventive measures and health care delivery. The impact on quality of life is often taken into consideration when discussing different treatment choices. This is especially relevant for the terminally ill, where quality of life can be used to weigh the benefits and costs of life-extending measures. In the context of deciding about the relative value of health expenditures, the concept of quality-adjusted life years (QALY) is often applied. It estimates the effect of an intervention on prolonging life and the quality of that prolonged life. It is used in cost-utility analyses to calculate the ratio of cost to QALYs saved for a particular health care intervention, which is then utilized to allocate healthcare resources accordingly.

Quality-of-Life Studies

Definition

Quality of life is an area of study that has attracted an ever-increasing amount of interest over the past two decades, particularly in the areas of health, rehabilitation, disability studies, and social services, but also in medicine, education, and others. The study of quality of life is an examination of influences upon the satisfaction and meaning in life, as well as people's happiness and well-being. The ultimate goal of a quality-of-life study and its subsequent applications should be to enable people to live quality lives – lives that are both meaningful and enjoyable.

Quality Management

Definition

Quality management depicts all activities of a project's ► quality assurance policy which determines the aims, goals and responsibilities as well as the resources needed for planning of ► quality, quality assurance and improvement.

Quantification

► Evaluation Models
► Measurement
► Measurement: Accuracy and Precision, Reliability and Validity

Quantitative Research

Definition

Quantitative research studies aim to quantify attitudes or behaviors, measure variables on which they hinge, compare, and point out correlations. They are most often conducted via a survey on a sampling that must be representative so that the results can be extrapolated to the entire population studied. It requires the development of standardized and codifiable measurement instruments (i. e. structured questionnaires).

Quantitative Research Synthesis

Definition

Quantitative research synthesis is used in research which concentrates on describing and analyzing phenomen by using numerical data and empirical models. There are some statistical methods that can help synthesists summarize research results. This quantitative procedure is called meta-analysis. Among the techniques there are counting study outcomes, combining probabilities from inference tests, averaging ► effect sizes, and examining the variability in effect sizes across studies. Quantitative research synthesis is an extension of the same rules of inference required for rigorous data analysis in primary research. If primary researchers must specify quantitatively the relation of the data to their conclusions, the next users of data should be required to do the same. Before using quantitative synthesis, it is important to take a closer look at some of the unique features off accumulated research results.

Cross-References

► Meta-Analysis

Quantitative Synthesis

► Meta-Analysis

Quarantine

Synonyms

Isolation of persons to prevent transmission of diseases

Definition

Quarantine in the public health context refers to the restriction of the activities of healthy individuals who have been exposed (or are thought to have been exposed) to a communicable disease. The restriction is for a specific period of time, till investigations or clinical signs/symptoms have clarified the infectiousness status of the individual.

Cross-References

► Outbreak Management and Surveillance of Infectious Diseases

Quarantine Diseases

Synonyms

Infections of quarantine; Infectious diseases requiring isolation

Definition

Quarantine is a measure of isolation that is performed in order to avoid the spread of an infectious disease. The term stems from the 14th century when travelers and merchants were isolated for a period of 40 days in order to avoid plague (Black Death) epidemics. Nowadays, quarantine is used to contain yellow fever, Ebola, plague and cholera. The duration of isolation is adapted to modern requirements and depends on the incubation periods of the different pathogens.

Cross-References

► Outbreak Management and Surveillance of Infectious Diseases

Questionnaire

Definition

A questionnaire is considered to be the written document used to obtain information from respondents. It consists of a predetermined set of questions used to collect data (clinical data, social status, etc.). There are two main types of questionnaires: structured (closed-ended, standardized, formal) and unstructured (unstandardized, informal). Closed-ended questions will refer to those in which all possible answers to a given question are listed on the questionnaire, whereas the term open-ended will apply to questions in which the possible answers are not listed in advance. The three common ways of obtaining information are: by sending a questionnaire by mail to individual to fill out and return, by having an interview by phone or in person. Sometimes combinations of these methods are used.

Quetelet Index

► Body Mass Index (BMI)

Quinine (Quinora®, Quinerva®, QM-260®)

Definition

Quinine, which is the oldest anti-malaria drug, is an alkaloid of the bark of the South American cinchona tree. Its effect results from the impairment of metabolic processes in plasmodia. Quinine is used for the treatment of infections with *Plasmodium falciparum*, in complicated cases it is combined with doxycycline or clindamycin. Treatment is performed for 7 days and can also be carried out throughout pregnancy. Side effects involve the central nervous system (tinnitus, visual defects, headache, cerebral seizures) or the gastrointestinal tract (nausea, vomiting). In cases of long-term and high-dosage therapy, a summation of side effects can occur, which is called ‘cinchonism’.

Rabies

► Acute Life-Threatening Infections

Rabies Immune Globulin

► Rabies Vaccination, Active
► Rabies Vaccination, Passive

Rabies Immune Prophylaxis

► Rabies Vaccination, Active
► Rabies Vaccination, Passive

Rabies Vaccination

Synonyms

Rabies immunization

Definition

The first rabies ► vaccine was introduced as early as 1885 by Louis Pasteur. Since 1967, a vaccine produced from human diploids has been available. The rabies vaccination containing a vaccine made from dead viruses is suitable for persons who are at high risk for infection due to their profession or due to traveling. The vaccine is well tolerated, and is given on days 0, 7 and 28, producing almost 100% protection. The first booster is given one year later, followed by further boosters every 2–5 years.

Rabies Vaccination, Active

Synonyms

Rabies immunization, active

Cross-References

► Immunization, Active

Rabies Vaccination, Passive

Synonyms

Application of rabies immune globulin; Rabies immune prophylaxis

Definition

The application of rabies-immune globulin is performed as a prophylactic passive vaccination after a contact with an animal which is suspected of being infected with rabies or which suffers from rabies. In this regard, contact is not only defined as a bite, but also as a touching of the animal or a licking by the animal.

Cross-References

► Immunization, Passive

Race

Synonyms

Subspecies

Definition

Race is socially defined population based on visible, genetically transmitted physical characteristics. People who belong to a race are distinguished in some way from other humans. The most widely observed races are those based on skin color, facial features, ancestry, and genetics. Conceptions of race, as well as specific racial groupings, are often controversial due to their impact on social identity hence identity politics.

Radiation

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Definition

Radiation is the transmission of energy through space, both in the form of waves (electromagnetic radiation, EMR) and in the form of streams of atomic particles (particulate radiation). Each of the several kinds of EMR spectrum is characterized by its own wavelength or frequency. Gamma rays have the shortest wavelength followed by, in increasing order, X-rays, ultraviolet radiation, visible light, infrared radiation, ► microwaves, and radio waves. Some of the forms of particulate radiation are alpha particles, protons, neutrons, and electrons (e^-, β^-, β^+). A narrow meaning of the term radiation is the transmission of energy by waves.

Basic Characteristics

The whole electromagnetic spectrum (EMR and particulate radiation altogether) is divided into two major regions—ionizing and nonionizing, according to wavelength and energy potential. Ionization means disruption of a molecule or atom's structure by removing one or more electrons. Ionizing radiation is more potent, with greater energetic potential, and higher frequencies, but shorter wavelengths than nonionizing radiation. Nonionizing radiation is more benign—of lower and insufficient ionizing potential.

Ionizing Radiation

Ionizing radiation has wavelengths shorter than 100 nanometers (nm; $1\,\text{nm} = 10^{-9}\,\text{m}$), with energies sufficient to produce ionization in matter (both nonliving and living).

Natural radioactivity on Earth may be of cosmic origin (protons and alpha particles from outer space or the Sun), originate in the atmosphere under the influence of cosmic radiation, or, finally, from Earth's crust; these are decay products of uranium and thorium, a trace constituents of some types of rocks and soils. During its natural decay, beside solid radioactive pollutants, ► radon gas is released. Artificial sources of ionizing radiation included detonations of nuclear devices until they were banned. Recent sources include accidents in nuclear power generating plants, uncontrolled release of energy by spent-fuel reprocessing plants, radioactive material from waste sites, some industrial and mining operations, and diagnostic and therapeutic procedures in nuclear medicine and radiology.

Ionizing radiation can produce extremely harmful effects in humans. Acute somatic effects occur within a few weeks of irradiation as *acute radiation syndrome*. The form of syndrome manifestation depends both on the route of contamination (external or internal) and on the contaminated body area. During the intrauterine embryonic period, developmental (teratogenetic) effects are possible. In *chronic radiation syndrome* in adults, genetic mutations and chromosomal aberrations are described after several years of exposure. Late somatic effects also occur in the form of various forms of cancer. According to the International Agency for Research on Cancer, all forms of ionizing radiation (neutrons, alpha and beta particles-emitting radionuclides, gamma radiation, and X-rays), are ranked as group 1 human carcinogens.

Nonionizing Radiation

Nonionizing radiation has wavelengths longer than 100 nm. It is further subdivided into ultraviolet radiation (A), visible light (B), infrared radiation (C), microwaves, and radiofrequencies. The final outcome of this radiation may be quite negligible, beneficial, healthful, or even harmful in different degrees.

A) Ultraviolet Radiation (UVR) Ultraviolet radiation is nonionizing and invisible EMR with wavelengths from 10 to 400 nm. It has longer wavelengths than the ionizing radiation spectrum, but shorter wavelengths than visible light. The borderline between the

two main EMR regions is not clear, therefore the shortest wavelengths of nonionizing UVR (< 100 nm) may produce ionization of matter.

According to main biological effects, the whole UV spectrum is further subdivided into three regions:

- UVA—between 400 and 320 nm (longwave or near ultraviolet radiation),
- UVB—between 320 and 280 nm (middle or sunburn ultraviolet radiation), this is the most biologically damaging UVR to the skin and eye,
- UVC—between 280 and 100 nm (shortwave, far, or germicidal UVR), this is only present from artificial sources on Earth.

UVR may be produced when a body is heated over 2500 K (incandescence) or when electrons are excited (gas discharge). As a large incandescent body, the Sun is the main natural source of UVR. Of the total solar energy on Earth's surface, only 5% falls into the ultraviolet region. There is no solar UVR below 290 nm on Earth because of its high absorption by the ozone layer in the ► stratosphere. Artificial sources of UVR have been used in industry (arc welding), science, medicine (therapy of some skin diseases, or germicidal lamps effective in killing microbes in air), cosmetic enterprises (special sun-tanning lamps), and even in everyday surroundings, like unshielded tungsten-halogen lamps used for lighting.

The Sun is the main source of human exposure to UVR. All outdoor workers are greatly exposed, but other population groups (mostly tourists) are also affected during prolonged unprotected exposure to sunlight. The amount of UVR depends on solar angle, altitude, air pollution, stratospheric ozone, cloudiness, and reflection from surfaces. The amount of UVR is expressed by the ► UV Index. One of the main beneficial health effects of UVR is vitamin D_3 synthesis in skin. However, in general population groups, prolonged exposure to UVR sources results in increased incidence of various cutaneous damages (e. g. erythema, sunburns, solar keratosis, premature skin aging, and malignancies), ocular impairments (photokeratitis, photoconjunctivitis, and possibly cataract formation), and changes in human immune system defense.

B) Light (Visible Light) Light is a form of nonionizing radiation with wavelengths in the range between 400 and 780 nm, and is the only visible part of the whole EMR spectrum. Light can be detected by highly differentiated retinal cells, rods and cones. Through the process of vision, the human eye receives about 80% of all sensations from outside space, e. g. concerning the size and shape of objects, movement, color, illumination and luminance. A certain quantity of light is always necessary because without light, we cannot see, but quality of light is also essential. To prevent deficiencies, both in daylight and artificial ► lighting, collaboration between architects, engineers, lighting designers, and occupational hygienists is needed from the beginning of interior space projects.

Sources of light are both natural and artificial. The greatest natural source of light on Earth is the Sun. The two main ways for producing light by artificial sources are incandescence (heating of solids above 1000 K), and electrical discharge in some gases or vapors. Both of these are based on conversion of electric energy into light. Visible light is the only desired component of artificial lighting sources output, though it is not possible that for this to be the only output obtained. Much of the energy input is dissipated as thermal radiation, by conduction or convection, and a small amount as UVR. A ► laser is a device that produces coherent EMR in any part of the UVR or infrared region, or visible light spectra.

C) Infrared Radiation Infrared radiation (IR) is nonionizing and invisible EMR with wavelengths in the range between 780 nm and 1 mm. The IR radiation spectrum is located between visible light and microwaves. Synonyms for IR are thermal radiation and radiant heat. Due to different biological effects, the IR spectral band is further subdivided into three regions:

- IRA—between 780 and 1400 nm (near or shortwave IR),
- IRB—between 1400 nm and 3 μm (middle IR),
- IRC—between 3 μm and 1 mm (far or longwave IR).

Infrared radiation is emitted from any warm object. There are natural and artificial sources of IR, and the Sun is the main natural source. Occupationally exposed individuals are outdoor workers, e. g. farmers, construction workers, seafarers, fishermen, and fire-fighters. Non-occupationally exposed people are general population groups that stay unprotected under sunlight for prolonged periods.

In industry, artificial sources include objects or technical processes of thermal curing of various materials, e. g. in smelteries, foundries, steel mills and oth-

er heavy industrial plants, and in glass factories. The general population is slightly exposed to IR from radiant heating devices in homes, or from incandescent lighting sources (tungsten filament or halogen lamps). In hospitals, IR lamps are used for heat treatment in physical medicine and pediatric departments (incubators).

Two main properties of IR are important for health considerations. First, the low penetration ability of IR means that surface tissues such as skin and eyes are endangered. Second, the thermal mechanism of its interaction means that heating of the affected tissues is the main consequence. Adverse health effects may be ocular lens opacities and cataract formation during chronic exposure and burns of the skin during acute irradiation. If the unprotected head is exposed, even sunstroke is possible. IR is also a contributing factor of other general adverse health effects like misbalance of thermoregulation and heat stroke.

Cross-References

- ► Lasers
- ► Lighting
- ► Microwaves
- ► Radon
- ► Stratosphere
- ► UV Index

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Radiation Oncology

Synonyms

Radiation therapy; Radiotherapy

Definition

Radiation oncology is concerned with the use of high-energy rays to damage cancer cells and stop them from growing and dividing. It is usually a local treatment targeted at the cancer cells in the affected area. The ► side effects of radiation therapy depend on the dose of treatment and part of the body treated, and might include tiredness, skin reactions, loss of appetite, decrease in white blood cells, and inflammation of tissues and organs in and around the body site irradiated.

Radiation Therapy

► Radiation Oncology

Radioactive Wastes

Definition

Radioactive wastes contain radioactive chemical elements that have no practical purpose. They are normally classified as low-level, medium-level or high-level wastes, according to the amount and types of radioactivity in them. Low-level waste (LLW) includes radioactively contaminated protective clothing, tools, filters, rags, medical tubes, and many other items. High-level waste (HLW) is "irradiated" or used nuclear reactor fuel. Uranium mill tailings are the residues remaining after the processing of natural ore to extract uranium and thorium. The approvals required for disposal of radioactive wastes are granted by regulatory authorities and/or other government agencies in individual countries. There are currently a number of organizations around the world which operate licensed disposal facilities for radioactive wastes. Waste characterization (WC) is the determination of the physical, chemical and radiological properties of the waste to establish the need for further adjustment, treatment, conditioning, or its suitability for further handling, processing, storage or disposal. "Health physics" is

the science of radiation protection – protecting people from exposure to radiation, monitoring the effects of any exposures, and recording any radiation dose received by the person.

Radiology

Definition

Radiology is the field of medicine that is concerned with the use of ionizing and non-ionizing radiation for the diagnosis and treatment of disease. The historic methods, which are still frequently used, are X-rays for diagnosis of disease and X-rays and gamma rays for the treatment of disease, both based on the use of ionizing radiation. Radiology furthermore comprises the use of isotopes and non-ionizing radiation like ultrasound waves and nuclear resonance imaging (MRI).

Radiotherapy

► Radiation Oncology

Radon

Definition

Radon (chemical symbol Rn, ^{222}Rn) is a chemically nonreactive noble gas, and a radioactive chemical element with an atomic number of 86 (in the periodic table) and an atomic weight of 222. It is one of the products of spontaneous uranium decomposition (^{238}U), and directly issues from radium alpha decay (the name radon is from radium, ^{226}Ra). Uranium is a natural trace constituent of some types of rocks and soils in the Earth's crust. Like radium, radon is also an alpha particle emitter, and has a half-life of 3.85 days. Humans are exposed to radon and its decay products, called radon daughters, either professionally in underground mines, or unprofessionally from the ground under and around buildings, from ground water, or from some building construction materials. From the ground, radon gas diffuses through cracks or holes and beside pipes, easily penetrating basements, ground floors, and other spaces of buildings; with penetration facilitated by low pressure. Good isolation and poor ventilation of indoor spaces prevent radon gas from leaving those interiors, and it can easily be inhaled. In such cases, irradiation of surrounding tissues can occur, with possible harmful consequences like lung cancer. Smokers are more susceptible than are non-smokers. Although radon is carcinogenic to humans (group 1, according to IARC—International Agency for Research on Cancer), a higher incidence of lung cancer has only been observed in uranium miners.

Raincoat

► Condom

Raising Children

► Parenting

Random

Definition

Something that is random is unpredictable and governed by chance. The opposite of random is determined. The chief importance of randomness in research is that by using it to select or assign subjects, researchers increase the probability that their conclusions will be valid. Random numbers are used to select random samples or assign subjects randomly. Random assignment increases internal validity. Random sampling increases external validity.

Randomization

Synonyms

On chance distribution

Definition

Randomization is a technique of assigning patients to treatment and control groups in ► experimental studies that is based only on chance distribution. It is used to diminish confounding in clinical trials. Proper randomization of patients is an indifferent yet objective technique that tends to neutralize patient prognostic factors

by spreading them evenly among treatment and control groups. Randomized assignment is often based on computer-generated tables of random numbers.
Randomization is the process of making something random. In biostatistical theory of design of experiments, it is a core principle that involves random allocation of the experimental units across the treatment groups. Thus, if the experiment compares a new drug against a standard drug used as a control, the patients should be allocated to new drug or control by a random process. This ensures that the different treatment groups are statistically equivalent, i. e. such that there should be no foreseeable possibility of any systematic relationship between the data and any measurable characteristic of the procedure by which the data was sampled. In generating the randomization sequences the questions of balance, selection bias and accidental bias should be considered. The randomization can be complete or restricted, algorithmic or non-algorithmic.

Cross-References

► Experimental Studies

Randomized Clinical Trials

Synonyms

Clinical studies

Definition

In a Randomized Clinical Trial (RCT), a group of patients is randomized into an experimental group and a control group. These groups are followed up for the variables or outcomes of interest. A RCT is, after ► meta-analysis, the highest form of evidence. Advantages are the unbiased distribution of confounders and the randomization, which facilitates statistical analysis. Disadvantages are the time, expense, and ethical problems in indications with an established therapy standard different from placebo.

Randomized Controlled Trials

Synonyms

Controlled studies

Definition

Study design comparing outcomes in intervention and control group. Participants are randomized to either intervention or control group in order to minimize selection effects.

Randomized Experimental Trial

► Experimental Studies

Random Variation

Definition

Variability of a process caused by many irregular (and individually unimportant) fluctuations or chnace factors that (in practical terms) cannot be anticipated, detected, identified, or eliminated. As such, random variation represents the sum of many small variations, arising from real but small sauses that are inherent in — and part of — a process, which cannot be tracked back to a root cause. Random variation follows the laws of propability — behaves statistically as a random propability function. Also, the tendency for the estimated magnitude of a parameter (e. g. based upon the average of a sample of observations of a treatment effect) to deviate randomly from the true magnitude of that parameter.

Range of Activity

► Spectrum of Efficiency

Range of Efficiency

► Spectrum of Efficiency

Rapid Disaster-Response

Definition

Activities in rapid disaster-response are designed to minimize loss of life, to organize the temporary removal of people and property from a threatened location and

facilitate timely and effective rescue, ► relief and rehabilitation. Disaster-response is the sum of decisions and actions taken during and after ► disaster, including immediate relief, rehabilitation and ► reconstruction after the issuance of a state of emergency upon the occurrence of a large-scale calamity in order to activate measures aimed at the reduction of the disaster's impact.

Rate

Definition

A measure of a part with respect to a whole. Epidemiological rates can be broken into three general categories: crude rates, specific rates, and adjusted rates. A rate measures the probability of occurrence of some particular event. A rate is expressed as: $x \times k/y$

x = Number of times an event has occurred during a specific interval of time.

y = Number of persons exposed to the risk of the event during the same interval.

k = 100; 1000; 10.000; 100.000; etc.

Rating

► Measurement

► Measurement: Accuracy and Precision, Reliability and Validity

Ratio

Definition

A ratio shows the relative magnitude of one quantity to another, obtained by dividing one quantity by the other. This can be expressed by formula a/b, where a is the numerator and b is the denominator. A ratio is dimensionless if these two quantities have the same unit, otherwise the ratio has dimension. In the mathematical meaning of the word, ratio is equivalent to quotient a/b, i. e. to division of numbers a (dividend) and b (divisor). If this expression is left unevaluated, it is called a fraction.

Examples of ratios include ► odds-ratio and ► risk ratio. A specific type of ratio is ► proportion, in which the numerator is part of the denominator, and with restricted values between 0.0 and 1.0. Proportion is equivalent to a proper fraction. ► Rate is a type of ratio, in which the numerator is represented by the number of events, and the denominator by the population at risk.

Rationing

Definition

Rationing is the controlled distribution of scarce goods and services. In health care, the term rationing describes the process by which choices are made when the demand for health care exceeds the resources available. Rationing involves strategies to allocate scarce health care resources under budget constraints such as rationing by denial, selection or deterrence. The reason for rationing in health care is the continuous upward spiral of medical expenses in all health care systems (► cost containment).

Rationing by Exclusion

► Utilitarianism

Reaction to Severe Stress

► Stress

Reactivation Tuberculosis

► Post Primary Tuberculosis

Reactive Depression; Psychogenic Depression

► Depressive Episode

Readiness

► Motivation

Reading and/or Spelling Disorder

Synonyms

Specific developmental disorder of scholastic skills

Definition

The main feature is a specific and significant impairment in the development of reading and/or spelling that is not solely accounted for by mental age, visual acuity problems, or inadequate schooling. Reading comprehension skill, reading word recognition, oral reading skill, and performance of tasks requiring reading may all be affected. Spelling difficulties are frequently associated with specific reading disorder. During school age, emotional and behavioral problems are often associated with these disorders. The disorders often continue into adolescence.

Reasoned Action Theory

Definition

The theory of reasoned action was first proposed by Ajzen and Fishbein (1980) to predict an individual's intention to engage in a behavior at a specific time and place. The theory was intended to explain virtually all behaviors over which people can exert self-control. Factors that influence behavioral choices are mediated through the variation of behavioral intent. In order to maximize the predictive ability of an intention to perform a specific behavior, it is critical that measures of the intent closely reflect the measures of the behavior, corresponding in terms of action, target, context and time. The predictive power of the model depends significantly on the identification of most or all of the salient outcomes associated with a given behavior for any particular target population.

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Recall Bias

► Bias
► Confounding and Interaction

Recombination

Synonyms

Crossing-over

Definition

Recombination is the biological process of the exchange of genetic information between homologous chromosomes, leading to genetic variability on the chromosomes transmitted from parents to offspring. Recombination or crossing-over results in the production of chromosomes some of whose alleles at multiple polymorphic sites differ from alleles at those same sites on the chromosome of the parent organism. Recombination occurs during prophase of the first round of meiotic cell division (prophase I), and occurs between duplicated homologous chromosomes. Recombination is one of two sources of genetic variation in offspring, the other being independent assortment. Independent assortment denotes the principle of transmission that, after recombination, either homologous chromosomes has an approximately equal probability of being transmitted or not transmitted (50–50%). Recombination and independent assortment are the reasons for why any two offspring of the same two parents share 50% of their genetic code on average. However, there are several constraints on the probability of transmitting a particular variant at random. One constraint is that, on any given chromosome, recombination is most likely to occur near the ends of the chromosomal arms, and least likely to occur near or at the centromere. Another constraint is that the probability of recombination between any two ► polymorphisms that are very close to one another on a chromosome is relatively low, and if as a result, these adjacent polymorphisms are frequently co-transmitted, it is said that they are 'linked' or in 'linkage disequilibrium' meaning that the probability of recombination between them is less than 50%.

Reconciliation

► Mediation

Reconstruction

Definition

Reconstruction is action taken to re-establish a community after a period of rehabilitation subsequent to a ► disaster.

Reconstruction Aide

► Occupational Therapy in Palliative Care

Record

Definition

A record is a group of techniques necessary for the harmonized presentation, organization and communication of the specific knowledge stored within.

Recovery Strategies

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Synonyms

Back-to-normal

Definition

Strategies of re-establishing order, life support systems, and human livelihoods in the area affected by a disaster. The aim of the recovery phase is to restore such an area to its previous (or better) state, if feasible.

Basic Characteristics

Recovery strategies should make it possible to re-establish order and continuity gradually after a natural or technological disaster (► hazards, natural; ► hazards, technological), to build life support systems, and human livelihoods. Recovery efforts mean much more than just rebuilding houses – they are concerned with actions that involve rebuilding destroyed property, but also re-employment and the repair of other essential infrastructure.

After the 1755 Lisbon disaster, Marquis de Pombal led the recovery action based on three principal tasks, formulated as follows: to take care of survivors, to bury the dead, and to rebuild the city. In general, none of these tasks is easy in a post-disaster landscape.

► Disaster responses are focused on immediate needs – providing emergency medical help, food and drinking water, warmth, shelter, and further medical assistance (*cum* psychological help) to survivors. Normal health care systems would not be functioning, yet the needs can be very serious. In the case of the 2004 tsunami, it was necessary to rescue survivors and try to care for millions of homeless, increasingly threatened by disease amidst the rotting corpses. It was also necessary to treat specific syndromes such as ► acute stress disorder, depression, and other anxiety disorders. After the 2004 tsunami, it was not easy to bury the dead. There were not enough body bags to accommodate the many bodies. There were not enough coffins and those available were too small for the bloated bodies of foreigners.

The recovery phase starts when the immediate threat to human life has subsided, after the phase called ► disaster response. The recovery efforts are concerned with issues and decisions that must be made after immediate needs are addressed. In the disaster aftermath, a decision has to be made whether the strategy of retreat is feasible and acceptable. If endangered locations have been developed (people built in the floodplain), a remedy is that humans, and infrastructure, move out of harm's way. Citizens from the disaster-struck area are more likely to accept mitigative measures that might otherwise be unpopular (e. g. permanent relocation) when a recent disaster is in fresh memory. After the Great Midwest Flood of 1993, the US Interagency Floodplain Management Review Committee (IFMRC 1994; Galloway 1999) recommended that the administration fund acquisition of land and structures at risk from willing sellers in the floodplain. The number of families relocated from the vulnerable floodplain locations in the USA was of the order of 20,000 (Galloway 1999).

In some disaster sites, wrecked, roofless, derelict buildings and piles of unidentifiable wreckage are not leveled

to the ground level – they keep the memory of disaster alive. If destruction is beyond repair (or if repair is not recommended, as above), then evacuees permanently move away from the area and the area is abandoned. In history, cases of disappearing settlements after a disaster are well known, e. g. after the eruption of the Vesuvius Volcano, which destroyed Stabies, Herculanum, and Pompeii on 23 August 79.

When the decision of rebuilding settlements is made, masses of refuse, composed of remains of human property, have to be removed to landfills. The homeless family problem has to be addressed, e. g. by establishing a tent city (climate permitting), temporary container-based accommodation, or trailer housing. Services, such as electricity, gas, water, telephone; legal and medical services; sanitation; transportation; postal services; and day care have to be re-established. It is necessary to help the population recover their livelihood, e. g. via temporary employment (possibly related to disaster recovery work, hence the important role of job counseling), to secure money flow and financial support.

In the reconstruction, it is recommended that the location and construction material of the property be reconsidered. An important aspect of effective post-disaster recovery efforts is taking advantage of a unique opportunity to build better. After a disaster, the building codes are carefully examined and strengthened, new housing is monitored and inspected far more stringently, and developers are more accountable. This is unlike before the disaster, when many areas may have experienced rapid, unplanned growth. Disasters unveil that existing structures may not have met building codes (e. g., use of plastic straps attaching roofs to walls), with poor workmanship, use of cheap materials, and temporary fixes.

In some long-term disasters, confinement may last for several months (or years). In this situation, the recovery takes place inside the home. The issue is to have a supply of water and bulk foods and appropriate storage and preparation equipment, and then to construct a simple balanced diet, including vitamin pills, cereals, beans, milk powder, and fat (oil) plus vegetables, fruits, spices, and meats, both prepared and fresh-gardened, when possible.

In the disaster aftermath, when the shelters close, the tent cities fold, the media spotlights turn off, and high-ranking decision makers leave the disaster area to go back to their time-consuming routine duties, continuation of assistance to disaster survivors is less spectacular, but nevertheless badly needed. There may be little available housing for the displaced populations. Rents increase and landlords take advantage of a scarce market. For a long time, a large number of inhabitants may live in substandard, or even unsafe, housing. The economic recovery can last a long time, since many jobs will have been lost and many small businesses destroyed or relocated. Unemployment may remain a critical concern for years. There is also a need for long-term medical assistance, including mental health and health monitoring.

The solidarity and altruism of individuals and groups is crucial for recovery efforts. Ad-hoc aid organizations are formed that do home repair for the uninsured and provide legal or medical advice. Joint initiatives arise to deal with the overwhelming task of moving toward recovery and becoming better prepared for the possibility of another disaster.

Cross-References

- ► Disaster Response
- ► Hazards, Natural
- ► Hazards, Technological

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Recruitment and Retention Schemes

Definition

Recruitment and retention schemes are systematic approaches of organizations to fill vacancies and to

keep personnel from leaving the organization. Such approaches may also apply to professional training schemes leading to graduation. Recruitment means to identify potential candidates and to convince selected persons to take up the job or training. Incentives offered to (future) personnel may be financial/material or non-material in nature. Examples include the improvement of physical working conditions, salary increases, facilitation of return after 'family breaks', policies for promotion, training opportunities, special conditions for insurance schemes, or support for housing and transport.

Recurrence Risk

Synonyms

Fix heritability recurrence risk

Definition

The term recurrence risk refers to the estimate of the probability that a relative (especially a child) will be affected by the same disorder as an affected individual. It describes the probability that a disease present in one family member will occur again in other family members in the same or following generations is known as recurrence risk. In general, for fixed heritability, the recurrence risk is approximately a linear function of prevalence when plotted on a logarithmic scale. In practice, it is necessary to offer some estimation of recurrence risk for counseling purposes even in the absence of any defined mechanism of inheritance.

Recurrent Depressive Disorder

Definition

A recurrent depressive disorder is characterized by repeated episodes of depression. The first ► depressive episode may occur at any age from childhood to old age, the onset may be either acute or insidious, and the duration varies from a few weeks to many months.

Recycling

Synonyms

Reusing

Definition

Recycling is a series of activities that include collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, and manufacturing raw materials into new products. It is the act of processing used or abandoned materials for use in creating new products. For many years direct recycling by producers of surplus and defective materials constituted the main form of recycling. However, indirect recycling, the recycling of materials after their use by consumers, became the focus of activity in the 1990s. For some time, most waste has been deposited in ► landfills or dumps. Landfills are filling up, however, and disposal of wastes in them has led to environmental problems. A growing alternative to such disposal is recycling. The individual consumer plays a large part in recycling. Products that are recycled in large quantities include paper and paperboard, ferrous metals, aluminum and other nonferrous metals, glass, plastics, and yard wastes. Recycling is a key concept of modern ► waste management.

Cross-References

► Communal and Industrial Waste

Red Bug

► Chiggers (Burrowing Fleas)

Red Cross

► International Red Cross and Red Crescent Movement

Reduction of Health Expenditure

Synonyms

Cost containment

Definition

Reduction of health expenditure implies a wide variety of strategies and measures to reduce overall health care expenditure, the growth rate of expenditure or certain costs of health care services. These measures include

for example enhanced government regulation of the prices of health care services through changes in the payment method of providers, co-payments, managed care programs, patient education, etc. The reason for the trend of cost containment in health care is the upward spiral of medical expenses in all health care systems due to medical progress and an improvement of technology, the expansion of coverage by public health systems and aging populations in the industrial world with higher levels of ► chronic diseases and ► disability.

Cross-References

► Resource Allocation

Refugee

Synonyms

Displaced person; Fugitive

Definition

A refugee is a person who has left or has been forced to leave his country or native place in order to escape persecution, war, terrorism, extreme poverty, famines or natural disaster.

Refugees and Internally Displaced People

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Definition

A refugee is any person fleeing to a place of safety and being outside the country of his or her nationality (UNHCR 1996). In contrast, internally displaced people (IDP) are those who have fled to a place of safety within the national borders of their country of origin. Both refugees and IDP are at-risk populations in terms of health. Recent international activities try to integrate both subgroups using the unifying concept of forced migration.

Basic Characteristics

Refugees and Relief Organizations

The United Nations High Commissioner for Refugees (UNHCR) is the UN organization caring for refugees. In the year 2005, the total population of concern to UNHCR increased to 20.8 million persons worldwide (UNHCR 2005). Of this endangered population, about 40 percent are regarded as being refugees, 32 percent as being internally displaced persons (IDP) and 11 percent as being stateless (► stateless person). These figures are estimates and the true numbers might be even higher (UNHCR 2006, 2). The International Organization for Migration is reporting 30 to 40 million unauthorized migrants for 2005, 6.6 million internally displaced persons and 8.4 million refugees worldwide (IOM 2006). In 2001, the World Health Organization released a fact sheet concerning emergency and humanitarian action (WHO 2001). Within the WHO, the Department of Emergency and Humanitarian Action is co-ordinating efforts of WHO with other humanitarian organizations worldwide. Assessment of health risks, health co-ordination, surveillance and prevention in the light of the human rights to health constitute the core elements of WHO's activities in emergency and humanitarian action.

Legal Situation in Forced Migration

On 28 July 1951 the United Nations adopted the Convention relating to the Status of Refugees that has been the comprehensive international codification of the rights of refugees down to the present day (UNHCR 1996). Article 1 (Definition of the term "refugee") of Chapter 1 (General Provisions) of the Convention constitutes a refugee being any person fleeing to a place of safety and being outside the country of his or her nationality. Hence, the crossing of an international border has been the legal precondition for full protection by the UN Refugee Convention, thus depriving the major population of internally displaced people (IDP) of the complete shelter of international law worldwide. There are attempts at international level to integrate both subgroups under the unifying concept of forced migration (University of Oxford 2006).

Health Hazards in Forced Migration

Refugees as well as internally displaced persons always constitute a population at elevated risk of severe dam-

age to health and life, morbidity and mortality being seriously elevated especially in refugee camps. Their forced migration might have been stirred up by natural, man-made or complex ► disasters (Gardemann 2002). At the place of refuge major health hazards are constituted by structural or individual violence, by trauma and psychosocial distress, by overcrowding of accommodation facilities or unfamiliar climatic conditions, by lack of shelter, food, of safe drinking water, by unfamiliar infective agents or by lack of basic medical prevention and treatment. To alleviate these major health hazards, the principles of Primary Health Care as stated in the Alma Ata Declaration of the World Health Organization in 1978 have to be followed.

Humanitarian and Technical Standards

As a consequence of the disastrous situation in camps after the Rwanda Genocide in 1994, the major humanitarian agencies founded an open source of humanitarian and technical standards for emergency situations (The Sphere Project 2004). UNHCR is also providing standard references for all aspects of humanitarian assistance (UNHCR 2000). The International Committee of the Red Cross, in its function as a body of international law impartially officiating humanitarian assistance within armed conflicts, has been making major contributions to all aspects of public health in wartime (Perrin 2001). In addition to the UN Convention relating to the Status of Refugees in all cases of international or non-international armed conflicts, the international humanitarian law is also applicable (Haug 1993). The United Nations Office for the Coordination of Humanitarian Affairs is operating "► reliefweb" as a global hub for time-critical humanitarian information on complex emergencies and natural disasters (UN-OCHA 2006).

Disaster Relief and Public Health

Recent media focus on forced migration movements after natural or man-made disasters worldwide has shifted public awareness and concern somewhat away from long-term international development cooperation to humanitarian disaster response. An earmarking of donations after circumstantial media coverage in particular is restricting the options of humanitarian agencies in their ► relief operations for refugees. Funds may be re-routed away from structural development projects into acute humanitarian relief operations. Moreover, isolated actions of disaster response may counteract long-term development projects by generating a price rise in local markets, by poaching local health staff or by privileged medical treatment in comparison with the resident population of the host country (Razum, Gardemann and Will 2006). From the very first day of action, any reasonable project of short-term disaster response and relief for refugees has to blend well, and co-operate extensively, with the local system of health and administration in the affected countries and societies. Examples of ► rapid disaster-response with the option of full and sustainable integration into local health structures are demonstrated by the Emergency Response Units of the International Federation of Red Cross and Red Crescent Societies (IFRC 2006).

Cross-References

► Disaster
► Rapid Disaster-Response
► Reconstruction
► Relief
► ReliefWeb
► Stateless Person

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Refuse Management

► Waste Management

Registration of Infectious Diseases

► Outbreak Management and Surveillance of Infectious Diseases

Registration of Occupational Injuries

Definition

Registration of occupational injuries is the process of collecting and recording data on ► occupational injuries. Registration could be organized on the enterprise, local community, regional, state, or national level. National laws specify the procedures for registration of ► occupational accidents as well as identifying persons responsible for submitting the information on occupational accidents. In most countries, the employer is responsible for submitting data on occupational accidents. Each country decides on the amount and the structure of data in the occupational accident reporting form. This huge variability among countries means that only basic comparison is possible on an international level.

Registry

Definition

A registry is a ► database and associated applications that collect a minimum dataset on a specified group of patients (often those with a certain disease or who have undergone a specific procedure), health professionals, organizations, or clinical trials. Registries can be used to explore and improve the quality of care or to support research; for example, to monitor long-term outcomes or rare complications of procedures.

Regression Analysis

Regression analysis is an inferential statistical method that develops equations (regression models) from empirical random samples to make predictions about the values of a dependent variable (outcome, response) based on the values of one or more independent variables (covariates, explanatory variables, predictors) with known probabilities of accuracy. If there is more than one independent variable the method is referred to as multiple regression. There are two major classes of regression – parametric and non-parametric. Parametric regression requires choice of the regression equation with one or a greater number of unknown parameters. Linear regression, in which a linear relationship between the dependent variable and independent variables is posited, is an example. The aim of parametric regression is to find the values of these parameters which provide the best fit to the data. The number of parameters is usually much smaller than the number of data points. In contrast, the nonparametric regression requires no such a choice of the regression equation. In regression analysis, there are several methods for variable-selection procedures aimed at selecting a reduced set of the independent variables: step-wise regression, forward selection and backward selection.

Regulated Competition

Synonyms

Managed competition

Definition

Regulated competition models are supposed to increase the efficiency of health care markets by increasing competitive pressure for health insurers and health care providers. A comprehensive set of regulatory instruments is supposed to counteract unwanted consequences of competition in health care markets.

Cross-References

► Competition for Health Care

Regulating Oneself

► Self Regulation

Regulation

► Cross-Sector Efforts
► Regulatory Mechanisms

Regulation of Pharmaceuticals (Drug Regulation)

Definition

Effective drug regulation has many aims. It promotes and protects public health by ensuring that medicines are of the required quality, safety and efficacy; and it ensures that health professionals and patients have the necessary information to enable them to use medicines rationally. It also ensures that medicines are appropriately manufactured, stored, distributed, and dispensed; that illegal manufacturing and trade are detected and adequately sanctioned; that promotion and advertising is fair, balanced, and aimed at rational drug use, and that access to medicines is not hindered by unjustified regulatory work.

National governments are responsible for establishing strong national drug regulatory authorities (DRAs) with a clear mission, solid legal basis, realistic objectives, appropriate organizational structure, adequate number of qualified staff, sustainable financing, capacity to exert effective market control, and access to technical literature, equipment, and information.

Regulatory Law

► Administrative Law and Public Health

Regulatory Mechanisms

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Synonyms

Regulation

Definition

Market failures would be imminent in most unregulated health care markets. Thus, regulatory mechanisms influence the way health care systems are financed and the way demand and supply in health care systems are determined. On the supply side, regulatory mechanisms strive to solve agency problems in the relationship between patients and health care professionals by introducing payment systems. However, little progress has made in designing payment schemes that encourage physicians to act as perfect agents for their patients as well as for third-party payers.

Basic Characteristics

Designers of health care systems around the world use a variety of regulatory mechanisms in order to overcome market failures that would be imminent in unregulated health care markets. Competitive health insurance systems need to overcome ► adverse selection. Comprehensive coverage leads to ► moral hazard and a relationship between patient and physician that has severe agency problems (► agency theory), which may lead to ► supplier-induced demand. The basic domains of regulatory action by designers of health care systems are health care financing, regulation of demand, and regulation of supply. For regulation of health care financing and regulation of demand, see ► health financing, ► health insurance markets,

► consumer choice, and ► competition, health care. This essay is therefore only concerned with the regulation of supply. More specifically, we explore regulatory mechanisms that are intended to reduce agency problems in the relationship between health care professionals and patients.

Patients rely on health care professionals to reduce information asymmetries and to support them so that they can make informed choices. This assumes that health care professionals act as perfect agents for their patients and refrain from pursuing self-interests that might be divergent from the interest of the patient. However, in practice physicians are quadruple agents. They pursue the interest of the patient, their own self-interest, the interest of the ► third-party payer, and the interest of society as a whole (Rice 2006). The key for aligning the interests of patients, physicians, third-party payers, and society as a whole is the development of physician payment systems. Before the introduction of third-party payers, health care professionals faced no external obstructions in treating their patients. They negotiated the price for their services individually with the patient and had a rather strong bargaining position in the physician-patient relationship. However, third-party payers intervene in this relationship and change the balance of power – most physician payments nowadays are determined by payment schemes, which are administered by a third-party payer in most cases. Traditionally, payment systems for physicians have been based on ► fee-for-service, ► capitation, ► salary, or some combination of these.

Fee-for-Service

Fee-for-service payment systems are intended to allow physicians to react in a flexible manner to patients' needs and also grant the physicians a high degree of autonomy. Financial rewards are directly connected with work performed; therefore, they are popular with the medical profession. Under fee-for-service payment systems, physicians tend to delegate fewer tasks to other health care professionals than under capitation or salary payment systems (Greß et al. 2006). This is not surprising since fee-for-service payment systems contain incentives to maximize income by maximizing self-produced services, which also entails longer working hours. Third-party payers try to counteract the trend for the expansion of services under fee-for-service systems by setting budgets for the volume of services. They also try to steer provider behavior by changing relative prices for services, e. g. by reducing relative prices for technical procedures and by raising relative prices for time-consuming individual counseling. While fee-for-service payment systems increase the activity of physicians, they also allow for a high degree of flexibility (Engström et al. 2001).

In fee-for-service systems, patients tend to consume more health care services than in capitation- or salary payment systems. However, without evidence on patient health status and clinical outcomes it is unclear if the increased consumption of services itself is hazardous or beneficial for patients (Gosden et al. 2001).

Capitation

Capitation is intended to reduce incentives for supplier-induced demand and to increase incentives for continuity of care. While there may be "under-delegation" in fee-for-service systems, there may be "over-delegation" in salary and capitation systems. In capitation, there are incentives to encourage physicians to withhold care, which may result in under-treatment of patients. Physicians can reduce their workload without reducing their income by referring their patients to other providers and can increase income by increasing the number of patients on their lists (Lynch 1998). For physicians in capitation systems, it may be profitable to dump patients (► dumping) in order to attract favorable risks (health care costs of the individual are lower than capitation payments for the individual), and to actively discourage non-favorable risks (health care costs of the individual are higher than capitation payments for the individual). However, this kind of behavior is severely restricted by ethical restraints. While risk-adjusted capitation payments are technically and administratively complex, they greatly reduce incentives for risk selection in situations where ethical restraints against risk selection may be less effective (Hutchinson et al. 2000).

Salary

A salaried payment system is intended to combine basic income security for physicians with high accessibility for patients. However, in salaried systems, patients sometimes complain about discourteous physicians. This behavior probably reflects low motiva-

tion of providers who have limited opportunities to increase income. Moreover, private practice may be more rewarding, not only financially but also professionally. However, a study from the UK shows that job satisfaction does not necessarily have to be lower in salaried systems than in capitation/fee-for-service systems (Gosden et al. 2002).

Mixed Payment Systems/Pay-for-Performance

"There are many mechanisms for paying physicians; some are good and some are bad. The three worst are fee-for-service, capitation, and salary. Fee-for-service rewards the provision of inappropriate services, the fraudulent upcoding of visits and procedures, and the churning of "ping-pong" referrals among specialists. Capitation rewards the denial of appropriate services, the dumping of the chronically ill, and a narrow scope of practice that refers out every time-consuming patient. Salary undermines productivity, condones on-the-job leisure, and fosters a bureaucratic mentality in which every procedure is someone else's problem (Robinson 2001: 149)."

This statement reflects the fact that little progress has so far been made in designing payment schemes which encourage physicians to act as perfect agents for their patients as well as for third-party payers (Rice 2006). However, a number of new payment schemes in the US may provide promising solutions. ► Pay-for-performance schemes associate part of the physician's payment to performance indicators such as clinical outcomes and patient satisfaction (Rosenthal et al. 2004; Rosenthal et al. 2005).

Cross-References

- ► Adverse Selection
- ► Agency Theory
- ► Capitation
- ► Competition, Health Care
- ► Consumer Choice
- ► Dumping
- ► Fee-for-Service
- ► Health Financing
- ► Health Insurance Markets
- ► Moral Hazard
- ► Pay-for-Performance
- ► Risk Adjustment
- ► Salary
- ► Supplier-Induced Demand
- ► Third-Party Payer

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Rehabilitation

Definition

The health strategy that, based on the WHO's integrative model of human functioning and disability, aims to enable people with health conditions experiencing or likely to experience disability to achieve and maintain optimal functioning in interaction with the environment.

Cross-References

- ► Prevention, Tertiary

Rehabilitation Delivery

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Definition

The World Health Organization defines rehabilitation as an active process by which those disabled by injury or disease achieve full recovery, or, if full recovery is not possible, realize their optimal physical, mental, and social potential and are integrated into their most appropriate environment. This refers to people with chronic illnesses, after trauma, and with congenital disabilities.

Basic Characteristics

Background

There are around 600 million people with disabilities worldwide. The disabilities may be physical, sensory, and/or mental conditions and limit the way the disabled persons carry out their daily activities. Many disabled people live in developing nations and do not have access to rehabilitation services of any kind. Internationally, there have been efforts to improve the quality of life for disabled people and their families in recent year, which are reflected in a stronger emphasis on social elements instead of predominantly the medical perspective. ► community based rehabilitation services emerged, especially in developing countries with only limited rehabilitation infrastructures. As rehabilitation aims to restore full independence by eliminating or at least reducing a handicap and by improving ability to participate in social life, it covers medical, psychological, occupational, and social aspects.

Approaches of Rehabilitation Delivery

Rehabilitation delivery aims at helping a disabled person to regain or acquire knowledge and skills, thus generating maximized ► functional ability and minimizing disability and handicap. This will allow for activity and participation by improved physical, psychological, and social function. There are three approaches towards rehabilitation. The first approach aims at reducing or eliminating disability by providing appropriate treatment and using medication control, for example. The second approach has the objective of acquiring new skills and strategies that will reduce the impact of disability such as enabling a disabled person to use a wheelchair for longer distances. The third approach helps to alter the physical and social environment to facilitate living with a given disability. An example could be the alteration of the work environment. In many cases, two or all of the approaches are pursued.

Types of Rehabilitation

Rehabilitation delivery covers a wide field of different services offered. The major categories of rehabilitation services are medical rehabilitation services, vocational rehabilitation services, and residential/community rehabilitation services. Medical rehabilitation is still a key element of rehabilitation delivery. It aims at minimizing physical, intellectual, and social consequences of disease, illness, injury, aging, and congenital factors. Amongst the most common health conditions targeted by medical rehabilitation are stroke, ► spinal cord injury, ► traumatic brain injury, ► arthritis, amputation, spinal pain, respiratory dysfunction, cardiac/pulmonary dysfunction, ► multiple sclerosis, ► Parkinson's disease, ► motor neuron diseases, and ► cancer. The objectives of medical rehabilitation are to maximize ► functional ability, restore or enhance vocational ability, improve ► quality of life, and avoid or reduce the need for ► long-term care. Vocational rehabilitation aims to enable temporarily or permanently disabled persons to enter, return, or remain in employment. Vocational rehabilitation offers a wide range of employment and pre-employment services to disabled persons. These services include, for example, ► sheltered work and supported employment. Vocational rehabilitation programs offer, amongst other services, career exploration, skill and potential assessment, advice and counseling on job selection, training in prevocational skills, training for particular jobs, and assistance in finding a job. Residential/community rehabilitation services offer informal services for disabled persons in residential settings like group homes, supported living, or assisted living settings. The objective is to enable persons with physical, cognitive, mental, or sensory disabilities to live and function as independent-

ly as possible at home, at work, and in the community.

Delivery Settings

Rehabilitation services are offered in a wide range of rehabilitation facilities and multidisciplinary and interdisciplinary ► rehabilitation teams are usually involved in providing the different services. With regard to medical rehabilitation, the first phase of rehabilitative care is usually provided to patients at acute care hospitals, general medical or surgical wards, trauma centers, or intensive care units. This sub-acute rehabilitative care – also called ► short-term rehabilitation – is either delivered in the rehabilitation unit of the hospital, in a dedicated rehabilitation hospital, or by outpatient rehabilitation services. The rehabilitation hospitals provide close medical supervision and have physicians, nurses, and therapists available. The therapies offered include ► physical therapy, ► occupational therapy, and ► speech therapy. At the end of the stay in the rehabilitation hospital, the patient is either moved home with – if required – outpatient rehabilitation services or transferred to another, longer-term, facility, which could be a skilled nursing facility or a long-term care hospital. Skilled nursing facilities and long-term care hospitals offer services for people with more severe disabilities who need to stay longer term but sometimes have less intense rehabilitation needs (especially relevant for skilled nursing facilities). Those facilities usually offer the whole range of rehabilitative therapies. Patients that are sent home can continue their rehabilitation in outpatient rehabilitation settings. The facilities focus on providing diagnostic, therapeutic, and restorative services for persons who periodically require rehabilitation services. They might offer the whole range of those services or specialize on specific areas e. g. physical therapy or speech therapy. The patients come either from home or from residential settings. There are also residential/community rehabilitation services that are offered for disabled persons in residential settings like group homes, supported living, or assisted living settings.

Benefits of Rehabilitation Delivery

There are several proven benefits of rehabilitation delivery on an individual level. Rehabilitation improves and optimizes both the physical and social functioning of the affected individual. It furthermore reduces the risk of unnecessary complications. Rehabilitation improves the chances and accelerates the speed of living independently at home and returning or starting to work. Rehabilitation also enforces the concentration of therapy and thus decreases the length of hospital stay and results in improved outcomes. On a micro- and macroeconomic level, rehabilitation can lead to cost reductions by reduced length of hospital stay, fewer complications, fewer unnecessary hospital admissions and readmissions, less sickness absence, lower early retirement, increased productivity, continued tax payment, and reduced payment of state benefits.

Conclusion

Rehabilitation efforts have grown significantly over the last 25 years and several delivery models have emerged and developed. Formal training programs have been established worldwide for the education of specialists in the different fields and areas of rehabilitation. Rehabilitation is commonly accepted as an important field in health care and public health. Rehabilitation is now shifting from its traditionally reactive focus towards a more proactive one yet there are still too few studies of rehabilitation that specifically address the future challenges and implications. The scientific, technological, and communications revolutions underway have to be utilized worldwide to better serve the needs of people that require rehabilitation services in the most integrated way possible.

Cross-References

► Motor Neuron Diseases
► Multiple Sclerosis
► Occupational Therapy
► Parkinson's Disease (PD)
► Physical Therapy
► Sheltered Work
► Speech Therapy
► Spinal Cord Injury
► Traumatic Brain Injury

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Rehabilitation Teams

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Definition

The rehabilitation team consists of professionals from different disciplines that are involved in the rehabilitation process. The multidisciplinary and interdisciplinary team agrees on explicit objectives that have an impact on team setup and function. It is a key success factor that the skills and roles are clearly defined and understood by each team member. The rehabilitation team works with the disabled person and their family and defines an appropriate, realistic, and timely treatment plan embedded in an integrated rehabilitation program.

Basic Characteristics

Team Structures

Successful rehabilitation teams have to be more than a mere collection of different health professionals from multiple disciplines. What actually differentiates an interdisciplinary team from only a multidisciplinary team is that the interdisciplinary team pursues a client centric approach. This means that the goals are set in cooperation with the disabled person and their family and for each single discipline. Such an integrative approach requires the team to define common actions and work cross-boundaries, with each individual bringing in their specific experiences, skills, and expertise. The rehabilitation teams are often led by a physician, which is primarily driven by historical or political reasons, but still makes sense as the physician often has the broadest view of the patient as a whole as well as of the contribution of the different team members. The core members of a rehabilitation team are usually the rehabilitation physician, a rehabilitation nurse, a clinical ► neuropsychologist, an occupational therapist, a physiotherapist, and a speech and language therapist. Depending on the specific case, there might be other specialists involved like, for example, social workers, ► dieticians, or ► podiatrists. In some cases, a key worker or case manager is assigned to act as liaison between the rehabilitation team, the disabled person, and the family, by providing information about the rehabilitation process and feeding back the thoughts and aspirations of the disabled person and their family to the team. The rehabilitation teams are usually established in all rehabilitation settings, which can be hospital-based and other inpatient settings as well as outpatient rehabilitation services.

Key Benefits of Rehabilitation Teamwork

There are several benefits that arise from establishing interdisciplinary and multidisciplinary rehabilitation teams. A rehabilitation team allows for improved communication and knowledge sharing between the representatives from the different disciplines. Tackling a case as a team enables a consistent, client centric, and goal-oriented approach and improves continuity of care. The stimulating environment has positive effects within the team by enhancing the contribution of each member, improving their motivation and passion, and allowing for a more effective working style. If the team is set up correctly, with clear rehabilitation objectives for the patient, the output of the team is usually higher than the sum of the individual professional inputs as experiences and workload are shared.

Outcome Measures

Outcome measurement has gained increasing importance in recent years in the health care industry. There is a wide range of different outcome measures in rehabilitation. The outcome measures have to be defined accurately to ensure that they do not only reflect the goal that has been set for the rehabilitation effort but also the process by which the goal is achieved. Outcome measures are a tool to evaluate the service but it is always

crucial to examine the underlying process as well, and get a detailed understanding of the whole context of the situation. When it comes to evaluating the work of rehabilitation teams, at least the following three standards concerning multi-professional working should be fulfilled. 1) The rehabilitation team should work according to written criteria for seeing and treating their patients. 2) The teams should define appropriate outcome measures, document at least one at admission of the patient, and review its fulfillment at discharge. 3) There should be a detailed rehabilitation plan for each patient with clearly defined goals that have been aligned with the patient and the family.

Conclusion

Rehabilitation will face constant changes in upcoming decades. There will be changes in the structure and function of the rehabilitation systems worldwide. To deliver rehabilitation services in the most efficient and effective way, there will be further efforts to enhance networking and integration both within the rehabilitation industry but also with other stakeholders involved in or close to the process. Furthermore, continuous learning and education is required to meet the changing needs of patients and society. The establishment and enhancement of rehabilitation teams, especially for more specialized rehabilitation services, will contribute to facing the future challenges by providing a coordinated source of information, advice, and treatment, thus facilitating minimization and prevention of disability and handicap.

Cross-References

- ► Dietician
- ► Neuropsychologist
- ► Podiatrists

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Rehydration

Synonyms

Replacement of fluids; Substitution of fluids; Fluid therapy

Cross-References

- ► Therapy of Infectious Diseases

Rehydration Solution

Synonyms

Replacement of fluids; Substitution of fluids; Fluid therapy

Definition

In oral rehydration the loss of fluids and electrolytes is replaced without intravenous infusions. The amount of an oral rehydration solution (ORS) depends on the assumed loss of fluids (or weight) and the requirements of the organism. To compensate the loss properly, the solution has to provide an optimal composition of salts (electrolytes) and sugar (glucose). This is achieved by an uptake of 60 mmol sodium, 20 mmol potassium and 90 mmol glucose (16.2 g) per liter and an osmolality of 240 mosmol/l. Osmolality means the amount of dissolved particles per liter of the solution. A number of products, which follow these recommendations, are available. A simple and easily self-made oral rehydration solution should contain eight teaspoons of sugar (40 g) and one teaspoon of salt (5 g) in one liter of boiled water. Cola or fruit juices are not suitable for rehydration because their content of sugar is too high and that of electrolytes too low. Furthermore, the osmolality of these beverages is too high.

Cross-References

- ► Therapy of Infectious Diseases

Reimbursement

Definition

Reimbursement in health care refers to the reimbursement of all types of health care services provided. Med-

ical services and drugs in the ambulatory sector or in hospitals are reimbursed by the health insurance of a patient. The reimbursement may be 100% or lower according to the service received and the health insurance contract. If a patient is not fully reimbursed for a treatment or drug he has to make a direct payment or co-payment in order to fill the gap between the price of a service and the reimbursement.

Reinfection in Sexually Transmitted Diseases

► Ping Pong Infection

Reinfection in Social Diseases; Reinfection in Veneral Diseases

► Ping Pong Infection

Relationship

Definition

A relationship is a connection between two or more variables usually assessed by a measure of association. Informally a term that describes a case where one variable is depending on the other, or a case where values of one variable vary together with values of the other variable(s). The relationships may be causal, meaning that the changes in one variable depend on the changes in another; or they may be correlational, meaning that the variables tend to change at the same time, but there is not necessarily a causal relationship between the two variables. A relationship between two variables that can be described by a straight line when variable values are plotted on a graph is a linear relationship.

Cross-References

► Association

Relative Odds

Synonyms

Odds ratio (OR); Cross-product ratio

Definition

The odds ratio is a measure of association, in which a value of "1.0" means that there is no relationship between variables. The value of an odds ratio can be less than or greater than 1.0. The magnitude of any relationship is measured by the difference (in either direction) from 1.0. An odds ratio less than 1.0 indicates an inverse or negative association. An odds ratio greater than 1.0 indicates a positive correlation.

Cross-References

► Odds Ratio (OR)

Relative Outcome Risk

Synonyms

Cumulative incidence ratio; Relative risk

Definition

The risk ratio (RR) of an event is the risk of the outcome in the treatment group (or exposed group) divided by the risk in the control group (or unexposed group). RR is an example of exposure effects used in connection with dichotomous outcomes. When the exposure factor under study is a risk factor RR $>$ 1. RR $=$ 1 when there is no association between exposure and disease. RR $<$ 1 corresponds to a protective exposure. In relative risk regression models, where regression coefficients for main effects exposure variables have an interpretation of log relative risk, a significant interaction between exposure and a second variable means that the second variable is an effect modifier. Logistic regression and multiplicative Cox regression are all examples of multiplicative models for which the relative risk is the implicit measure of effect. Relative risk is the same as the cumulative incidence ratio which represent the ratio of the risk of disease in an exposed cohort over a defined time interval to the risk of disease in an unexposed cohort over this same time interval.

Cross-References

► Risk Ratio

Relative Ratio (RR)

► Relative Risk

Relative Risk

Synonyms

Cumulative incidence ratio; Relative ratio (RR)

Definition

The relative risk quantifies how many times more or less likely the disease is in "exposed" people compared to "unexposed" people. Traditionally, exposure has been considered in terms of environmental agents, but in genetic studies exposure can refer to the underlying genotype or allele. A null value of 1.0 indicates that the disease is equally likely in exposed and unexposed people; a value greater than 1.0 indicates that the disease is more likely in exposed people; and a value less than 1.0 suggests that the disease is more likely in unexposed people. Usually, a relative risk is given in percent.

Cross-References

► Risk Ratio (RR)

Reliability

Definition

Reliability indicates the degree to which the measurement instrument is consistent, free from random error, and the measurements of the characteristics of individuals under different conditions yield similar results. There are three ways to analyze reliability: internal consistency reliability, test-retest reliability and inter-rater reliability. Internal consistency reliability is the degree of congruence of items on the questionnaire or scale. Congruence between them suggests that all items measure the same thing as the instrument as a whole. Inter-rater reliability measures the agreement of two or more raters that use the same information on the same analyzing unit. Test-retest reliability is an estimation of the scale of stability over time that is measure of result congruency obtained by repeated measurement on the same objects, under the condition that there was no change in the condition of those objects.

Relief

Definition

Relief is assistance or intervention from outside during or after ► disaster to meet the life preservation and basic subsistence needs.

Relief Organization

► Humanitarian Agency

ReliefWeb

Definition

ReliefWeb is an independent, internet-based source of information on humanitarian emergencies and ► disasters. It is administered by the UN Office for the Coordination of Humanitarian Affairs (OCHA). ReliefWeb has been started in 1996 and has been designed to assist the international humanitarian community in evidence-based delivery of emergency assistance. ReliefWeb maintains three offices in three different time zones (New York, Geneva, and Kobe) to update the web site around the clock, posting some 150 maps and documents daily from over 2,000 sources from the UN system, governments, NGOs, the scientific community and the media.

Religion

Synonyms

Faith; Devotion; Spirituality

Definition

Religion is commonly defined as belief concerning the supernatural, sacred, or divine, and the moral codes, practices and institutions associated with such belief. It may also be understood as the sum total of answers given to explain humankind's relationship with the universe.

The relation of human beings to God or the gods or to whatever they consider sacred or, in some cases, merely supernatural.
A belief in God with the knowledge and observation of religious Cults in their abundance, sacred songs, and artistic representation of pictures of churches or temples.

Religion and Health

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Definition

There are many different definitions of ► religion. One of the most commonly used defines religion as a set of beliefs, values, and practices based on the teaching of a ► spiritual leader. Religion is a system of thought, feeling, and action shared by a group. Also, religion is an acknowledgment of the extraordinary, the mysterious, the supernatural. The religious consciousness generally recognizes a sacred order and elaborate a technique to deal with the inexplicable or unpredictable elements of human experience.
Most languages have no word for religion but this does not mean their speakers are not religious.

Basic Characteristics

Types of Religious Systems

Religion is an essential part of the human experience.
Main concerns of every religion are health, wealth, and the pursuit of happiness. Through religion people express their desire for a better life. How "better", "healthy", "wealthy" or "happy" are understood varies from one community to another as well as from one individual to the next. The ways in which it is appropriate to express one's desire for the above attributes also vary. Sometimes wealth or the good life are not defined by human desire but by divine dictate. People adjust their views, beliefs, and actions to what is acceptable to their source of authority.
Indigenous religions are the majority of the world's religions. They are as diverse as are languages, cultures, traditions, and the ways of life of people living in a variety of settings all over the world. *Indigenous religions are co-operative activities in which individuals often have considerable freedom.* There is considerable diversity of indigenous religions. Each indigenous religion is unique to a specific ethnic group or part of a group. However, several groups may share elements of belief and ritual because of common ancestry or mutual influence. Believing and acting in a religious mode is incorporated in every day life and is part of the social, cultural as well as economic and political actions and relationships of the group.
Due to growth and spread of transcultural or global religions (Buddhism, Christianity and Islam) some indigenous religions have been rejected, abandoned or destroyed. Others have accepted the arriving religion on their own terms slotting it into an indigenous understanding. Many have adapted to the presence of more powerful dominant religions, but many people have returned to their 'traditional' religion or are engaged in both indigenous and newer religion.
Many beliefs and practices of indigenous religions are not systematized. The distinction between the natural and the supernatural or divine usually is not relevant to the traditional religions. In many indigenous religions spirits may have much greater power than humans. Their powers are perceived not as altering the way the world commonly works but as explaining occurrences in nature or in the social world.

Religion and Health

Understanding and explanation of causes and consequences of illness and health very often are different from the evidence based medical viewpoint. In some indigenous religions it is believed that illness is a result of spirit possession. Spirit possession is found in virtually all religions of humankind from earliest times until now. Its forms and belief content, show an amazing diversity, for example shamanism (Arctic, Siberian and other) and zar and bori cults in Africa.
Approaches to healing are different as well. Very often in indigenous religions we encounter men and women who are believed to have extraordinary powers. Understanding regarding the way these powers have been acquired and exercised varies from group to group. In general, however, some people are thought to have inherited the capacity to harm others and to have a dis-

position to do so. Typically they are accused of inflicting illnesses on specific individuals. On the other hand, very often it is believed that some men and/or women have powers of healing which is an important issue in terms of acceptance of medical care and provision of health service.

Religious practices may be beneficial for human health as proved in some investigations. For example, many indigenous religions forbid the use of certain food types during specific times of the year.

Is religion related to better health? Research in this area is obscure but not entirely absent. Australian studies for example have found greater marital stability, less alcohol and illicit drug use, lower rates of and more negative attitudes toward suicide, less anxiety and depression, and greater altruism among the religious. Religiosity has also been associated with less cigarette smoking, more conservative sexual practices (reducing risk of sexually transmitted diseases), lower cortisol and catecholamine levels (for meditators), lower blood pressure, lower cholesterol, and even lower risk for colon cancer. Health practitioners should consider a patient's religion or spirituality in clinical practice.

Religious practices have to be considered in terms of either health benefits or a possible disturbing factor in utilization of health care, depending on the features of specific indigenous group.

Health professionals working in indigenous communities have to be aware of the religious practices and beliefs of indigenous groups. What is more they should be trained to react accordingly if they estimate religious issues might interfere with the treatment. Further research of the relationship between spirituality and health of indigenous groups is needed for better understanding of causes as well as more successful implementation of treatment.

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Religious

► Spiritual

Religious Wars

Definition

A religious war is a war fought due to religious reasons. For the purpose of such definitions, this includes wars between Protestants and Catholics because of different religious denomination during the sixteenth and seventeenth centuries.

Remedy

► Drug Law

Removable Partial Denture

► Partial Removable Dental Prosthesis

Removable Prosthesis

► Complete Removable Dental Prosthesis
► Partial Removable Dental Prosthesis

Removal

► Disposing

Removal of Viable Microorganisms

► Sterilization

Repeated Measurements

Definition

Research situation in which the groups of cases are measured more than once, i. e. before and after an intervention. The feature of experimental design in which several observations of the same variable belong to the same test subject.

Repeated Measures Design

► Paired Groups Design

Replacement of Fluids

► Rehydration
► Rehydration Solution

Replication

Synonyms

Repeating

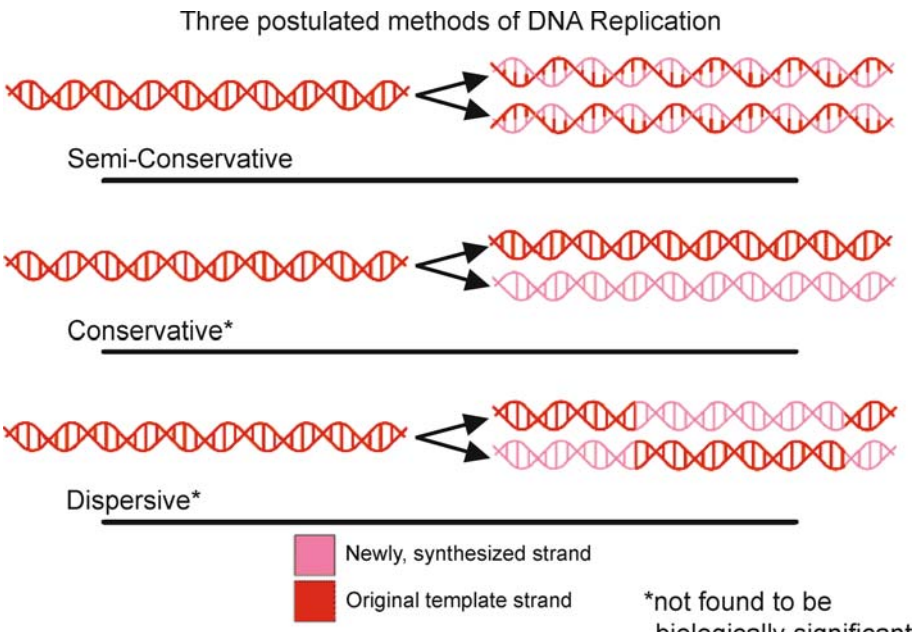
Definition

Replication is performing the same treatment combination more than once to increase confidence in those findings; repetition of the same research procedures (usually by a second researcher) for the purpose of determining if earlier results can be duplicated; the collection of two or more observations under a set of identical experimental conditions. Repeating the creation of a phenomenon, so that the variability associated with the phenomenon can be estimated. If affordable, replication should be part of every design. Replication allows us to compute a model-independent estimate of the process standard deviation. Such an estimate may then be used as a criterion in an objective goodness of fit test to assess whether a given model is adequate. Such an objective test can be employed only if the design has built-in replication. Some replication is essential; replication at every point is ideal.

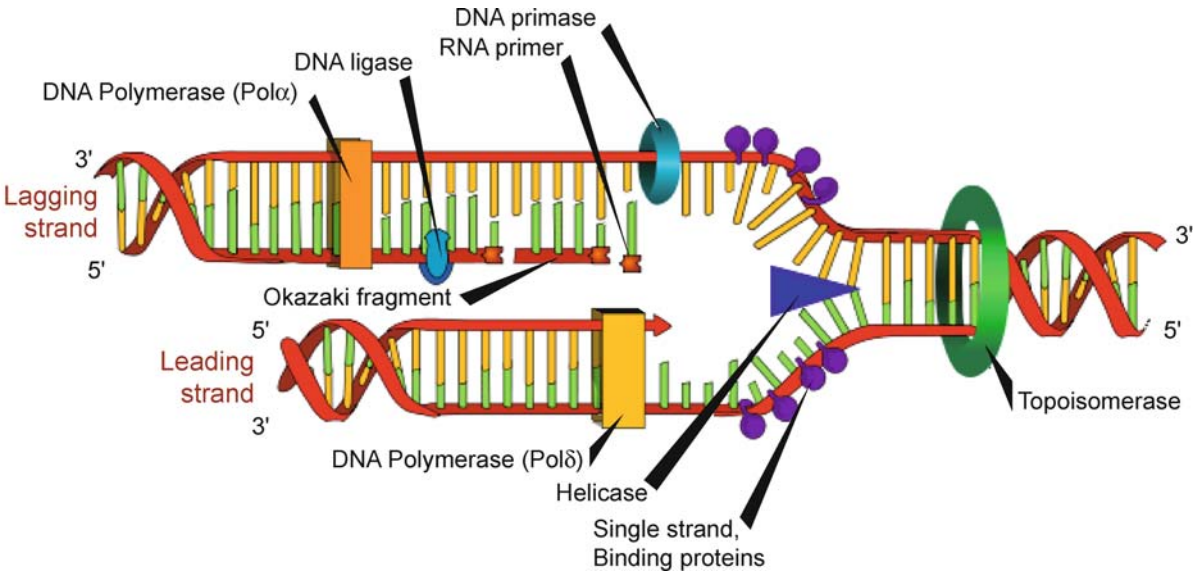
Replication (DNA)

Definition

Replication is the process by which DNA is copied, producing two new double-stranded DNA sequences from one original. Each new double-stranded sequence is made of one strand which initially served as a template, and one strand which was constructed on that template; hence, it is therefore said that DNA replication is 'semi-conservative' (Fig. 1). Several complicated steps transpire in order for DNA to replicate. The first step is the separation of the DNA double-strand. In this first step, several enzymes perform key functions: topoisomerase 'nicks' one strand at a specific site, the origin of replication, breaking a bond between two adjacent nucleotides to lower torsional stress and permit uncoiling; helicase unwinds and separates the two strands, dissociating the base pairs; and single-strand binding proteins attach to the separate strands, holding them open. With this newly opened 'replication bubble', the enzyme primase reads the exposed single strand and attaches short segments of ribonucleotides ('primers' of RNA) at various specific sequences in order to create sites from which to begin replicating the DNA. It is then that the enzyme DNA polymerase begins the process of attaching their 5′ ends to the 3′ ends of the RNA primers by removing phosphate ($-PO_4$) groups from deoxynucleotide triphosphates (dNTPs) to extend a new duplicate strand along the template. At a replication origin, replication will proceed bidirectionally on each strand, towards both the 5′ and 3′ ends. DNA polymerization, however, always goes from the 5′ to 3′ direction. On one of the two strands, a single primer will be used to start the addition of nucleotides from 5′ to 3′; on this strand, replication proceeds continuously as the DNA double-strand is unwound and separated into individual strands. The strand which is continuously duplicated is called the leading strand. However, on the complementary strand, and on the 5′ side of the replication origin, the template is being opened in a 5′ direction. As



Replication (DNA), Figure 1 Illustration of semi-conservative vs. conservative replication



Replication (DNA), Figure 2 Illustration of replication at the site of uncoiling and opening of the template

a result, primase attaches RNA primers at multiple sites along the single strand as the distance from the origin of replication increases (Fig. 2). At each primer, DNA polymerase attaches nucleotides until it encounters the end of that segment of DNA at another primer. Thus, the strand opposite the leading strand, the lagging strand, is made by continuously duplicating short stretches in the 5′ to 3′ direction as the bubble expands. These short stretches of replication on the lagging strand are collectively called Okazaki fragments. After a section of strand has been duplicated, the sequence is proofread to ensure both correct duplication of the strand and the removal and replacement of the RNA primers with the appropriate deoxyribonucleotides. Finally, any remaining nicks or separations in the strand are sealed using the enzyme DNA ligase.

Reportable Disease

► Notifiable Disease

Representativeness of a Surveillance System

Definition

In order to generalize findings from surveillance to the target population at large, the data from a surveillance system should reflect the population characteristics related to time, place, and person. Representativeness is assessed by comparing the characteristics of health events detected through a surveillance system with those of all such health events in the target population. A lack of representativeness may lead to misallocation of health resources.

Reproductive Health

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Definitions

Reproductive health refers to the complete physical, mental and social well-being in all matters concerning the reproductive system, its functions and processes. Reproductive morbidity may be divided into three categories: obstetric/maternal morbidity (related to pregnancy and childbirth), contraceptive morbidity (complications with methods of birth control) and gynecologic morbidity (endocrine disorders, infertility, cancer, sexual dysfunction, symptoms related to the ► menstrual cycle and ► menopause, sexually transmitted infections).

Healthy sexuality and reproduction involves safe, satisfying behavior and experience. Reproductively healthy people are able to reproduce, and enjoy the freedom to decide if, when, and how to reproduce. Both sexual and reproductive health is influenced by the availability of necessary resources, individual decision-making, and environmental contexts. Sexuality and reproductive concerns change over a person's lifetime; thus, gender and lifestages affect sexual and reproductive health.

Basic Characteristics

Sexual and reproductive health are vital elements of physical and emotional well-being. But while sexual and reproductive health are sometimes synonymous, healthy sexual expression need not always lead to reproduction. Healthy reproduction includes a problem-free conception, normal pregnancy and birth, and easy postpartum recovery. Gender-specific reproductive health information is essential for informed consent, and should include information about sexual and reproductive behavior that is preventative in nature. Loving relationships in early childhood and later life also support sexual and reproductive health. Access to adequate and affordable health-care is essential for safe pregnancy, childbirth, and postpartum recovery. Sexual coercion and violence, genital cutting, inadequate child-spacing and child trafficking all threaten individual health, especially of women and children. Sexual and reproductive health are closely related to the realization of human and reproductive rights.

Adolescence, Sexuality and Reproductive Health

Adolescence is typically a time of sexual experimentation. Ideally, good sex education cultivates understanding and awareness of a broad range of human sexual expression, as well as the long-term risks of some behaviors. Adolescents may be sexually vulnerable because of family history and relationships, cultural norms and societal pressures. Statistically, adolescents are at comparatively high risk for unintended pregnancies and ► sexually transmitted diseases, including ► HIV/AIDS. Half of all new HIV-infections take place among people under the age 25, and girls and women are disproportionately affected.

About 10 percent of all newborns worldwide have teenage mothers. Impaired access to family planning services and basic sex education has led to a worldwide increase in the number of young single mothers. Pregnant teenagers often experience poor nutrition, inad-

equate weight gain, and high rates of smoking, thus experiencing higher risk pregnancies.

Reproductive Responsibilities, Family Planning and Abortion

Sexual pleasure as well as sexual risk goes hand-in-hand with reproductive responsibility, and men and women alike are responsible for healthy sexual and reproductive praxis. Sexual and reproductive coercion, on the other hand, can take different forms: Most extreme forms would include being forced to have sex, or to carry an unwanted child. Lesser forms include overmedicalization of normal reproductive practices like pregnancy. Further, the prevention of unintended pregnancies requires access to a wide range of family planning methods including abortion. Unsafe abortion can lead to maternal morbidity and mortality and can potentially cause later infertility.

Childlessness and Infertility

Many couples choose to remain childless. Other couples have trouble conceiving. There are about 80 million infertile men and women worldwide, and many causes of ► infertility are preventable. For example, the most common cause of infertility are sexually transmitted diseases, which the use of condoms could prevent. Likewise excessive use of toxic substances (e. g. caffeine, tobacco, alcohol, drugs), ► environmental pollutants, excessive exercise, and weight loss or weight gain can result in abnormal ovulation and sperm production. Additionally, an increasing number of women working in formal economies are postponing childbearing until the age of 35–45, when the chance of becoming pregnant is reduced.

Pregnancy

Pregnancy is a normal condition for a reproductively healthy woman. At the same time, pregnancy may induce conditions the woman might not otherwise experience, like hypertension, ► gestational diabetes, ► anemia, and ► depression. Effective pregnancy management can minimize these conditions. Access to information about the physiological changes of pregnancy, good nutrition, proper exercise, stress reduction, and working during pregnancy, as well as access to the assistance of a trained birth attendant should be available and affordable for all women. Having many children and lacking control over child-spacing can also threaten women's long-term health. Additionally, other factors over which women do not have control – exposure to ► environmental toxins, economic and cultural stressors, and violence (4–20 percent of women worldwide experience violence during pregnancy) – affect the health and wellness of mother and fetus.

Childbirth

Experiencing an uncomplicated delivery can contribute to a women's overall good physical and mental health, and can simultaneously be an empowering experience. Women choose to give birth at home, in birthing centers, and in hospitals. Despite worldwide improvements in childbirth outcomes – fetal and maternal mortality and morbidity rates – contemporary public health initiatives focus on the disparities of childbirth outcomes throughout the world. Adverse socio-economic conditions, inadequate care during pregnancy, lack of good childbirth support, smoking, drinking, and drug use contribute to childbirth-related death and disability. Many women in developing countries lack medical and midwifery care, while in most European and North American countries there is an overmedicalization of birth (high tech – low touch). Despite the rising prevalence of induced labour, epidural anesthesia, and c-section deliveries (in some countries, as high as 30 percent cesereans or more), research does not support the overall efficacy of these high intervention rates for women's and children's long-term health.

Postpartum Period

After birth, women require rest and quiet. At this time, the well-being of the mother and child is closely linked. Opportunities for parents and children to bond will increase the likelihood of long-term physical and mental health. Some women are vulnerable to postpartum depression, not only in the days immediately following birth, but also for as long as a year afterward. Social support can help alleviate the stress and challenges of adding a new family member. Long-term successful ► breastfeeding can be faciliated by consultations from experts as well as family support and cultural acceptance. There are some long-term physiological advantages for women who bear children, especially for those who are young at first birth and breastfeed for pro-

longed periods of time. These include lower incidence of breast and ovarian cancer, reduced risk of fibroids, and less incidence of mental illness, particularly in old age.

Reproductive and Sexual Health of the Elderly

Like ► menarche (the onset of menstruation), ► menopause (the cessation of menstruation) does not require medical intervention. In recent years, however, many women in industrialized countries have been encouraged by their doctors to take hormone treatments as anti-aging antidotes. These hormone treatments have been shown to increase cardiovascular risk and estrogen-induced cancers. Menopause is the cessation of reproductive but not sexual capability. Improving male sexual performance by taking drugs is efficient but also adds (e. g. cardicovascular) health risk. Maintaining healthy sexuality can positively affect all aspects of physical health and emotional well-being. The need for intimacy does not disappear with aging, although physiological changes in hormone secretion may alter sexual functioning of men and women.

Reproductive Health Care and Health Promotion

Important reproductive health indicators are: contraceptive prevalence rate, maternal and perinatal mortality ratio, antenatal care coverage, births attended by skilled health personnel, low birth weight prevalence, prevalence of anemia in women, maternal morbidity and mortality owing to abortion, reported prevalence of women with ► female genital mutilation (FGM), prevalence of infertility in men and women, STD and HIV prevalence among pregnant women and knowledge of STD and HIV related prevention practices.

Improving antenatal, perinatal, postpartum and newborn care; providing high-quality services for family planning, including infertility services; eliminating unsafe abortion; combating sexually transmitted infections including HIV, reproductive tract infections, cervical cancer and other gynecological morbidities; and improving sexual health are fundamental aspects of reproductive and sexual health care. Well-designed, comprehensive, community-based sexual and reproductive health services can empower women and men to make safe and satisfying sexual and reproductive health choices (WHO 2004).

Cross-References

► Anemia
► Breastfeeding
► Depression
► Environmental Pollutants
► Environmental Toxins
► Female Genital Mutilation
► Gestational Diabetes
► HIV/AIDS
► Infertility
► Menarche
► Menopause
► Sexually Transmitted Diseases

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Reproductive Tract Infection (RTI)

Definition

Reproductive tract infections are infections of the genital tract. They affect both men and women. Some RTIs (such as syphilis and gonorrhea) are sexually transmitted, but many are not. RTIs include endogenous infections, such as bacterial vaginosis, or iatrogenic infections that appear as a result of unsanitary medical procedures.

Cross-References

► Infertility

Research

Definition

A continuous process with a precisely defined aim (or aims) and duration as well as a conveniently chosen research strategy. It implies existence of a plan and a certain number of accurately chosen test subjects whose characteristics are properly explained and are observed and measured using instruments of acknowledged quality. It contains an adequate description, analysis, generalization, interpretation, and presentation.

Cross-References

► Ethics, Aspects of Public Health Research

Research Hypothesis

► Alternative Hypothesis

Research Question

Definition

A research question acts as the guiding force behind each experiment. It is the broad question that the experiment is supposed to answer. The research question poses the problem of the relationship between the objective(s) and the purpose(s), and between the specific experimental procedure and why a researcher is doing a distinct procedure in the first place.

Research Review

► Systematic Reviews

Research Synthesis

► Systematic Reviews

Reservoir of Infection

Definition

The reservoir is the natural habitat of the infectious agent. It may be any person, animal, plant, soil, or substance in which an infectious agent normally lives and multiplies. The reservoir typically harbors the infectious agent without injury to itself and serves as a source from which other individuals can be infected. The infectious agent depends primarily on the reservoir for survival.

Residential Care Facility

► Assisted Living Facilities

Residential Health Care Facility

► Nursing Homes

Residual

Definition

The difference between the predicted value (often from a regression equation) and the actual or observed value is termed the residual value. Residuals reflect the overall badness of fit of the model. Examination of residuals in regression analysis will identify atypical cases. Ideally, the residuals should have constant variance along the line. A normal probability plot of the residuals can check this. In the plot of residuals against the explanatory variable (or the fitted values), there should not be any pattern if the assumption of constant variation is met, i. e. residuals do not tend to get larger as the variable values get larger or smaller.

Residual and Late-Onset Psychotic Disorder

Definition

A disorder in which alcohol- or psychoactive substance-induced changes of cognition, affect, personality, or behavior persist beyond the period during which

a direct psychoactive substance-related effect might reasonably be assumed to be operating. Onset of the disorder should be directly related to the use of the psychoactive substance. Cases in which initial onset of the state occurs later than episode(s) of such substance use should be coded here only where clear and strong evidence is available to attribute the state to the residual effect of the psychoactive substance. Flashbacks may be distinguished from psychotic state partly by their episodic nature, frequently of very short duration, and by their duplication of previous alcohol- or other psychoactive substance-related experiences.

Cross-References

► Substance Induced Disorders

Resiliency

Definition

Resiliency is a property of a system that describes its smooth and fast recovery from a state of failure.

Resistance

Synonyms

Resistibility; Insensitivity

Definition

Resistance means insensitivity. In connection with microorganisms resistance is understood as the insensitivity for antibiotics or chemotherapeutics. One has to differentiate between natural and acquired resistance. In cases of natural resistance the characteristics of bacterium make the drug ineffective. These characteristics can either lie in the structure of the bacterium or their enzymes, which are able to neutralize the drug. As for acquired resistance, a bacterium, which has once been sensitive for an antibiotic becomes insensitive due to changes in its structure or its metabolic capabilities. The increased, and sometimes uncritical, use of antibiotics supports the development of resistant bacteria and diminishes the number of antibiotics that are effective against particular pathogens. The mismanagement of antibiotic treatment leads to the development of multiresistant bacteria.

Resistibility

► Resistance

Resource Allocation

Synonyms

Cost containment

Definition

Resource allocation describes the process of decision to use available resources selectively between competing projects. In health care, resources are allocated in order to achieve the defined ► health policy goals in the future. Generally resources should be allocated to achieve the highest ► health outcomes in terms of disease prevention and therapy. The basic allocation is made once a choice has been made on which health care areas and projects are to be funded and what level of funding each of these areas should receive. As health care systems are always subject to cost containment, resource allocation also involves a decision on which areas or projects must be sacrificed to lower the overall funding.

Cross-References

► Scarity of Resources

Respect for Persons

Definition

As a basic ► ethical principle in research, respect for individuals was clearly defined in the ► *Belmont report* in 1979 in the USA by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. Respects for persons incorporates two ethical considerations:

a) respect for ► autonomy, which requires that those who are capable of deliberation about their personal choices should have their capacity for self-determination respected; and

b) protection of persons with impaired or diminished autonomy, which requires that those who are depen-

dent or vulnerable be afforded security against harm or abuse.

Respiratory-Syncytial-Virus (RSV) Infection

Definition

For RS-viruses, humans are the only reservoir. These viruses, which are spread by droplets, are the most common cause of respiratory tract infections during the first two years of life. RSV-infections are mainly seen in the winter months. After an incubation period of 3–6 days the infection leads to bronchiolitis, obstructive bronchitis, pneumonia and otitis media. The virus can be detected in nasopharnyngeal secretions. For special groups at risk (like premature babies and children with chronic pulmonal diseases) passive immunoprophylaxis is recommended during the first two years of life.

Respite Care

Definition

Respite care services are usually provided for functionally disabled or frail individuals in their homes, at a ► day care center or by temporary placement in a nursing home or residential home. Respite care allows for occasional or systematic relief for the informal caregivers, often members of the family. Most respite care programs offer their services on a fee scale with hourly or daily rates. Depending on the type of respite care that is available in the community, services can range from several hours of care to several months. Some respite care programs aim at a specific disability or illness.

Response

► Event

Restriction

Definition

Restriction is straightforward, convenient and inexpensive means to control confounding. It is a process of limiting the entrance into the study to individuals who fall within a specified category of a confounder. For example if sex is potential confounder, the study could include only men or only women. Similarly, control of age could be achieved by restricting admissibility to those within o narrow range that corresponds to a relatively homogeneous rate of disease incidence.

Result

► Outcome Research Variable

Resulting Variable

► Outcome Research Variable

Retrospective (Historical) Cohort Study

► Observational Studies

Reusing

► Recycling

Revealed Preferences

Definition

The revealed preferences approach is an indirect determination of the ► willingness to pay by observing the behavior of individuals and estimating the willingness to pay for a specific health care service by observed choices in other but comparable contexts. Revealed preferences have a strong foundation in the utility theory. The results of revealed preference measurements can be used as outcome measure in a cost-benefit analysis.

Revision

► Evaluation, Models

Right-to-Know

Synonyms

Risk communications

Definition

Many workplace chemicals and other substances are referred to only by brand names or code numbers. The right-to-know movement, initiated in the late 1970s in many countries, resulted in the development of right-to-know laws in the early 1980s, which are the legal rights and obligations that govern the transfer of workplace information on toxic substances. According to those laws, employers have a duty to inform workers of the identity of substances with which they work through labeling the product container, and the workers should be counseled on the importance of personal hygiene and the use of protective equipment to reduce exposure.

Rights of Indigenous Peoples

► Indigenous Rights

r Index

Definition

The *r* index is the most appropriate metric for expressing an ► effect size when the researcher is interested in describing the relationship between two continuous variables. It is simply the Pearson product-moment correlation coefficient. Very often we do not have presented variances and covariances in primary research. If only the value of the $t-$test associated with *r* index is given, formula for its calculation is:

$$r = \sqrt{\frac{t^2}{t^2 + df_{\text{error}}}}$$

Risk

Synonyms

Absolute risk

Definition

There are two commonly used terms associated with ► risk assessment. They are ► hazard and risk. A risk is the likelihood that exposure to a hazard will result in injury or disease. In risk assessment, risk combines the probability of an event occurring with the impact that event would have under different circumstances. The level of risk can be viewed as a function of probability and severity of impact.

Risk is the probability that a risk event, such as disease, injury, disability, or death, will occur during (over) a specified time period. For calculation of risk, the numerator contains the number of persons experiencing the risk event during the time period. The denominator contains the population at risk, i. e. the number of persons who are free of the risk event at the beginning of the time period, but capable of having disease.

Variables associated with an increased or decreased risk are the risk factor or protective factor, respectively. The risk factor and protective factor are any characteristics, such as personal behavior, inheritance, or environmental conditions, that are considered to be associated with occurrence of the risk event.

Risk Adjustment

Synonyms

Risk equalization

Definition

Risk adjustment refers to the use of information to calculate expected health care expenditures of consumers and to determine subsidies to health insurers to neutralize incentives for ► preferred risk-selection.

Risk Analysis

Synonyms

Risk assessment

Definition

Risk analysis consists of risk assessment, risk management and risk communication. ► Food safety risk

assessment is a process of identifying food borne hazards, assessing risks, gauging severity and potential health effects. Through risk assessment the likelihood of an undesirable event occurring and the consequences of this event are estimated. The mathematical model for calculating the probability of an undesirable effect occurring and the magnitude of the impact of the hazard are calculated. Risk management is a process of regulating the risks to acceptable levels. Risks should be transparently communicated to the public and they should be educated on how to avoid food borne diseases.

Cross-References

► Risk Assessment

Risk Assessment

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Definition

A risk assessment is a systematic procedure to identify potential health hazards, evaluate the extent of exposure and to establish the need for, and effectiveness of existing control measures. It is an organized look at what, in work activities and the workplace, can cause harm to employees. In the context of occupational health, risk assessment is the process of quantifying the probability of a harmful effect to individuals or populations from certain activities at the workplace.

Basic Characteristics

Determination of Risk

The risk assessment is a part of four interrelated activities including risk research, risk management and risk communication. The concept of the risk assessment is not new – we make decisions about risks in our daily lives. What is new is the shift from concern for immediate hazards with readily discernable linkages between a specific hazardous situation and an adverse outcome to situations where there are only probabilistic linkages between exposure to an agent and the occurrence of an adverse effect over a long period of time.

Risk assessment estimates the risk to humans of a specified hazard, based on the availability of exposure data. There are two commonly used terms associated with risk assessment. They are hazard and risk. A ► hazard is a source of potential harm. A ► risk is the likelihood that exposure to a hazard will result in injury or disease. The outcome is the result of when the hazard causes harm. Mathematically, the level of risk can be viewed as a function of: probability x severity of impact. Hence, risk assessment is measuring two quantities of the risk, the magnitude of the potential harm, and the probability that the harm will occur. The difficulty of risk assessment is that measurement of both of the quantities in which risk assessment is concerned can be very difficult itself. Uncertainty in the measurement is often large in both cases. Also, risk assessment would be simpler if a single metric could embody all of the information in the measurement. However, since two quantities are being measured, this is not possible. A risk with a large potential loss and a low probability of occurring must be treated differently than one with a low potential loss but a high likelihood of occurring. In theory both are of near equal importance but in practice it can be very difficult to choose which one to prioritize.

Risk Assessment Phases

There are no fixed rules about how a risk assessment should be carried out. It will depend on the nature of the undertaking and the type and extent of the hazards and risks. Various models for conducting occupational health risk assessment provide step-by-step guidance and assist in producing risk assessment reports. In particular, a risk assessment should:

- ensure that all relevant hazards and risks are addressed, with the aim of identifying significant risks in the workplace;
- address what actually happens in the workplace, including non-routine operations;
- ensure that all groups of employees and others who might be affected are considered;
- identify groups of workers who might be particularly at risk (women and young workers are of special concern);
- take account of existing preventive measures

Risk assessment should be performed by competent occupational safety and health professionals with appropriate theoretical and practical knowledge and

experience of relevant systems. To be able to identify all hazards and events, it may be necessary to split them into manageable parts. A risk assessment is performed by considering types of hazards, extent of exposure to the hazard and the relationship between exposures and responses, including variation in susceptibility. In general, risk assessment consists of the following four components:

1. Hazard identification;
2. Dose-Response Assessment;
3. Exposure Assessment;
4. Risk Characterization.

► Hazard identification evaluates the weight of evidence for adverse effects in humans based on assessment of all available data on health impact and mode of action. This step aims to determine the probability that an individual receiving a specific dose of the contaminant (chemical, radiation, noise, etc.) will develop an adverse effect. This is done, for chemical hazards, by drawing from the results of the toxicology and combining them with the data from epidemiological studies. The appropriate pathways and route of exposure are established for each chemical, its effect on body tissues and the type of effect. For different kinds of hazard other disciplines are involved. The complexity and uncertainty of this step derives mainly from the need to extrapolate results from experimental animals to humans, and from high to lower doses. The hazard may be higher for particular groups, called the susceptible populations, due to their special vulnerability to a given contaminant, greater exposure, age, sex or genetics.

The ► dose-response assessment identifies the relationship between the exposure level and the magnitude of risk. It determines whether the adverse effect increases with increasing exposure to the hazard. The result of the dose-response assessment provides either a reference dose or a threshold limit value (TLV), below which the threshold contaminant is expected to pose little or no hazard, or a risk-specific dose below which a non-threshold contaminant poses a tolerably low probability of an adverse effect. These respected values are referred to as exposure limits.

The exposure quantification determines the amount of a contaminant (dose) that individuals and populations will receive. This is done by examining the results of the ► exposure assessment. The exposure assessment determines how much exposure causes how much of a given effect in how many of the exposed persons. As different location, workload, lifestyles and other factors likely influence the amount of contaminant that is received, a range of possible exposures for different exposure scenarios and different subpopulations is generated in this step. Typical exposure is also determined. Particular care is taken to identify the magnitude of exposure for those groups that are either particularly vulnerable to a contaminant (e. g. children to lead and methyl mercury) or that are expected to be exposed to higher levels than the rest of the population.

The results of the previous three steps are then summarized and integrated into quantitative and qualitative characterizations of risk.

Risk Characterization

A ► risk characterization is the final step in risk assessment. It is the estimation of the incidence and severity of the adverse effects due to actual or predicted exposure including risk estimation or calculation, i. e. the quantification of that likelihood. The calculation of the risk is made by combining the severity of consequence with the likelihood of occurrence in a risk rating matrix. This can be expressed mathematically as a quantitative assessment (by assigning low, medium and high likelihood and severity with integers and multiplying them to give a risk factor), or as a description of the circumstances by which the harm could arise i. e. qualitative (Table 1). Risks that fall into the 'unacceptable' category (e. g., high severity and high probability) must be mitigated by some means to reduce the level of safety risk.

Risk acceptance criteria are an important part of safety management and reflect the targeted safety level. They should be established prior to performing risk assessment analysis. The results of risk assessment are then compared with established risk acceptance criteria to determine whether the risk level is acceptable or not. Occupational health professionals may be tempted to

Risk Assessment, Table 1 Risk rating matrix

	Probability		
Severity	**1**	**2**	**3**
3	MEDIUM	HIGH	HIGH
2	MEDIUM	MEDIUM	HIGH
1	LOW	MEDIUM	MEDIUM

6,9: High Risk; 2–4: Medium Risk; 1: Low Risk

advocate the adoption of a zero-risk policy. Although in some cases risk can be eliminated, in most cases a certain degree of risk must be accepted. Some accepted degrees of risk are specified by laws, regulations and standards and may change as knowledge of the risks grow and safety techniques improve. Some risks we accept as part of normal living. Most would consider such conditions to be 'safe'. Other risks we tolerate because we consider the benefits outweigh the risks (e. g. driving a car). Some risks are considered intolerable and most would consider conditions 'unsafe'. The region in between the unacceptable and the broadly acceptable level of risk is where the risks need to be reduced as low as reasonably practicable (ALARP). In the interest of occupational and environmental health, the risks vs. costs and benefits of the possible alternatives must be carefully considered. In practice however, a true zero-risk is possible only with the suppression of the risk-causing activity. Until technological developments offer superior methods, the choice based on risk assessment must be that of the lesser evil.

The risk assessment is a dynamic process and should be reviewed periodically and whenever there is a significant change to work practices. This is an ethical and legal responsibility of both industry and government.

Cross-References

- ► Dose-Response Assessment
- ► Exposure Assessment
- ► Hazard Identification
- ► Risk
- ► Risk Characterization
- ► Source of Potential Harm

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Risk-Benefit Analysis

Definition

Risk-benefit analysis is the comparison of the risk of a situation to its related benefits. For research that involves more than minimal risk of harm to the subjects, the investigator must assure that the amount of benefit clearly outweighs the amount of risk. Only if there is a favorable risk-benefit ratio may a study be considered ethical. The Declaration of Helsinki, adopted by the World Medical Association, states that biomedical research cannot be done legitimately unless the importance of the objective is in proportion to the risk to the subject. The Helsinki Declaration and the ► CONSORT-statement stress the importance of a favorable risk-benefit ratio.

Risk-Benefit Evaluation

Definition

Prior to medical experiments or clinical trials, the potential risks and benefits for the participants have to be analyzed and evaluated. Depending on the medical condition to be treated, different risks may be taken depending on the potential benefit. For instance, it is obvious that a substance or procedure intended to treat a headache after a social event and a substance or procedure intended to cure leukemia have to be evaluated differently because the risks of both conditions differ so widely.

A risk–benefit evaluation has to be updated as new data become available (e. g. after each adverse reaction occurring during a trial, because as this may increase the potential risk it has to be ensured that the potential benefit of the procedure still outweighs the new risk status).

Risk Characterization

Definition

A risk characterization combines information on exposure and toxicity to estimate the risk of a particular substance in a particular situation. The risk characterization step combines the information on toxicity and exposure

to describe what is likely to happen to people. It is the estimation of the incidence and severity of the adverse effects due to actual or predicted exposure including risk estimation or calculation, i. e. the quantification of that likelihood.

Risk Determinant

Synonyms

Risk factor

Definition

Any aspect that may increase the chance of developing a disease.

Risk-Equivalent Premiums

► Risk-Related Premiums

Risk Factor

Synonyms

Determinant of disease

Definition

A risk factor is an aspect of behavior or life-style, such as an habitual pattern of diet, exercise, cigarette and alcohol use, etc., or a biological characteristic, an inborn or inherited characteristic, or a health-related condition or environmental exposure with predictable effects on the risk of disease due to a specific cause, including in particular an increased likelihood of an unfavorable outcome. Another meaning of this term is that a risk factor is a determinant of disease that can be modified by specific actions, behaviors, or treatment regiments. Risk factors can be categorized as genetic, physiological, behavioral and socioeconomic characteristics of individuals that place them in a cohort of the population that is more likely to develop a particular health problem or disease than the rest of the population. Usually applied to multifactorial diseases for which there is no single precise cause, they have been particularly useful in identifying candidates for primary preventive measures and in assessing the effectiveness of the prevention program in controlling the risk factors being targeted. A risk factor may be directly related to disease outcomes (proximal risk factor) or may have indirect effect on outcomes (distal risk factor).
Risk factor is clearly defined occurrence or characteristic that has been associated with the increased rate of a subsequently occurring disease. Risk factors are defined as factors influencing health in a way that causes health impairment. Risk factors may be genetic (e. g. inherited susceptibility to certain ailments) (► disease, ailment), psychologic (e. g. psychosomatic illness), behavioral (e. g. smoking, etc.), socioeconomic status (e. g. hygiene, proper nutrition, clothing, availability and accessibility of ► health care), environmental (e. g. different types of pollution), etc.

Cross-References

► Risk Determinant
► Risk Marker

Risk Factor Information System

Definition

The risk factor information system is a new branch of ► health information system designed to produce estimates of risk factors leading to serious diseases, injuries, and death. Risk factor information systems support public health practice by assessment of population health, and comparisons across states and geographic regions over time. Risk factor systems focus on factors such as smoking, environmental risk factors, nutrition, behavioral risk factors, some health conditions, etc. They provide information for implementation of prevention programs and monitoring of the impact of public health prevention programs on a national level.

Risk Factors and High Risk Groups

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Synonyms

Causal factors; Etiological factor; Risk indicator

Definition

In dentistry a risk factor is a variable associated with an increased risk of an ► oral disease. However, risk factors are not necessarily causal. Risk factors include aspects of a person's condition (genetics), lifestyle or environment. Various combinations of risk factors lead to the disease. The more risk factors are involved in the disease process the more complex is the etiology of the disease. Risk factors with dental public health importance should contribute a considerably attributable risk for the disease process and should be modifiable by public health measures. Subjects of high risk groups show more often such patterns of risk factor combinations which lead to an earlier disease onset and – in consequence – to a higher disease prevalence.

Basic Characteristics

Specific or Common Risk Factors for Oral Diseases

For a long time research in dentistry was aimed at specific biological risk factors (bacterial or micro-structural causes) for oral diseases. The reason was to clear up the etiology of these diseases. For the most prevalent chronic oral disease – ► dental caries – the following specific risk factors are known: plaque accumulation on the teeth and frequent intake of simple sugar (instead of complex carboanhydrates). The production of organic acids in ► plaque leads to the demineralization of dental hard tissue (enamel). In an early stage, this process can be reversed (re-mineralization) by continuous plaque removal (tooth brushing, flossing). The bacterial plaque also damages the ► periodontium – initially by an inflammation of the gum (► gingivitis) followed by the chronic destruction of the attachment apparatus (► periodontitis). The etiopathogenetic mechanisms of this process in relationship to the genetic and immunological background are not fully clear in detail. However, it is well known that the destruction of the attachment apparatus can be reduced by continuous plaque and ► calculus removal.

Current research in dentistry is more directed towards a wider risk concept including biological and psychosocial determinants. It became obvious, that a core group of modifiable risk factors is common to many chronic diseases and injuries. The four most prominent noncommunicable chronic diseases (NCDs) – cardiovascular diseases, diabetes, cancer and chronic obstructive pulmonary diseases – share common risk factors with oral diseases, preventable risk factors that are related to lifestyle. For example, dietary habits are significant to the development of NCDs and influence the development of dental caries. Tobacco use has been estimated to account for over 90% of cancers in the oral cavity, and is associated with aggravated periodontal breakdown, poorer standards of oral hygiene and thus premature tooth loss (Petersen 2003).

Available data from population based studies show, that lifestyle problems as well as chronic (oral) diseases are more prevalent in disadvantaged and socially marginalized populations. Members of these social strata are characterized by:

- an unhealthy and risky lifestyle (smoking, obesity, frequent alcohol consumption, more violence),
- inability to change unhealthy behavior (because it often results in only a brief need satisfaction),
- bad oral hygiene (no daily tooth brushing, no flossing, no use of fluorides),
- bad self-assessment of health (oral and general),
- non-participation in prevention programs even if they are free of charge,
- low social support (unemployment, difficulties in family, migrants),
- no resources for rehabilitation.

The consequence is a higher prevalence of oral diseases in these subjects. That is the case for all oral diseases with public health importance: dental caries, periodontal diseases, oral cancer, and dental trauma (Daly et al. 2002). The poorer oral health of disadvantaged and socially marginalized subjects becomes manifest in early childhood and youth and is present for the whole life (Micheelis and Reich, 1999).

Problems with Prediction of Risk and Risk Groups

There has been an intense search for risk indicators for oral diseases in the past. However, because of the complex etiology of chronic oral diseases it is difficult to predict the disease in an individual subject using an isolated risk factor. Sensitivity, specificity, and predictive values are not sufficient. Only a certain probability for the onset of a disease can be given if a risk factor is present. Ultimately, the use of a dentist's clinical judg-

ment to identify people at risk of oral diseases has been shown to be as good as other selected methods because it includes not only aspects of the oral situation, but also aspects of lifestyle and environment (Kay 1999).
Moreover, the care of risk groups requires a clear risk definition. However, the definition of risk factors and risk groups is context-sensitive. An example might be the changes of "risk definition" for dental caries against the backdrop of caries decline: In the past 10 years of the last century a mean caries index (► DMFT-Index: number of decayed, missed, and filled teeth) of 4 was considered as "normal" for 12-year-olds in Europe. Today – the mean caries index is between 1 and 2 – such a child belongs to the high risk group with "need" of special care. The question is whether all subjects or only the risk groups should be included in prevention programs? In the end, the care of risk groups is limited by the available resources in the health care system.

Risk Groups for Oral Diseases

There are specific risk groups for oral diseases:

- In industrialized countries up to 10% of infants and preschool children suffer from the so-called ► nursing-bottle-tooth-decay (a special type of early childhood caries) caused by long-lasting use of baby bottles with sweet content and sugar-rich diet.
- Dental caries occurs mainly in disadvantaged and socially marginalized populations (Micheelis and Reich 1999; Pieper 2004). Caries risk subjects have less ► fissure sealants compared to others. They also have more orthodontic problems and dental trauma due to less frequent orthodontic treatment and a more risky lifestyle.
- Periodontal diseases occur more often in smokers and in subjects with poor general health.
- People with frequent tobacco and alcohol use show an increased risk for oral cancer.
- Physically disabled and mentally handicapped subjects as well as immobile subjects show a higher risk for oral diseases.

Special Care for Risk Groups

To improve oral health of risk groups the following specific measures are useful in addition to common preventive measures for the whole population:

- giving specific information to risk groups (for example information about nursing caries and fluoridation to pregnant women and young parents with low socioeconomic status),
- taking care of risk groups in special settings (family welfare service, fluoridation programs in schools of poorer communities, organized dentist visits to old-age-homes, special care for periodontal conditions in immunosupressed patients etc.),
- reducing the barriers for participation of risk subjects in prevention programs,
- making risk subjects "regular attenders" in dental practices and establish a monitoring for risk groups (for example for handicapped subjects or those with precancerous changes of oral mucosa).

Conclusion

The care of risk groups in dentistry should be directed to the change of their unhealthy and risky behavior. This can be successful on the individual level which is often observed in daily practice. Lower plaque indices and less bleeding gum show that tooth brushing exercises are useful to improve oral health in youth. However, the non-participation of risk subjects in individual and community prevention programs limits the wide success of that approach. Therefore, it seems more useful to influence common risk factors for oral diseases related to lifestyle and environment. A major benefit of the common risk factor approach is the focus on improving health conditions for the whole population as well as for high risk groups, thereby reducing inequalities.

Cross-References

► Calculus
► Dental Caries
► Dental Plaque
► Dental Sealant
► DMFT-Index
► Gingivitis
► Nursing Bottle Tooth Decay
► Oral Diseases
► Periodontitis
► Periodontium

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Risk Identifying

Synonyms

Risk analysis

Definition

Risk identifying is a scientific tool for identifying and evaluating the potential health hazard posed by exposure of humans to physical, chemical and/or biological entities present in the environment; such as that of a school building contaminated with PCBs (polychlorinated biphenyls). In order to gain this information, risk analysis includes such varied research methods as toxicological animal trials, epidemiological surveys, exposure modeling, etc. In addition to assessing acute exposure, risk analysis also is used to predict and compare risks (e. g., prospective testing for potential hazards posed to human health and the environment). Amongst others, the results are used to set threshold values, standards and reference points for environmental toxins. Furthermore, risk assessment also provides a scientific basis for political decisions relating to the environment and public health, and hence risk management.

The usual problem with risk assessment is that it is restricted by the data available and methodological limitations. A further problem is that for the most part, only the adverse effects of single substances (such as anthropogenic chemicals) in the various parts of the environment are known, while the effects of combinations – which comprise most types of exposure – remain largely unknown. Scientific risk assessment can therefore never eliminate a residual risk, especially regarding particularly susceptible groups (e. g., children, pregnant women), thus allowing only a partial assessment of the actual health risk.

Cross-References

► Risk Analysis

Risk Indicator

► Risk Factors and High Risk Groups

Risk Management

Synonyms

Human activity integrating risk identification; Assessment and mitigation

Definition

Risk management strategies include: avoiding the risk, reducing adverse consequences, accepting some or all of the consequences (e. g. "living with floods"), and risk transfer.

Risk Management and Communication

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Synonyms

Safety management; Hazard management; Hazard reduction; Hazard information; Guidance sheets

Definitions

Risk Management is the process of minimizing risk to an organization by developing systems to identify and analyze potential hazards in order to prevent accidents, injuries, and other adverse occurrences; and by attempting to handle events and incidents which do occur in such a manner that their effect and cost are minimized. Effective risk management has its greatest benefits in application to insurance in order to avert or minimize financial liability.

Communication is the transfer of information regarding workplace exposure to toxic substances from employer to workers.

Basic Characteristics

History

In the early 1970s, basic principles about occupational risks had been regulated and managed. In the late 1970s, the trend for managing risk at work was to merge and centralize the authorities responsible for occupational health and safety, and to clarify responsibilities in criminal law for managing risks in particular circumstances through the establishment of regulatory regimes, whereby broad general duties are explicitly put on those who are best placed to do something about preventing or controlling the risks. The broad duties are supplemented by specific regulations. Many of these regulations place absolute duties on the duty holders: on employers, the self-employed, employees, designers, manufacturers, importers, suppliers, and people in charge of premises. Associated legislation places additional duties on owners, occupiers, licensees, and managers. However, in order to avoid the imposition of duties that no one can fulfill – because absolute safety cannot be guaranteed – and in order to ensure that preventive and protective actions are commensurate with the risks, others, like broad general duties are qualified by expressions such as 'as low as reasonably achievable' (ALARA), 'as low as reasonably practicable' (ALARP), and 'so far as is reasonably practicable' (SFAIRP).

Many workplace chemicals and other substances are referred to only by brand names or code numbers. The ► right-to-know movement, initiated in the late 1970s in many countries, resulted in development of right-to-know laws in the early 1980s, which are the legal rights and obligations that govern the transfer of workplace information on toxic substances (communication). According to those laws, employers have a duty to inform workers of the identity of substances with which they work through labeling the product container, and the workers should be counseled on the importance of personal hygiene and the use of protective equipment to reduce exposure.

In 2004, a Global Implementation Strategy was established under the auspices of the ► International Programme on Chemical Safety (IPCS). This Global Implementation Strategy aims to build and implement an Occupational Risk Management Toolbox, containing toolkits to manage different workplace hazards. The first such toolkit is the ► International Chemical Control Toolkit.

Risk Management and Communication Scope

The terms hazard and risk are used interchangeably in everyday vocabulary. Risk Management involves the employer looking at the risks that arise in the workplace and then putting sensible ► health and safety measures in place to control them. By doing this they can protect their most valuable asset, their employees, from harm, as well as members of the public. The law requires an employer to assess and manage health and safety risks. There are three basic steps in managing the risk from workplace hazards: eliminate hazards, control the hazard, and protect workers from the hazard.

There are a number of tools used in risk management: ► environmental engineering, ► economic analysis in toxic substances control, and ► pollution prevention hierarchy.

Communication is the transfer of information regarding workplace exposure to toxic substances from employer to workers. It is mandatory sharing between management and labor, and mandates that workers receive training and information on all potentially hazardous chemicals with which they work. They provide information through ► material safety data sheets as the foundation of a successful safety and health program, which can be on paper and/or in electronic form.

The Chemical Toolkit of the Global Implementation Strategy is available on the Internet through the ILO SafeWork Website. The hazard information employed by the Toolkit is either European Union (EU) label Risk (R) phrases or the hazard statements of the Globally Harmonized System for Classification and Labeling (GHS). The target for global implementation of the GHS is 2008.

Cross-References

► Economic Analysis in Toxic Substances Control
► Environmental Engineering
► Health and Safety Measures
► International Chemical Control Toolkit
► International Programme on Chemical Safety
► Material Safety Data Sheets
► Pollution Prevention Hierarchy
► Right-to-Know

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Risk Marker

Synonyms

Risk factor

Definition

An aspect of personal behavior or lifestyle, an environmental exposure, or an inborn or inherited characteristic, which on the basis of epidemiological evidence is known to be associated with health-related condition(s) considered important to prevent. Not necessarily a causal factor but an indicator of an increased probability of occurrence of a disease or other specific outcome–a risk marker.

Risk of Natural Disasters

► Hazards, Natural

Risk Perception

Definition

Subjective judgment that people make about risk, including its severity and characteristics.

Risk and Protective Factors of Psychological Health and Well Being

► Health Determinants, Psychological

Risk Ratio (RR)

Synonyms

Relative risk

Definition

The *Relative Risk (RR)* of an event, such as the occurrence of a specified disease or a death from a specified cause, is the ratio of the risk of a disease or death among those exposed to a specified factor to the risk among those not exposed to this factor. It is calculated from the incidence of the specified disease or the death rate due to the disease.

If the level of risk in both the exposed and unexposed group is the same, the RR will equal 1. If an exposure is harmful (e. g., cigarette smoking), the RR is expected to be greater than 1. If an exposure is protective (e. g., vaccine), the RR will be less than 1. The RR is used in randomized controlled trials and cohort studies.

The RR is less relevant to making decisions in risk management than attributable risk. Nevertheless, relative risk is the measure of association most often used by epidemiologists.

Cross-References

► Relative Risk

Risk Reduction Strategies

► Mitigation Strategies

Risk-Related Premiums

Synonyms

Actuarially fair premiums; Risk-equivalent premiums

Definition

Health insurers calculate risk-related premiums if expected health care expenditures of individuals are equivalent to premiums paid by individuals. As a consequence, high-risk individuals pay higher premiums than low-risk individuals.

Risk Sharing Plans

Definition

The distribution of financial risk among two or more parties furnishing a particular service. By establishing a formal arrangement between health care providers, managed care organizations and another entity such as a governmental health care program, these plans protect the parties from excess risk.

Risk Solidarity

Definition

The term risk solidarity refers to redistribution from individuals with low health risks toward individuals with high health risks.

Risk Solidarity, ex-ante

Definition

Ex-ante risk solidarity implies redistribution from those individuals who are expected to be healthy to those who are expected to be sick.

Risk-Solidarity, ex-post

Definition

Ex-post risk solidarity implies that there is limited redistribution from the unexpectedly healthy towards the unexpectedly sick.

River Blindness

► Onchocerciasis

Role Taking

Synonyms

Perspective taking

Definition

A mental process that enables an individual to understand the point of view of another person or group of people. Specifically, role taking allows the individual to understand why others have certain attitudes and beliefs, and why others behave as they do. To accomplish role taking, the individual imagines himself or herself as that person (or group of people). A key period for the development of role taking abilities is between the ages of 4 to 12 years, and role taking is vital to the development of social skills.

Root

Definition

The root is the invisible part of the tooth that anchors the tooth in the jaw. Inside every root, there is a root canal with nerves, blood vessels, and connective tissue.

Root Canal

► Root

Root Canal Treatment

Synonyms

Endodontic treatment

Definition

Inside each tooth is the pulp consisting of blood vessels, nerves, and connective tissue. When the pulp is infected or injured, the pulp tissue dies. During a root canal treatment, the pulp is removed, the pulp cavity is cleaned and sealed using a root filling.

Roseola infantum

► Erythema subitum

Rotavirus Infection

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Rotavirus Vaccination

Synonyms

Rotavirus immunization

Definition

Active rotavirus immunization is carried through as an oral vaccination from the age of 6 weeks. At intervals of at least 4 weeks, there can either be used a monovalent ► vaccine which has to be given twice or a vaccine containing 5 different serotypes which has to be applicated thrice. At the age of 24 weeks, immunization has to be finished as the risk of intestinal intussusception (invagination) increases with a later onset of vaccination. Rotavirus vaccine is tolerated well, the protection rate is about 85 %. Possible side effects are a lack of appetite, diarrhea, fever and irritability. Contraindications for the rotavirus vaccine are immunodeficiency, acute illness with fever and a known severe allergic reaction to components of the vaccine.

Cross-References

► Immunization, Active

Rotavirus Vaccination, Active

Synonyms

Active immunization against rotavirus infection

Cross-References

► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Roundworm Infection

► Ascariasis

Routine Health Care Research

► Health Services Research

Rubber

► Condom

Rubber Johnny

► Condom

Rubbish

► Communal and Industrial Waste

Rubella

Synonyms

German measles; Three-day measles

Definition

Rubella is a common communicable disease of childhood, which is spread by oral droplets; humans are the only natural hosts. The incubation period lasts 14–21 days, and it has to be assumed that it remains contagious for seven days before and seven days after the appearance of the rash. Rubella's exanthem is maculopapulous. It starts in the face and spreads quickly. Furthermore, there is a lymphadenopathy, which is typically located behind the ears (retrooauricular), in the neck (posterior cervical) and at the back of the head (postoccipital). In most cases there is only a mild elevation of body temperature. In up to 50% the course of the infection is asymptomatic. An arthritis can appear, further complications (encephalitis, thrombocytopenic purpura) are rare. An infection during pregnancy has to be feared as the transmission of the virus to the unborn child can cause severe congenital anomalies, the ► congenital rubella syndrome. Rubella infection can be prevented by an active rubella-vaccination (► immunization, active).

Cross-References

► Rubeola

Rubella Immune Globulin

► Rubella-Vaccination, Passive

Rubella Immune Prophylaxis

► Rubella-Vaccination, Passive

Rubella, Morbilli

► Measles

Rubella Vaccination

Synonyms

Rubella immunization; German measles immunization; German measles vaccination; Three-days measles vaccination; Three-days measles immunization

Definition

The course of rubella is harmless for the patient, both in childhood and in adulthood. However, if the first infection occurs during pregnancy, it represents a great threat to the embryo. For this reason, the number of rubella antibodies (antibody titer) in women in the early stage of pregnancy is checked in order to determine their immunity to rubella. The rubella vaccination was introduced in 1969/1970. Nowadays, it is generally applied in combination with the vaccination against measles and mumps (MMR). The patient receives the first inoculation at a minimum of 11 months of age and a second vaccination at an interval of at least 4 weeks later. The protection rate is 95%. Contraindications for rubella or MMR vaccination are immunodeficiency, acute illness with fever, pregnancy and a known severe allergic reaction to components of the ► vaccines or the carrier protein.

Rubella Vaccination, Passive

Synonyms

Application of rubella immune globulin; Rubella immune prophylaxis; Application of German measles immune globulin; German measles immune prophylaxis; Three-day measles immune globulin; Three-day measles immune prophylaxis

Definition

In general, German measles is an infectious disease with a harmless course, but for unborn babies in the womb it is very dangerous. Prenatal infection can lead to the congenital rubella syndrome (CRS or Gregg's syndrome), which is associated with low birth weight, deafness, cataract and heart defects. At the beginning of a pregnancy the woman's immune status against rubella is checked by determination of the amount of ► antibodies (titer). In the case of a low or a missing immune status a passive rubella vaccination should be given when the pregnant woman has come into contact with German measles.

Rubeola

Synonyms

Rubella; Measles

Definition

Measles or rubeola is a highly contagious disease of young children, caused by a virus and spread by droplet spray from the nose, mouth, and throat of individuals in the infective stage. This period begins 2 to 4 days before the appearance of the rash and lasts from 2 to 5 days thereafter. The first symptoms of measles, after an incubation period of 7 to 14 days, are fever, nasal discharge, and redness of the eyes. Characteristic white spots appear in the mouth, followed by a rash on the face that spreads to the rest of the body. The symptoms disappear in 4 to 7 days. One attack of measles confers lifelong immunity. Complications are possible such as bronchial pneumonia and encephalitis. Common measles in pregnant women can be a threat to the unborn child, and ► vaccination of women well before pregnancy is recommended. Immunization by injection of live measles-virus vaccine.

Sackett, David

Definition

As the founder of Canada's first department of clinical epidemiology at McMaster University in Hamilton, Ontario in 1967, Dr. Sackett has made significant contributions to how we measure the presence of diseases in populations, and in particular how we assess the effectiveness of various forms of treatment. By employing precise models and innovative approaches, Dr. Sackett has emphasized the importance of clinical trials and other forms of objective evidence in evaluating what the various possible forms of treatment accomplish, and how they can be made more effective for the patient's benefit. His textbook "Clinical Epidemiology: A Basic Science for Clinical Medicine" has gone through several editions and is a classic in the field.

SAE

Definition

SAE is an abbreviation for serious adverse event. Adverse events are undesirable experiences associated with the use of a medical product (drug or device) in a patient. Such events are classified as serious if the event meets at least one of the following criteria:

- death of the patient;
- life-threatening (substantial risk of dying, or suspicion that continued use of product would result in the death of the patient);
- hospitalization (due to the event, or prolonged stay in hospital due to the event);
- disability (events resulting in a significant, persistent or permanent change, impairment or damage in the patient's body function or quality of life);
- congenital anomaly (adverse outcome in a child due to exposure to the medical product prior to conception or during pregnancy);
- requires intervention to prevent impairment or damage (use of the medical product results in a condition which requires medical or surgical intervention to preclude permanent impairment or damage to the patient).

Serious adverse events should be reported to the competent authorities (e. g. FDA in the US).

"A Safe Place to Suffer"

Synonyms

Palliative medicine; Palliative care; Hospice

Definition

Hospice and palliative care may not be described by anything better than by the term 'a safe place to suffer.' This expression was first used in 1987 by Averil Stedeford a psychiatrist working at a hospice in Oxford, UK in order to illustrate palliative care (place = relationship between a patient and his person in charge; suffer = rest distress after palliative help).

Cross-References

► Palliative Medicine and Hospice Care

Safety Management

► Risk Management and Communication

Safe Water

► Drinking Water

Sakai

► Indigenous Health, Asian

Sakha

► Indigenous Health, Asian

Salary

Definition

In salaried payment systems, the physician is paid for units of time. Remuneration is independent of the volume of services and independent of the number of patients. Salaried providers work within a defined schedule; in some countries, they are allowed to treat patients privately after hours. Physician income is determined by the content of the employment contract. Salaries mostly depend on the physician's qualification and his or her task profiles and provide a high degree of income security to physicians.

Saldana

► Leishmaniasis, Cutaneous

Salutogenic

Synonyms

Health generating; Health creating

Definition

This is a composite word coined by the medical sociologist, Aaron Antonovsky. In seeking to reorient health professionals from a ► pathologising approach to the discussion of health related issues and processes, he chose a Latin word for health, *salus*, and a Greek word for generation or origin, *genesis*. The combination resulted in the word *salutogenesis*, or health generation. The adjectival form, *salutogenic*, emphasizes the health generating propensities of processes and mechanisms.

Sample

Definition

A set of subjects or objects from a population. For a sample to be useful in drawing inferences about the larger population from which it was drawn, it must be representative of the population. Thus, typically (although there are exceptions), the ideal sample to employ in research is a random sample. In random sampling, each subject or object in the population has an equal likelihood of being selected as a member of that sample.

Sample Size

Definition

The sample size represents the number of persons who should be included in the ► experimental study before the investigation commences. The sample size should be large enough to keep the chances of statistical errors low. Several factors are considered in the calculation of sample size. For dichotomous outcome studies, these factors are event rate in the control group, expected benefit from the intervention, level of adherence to the control regimen, alpha level, and power. For continuous outcome studies, the mean and variance of the control and intervention groups, plus the level of adherence, alpha level, and power are the relevant variables.

Sample Size Calculation

► Sample Size Determination

Sample Size Determination

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Synonyms

Sample size calculation

Definition

One of the major steps in research design is sample size determination, meaning determination of the exact number of subjects (i. e. sizing the ► sample as necessary for reaching the expected ► research goal). The quality of the estimate ultimately depends on the quality of the information used to derive it. Care should be taken to avoid overestimating the likely event rate and the feasible effects of treatment.

Basic Characteristics

To make this crystal clear from the very beginning, the "magic number" as an optimal size of a sample simply does not exist. The optimal number depends on the research characteristics and the characteristics of the ► population used as the sample source. These demands can be summarized as follows:

1. Measuring or using knowledge of the outcome variable's variability (► outcome research variable)
2. Identifying the research aim (whether it is regarding estimation of a population ► parameter, p, or a combination of parameters, $p_1 - p_2$, or hypothesis testing regarding a parameter or a group of parameters)
3. Establishing the size of the effect, i. e. conciliating statistical and research (problem-based, medical) significance, and
4. Whether the issue at stake is ► repeated measurements or not?

Variability of the Outcome Variable

Measuring ► variability usually encompasses a practical assessment of the real variability of the outcome variable (σ), irrelevant of the statistical procedure: estimation of a population parameter or hypothesis testing.

Example

Effects on subjects' heart rate (defined as beats per minute, bpm) were tested for two drugs (A and B). Five subjects were given drug A and another five were given drug B, and their results were:

Drug A: 55, 55, 55, 55, 55
Drug B: 60, 60, 60, 60, 60.

It can easily be concluded that the average heart rate in subjects taking drug A was lower than that of those taking drug B.
In reality, these values will never be obtained, therefore the second possible scenario could be:

Drug A: 59, 51, 60, 50, 55
Drug B: 56, 49, 60, 71, 64.

In both cases, the mean value derived from the Drug A group is 55 bpm and that from the Drug B group is 60 bpm. Of course, in the case of the latter, it is more difficult to state whether there is a real difference in heart rate in subjects treated with Drug A or Drug B. The variability of the value itself blurs the possible existence of the real difference between the two.
Generally, the greater the variability of the outcome variable, the harder it is to answer certain research questions, meaning that the relationship between variability and sample size is directly proportional. If the variability of the population is unknown – which is practically a rule – it is acquired through available literature or from pilot studies. If a pilot study is the case, the following approximation is recommended:

$$\sigma \approx (\text{max value} - \text{min value})/4\,,$$

where σ is the standard deviation in the population; the denominator can be 6 instead of 4, although rarely.

Estimation of a Population Parameter

The research aim is often an estimate (► estimation) of one or more parameters or their linear combination. Research aims of this type include estimating the mean length of treatment for myocardial infarction (μ), estimating the mean difference ($\mu_1 - \mu_2$) of heart rate values in subjects receiving the same drug in different doses, and estimating the population of patients suffering from multiple sclerosis, etc.
The estimate of parameters is based on ► standard error (SE), which measures the difference of the sample

statistics from the real population parameter. Its relation to sample size is as follows:

SE is proportional to $1/\sqrt{n}$.

What the aforementioned shows is that the greater the sample size (n), the lesser the standard error. Furthermore, SE is inversely proportional to the square root of the sample size, meaning that by doubling the sample size, standard error is reduced only by the factor that is the square root of 2, i. e. 1.41. Similarly, a nine-fold increase of sample size is followed by only a triple-size increase in the sample error.

In any case of parameter estimation, the researchers have to determine point estimation and interval estimation (confidence interval) when they wish to determine the ► probability level – accuracy and precision. The width of the interval estimate, together with the knowledge of the variability of the outcome variable, determines optimal sample size.

Determining the number of subjects required is done by calculations using the aforementioned formulas or, more often, using particular tables, depending on what is estimated: the population proportion (π), difference of population proportions ($\pi_1 - \pi_2$), population mean (μ) or difference of $\mu_1 - \mu_2$ (actually, the most frequent mean difference of the outcome variable between the two factor categories). Naturally, together with these, there are also other population parameters: cross relation in case-control research, relative risk, incidence, size effect, etc.

Example

Determine the sufficient number of subjects for estimating the proportion of diabetics in a given population.

The following formula can be used:

$$n = \left(Z^2_{1-\alpha/2} \times \pi \times (1-\pi)\right)/E^2.$$

First, it is assumed that the proportion of diabetics in the entire population is roughly 3%, and the solutions for various confidence levels and different estimate precision are provided:

1. We choose $E = 0.5\%$ for the assumed proportion of the entire population. For an accuracy of 95%, $z = 1.96$:

$$n = \left(1.96^2 \times 0.03 \times (1-0.03)\right)/0.005^2 = 4472$$

2. For $E = 2\%$ and $z = 1.96$, we get the following:

$$n = \left(1.96^2 \times 0.03 \times (1-0.03)\right)/0.02^2 = 279$$

3. For $E = 1\%$ and $z = 2.575$ (99% accuracy), we get the following:

$$n = \left(2.57^2 \times 0.03 \times (1-0.03)\right)/0.01^2 = 1922$$

Consequently, the change of estimate precision from 0.5% to 2% diminished the sample size from the initial 4472 to 279, while the change in confidence level from 0.95 to 0.99 changed the sample size from 279 to 1922.

Hypothesis Testing

The research aim can take the form of a question:

Is the frequency of epileptic seizures less in patients taking Drug A or in those taking Drug B?

In this case, the hypothesis involves testing the difference between parameters.

When determining the sufficient number of subjects for the situation of ► hypothesis testing, the key information is provided by:

1. The level of significance (α; or the probability of making a Type I error)
2. β (or the probability of making a Type II error)
3. $1 - \beta$, which is the power of the statistical test.

Prior to beginning the investigations, α and β, which – together with the estimates of variability of the outcome variable – affect sample size, are chosen. The chosen Type I and Type II errors not only influence sample size, but they are important in interpreting the reach of the statistical conclusions. Type I error represents a "false alarm", while Type II error is a "miss".

Reducing the odds of a Type I error is achieved by choosing an acceptable level of significance, α – usually of 0.05 or less. This convention helps the "false alarm" to be reduced to a rate lower than 1/20 (i. e., 5/100). A sole repetition of the finding by independent researchers provides important evidence that the original decision of rejecting the null hypothesis was correct.

Reducing the odds of a Type II error is achieved by increasing the size of the sample, n; reducing measurements' variability; using one-sided testing; and lowering the criteria regarding α.

Example

The difference between parameters π_1 and π_2, meaning μ_1 and μ_2, in a sole test is assessed. In both cases, the researcher decides the size of the difference between the two parameters is worth determining. For example, for a 4% difference, besides the usual values of $\alpha = 0.05$ and $\beta = 0.20$ ($1 - \beta = 0.80$, the power of the test), with the assumption that P_1 and P_2 are 5% and 9%, respectively, using one of the Tables, we determine an n value is 552. Therefore, 552 subjects are necessary for each group to show a 4% difference between the two parameters.

Size Effect

► Statistical vs. Clinical Significance.

Instead of tables, we can use various formulas for sample sizing as shown in Table 1.

Consequently, in a controlled clinical trial aiming to assess the efficiency of a given substance (parallel groups: control group with placebo and experimental group with the substance) in asthma patients, in the procedure of determining necessary sample sizes of the two groups, an accord should be reached regarding the following values:

1. Therapy efficiency – the outcome (measured by the forced expiratory volume of the first second, FEV_1);
2. Clinically relevant difference – of 150 ml minimum when compared to placebo;
3. σ (assumed standard deviation of the outcome) is 420 ml;
4. α (probability of Type I error providing the null hypothesis [H_0] is correct) is 0.05, and
5. β (probability of Type II error providing H_0 is wrong) is 0.2.

Replacing these values in the table's formula, we find:

$$n = 2 \times (1.96 + 0.84)^2 \times 420^2/150^2 = 122.9$$

The result shows that each group should encompass 123 patients.

The numerous formulas from the previous Table are, actually, adequate for getting initial information on the sample size. Practically speaking, there is a myriad of problems one should be bear in mind before applying them. The most common is unknown variability of the outcome, which is usually shown through standard deviation. To evade it partially, a new element of incertitude can be introduced, which is the approximation of the unknown variability with a reasonable estimate derived from previous research and/or pilot studies. The remaining, equally important, issues are lack of standard clinically relevant differences, robustness or sensitivity of the chosen statistical methods, and the arbitrary level of chosen errors' probabilities. Disregarding these, this (classical) approach to sample sizing is used more frequently than the sequential approach, where the sample size is not determined in advance but the measurements and analyses are preformed in sequences (a couple of subjects – each one belonging to a different group) and the procedure is repeated until the null hypothesis for the assigned probabilities is accepted or rejected.

Statistical Software Packages

There are several commercial statistical software packages capable of being used for sample size calculation. They include EGRET-SIZ by Cytel Software Corporation, SamplePower by SPSS Inc., nQuery Advisor by Statistical Solutions, and PASS by Number Cruncher Statistical Systems. Most of the software packages pro-

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Sample Size Determination, Table 1 Approximate formulas for sample size determination in some empirical situations

Statistical methods for testing the significance of difference between:	Necessary size of a sample (n)
Mean value of a group (e) and standard value (sg)	$[(Z_{1-\alpha/2} - Z_\beta)\sigma/(\mu_e - \mu_{sg})]^2$
Two mean values (e and k)	$2[(Z_{1-\alpha/2} - Z_\beta)\sigma/(\mu_e - \mu_{sg})]^2$
Proportions of a single group (e) and the standard value (sg)	$[Z_{1-\alpha/2}(\pi_{sg}(1-\pi_{sg}))^{1/2} - Z_\beta(\pi_e(1-\pi_e))^{1/2}/(\pi_e - \pi_{sg}))]^2$
Two proportions (e and k)	$[Z_{1-\alpha/2}(2\pi_k(1-\pi_k))^{1/2} - Z_\beta(\pi_e(1-\pi_e)_+\pi_k(1-\pi_k))^{1/2}/(\pi_e - \pi_k))]^2$

where Z is standardized normal value – z score, while σ, μ and π are parameters of the population – standard deviation, mean, and proportion respectively

vide sample size estimates for a broad range of statistical models including tests for means, proportions, analysis of variance, regression, and survival analysis. Other "freeware" may be found in public health service organizations or from individual statisticians.
In all cases, it is important to understand the statistical procedures by which a computer package is calculating the sample size. Otherwise, the calculated sample size can be erroneous and lead to an underpowered or overpowered study.

Cross-References

- ▶ Estimation
- ▶ Hypothesis Testing
- ▶ Outcome Research Variable
- ▶ Parameter
- ▶ Population
- ▶ Probability
- ▶ Repeated Measurements
- ▶ Research
- ▶ Sample
- ▶ Standard Error
- ▶ Statistical vs. Clinical Significance
- ▶ Variability

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Sample Size Estimation

- ▶ Power Analysis

Sanitation

Synonyms

Sanitization

Definition

Sanitation refers to principles of health preservation, including hygiene on an individual level and public health on a communal level. Sanitation is aimed at elimination or reduction of health hazards associated with the water supply, the collection and disposal of solid and liquid waste, and the prevalence of rodents and insects. It also refers to noise, air pollution, and improper food handling. Disposal of toxic, medicinal or radioactive waste is also important.

San (Southern Africa, Kalahari Desert, Namibia, Botswana)

- ▶ Indigenous Health – Africa

SARS

Synonyms

Severe acute respiratory syndrome

Definition

SARS is an infection with the coronavirus, which appeared for the first time at the end of 2002, and which became the first big epidemic of the 21st century, mostly involving China, Hong Kong, Singapore and Canada. Initially, the disease was transmitted from animals to humans by the civet cat, which is a popular food in South China. SARS can also be transmitted between humans by direct contact as a droplet infection. After an incubation period of 2–7 (maximum 12) days the infected person suffers from fever, sore throat, bad cough and difficulties in breathing; an atypical pneumonia develops. Lethality of SARS is about 10%. A specific therapy is not available. Persons with SARS have to be isolated; people who come into contact with the patient should wear protective clothing and use a face-mask. These face masks (covering nose and mouth) can also be used outside of hospitals for infection prophylaxis.

Saved Young Live Equivalent (SAVE)

Definition

The concept of saved young life equivalent attempts to estimate the limitations to the individual by defined changes of health in relation to life expectancy and the quality of life of young people. The concept has not been used in larger empirical studies so far.

SBRI

► Specific Building- and Home-Related Illnesses

SBU

Definition

The Swedish Council on Technology Assessment in Health Care (SBU) is an independent governmental agency promoting the rational use of health care resources in Sweden. It assesses clinical, economic, social, and ethical implications of new and established health technologies. It reviews and synthesizes data and disseminates its assessments widely to help decision-making that promotes the efficient delivery of high quality care. It also houses the headquarters of the International Network of Agencies for Health Technology Assessment (► INAHTA) and European Collaboration for Health Technology Assessment (► ECHTA).

Scabies

Synonyms

Infection with *Sarcoptes Scabiei*; Itch

Definition

Scabies is caused by the mite *Sarcoptes scabiei*. The infection is transmitted by close contact. As the parasites can survive outside their host for about 4 days, transmission can also take place by bedlinen, clothing or soft-toys. While the male mite stays on the surface of the skin, the female parasite penetrates the skin and tunnels into the stratum corneum, where it releases eggs. On the skin, papules and slightly prominent aisles are visible. Besides the genital region, the umbilical area and the nipples are involved as well as the interdigital region of the fingers and the toes. A characteristic symptom is strong itching, especially at night (due to the warmth of the bed); scratching can cause a bacterial superinfection of the affected parts of the skin. Medicinal treatment, which often has to include people in close contact, is performed as a local therapy; lindane, benzylbenzoat (10%), permethrin (5%), crotamiton (10%) or malathion can be used. As a supporting hygienic measure, bedlinen and laundry should be washed at temperatures of at least 60°C. Mites on soft-toys can be killed by freezing or by keeping them in plastic bags for about two weeks.

Cross-References

► Sexually Transmitted Diseases

Scale of Measurement

► Level of Measurement

Scarcity

Synonyms

Limited resources

Definition

The fact that goods are scarce while needs are in principle infinite is the reason why budgeting is necessary. Hence scarcity is the basic axiom of economics, which is concerned with the efficient distribution of scarce resources. The scarcity of resources in the healthcare system calls for prioritization – i. e. the setting of (oral) health goals – and in certain cases also implies the rationing of medical benefits. Decisions on the efficient allocation of resources can be placed on a rational foundation by the use of the models and data of health economics. For instance, the various possible applications of scarce funds can be evaluated by means of the "opportunity cost" approach. The opportunity cost is the value to society of the resources appropriated for a given medical program if they were to be used for an alternative purpose.

Scarity of Resources

Synonyms

► Resource Allocation

Definition

The basic assumption of health economics is that resources for health care are limited (scarcity of resources). From a health care system's perspective or a public payer's point of view, the consequence of that assumption is the necessity to decide where to allocate the resources; or in other words: which health care technologies should be reimbursed and to what extent. One criterion for resource allocation decision making can be cost-effectiveness.

Scarlet Fever

Synonyms

Scarlatina

Definition

Scarlet fever, which is caused by group A streptococci, is spread by droplets. Following an incubation period of 3–4 (–8) days, there is an acute onset with fever, headache, pharyngitis, vomiting and an inflammation of the tonsils. The rash which is fine, red and rough-textured (like sandpaper), appears first on the chest, in the axilla and behind the ears and afterwards generalizes. The cheeks are flushed, the area around the mouth is pale. A characteristic symptom is the inflammation of the papillae of the tongue, called "red strawberry" or "raspberry tongue." Streptococci can be detected by throat culture and treatment consists of antibiotic therapy. Scarlet fever is followed by a desquamation of the skin, which is characteristic on the palm of the hands and the sole of the feet. Possible complications are otitis, myocarditis, arthritis and nephritis. Scarlet fever usually induces immunity, but recurring attacks may occur.

Schistosome dermatitis

► Cercarial Dermatitis

Schistosomiasis

Synonyms

Bilharziasis; Infection with schistosomes

Cross-References

► Water Quality and Waterborne Infectious Diseases

Schizoaffective Disorder

Definition

Individuals with schizoaffective disorders show both affective and schizophrenic symptoms. However, the symptoms do not justify a diagnosis of either ► schizophrenia or depressive or manic episodes.

Schizophrenia

Definition

According to ICD-10, schizophrenic disorders are characterized in general by fundamental and characteristic distortions of thinking and perception, and affects that are inappropriate or blunted. Clear consciousness and intellectual capacity are usually maintained although certain cognitive deficits may evolve over the course of time. The most important psychopathological phenomena include thought echo, thought insertion or withdrawal, thought broadcasting, hallucinatory voices commenting or discussing the patient in the third person, thought disorders, negative symptoms, and delusional perception and ► delusions of control, influence or passivity. Paranoid schizophrenias are the most prevalent form; other forms of schizophrenia are hebephrenic (only in adolescents and young adults), catatonic, simple, and residual schizophrenias.

Schizotypal Disorder

Synonyms

Latent schizophrenic reaction; Borderline schizophrenia; Latent schizophrenia; Prepsychotic schizophrenia;

Prodromal schizophrenia; Pseudoneurotic schizophrenia; Pseudopsychopathic schizophrenia; Schizotypal personality disorder

Definition

A schizotypal disorder is characterized by eccentric behavior and anomalies of thinking and affect which resemble those seen in ► schizophrenia, though no definite and characteristic schizophrenic anomalies occur at any stage. The symptoms may include a cold or inappropriate affect; anhedonia; odd or eccentric behavior; a tendency to social withdrawal; paranoid or bizarre ideas not amounting to true ► delusions; obsessive ruminations; thought disorder and perceptual disturbances; occasional transient quasi-psychotic episodes with intense ► illusions; auditory or other ► hallucinations; and delusion-like ideas, usually occurring without external provocation. There is no definite onset and evolution and course are usually the same as those of a personality disorder.

Schizotypal Personality Disorder

► Schizotypal Disorder

Science-Based Medicine

Synonyms

Evidence-based medicine; Evidence-based clinical practice; Evidence-based health care practice

Definition

Evidence based medicine is a term used to denote a recent movement to establish the most effective practice through the use of the scientific method and modern information technology. As the result, standard protocols for diagnosis and treatment are delivered to health care providers.

Cross-References

► Evidence Based Medicine

Scientific Evidence

Definition

Scientific evidence is evidence that serves to either support or counter a scientific theorem or hypothesis. Such evidence is expected to be empirical and properly documented in accordance with scientific methods that are applicable to the particular field of inquiry. Standards for evidence may vary according to whether the field of inquiry is among the natural sciences or social sciences.

Scope

► Environment

Scorn

► Disdain

Screening

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Definition

Screening can be defined "as the presumptive identification of unrecognized disease or defect by the applications of tests, examinations or other procedures which can be applied rapidly. Screening tests sort out apparently well persons who probably have a disease from those who probably do not" (Last 2001).

The aim of the screening test is to detect disease in the preclinical phase (► Preclinical Phase of Disease), when it is more easily curable. A screening test is not a diagnostic test. All persons who screen positive must be referred to their physicians for diagnosis and necessary treatment (Gordis 2004).

Basic Characteristics

Diseases Appropriate for Screening

To be appropriate for screening, a disease should be an important health problem, the treatment should be more beneficial in terms of reducing morbidity or mortality when given before rather than after symptoms develop, the ► natural history of the disease should be well known, and the ► prevalence of the preclinical phase of the disease should be high among the population screened (Miller 2005).

Characteristics of a Good Screening Test

A suitable screening test must be available, inexpensive, quick and easy to administer, impose minimal discomfort on patients, and have good validity and reliability (Webb et al. 2005).

Validity of Screening Test

The validity of a screening test is defined as the ability of a test to distinguish individuals who have a disease, as test-positive, from those who do not have a disease, as test-negative. Sensitivity and specificity are two measures of the validity of a screening test. These two components of validity are determined by comparing the results obtained by the screening test with those derived from some "► gold standard" (Table 1).

Sensitivity is the ability of the test to identify all screened individuals who actually have the disease; it is the percentage of individuals with disease who test positive (Table 1).

Specificity is the ability of the test to identify only disease-free individuals who do not actually have the disease; it is the percentage of individuals without disease who test negative (Table 1) (Gordis 2004).

Screening, Table 1 Sensitivity, specificity and predictive value of the screening test

	EXAMINATION	
Screening test	**Disease present**	**Disease absent**
Positive	A (true positives)	B (false positives)
Negative	C (false negatives)	D (true negatives)
Total	A + C	B + D

Sensitivity (%) = A / (A + C) × 100
Specificity (%) = D / (B + D) × 100
Predictive value (+) = A / (A + B) × 100
Predictive value (–) = D / (C + D) × 100

True Positives

True positives are individuals with the disease who are correctly screened "positive".

True Negatives

True negatives are individuals without the disease who are correctly screened "negative".

The Importance of False Positives

False positives are individuals who screened positive but do not really have the disease. The problems with *false positive results* are firstly that they pose a burden to the health system, and secondly that they cause anxiety and worry in individuals who have been told that they have tested positive.

The Importance of False Negatives

False negatives are individuals who screened negative but actually have the disease.

Individuals with *false negative results* usually start interventions late and, because of that, the ► effectiveness is reduced.

Correlation of Sensitivity and Specificity

An ideal screening test would be 100 per cent sensitive and 100 per cent specific. In practice this does not occur. Sensitivity and specificity are usually inversely related.

The Cutoff Level Between Sensitivity and Specificity

For many screening tests, there are some people who are clearly ► normal, some clearly abnormal, and some who fall into the gray zone between the two. In these situations, the ► cutoff level between normal and abnormal is an arbitrary decision. Lowering the criterion of abnormality will mean that more people who actually have the disease will be test-positive (increased sensitivity), but the number of people who do not have the disease but test positive will also increase

(decreased specificity). Conversely, making the criterion more stringent leads to increased specificity and decreased sensitivity.
One way of addressing the problem of the cut-off between sensitivity and specificity is to use the results of several screening tests together (Gordis 2004).

Predictive Value of Screening

The predictive value of the screening test can be positive or negative. It measures whether or not an individual actually has the disease. *Predictive value positive* is the percentage of individuals who test positive and who actually have the disease. Analogously, *predictive value negative* is the percentage of individuals who test negative and who are actually disease-free. The calculations of these measures are illustrated in Table 1.
The predictive value of a screening test is determined not only by factors that determine the validity of the test itself, but also by the prevalence of preclinical disease. When the prevalence of preclinical disease is low, the predictive value positive will be low even using a test with high sensitivity and specificity (Bhopal 2002).

Reliability (Repeatability) of Screening

The reliability of a screening test is the ability of a measuring instrument to give consistent results when a measurement is repeated under ideal conditions. Two major factors that affect the consistency of the results are the variation of a method and observer variation. The variation of a method depends on such factors as the stability of the reagents used and fluctuations in the substance being measured (e. g. blood pressure). Observer variation can stem from differences among observers (*interobserver variation*) and also from variation in readings taken by the same observer on separate occasions (*intraobserver variation*) (Gordis 2004).
The best quantitative measure for reliability is *kappa*. Kappa is used to measure agreement between two observers. It is defined as the agreement beyond chance divided by the amount of possible agreement beyond chance.

Different Types of Screening

Mass screening (population screening) refers to screening on a large scale, consisting of total population groups.

Selective screening (targeted screening) is applied to subsets of the population who are at high risk for disease or certain conditions as the result of family, age, or environmental exposure.
Multiple screening is defined "as the use of two or more screening tests on a single occasion" (Last 2001). Multiple screening tests can be *sequential (two-stage)* or *simultaneous*. Sequential screening is carried out in stages, and only initially positive individuals undergo the second stage. Simultaneous screening means that two or more tests are used simultaneously to detect disease. The individual is generally considered to have tested positive if he has a positive result for one or more of the tests.
Opportunistic screening is screening of individuals who visited their doctor regarding a condition unrelated to the screening (Gordis 2004).

Study Designs for Evaluation of Screening

A number of epidemiological design strategies are utilized to evaluate the ► efficacy of a screening program, including ► observational studies (such as correlation, case-control, and cohort studies), as well as ► experimental studies.
► Correlation studies are used to examine trends in disease rates in relation to screening frequencies within a population, or to compare the relationship between the frequencies of screening and disease rates in different populations. In ► case-control studies, participants with and without the disease are compared with respect to their past exposure. Using ► cohort studies, the case-fatality rate of those who chose to be screened is compared with the comparable rate among those who were not screened. ► Randomized experimental trials can provide the best and most valid evidence concerning the efficacy of a screening program (Webb et al. 2005).

Biases in Evaluation the Benefits of Screening

Biases (► Bias; ► Confounding and Interaction) of particular relevance to the evaluation of screening are lead-time bias, length/time bias, and selection bias.
Lead-time bias is the perception that the screen-detected case has a longer survival simply because the disease was identified earlier in the natural history of the disease. Lead-time is the period of time from the detection of a medical condition by screening to the

appearance of symptoms. When lead-time is very short (e. g. lung cancer), the treatment of medical conditions picked up by screening is likely to be no more effective than treatment after symptoms appear. On the other hand, when lead-time is long (e. g. cervical cancer), treatment of the medical condition found by screening can be effective.

Length/time bias is an error that occurs because the proportion of slow-growing lesions diagnosed during screening programs is greater than proportion of fast-growing lesions. The effect of including a greater number of slow-growing cancers makes it seem that the screening is more effective.

Selection bias (volunteer bias) is an error due to differences in characteristics between people who are screened and those who are not. In general, volunteers tend to have better health and are more like to comply with medical recommendations. On the other hand, volunteers may represent people who are at high risk of developing the disease because they have anxieties based on a positive family history or lifestyle characteristics. The problem is that we do not know in which direction the selection bias might operate and how it might affect the study results (Gordis 2004).

Cross-References

- ► Case Control Studies
- ► Cohort Studies
- ► Cutoff Level
- ► Ecological Study
- ► Effectiveness
- ► Efficacy
- ► Experimental Studies
- ► Gold Standard
- ► Natural History
- ► Normal
- ► Observational Studies
- ► Preclinical Phase of Disease
- ► Prevalence
- ► Randomized Experimental Trial

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Scrofula

- ► Morbus Koch (Koch's Disease)
- ► Tuberculosis

Scrofula, Pott's Disease

- ► Tuberculosis and Other Mycobacterioses

Scrub Typhus

- ► Tsutsugamushi Fever

Seamless Care

- ► Continuity of Care

Secondary Association

Definition

When a factor C and a disease A are associated only because both are related to some common underlying condition B, this is a non-causal type of association. Alteration in factor C will not produce alteration in the frequency of disease A unless the change also affects the common underlying condition B as well.

Secondary Care

Synonyms

Specialized health services; Ambulant or inpatient service

Definition

Secondary care describes all health care services provided by medical specialists generally not having the first contact with patients such as dermatologists, cardiologists, urologists, etc. On referral from ► primary care patients have access to the specialized services in secondary care which are provided either in ambulatory settings or in inpatient services such as emergency rooms, intensive care medicine and surgery services. In some health care systems patients may have direct access to secondary care through specific health insurance, but in most health care systems this direct access is limited due to cost containment reasons. Secondary care does not include highly specialized, technical ► inpatient health care services; those are part of tertiary care.

Secondary Channels

Definition

Secondary channels provide information about primary research documents, and some even contain the documents. The major secondary channels are bibliographies, research registers, and references databases, including citation indexes. They are constructed by third parties for the explicit purpose of providing literature searchers with a relatively comprehensive list of studies relating to a topic. Secondary channels have summarized accounts that often include just research abstracts, research summaries, bibliographic information, or all three, which can be used to obtain the full reports.

Secondary Dental Care

Definition

Secondary dental care services are provided by dental specialists in their offices, in local community hospitals or universities for a patient referred by a primary care provider who first diagnosed or treated the patient. Referrals are for those patients who require the specific expertise or treatment measures performed by specialized dentists. These include both outpatient dental care and inpatient services, oro-maxillo-facial surgery services, orthodontic services, periodontal services, services for people with disabilities, diagnostic laboratory and dental imaging services, etc. Some primary care providers may also take care of hospitalized patients.

Secondary Patient Data

Definition

Secondary patient data are derived from primary data – including disease and procedure indexes, health care statistics, and disease registries. Secondary data are created in a highly standardized way. For this reason, the information derived from secondary data are comparable to other sources.

Secondary Plant Compounds

Definition

Secondary plant compounds are a group of approximately 60 000–100 000 substances which can be classified according to their chemical structures and functional properties into different sub groups. The main groups are carotenoids, phytosterole, glucosinolate, flavonoids, phenolic acid, protease inhibitors, monoterpens, phyto estrogenes and sulfur compounds. They are found in plants as plant pigments, growth regulators, pest and parasite repellents and aromas and scents. So far only a little group of approximately 100 substances has been investigated. Approximately 1.5 g of secondary plant compounds are absorbed daily in a mixed diet.

Secondary Research

Definition

Secondary research means research using data that already exist in some form, having been collected for a different purpose, perhaps even by a different organization, and which might be useful in solving a current problem.

Secondhand Smoke

► Passive Smoking

Secrecy

Synonyms

Privacy; Health data protection

Definition

Secrecy means the legal duty of a person or a legal entity (including public health agencies) to keep certain information secret (thus, confidential) and not to reveal it to any other person or entity. Such confidentiality duties may result from contracts, statutory laws or other express warranties. Public health agencies as well as health professionals have regular statutory confidentiality duties with respect to personal and other sensitive information obtained during the course of their professional conduct. Breaches of confidentiality may be punished under criminal law and lead to contractual or tort liability under private law.

Cross-References

► Confidentiality

Secularization

Definition

Recognized in all forms of worldly religions, with particular reference to the explanation of the processes by which earlier religious practices were formed and used as the basis of human behavior.

Security Council

► United Nations Security Council

Sedentary Lifestyle

Synonyms

Inactivity

Definition

Sedentary lifestyle is defined as way of life that includes little or no physical activity. It is often associated with different ailments of the contemporary age such as obesity, cardio- and cerebrovascular diseases, spinal deformities, etc. It is common in urban areas whereas in rural areas people tend to be much more physically active, for example walking to and from work, gardening, etc.

Segregation Analysis

Definition

Segregation analysis is a complex statistical technique which is used for investigation of the pattern of disease occurrence within pedigrees. It is focused on elucidation of the types of genetic effects that underline familial aggregation of the disease or trait. In this analysis, the most likely mode of inheritance is determined through comparison between the observed familial distribution and the distribution expected from various specific genetic models.

Selection Bias

► Observational Studies

Selective Prevention of Mental Disorders

Definition

Interventions target individuals or subgroups of the population whose risk of developing a mental disorder is significantly higher than average, as evidenced by biological, psychological or social risk factors.

Selective Sweep

Definition

The fixation of an ► allele in a gene pool can also result in neighboring alleles being swept to fixation where it occurs sufficiently rapidly that the effects of recombination can not oppose it. The resultant reduction in allelic and ► haplotype diversity around this locus is known as a selective sweep and can be used to identify loci under positive selection.

Self-Cleaning of the Soil

► Purification

Self Concept

► Self-Identity

Self-Determination

Synonyms

Sovereignty; Self-rule

Definition

Self-determination denotes determination of ones own fate or course of action without compulsion. It is a principle in international law that a people ought to be able to determine their own governmental forms and structure free from outside influence. Self-determination refers to a number of distinct human rights. These include the right to equality under the law, the right to a nationality, the right to freely leave and return to a person's country of origin, the right to freedom from persecution because of race, religion, or gender, and a host of others.

Indigenous peoples do not have rights based on their knowledge per se, but on the recognition of their rights to self-determination as peoples. This is clearest in settler societies, in there was a distinct and massive colonizing event, such as happened in Australia, New Zealand, Latin America, and North America. In most of these countries, indigenous peoples are recognized as a distinct class of people with "dual citizenship". They are members of their nation states, but they are also members of indigenous collectives (first nations, clans, tribes) that governed themselves prior to contact and through the Law of Nations retained sovereign powers not ceded or lawfully terminated. The dual citizenship has given rise to very complex rules of laws which recognize spheres of rights to self-governance and self-determination.

Cross-References

► Self-Government

Self-Direction

Synonyms

Autonomy

Definition

Personal governance of the self that is free from controlling interferences.

Self-Government

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Synonyms

Sovereignty; Self-determination; Self-rule

Definition

The most widely accepted definition of self-determination is: ones right to participate in the democratic process of governance and to influence ones future – politically, socially and culturally.

Self-determination or the right to self-determination is defined as freedom of the people having the characteristics of a nation to decide whether they will be independent (choose their own government) or (continue) to be part of another state. It is important to stress that self-determination for indigenous peoples does not necessarily imply secession from the state.

Self-determination has been defined by the International Court of Justice, as the need to pay regard to the freely expressed will of peoples.

Basic Characteristics

History

The principle of self-determination has been recognized since 1919, when the League of Nations, precursor of the United Nations, was established. At that time focus was on the "principle" not the "right" of self-determination. It was only after the foundation of the United Nations in 1945 that "principle" evolved into "right" under international law.

The primary aim of the right to self-determination in international law was to allow the former colonies that existed before World War II to have their say in their future. So far the United Nations have been reluctant to recognize any further extension of the right beyond the traditional de-colonization context and this is still a matter of dispute and controversy. However, efforts are being made to further evolve this process.

Right of Self-Determination Under International Law

The right of self-determination is a fundamental principle and right under international law. It is incorporated in the Charter of the United Nations and the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights. Common article 1, paragraph 1 of these Covenants says:

1. "All peoples have the rights of self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development.
2. All peoples may, for their own ends, freely dispose of their natural wealth and resources without prejudice to any obligations arising out of international economic co-operation, based upon the principle of mutual benefits, and international law. In no case may a people be deprived of its own means of sustenance.
3. The States Parties to the present Covenant, including those having responsibility for the administration of Non-Self-Governing and Trust Territories, shall promote the realization of the right of self-determination, and shall respect that right, in conformity with the provisions of the Charter of the United Nations".

The right of self-determination has also been recognized in many international and regional human rights instruments such as Part VII of the Helsinki Final Act 1975, Article 20 of the African Charter of Human and Peoples' Rights and Declaration on the Granting of Independence to Colonial Territories and Peoples. The International Court of Justice has endorsed it. The scope and content of the right of self – international human rights experts have elaborated upon determination.

Right of Self-Determination of Indigenous Peoples

► Indigenous peoples consider the right to self-determination as one of the fundamental conditions for the enjoyment of all the individual human rights (civil, political, economic, social or cultural). The right of self-determination is equal for all people.

The United Nations has an important role in protecting and promoting the rights of indigenous peoples. The Working Group on Indigenous Populations (WGIP) adopted the United Nations Draft Declaration on the Right of Indigenous Peoples in 1994. It is divided into nine parts and each part addresses particular thematic concerns. The ninth part refers to miscellaneous provisions.

Part I includes General principles (Articles 1–5), which proclaim the rights of indigenous peoples to equality, freedom from adverse discrimination and nationality. Article 3 says that "indigenous peoples have the right to self–determination", and Article 4 recognizes the right of indigenous peoples to maintain and develop their distinct characteristics and legal systems, while participating fully in the life of the State. Part II of the Declaration (Articles 6–11) addresses the right of indigenous peoples to physical existence, integrity and security and a full guarantee against genocide, including removal of indigenous children. Part III (Articles 12–14) refers to rights in relation to cultural, spiritual and linguistic identity of indigenous peoples. Educational, information and labor rights are incorporated in Part IV of the Draft Declaration (Articles 15–18). These refer to the right to all forms and levels of education including indigenous peoples' own education institutions, the right to establish media in their own languages and equity in terms of international labor law and national labor legislation. Part V (Articles 19–24) includes participatory rights, the right to development and other social and economic rights. In Part VI (Articles 25–30) refers to land, water and other resources. Part VII (Articles 31–36) contains rights relevant to exercise of self–determination and formation of indigenous peoples' institutions. Part VIII (Articles 37–45) includes issues regarding Declaration implementation as well as UN cooperation and a special UN indigenous Body among other issues.

The Draft Declaration provides a solid framework for indigenous peoples' rights as well as a basis for mobi-

lizing resources. The majority of indigenous peoples who took part in the UN work on the Draft Declaration emphasize that their goal is to gain greater control over their lives by having the right to participate in the decision making, not secession and independence through the establishment of independent nation states.

Ever since its adoption the Draft Declaration has had considerable impact on the lives of indigenous peoples worldwide.

There is an increasing number of State delegations supporting the right to self-determination provided that it poses no threat to the territorial integrity of the States. These include Argentina, Bolivia, Canada, Chile, Colombia, Denmark, Finland, Mexico, New Zealand, Norway, Peru and Switzerland.

Right of Self-Determination and Indigenous Peoples Health

Being the fundamental right of all peoples and, as such, firmly established in international law, the right of self-determination is one of the cornerstones of health issues of ► indigenous peoples worldwide.

By the right of self-determination in terms of health, the right to influence decisions regarding health care system provisions is fundamental. Cultural, traditional and religious beliefs all influence both health knowledge and health practices of indigenous peoples. Understanding of illness as well as methods to overcome different ailments varies greatly not only between indigenous and other population groups but also within different indigenous communities. An holistic approach to health and disease provides a basis for health practices in indigenous communities. However, very often indigenous peoples are deprived of proper medical care due to the negligence of the national health care services towards the specific needs of indigenous groups. Access to health services and to health promotion and prevention programs for indigenous people are limited, inadequate and frequently culturally inappropriate. Therefore, sustainable solutions to indigenous health problems must address and acknowledge the right of self-determination which needs to be implemented in the health care systems. Otherwise, in the future, we will witness a rise in differences in morbidity as well as mortality between indigenous and non-indigenous peoples.

Cross-References

► Self-Determination

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Self-Help

Definition

The primary focus of self-help is to provide emotional and practical support and an exchange of information. Usually, self help actions are taken by non-health professionals to mobilize the necessary resources to promote, maintain, or restore the health of individuals or communities. They are carried out in a participatory process to provide opportunities for people to share knowledge, common experiences, and problems (i. e. on diseases). Self-help can be carried out on an individual or an organized level. It is depicted as an important element for coping with diseases; supporting competences in health and empowerment.

Self-Identity

Synonyms

Self concept

Definition

Self-identity (► identity) sums total of being's knowledge and understanding of his or her self. Integral part

of self-identity are physical, psychological, and social attributes. They may be influenced by the individual's attitudes, habits, beliefs and ideas.

Self-Organizing Maps

Definition

A neural-network unsupervised learning algorithm to analyze high dimensional data. SOMs are used for dimensionality reduction for gene expression in reducing the large dataset into groups of genes that are similar.

Self-Regulation

Synonyms

Regulating oneself

Definition

Self-regulation is a concept that derives from cognitive social learning theory, and it includes what is commonly named willpower. Self-regulation includes cognitive and behavioral processes that involve the initiation, termination, delay, modulation, modification, or redirection of a person's emotions, thoughts, behaviors, physiological responses, or environment.

Self-Rule

► Self-Determination

Self-Stigma

Definition

Self-stigma is the ► prejudice which people (e. g., suffering from mental disorders) turn against themselves.

Self-Therapy of Malaria

Synonyms

Presumptive therapy of malaria; Standby therapy of malaria

Definition

Standby therapy of malaria is self-therapy practiced by travelers when they develop symptoms suggestive of malaria (fever, flu-like symptoms) in an endemic region where there is no chance of consulting a doctor soon. Due to the specific circumstances and the risk of infection, chemoprophylaxis or standby therapy is preferable. Depending on the region and the resistance of the plasmodia, ► mefloquine (Lariam®, Mephaquin®), ► atovaquone + proguanil (Malarone®) and ► artemether/lumefantrine (Riamet®) are recommended for self-therapy.

Semang (Southeast Asia)

► Indigenous Health, Asian

Semantic Aspect of Data/Information

Definition

The semantic aspect refers to the meaning of the message carried by the data. The interpretation of data, and creation of information from it, can be made only if the data have some meaning and the context of production of the data is taken into consideration.

Semantic Errors

Definition

A semantic error is a type of ► data error referring to the meaning of data.

Semen Quality

Definition

Semen quality refers to the structure/morphology and motility of the sperms. Semen quality and sperm count (the total number of sperm cells per ml of semen) as well as quantity and quality of the ejaculate predict male fertility.

Senescence

Definition

Senescence should be distinguished from aging. The term "aging" refers simply to the accumulation of chronological time and maturation. Senescence, in contrast, refers to the increasing vulnerability or decreasing capacity of an organism to maintain homeostasis as it progresses through its life span. Previously thought to be synonymous, it is now increasingly understood that while the two terms are related, aging refers generally to changes over time while senescence describes a process of degeneration.

Theories explaining biological senescence can generally be divided into two categories. Programmed senescence theories imply that senescence is regulated by biological clocks operating throughout the life span. This regulation would depend on changes in gene expression that affect the systems responsible for maintenance, repair and defense responses. Error theories see senescence as the outcome of accumulated environmental impacts that induce damage at various levels on an organism.

Sensitivity

Synonyms

Operating characteristics of diagnostic tests

Definition

The sensitivity is the operating characteristic of a diagnostic test that measures the ability of a test to detect a disease (or condition) when it is truly present. Sensitivity is the proportion of all diseased patients for whom there is a positive test, determined as: [true positives ÷ (true positives + false negatives)], in contrast to specificity.

Sensitivity Analysis

Definition

Sensitivity analysis is a technique or methodological approach to describe the ► uncertainty around the estimated results of health economic evaluation studies, especially decision analytic modeling. The influence of plausible changes of one or more parameters of the analysis on the results when the other parameter is kept constant is described. Sensitivity analysis is a key standard element of health economic evaluation.

Sensitivity of a Surveillance System

Definition

Sensitivity of a surveillance system is defined as the proportion of the total number of cases of a disease or health condition in the target population that are detected by the system (the completeness of case reporting). For assessing the impact on health, high sensitivity is required. A surveillance system with low sensitivity can still be useful in monitoring trends if sensitivity and predictive value positive (PVP) are consistent over time.

Sensoric Quality of Food

Definition

Sensory experiences such as taste, color, shape and consistency defines the quality of food.

Sentinel Events

Definition

A sentinel event is an unexpected occurrence involving untimely death, preventable disease, serious injury, or disability, whose occurrence serves as a warning signal that the quality of preventive and/or therapeutic medical care may need to be improved. Sentinel events (such as cases of certain communicable diseases, e. g., influenza cases, adverse drug reactions, etc.) are harbingers of broader public health problems. Surveillance for such events can be used to identify situations where public health investigation or intervention is required.

A Sentinel Event Alert identifies the most frequently occurring sentinel events, describes their common underlying causes, and suggests steps to prevent occurrences in the future.

Sentinel Surveillance

Definition

Sentinel surveillance is a type of ► active surveillance. It implies that department of health officials regularly call a sample of physicians' offices to ask if they have identified any cases of a particular disease; in this instance, information required is very detailed because the disease often is not well understood and this surveillance system provides a means of collecting information that may help identify its causes or risk factors.

Separation Anxiety Disorder of Childhood

Definition

This disorder should be diagnosed when fear of separation constitutes the focus of the anxiety and when such anxiety first arose during the early years of childhood. It is differentiated from normal separation anxiety when it is of a degree (severity) that is statistically unusual (including an abnormal persistence beyond the usual age period), and when it is associated with significant problems in social functioning.

Sepsis

Synonyms

Bloodpoisoning; Septicemia

Cross-References

► Acute Life-Threatening Infections

Septic Course of Infection with Yersinia pestis

► Plague Sepsis

Septic Course of Meningococcal Infection

► Waterhouse–Friederichsen Syndrome

Septicemia

► Sepsis

Septic Infection

► Bloodpoisoning

Serial Analysis of Gene Expression

Definition

A method to monitor large-scale gene expression within a cell or group of cells by sequencing short sequence tags from the population of mRNA. Unlike microarray, this sequence based technique does not need a priori knowledge of the mRNA population and thus can be used to find novel transcripts. Furthermore, absolute levels can be measured and thus comparison between different experiments is easier. However, the cost of production is higher than microarray.

Serpent Worm Infection

► Dracunculiasis
► Guinea Worm Infection

Serum Electrolytes

Synonyms

Blood salts

Definition

In any given fluid compartment of an organism there is a particular composition of electrolytes. These are salts, acids and bases, which – in watery solution – disintegrate to ions, loaded atoms. Electrolytes play an important role in the excitation of cells, closely related to the body fluid balance. It is necessary to keep the electrolytes in balance to maintain the optimal pH-value in arterial blood. If there is a relevant alteration of the levels of the electrolytes the fluid volumes of the cells change. Thus different metabolic processes might be influenced.

Service Provision and Infrastructure

► Infrastructure and Service Delivery

Setting

Synonyms

Physical and social/cultural environments; Microenvironments

Definition

The term 'settings' goes back to the Ottawa Charter for Health Promotion of 1986, which outlined the need for creating a health-promoting environment. Going further afield, the World Health Organization (WHO) explicitly called for setting-based health promotion in its 'Health 21' plan (► health goal no. 13) in 1999. With its holistic nature, the setting approach moves away from the one-sided focus on individual risk-prone behavior and takes a broader view by looking at social systems and organizations – settings – such as companies, schools, hospitals, neighborhood, etc. where the necessary conditions for good health can be created, shaped and maintained. The setting strategy is seen as the core strategy of health promotion since it takes into account living conditions and behavior, and so can accommodate the specific requirements of widely different ► target groups.

Furthermore, since it allows incorporating health promotion into everyday activities, the setting approach has been particularly successful at low-level communication with otherwise hard-to-reach target groups (e. g., socially disadvantaged segments of the population). Examples of setting-based international and national projects as well as integrated programs addressing both human health and the environment include the Healthy Cities Network and the Health Promoting Hospitals Network.

Cross-References

► Environment
► Setting Concept

Setting Concept

Synonyms

Setting; Settings for health promotion

Definition

The setting concept (orientated towards lifestyle and different areas of life) includes measures of health promotion in the most common and frequently visited areas in the life of an individual (workplace, office, school, family, place of residence, etc.) which have a great impact on the individual's health. This type of health promotion is regarded as being very promising from the viewpoint of health science. Thus, health-orientated basic conditions may be improved within delimited social systems by the inclusion and participation of the individual.

Settings for Health Promotion

► Setting Concept

Settlement

► Colonization

Seven-Day Fever

► Dengue Fever

Severe Acute Respiratory Syndrome

► SARS

Severe Overweight

► Obesity

S

Sewage Disposition

Definition

Sewage disposition is the disposal of human excreta and other waterborne waste products from houses, streets, and factories. In an urban environment, sewage disposal is collection of sewage by the sewerage system and the disposal of the sewage, with or without treatment. The determinants commonly included in sewage analysis are tests measuring organic matter, biochemical oxygen demand, nitrogen, chlorides, hardness, alkalinity, pH, dissolved oxygen, hydrogen sulfide, carbon dioxide, and living organisms including bacteria and larger organisms. By appropriate processes, sewage and industrial waste water can be treated so that the decomposable organic matter is removed or oxidized and the bacteria and other organisms removed or killed. The fundamental processes of sewage treatment are: separation of the suspended matter from the liquid sewage; destruction of the putrescible organic matter in the liquid sewage looking to final mineralization by processes of biological action; transformation of the sewage sludge to a condition of stability and inertness by biological action; and destruction of the bacteria and other microorganisms in the liquid effluent or their removal from it.

Sex

Definition

A biological characteristic that differentiates people on the basis of X-chromosome versus Y-chromosome linked attributes. It is a dichotomous outcome, i. e. sex is defined as either male or female.

Sex Differences and Health

► Gender Differences and Health

Sex/Gender

Synonyms

Male; Female; Masculinity; Femininity

Definition

Sex refers to whether one is biologically a male or female. Gender refers to masculinity, the expected social behaviors for men in society, and femininity, the expected social behaviors of women in society. What constitutes masculinity and femininity varies from culture to culture, and can change over time. Although sex and gender are conceptually different, they are often used interchangeably in everyday discourse.

Sexism

Definition

An institutionalized practice of denying rights, responsibilities, and/or resources to a specific individual on the basis of his or her ► sex.

Sex Ratio at Birth

Definition

The sex ratio at birth represents the number of male live born infants per 100 female live born infants in a given year. In humans the sex ratio at birth is commonly assumed to be 105 boys to 100 girls. However, sex ratios at birth or among infants may be considerably skewed by sex-selective abortion and infanticide. Even in the absence of such practices, a range of "normal" sex ratios at birth of between 103 to 107 boys per 100 girls has been observed in different societies, and among different ethnic and racial groups within a given society, though more extreme ratios documented in some populations should be attributed rather to cultural preferences than to biological variation in the propensity to bear boys or girls.

Sexual Behavior

► Sexual Practices

Sexual Contact

Synonyms

Sexual intercourse; Sexual activity; Physical intimacy

Definition

Physical intimacy that includes a broad range of behaviors such as kissing and touching breasts or genitalia through clothing or direct contact. Sexual contact also includes sexual intercourse, which refers to the occurrence of one person penetrating a body part or an object into another person's genital or anal opening.

Sexuality

Definition

The set of behaviors that allow an individual to express his or her sexual identity in a manner consistent with his or her ► gender. It involves giving and receiving sexual pleasure, and may or may not involve reproduction and reproductive biology.

Cross-References

► Sexual Practices

Sexually Transmissible Diseases

► Sexually Transmitted Diseases

Sexually Transmitted Diseases

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Synonyms

STDs; Sexually transmissible diseases; Veneral diseases; Veneric diseases; Social diseases

Definition

Sexually transmitted diseases (STDs), which can be caused by different pathogens, are primarily transmitted from one human to another by sexual intercourse or by close contact. Most frequently, the symptoms of these infectious diseases manifest in the genital region.

Basic Characteristics

Introduction

Sexually transmitted diseases can be caused by viruses, bacteria or other microorganisms. Frequently, mixed infections occur. All pathogens causing STDs prefer a warm and moist climate. Therefore, they grow best on the mucous membranes of the genitals, the mouth and the rectum. Outside a humid milieu, the germs quickly die. Infectious diseases, which belong to the classic STDs, are syphilis, gonorrhea, ► ulcus molle (soft chancre) and ► lymphogranuloma venereum (LGV). Syphilis and gonorrhea are the most dangerous and widest spread social diseases. Besides HIV-infection, which is treated separately, the STDs considered here are ► granuloma inguinale, ► trichomoniasis, *Chlamydia trachomatis* infection, ► *Ureaplasma urealyticum* infection and ► herpes genitalis infections, ► condyloma, ► hepatitis B, ► scabies as well as infestation with ► pubic lice. Having a veneral disease does not confer immunity; thus reinfections are frequent.

History

Veneric diseases have been known since ancient times. Due to its possible severe or even deadly course, syphilis holds prime position. Remnants of skeletons, showing syphilitic changes, can prove that syphilis has occurred in Europe throughout antiquity. However, it achieved a special significance in 1495, when the French king Charles VIII conquered Naples. After the victory, 80-days festivities were held, which were followed by a syphilis epidemic, which spread all over Europe within five years. The origin of the name syphilis has been associated with a poem of Girolamo Fracastoro written in 1530; in the poem the shepherd Syphilis, as punishment for an act of impropriety, suffers from a disease with the symptoms of syphilis. For a long time, veneral diseases have been regarded more as a moral than a medicinal problem. They were thought to be the rightful punishment for wantonness. As tougher moral attitudes were adopted, social taboos prevented discussion about sexually transmitted diseases, and, especially, it was thought better that young people should not know too much about these kinds of diseases. In 1879, Albert Neisser determined that the bacterium *Neisseria gonorrhoe* was the cause of gonorrhea. In 1909, Fritz Schaudinn and Erich Hoffmann identified *Treponema pallidum* to be the cause of

syphilis. For centuries, mercury had been the treatment for syphilis but in 1909 Paul Ehrlich and Sahachiro Hata developed the first real therapeutic breakthrough, Salvarsan. Using Salvarsan reduced primary and secondary stages of syphilis by more than 60%. Since 1953, penicillin has been used for therapy, which – in most cases – can cure the disease if it is administered at an early stage.

Transmission

Usually, transmission of veneric diseases takes place during sexual intercourse. As the germs cannot survive outside the humid milieu for any length of time, transmission by toilet seats or – lids or by other objects of sanitary equipment is quite improbable. Although it is not a common way of transmission, infection is possible by the use of contaminated toothbrushes, washclothes, towels, bedlinen or sex toys. In rare cases, transmission can also take place by kissing. In every unprotected vaginal sexual intercourse, the risk of syphilis infection is 30–60%; as for gonorrhea, in every heterosexual intercourse with an infected partner the risk is 20–35% for men and 50–70% for women. Social diseases can also be transmitted by oral or anal sex. Furthermore, transmission is possible by contaminated blood conserves or by the re-use of contaminated needles. As for syphilis, an infection during pregnancy can be transmitted to the unborn child via the placenta, causing ► congenital syphilis. Hepatitis B can also be subject to intrauterine transmission. Moreover, a number of veneral diseases can be transmitted during the birth process.

Syphilis (Lues, French Disease)

Syphilis is caused by the bacterium *Treponema pallidum*. Half of the transmissions lead to an outbreak of the diseases, 30% of which heal spontaneously. The course of lues is made up of 3 (or 4) phases. During the primary stage, the germs can be detected in slide preparations from skin lesions, but diagnostic determination of antibodies is preferred in the following stages. Following an incubation period of 2–3 weeks (maximum 3 months), at the site of infection (at the male glans or at the female labia) a small nodule appears; this nodule develops into a hard-edged ulcer. Ulcer secretions are colorless and highly contagious. Additionally, there is a swelling of the regional lymph nodes. The ulcer and the swollen lymph nodes form the so-called primary complex. Four to ten weeks after the ulcer heals, the secondary stage starts, which heals without consequences after about 2 years. During this stage, different symptoms can be present. At the beginning, the symptoms are similar to a flu-like infection with fever and rheumatic pains; exanthemas and swellings of the lymph nodes can appear. Later on, nodulous efflorescences, lesions of the mucous membrane of the oral cavity and inflammation of the tonsils can appear. Moreover, at locations of skin-to-skin contact (under the breasts, in the armpits, in the groins) hard nodules develop, the so-called condylomata lata. Tertiary syphilis, which can involve all organs, occurs in about 25% of infected people; the latency phase prior to this late-stage of syphilis is variable and can last months to years or even decades. Soft nodules (gummas) ulcerate; widening of the blood vessels (aneurysms) can develop, which can rupture and cause a lethal hemorrhage. Neurological complications are often called the forth stage of syphilis. They are characterized by paralyses, difficulties in the coordination of muscle movements and cerebral seizures; frequently psychoses occur. Finally, there is a loss of intellectual capacities, resulting in dementia. Without treatment, the progressive paralyses lead to death within 4–5 years. Involvment of the posterior part of the spinal cord is called tabes dorsalis. In this case, the patients suffer from episodes of intense pain in the legs and disturbed sensation. Lues is treated antibiotically with ► penicillin. In the stages I and II benzathine penicillin is administered intramuscularly once a week for 3 weeks. If penicillin is not tolerated, tetracyclines or erythromycin can be used. Neurosyphilis demands intravenous treatment with penicillin G for 3 weeks. At the onset of antibiotic therapy, a ► Jarisch–Herxheimer reaction can appear. As a reactivation of the infection is possible, serologic controls should be performed after the end of treatment. The tests should be carried out after 3, 6 and 12 months, and once yearly thereafter.

Gonorrhea

Gonorrhea, also called “drip”, is caused by the bacterium *Neisseria gonorrhoe*. It is the most common sexually transmitted disease worldwide. According to estimations of WHO, there are 12 million new infections every year, primarily in men. Asymptomatic courses

are found in 15–30% of infected men and in up to 80% of infected women. Following an incubation period of 2–7 days, there is an inflammation of the urethra (urethritis); discharge and a burning sensation during micturition occurs. A typical symptom of gonorrhea is the so-called "bonjour-drop", a purulent secretion from the urethra, which appears after a long pause in urination. Gonorrhea can spread locally and cause inflammation of the tubes, the prostata or the peritoneum. Moreover, there is the risk of a general spreading by the blood (hematogenic) with the development of fever, joint pain and arthritis. In severe cases, inflammation of the meninges or the cardiac muscle can occur (menigitis, myocarditis). Infection can lead to adhesions in the tubes or the seminal vessels, thus causing infertility. Transmission during birth can cause a ► congenital gonorrhea. Usually, *Neisseriae* can be detected by slide preparation or culture. Before the onset of therapy, the possibility of infection by other STDs should be investigated; frequently, a simultaneous infection with *Chlamydiae* is present. Due to possible resistances against penicillin and tetracyclines, gonorrhea should be treated with intramuscular ceftriaxon or oral gyrase inhibitors (ofloxacin, levofloxacin). In uncomplicated cases, a single shot is sufficient, systemic infections have to be treated for 7 days. The sexual partner (or partners) should also be treated, otherwise ► ping pong infections could appear.

Prophylaxis

The most effective prophylaxis for sexually transmitted disease is sexual abstinence. The Catholic Church demands the restriction of premarital sex. Some institutions organize campaigns for marital faithfulness and against promiscuity. In Uganda, the so-called ABC-program was propagated; **a**bstinence, faithfulness (**b**e faithful) and safer sex (**c**ondoms). Even if there is no absolute security and protection, the risk of transmission of STDs considerably declines with the use of ► condoms (http://en.wikipedia.org/wiki/Condom). People with multiple partners should regularly be checked for the presence of veneric diseases. Sexually active persons should be informed about the risks of transmission, effective protective measures, symptoms and the urgency of immediate treatment (http://kidshealth.org/teen/sexual_health/contraception/contraception_condom.html).

Current Problems

The World Bank Group calculates that sexually transmitted diseases' costs, due to the treatment of the 15 to 44 years age group, ranks second worldwide. Thus, STDs have far-reaching health, political, social and economic significance. The introduction of modern methods of contraception caused a decrease in the use of condoms; while the rate of unintended pregnancies declined, sexually transmitted diseases were spread more easily and more quickly. An increased risk of transmission is present when anal sexual intercourse in homosexual men occurs. Immediate treatment of infected individuals is still hindered by their sense of shame and their fear of stigmatization. In the developing countries these factors are complicated by a lack of medical care. Especially in young people, there often is an insufficient knowledge about causes and symptoms of sexually transmitted diseases. Frequently, parents are not aware of the sexual activity of their children and, fearing discovery, teenagers are afraid to seek treatment. If the disease is transmitted by a third party, the fear of conflicts within the original partnership can lead to concealment of the infection. A further problem arises with long-distance tourism, which – under special conditions – can be designated as "sex tourism". On such journeys the travelers repeatedly have brief sexual contacts, often without the use of condoms. The risk of the transmission of sexual diseases is high.

Procedures in Case of Infection

Because sexually transmitted diseases are still taboo, public institutions have been established which perform diagnostic and therapeutic measures confidentially. When diagnosis is confirmed, not only is the infected person immediately treated, but also his or her sexual partner (or even partners). Until complete healing of the infection is achieved, individuals should undertake sexual abstinence. As the occurrence of social diseases is rare before the onset of puberty, the appearance of STDs in young children should give rise to suspicion of possible sexual abuse.

Cross-References

► Chlamydia trachomatis Infection
► Condom
► Condyloma

- ► Congenital Gonorrhea
- ► Congenital Syphilis
- ► Granuloma Inguinale
- ► Hepatitis B
- ► Herpes Genitalis Infection
- ► Jarisch–Herxheimer Reaction
- ► Lymphogranuloma venereum (LGV)
- ► Penicillin
- ► Ping Pong Infection
- ► Pubic Lice
- ► Scabies
- ► Trichomoniasis
- ► Ulcus Molle
- ► Ureaplasma urealyticum Infection
- ► Venereal Diseases

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Sexually Transmitted Diseases and Family Health

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Synonyms

Venereal diseases (VD); Sexually transmitted infections (STI)

Definition

Sexually Transmitted Diseases (STDs) refer to a broad category of infections that can be transmitted from person to person through sexual contact and from mother to child during birth. There are 20 known STDs. Common STDs include Chlamydia, genital warts, gonorrhea, hepatitis B virus, herpes, syphilis, Human Papilloma Virus (HPV), and ► human immunodeficiency virus (HIV). Acquired Immune Deficiency Syndrome (AIDS) is a condition in which HIV reaches an advanced stage (Berger 1998).

Family health refers to the concept that each individual can affect the health of his or her family members. For example if one family member becomes infected with an STD, he or she may infect other family members with the disease as well. Secondly, the experience of a family member having an STD may have a negative social and psychological effect on individuals, especially children, regardless of whether or not they contract the disease themselves. Denham (1999) suggested that HIV may have an especially negative impact on the lives of family members as it is a life-threatening disease to those infected. In such circumstances, family members can sustain each other's health through effective communication, cooperation, and care giving.

Basic Characteristics

Transmission Through Sexual Contact

Once an individual becomes infected with an STD, he or she may infect others through ► sexual contact. However symptoms appear only after an incubation period has passed. Incubation periods vary depending upon the STD – 2 to 8 days for Gonorrhea and up to 8 months for genital warts (Daugirdas 1992). During this time individuals may unknowingly infect their sexual partners. Sexual partners may also re-infect each other with the

same STD. This is known as the ► "ping-pong effect"; the disease travels back and forth between two partners.

Transmission from Mother to Child

Pregnant mothers who have STDs may pass the infection to their child before or during vaginal childbirth. The child may suffer serious health consequences. For example Chlamydia can cause serious eye and lung infections and Herpes can cause death or major damage to the central nervous system. These infections can be prevented by cesarean section delivery. Syphilis microbes, however, can infect the fetus after the first 3 months of pregnancy and result in death or lasting damage to major body organs (Daugirdas 1992).

HIV/AIDS

An STD on the rise: The prevalence of HIV and AIDS has steadily risen since the 1980s. The United Nations Programme on HIV/AIDS 2003) estimated that approximately 40 million people are infected worldwide. Furthermore the Centers for Disease Control and Prevention stated in a 2003 report that HIV and AIDS are increasing among women of childbearing age. In the United States alone, at least 200,000 children live with at least one parent who has HIV or AIDS (Murphy et al. 2006). HIV and AIDS may especially impact the family if the mother is infected, since mothers are generally the main caregivers of the family.

The Social and Psychological Impact of Mothers' HIV/AIDS on Their Children

The extent to which children are affected by their mother's illness varies greatly, and depends upon several factors including demographics, mothers' physical and mental health, the mother-child relationship, and unique characteristics of the child.

Demographics

Children's age and the ► socioeconomic environment that they are raised in largely determine how they are affected by their mothers' HIV/AIDS status. Masten and colleagues (1990) suggested that youner children are especially dependent on caregivers for protection. Therefore they are more likely to suffer the consequences of poor ► parenting due to their mothers' declining health. On the other hand, older children can more fully comprehend their mother's illness, have more developed psychological ► coping mechanisms, and can more easily draw upon the support of people outside of the immediate family when needed. Poverty is an added stressor for children that makes coping with their mothers' illness even more difficult.

Mothers' Physical and Mental Health

Although HIV-positive individuals are infected with the virus, they may still be in good health and have few or no symptoms. Nevertheless 30 to 40% of HIV-positive women have clinical levels of anxiety and depression, which in turn are risk factors for poor parenting, lower resilience among children, and less ability for family members to cope, support each other, and solve problems (Murphy et al. 2006). When mothers' disease progresses from HIV to AIDS, children often take on adult roles that they often may not be prepared for (► role taking). Physical and mental health enables HIV-positive mothers to properly care for and monitor their children, and assists children to effectively cope with their mother's illness.

Mother-Child Relationship

The manner in which HIV-positive mothers communicate with their children about their HIV status may also affect their children's health. Murphy and colleagues (2006) suggest that if HIV-positive mothers try to cope with their disease by simply avoiding it, their children are more likely to experience adjustment problems. They also suggest that HIV positive mothers inform and educate their children about their disease, they will have better relationships with their children, can more easily access resources to effectively cope with the family's situation, and will lead to better child adjustment (Murphy et al. 2006). Nagler and colleagues (1995) found that children who do not know about their mother's HIV-positive status often feel distressed because they are aware that something is wrong but feel unable to ask what is wrong.

Family Health Prevention

It is clear that the health of one family member can impact the health of other family members. Therefore preventing, diagnosing, and treating diseases such as STDs are important not only for the individual who has

the disease, but his or her family members as well. An ideal family health program should incorporate activities that promote behaviors directly related to physical health as well as improve communication among family members. Murphy and colleagues (2006) believe that to date, little is known about how to effectively provide services to families affected by HIV/AIDS. Providing services to promote family health are often a challenge because it requires the motivation and cooperation of several family members as well as a substantial amount of resources.

Cross-References

- ► Coping Mechanisms
- ► Human Immunodeficiency Virus (HIV)/ Acquired Immune Deficiency Syndrome (AIDS)
- ► Parenting
- ► Ping-Pong Effect
- ► Role Taking
- ► Sex/Gender
- ► Sexual Contact
- ► Social/Emotional Support
- ► Socioeconomic Environment

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Sexually Transmitted Infections (STI)

► Sexually Transmitted Diseases and Family Health

Sexual Maturation

► Pubertal Maturation

Sexual Maturity

► Pubertal Maturation

Sexual Practices

Synonyms

Sexual behavior; Sexuality

Definition

Sexual relationships and practices are complex to investigate, but their study is important because infectious disease has always been a possible outcome of sexual relationships, as has unwanted pregnancy. Concern about AIDS has been an important motivation for recent studies of sexual behaviors. Sexually transmitted infections are behavior-linked diseases that result from unprotected sex. Safe sex is sexual activity in which safeguards, such as the use of a condom and the avoidance of high-risk acts, are employed to reduce the chance of acquiring or spreading a sexually transmitted disease.

Sexual and Reproductive Health

Definition

Sexual and ► reproductive health addresses, within the framework of WHO's definition of health as a state of complete physical, mental and social well being, and not merely the absence of disease or infirmity, the reproductive processes and functions at all stages of life. Sexual and reproductive health hence implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how

often to do so. This implies certain rights, firstly that of men and women to be informed of and to have access to safe, effective, affordable and acceptable methods of fertility regulation of their choice. Secondly, the right of access to appropriate health care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant.

Shaking Palsy

► Parkinson's Disease

Shaman

Definition

Shaman is a member of certain tribal societies who acts as a medium between the visible world and an invisible spirit world and who practices magic or sorcery for purposes of healing, divination, and control over natural events in some indigenous communities.

Sheath

► Condom

Sheltered Work

Definition

Sheltered work facilities provide paid employment and educational and therapeutic programs to people with disabilities. Usually, employment in a sheltered work setting is transitional. However, it should lead to a regular job placement. The sheltered aspect ensures that the disabled persons are protected from some elements of real business life while nevertheless having the opportunity to build or rebuild job skills and experience a work environment. Workers with severe physical or mental impairments are offered employment where productivity is far less important. The focus is put on the therapeutic activities offered in a work like setting. For those cases, transition to the outside is often not considered a feasible alternative.

Shift Work

Definition

Shift work means any method of organizing work in shifts whereby workers succeed each other at the same workstations according to a certain pattern, including a rotating pattern, and which may be continuous or discontinuous, entailing the need for workers to work at different times over a given period of days or weeks.

Shift work is an employment practice designed to make use of the 24 hours of the clock, rather than a standard working day. Different kinds of work schedules and changing shifts are used. For example, from three shifts, each of eight hours, to four or more sets of employees who work twelve-hour shifts over a 48-hour period and take the subsequent 48 hours off. Shift work is known as a risk factor of work-related stress with the consequence of disturbing natural circadian sleep rhythms as well as the risk of behavioral changes.

Reasons for shift work are its clear effect on economy (increasing use of capital equipment and production compared to an eight-hour day) and the growing needs of modern 24-hour society. In present times, up to 30% of workers are exposed to different kinds of shift work, with an increasing trend.

Health effects of shift work may be summarized as follows: a reduction in the quality and quantity of sleep; widespread complaints of "fatigue"; anxiety, depression, and increased neuroticism; increasing evidence of adverse cardiovascular effects; possible increase in gastrointestinal disorders; and increased risk of spontaneous abortion, low birth weight, and prematurity.

A different but related concept of work shift means the time period during which a person is at work.

Shompen

► Indigenous Health, Asian

Short-Course

► DOTS

Short Tandem Repeat (STR)

Synonyms

Microsatellite DNA

Definition

A short tandem repeat (STR) is a type of polymorphism characterized by the repetition of two or more nucleotides (for example, 'CA') in multiple copies directly adjacent to one another in a DNA sequence. The lengths of the repeated sequences can vary from 2 to 10 nucleotides in length and are typically non-functional sequences of DNA present in the non-coding intronic regions of genes, thereby reducing the probability of their directly affecting gene function. Alleles of STRs are often characterized by the number of repetitions of the short sequence (e. g., 36 vs. 38) and can often have multiple alleles with relatively high frequency in the population. Beyond their use in research on the genetics of populations, forensic scientists often examine several STR loci in genetic materials and, by counting how many repeats are present within a specific STR sequence at a given locus, and doing this over a set of STRs, a unique genetic profile for an individual can be established, allowing forensic scientists to genetically 'fingerprint' individuals. For this reason, STR analysis is the most common method of identification employed in forensic cases. There are currently over 10,000 published STR sequences in the human genome.

Short-Term Rehabilitation

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Synonyms

Sub-acute care

Definition

Short-term rehabilitation follows an acute illness, injury, or surgical procedure like a hip replacement. Short-term rehabilitation is considered appropriate when there is a reasonable medical expectation of a significant functional improvement within 2 to 3 months after initial treatment. It focuses on establishing the prior level of function that will allow the patients to return home; however, there are also cases where transfer to a long-term rehabilitation setting is required. The services are performed either in the rehabilitation unit of a hospital, in specialized rehabilitation hospitals, or in outpatient settings. Depending on the rehabilitation requirements, the services are performed by the respective specialist, e. g. a physiotherapist after a broken leg, or by an interdisciplinary ► rehabilitation team.

Basic Characteristics

Delivery Process and Setting

Short-term rehabilitation covers the first phase of rehabilitative care following acute illness or injury. It usually starts in the hospital setting under the supervision of the admitting physician or surgeon. It is then often continued in a rehabilitation hospital due to the increasing pressure on hospitals to discharge their patients early. The objective of the delivery process is to get the patients to the point where either a more definitive rehabilitation can occur or the patients are able to return to home and resume their lives in the community. Short-term rehabilitation is characterized by a timeframe of 2 weeks to 3 months and is impairment driven. It can be observed that short-term rehabilitation services are increasingly being shifted to inpatient or outpatient community settings. Similar to medium and long-term rehabilitation delivery, short-term rehabilitation often uses a comprehensive, interdisciplinary team approach with the patient and their family being at the center of the treatment plan.

Services Offered

Although the focus of short-term rehabilitation is put on the recovery aspect, the full range of rehabilitation services might be applied. This includes ► physical therapy, ► occupational therapy, ► speech therapy, and other daily therapies like aquatic therapy, massage therapy, or recreational therapy. The services are usually provided to patients of all ages with the goal of achieving maximum physical, social, and emotional independence. Inpatient rehabilitation units or hospitals ensure

close medical supervision, with physicians available 24 hours a day. There are also registered nurses and therapists to allow comprehensive rehabilitation program to be offered.

Conclusion

In many health care systems worldwide, there are still inefficiencies at the interface of acute care and short-term rehabilitation, which might result in prolonged disease states and additional costs for the system. Going forward, additional focus should therefore be put on the integration of inpatient acute care, the rehabilitation unit, and outpatient care. This implies that the rehabilitation efforts have to be started early, ideally in parallel to the curative measures, to ensure an integrated and holistic treatment approach.

Cross-References

► Occupational Therapy
► Physical Therapy
► Speech Therapy

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Sick Building Syndrome

Synonyms

Indoor air quality

Definition

The term "Sick building syndrome" (SBS) is used to describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified. Causes of SBS are inadequate ventilation, poor heating, bad acoustics, chemical contaminants from indoor sources, chemical contaminants from outdoor sources, and biological contaminants. Building occupants complain of symptoms associated with acute discomfort. These symptoms include headaches; eye, nose, and throat irritation; a dry cough; dry or itchy skin; dizziness and nausea; difficulty in concentrating; fatigue; and sensitivity to odors. With SBS, no clinically defined disease or specific chemical or biological contaminant can be determined as the cause of the symptoms. Most of the complainants feel relief soon after leaving the building. This spectrum of specific and non-specific complaints, when tied to a particular building, became known as the "sick building syndrome." It is important to note that "sick building syndrome" is not the same as "building related illness" which refers to a specific airborne building contaminant. One well known example of this is Legionnaires' Disease.

Sick Leave

Synonyms

Sickness pay; Sick pay

Definition

Sick leave is a paid form of sickness absence. Provisions (levels of compensation or duration of leave) for employee sick leave vary from country to country and depend on legislation or social security systems. Usually, it covers leave due to personal illness or injury certified by medical doctors or other types of authorized body. The term sick leave, in some countries, covers absence of an employee from work to care for or support ill family members.

Sick leave is better understood as an interplay between the individual's health contra the social insurance system; levels of benefits; type of work; flexibility at work by lowered working capacity; attitudes towards work; and other medical, social, and psychological factors.

Sickness Pay

► Sick Leave

Sick Pay

► Sick Leave

Side Effect

Synonyms

Adverse drug reaction; Adverse events; Adverse effect

Definition

Side effects are problems that occur when the medical treatment goes beyond the desired therapeutic effect or that occur in addition to the desired effect. In many countries, law requires side effects to be reported and they have to be researched in clinical trials. Drug manufacturers have to list all the known side effects of their products in patient information leaflets supplied with the drugs. As side effects are a function of dosage or drug level at the target organs, they may be decreased or avoided by adjusting the dosage. Another potential cause of side effects is drug interactions. It is therefore crucial that a physician checks all the medicaments a patient takes for potential harmful interactions. In some cases, side effects might be reduced by the use of a second medication or a change in lifestyle or diet. In the case of cancer treatment, characteristic side effects are fatigue, nausea, vomiting, decreased blood cell counts and hair loss.

Cross-References

► Adverse Drug Reaction
► Adverse Effect

Significance

Definition

Statistical significance is the conclusion that an intervention has a true effect, based upon observed differences in outcomes between the treatment and control groups that are sufficiently large such that these differences are unlikely to have occurred due to chance, as determined by a statistical test. Statistical significance indicates the probability that the observed difference was due to chance if the null hypothesis was true, it does not provide information about the magnitude of a treatment effect. Statistical significance is necessary but not sufficient for clinical significance. Clinical significance is the conclusion that an intervention has an effect that is of practical meaning to patients and health care providers. Even if an intervention is found to have a statistically significant effect, this effect might not be clinically significant.

Significance Probability

► Statistical vs. Clinical Significance

Similar Trends of Health Care Systems Reform

► Health System in Dentistry

Simple Chancre

► Ulcus Molle

Simple Nucleotide Polymorphism

► Single Nucleotide Polymorphism (SNP)

Simple Phobia

► Anxiety Disorders
► Specific Phobia

Simulation

► Modelling

Simultaneous Vaccination

Synonyms

Simultaneous immunization; Combined vaccination; Combined immunization

Cross-References

► Immunization, Active

Single-Celled Eukaryotes

► Protozoa

Single Nucleotide Polymorphism (SNP)

Synonyms

Simple nucleotide polymorphism

Definition

A single nucleotide polymorphism (SNP, pronounced '*snip*') is a variation in DNA occurring when a single nucleotide (A, T, C, or G) at a particular site in the genome differs between members of a species. An example might be that if two stretches of DNA sequence at the same site in two different individuals were sequenced and revealed to be TTGC*T*ATT in the first individual and TTGC*A*ATT in the second, they would contain a difference in a single nucleotide. In this hypothetical example, if both the A allele and T allele at this site were sufficiently frequent on the chromosomes of the population of interest, the variants at this genomic site would be designated as a biallelic SNP. SNPs have been identified throughout the genome: within genes in both coding and noncoding regions, as well as in the regions between SNPs. SNPs can manifest functional effects on the final protein product if they alter ► transcription, post-transcriptional splicing, or the actual mRNA transcript. Among SNPs which fall in coding regions, SNPs which alter coding sequence incorporated into mRNA transcripts are said to be synonymous coding SNPs if the ribonucleotide they change does not change the amino acid incorporated (due to degenerate coding); SNPs which alter both the coding sequence and the amino acid incorporated are said to be non-synonymous coding SNPs. SNPs make up 90% of all genetic variations in the human genome, and SNPs with a minor allele frequency greater than 1% occur an average of once every 100 to 300 bases in the human genome. Also, approximately 66% of SNPs include substitutions of the nucleotide cytosine (C) with thymine (T). Currently, the largest collection of identified SNPs is of the 2.4 million SNPs which have been identified by the International HapMap Project. SNPs are useful in the genetic research of populations for their ability to characterize variability over large portions of the genome.

Size of Effect

► Statistical vs. Clinical Significance

Slapped Cheek Syndrome

► Erythema Infectiosum

Sleeping Sickness

Synonyms

African trypanosomiasis; Infection with Trypanosoma brucei (T. brucei gambiense and T. brucei rhodesiense)

Definition

Sleeping sickness, which is found in Africa, is caused by *Trypanosoma brucei gambiense* and *Trypanosoma brucei rhodesiense*. It is transmitted by the bite of the tsetse fly. After an interval of 10 days, a red papule develops at the place of the bite. A generalized infection, with fever, flue-like symptoms, pressure pain over the long bones, splenomegaly and cardiac arrhythmias, occurs 3–10 days later. During the following chronic stage, central nervous system symptoms appear with epileptic seizures, sensory and motor impairments and a progressive dementia. Without treatment the disease takes a lethal course due to the progressive degeneration of the central nervous system. A quick onset of therapy is important. In the early stage pentamidine (Pentacarinat®) or suramin (Metaret®) are effective, in later stages very toxic arsenic compounds (like Arsobal®) have to be used in combination with steroids. Tsetse flies are exterminated with insecticides and flytraps; moreover, prophylaxis of insect bites is useful.

Cross-References

► Tropical Diseases and Travel Medicine

Sleep Stage

Definition

Several stages of sleep can be identified from EEG responses. On relaxing prior to sleep, the EEG pattern changes from rapid, irregular waves to a regular pattern – the alpha rhythm. This is followed by sleep stage 1, which is characterized by prolonged reductions in wave amplitudes and frequencies. Later, in sleep stage 2, the pattern changes to consist of bursts of waves (spindle waves) mixed with single, slow waves of relatively large amplitude (K-complexes). About 30–45 minutes later, periods of slow, high amplitude waves (delta waves) appear in the EEG (stage 3). When the delta waves occur for about 50% of the recording period, the deepest stage, sleep stage 4, has been reached. About an hour and a quarter later, the EEG pattern resembles that found in stage 1, but electrodes placed near the eye reveal joint rapid eye movements (REM). In this sleep stage most dreaming occurs.

Smallpox

Synonyms

Smallpocks; Variola

Definition

Smallpox, which have been known for thousands of years, is a viral infectious disease transmitted by droplets. Humans are the only reservoir of the virus. Following an incubation period of 1–2½ weeks the outbreak of the disease is characterized by fever and shivering fits. Later, vesicles develop all over the body, which on healing leave scars. Without treatment, the outcome is lethal in about 30% cases, complications are blindness, deafness, pareses and brain damage. At the end of the 18th century, Edward Jenner developed a vaccine against smallpox. Thanks to a WHO vaccination program, which was started in 1967, smallpox have been eradicated; in May 1980 WHO certified the world to be free of smallpox. Variola viruses are stored at two places, in a research center of the CDC in Atlanta and in a Russian research center near Novosibirsk. The devastating use of variola viruses in biological warfare can only be imagined.

Small Settlement

► Hamlet

Smear Infections

► Fecal-Orally Transmitted Diseases
► Food-Safety and Fecal-Orally Transmitted Infectious Diseases

Smog

Definition

Smog is a contraction of the words smoke and fog, suggested by a London physician, and it has been in common usage since the beginning of the 20th century. It is a common term that indicates the presence of an enormous amount of pollutants in the air around a large human settlement. Two different types of smog have been described – winter smog (London smog or industrial type of air pollution), and summer smog (photochemical smog or Los Angeles type), depending on the period of year in which it appears, and the presence or relative absence of solar UV radiation. Originating merely during the daytime, Los Angeles smog is a phenomenon characterized by a high concentration of ozone, haze, a characteristic odor, eye irritation, and plant damage. London smog, not related only to Great Britain's cities but also to other parts of the industrialized world, is a phenomenon produced by the unrestricted use of coal, primarily that containing large amount of sulfur. For this extreme atmospheric air pollution (smog episodes), numerous diverse sources and a variety of pollutants may be responsible (► Air Quality and Pollution), but major pollutants are carbon monoxide (CO), hydrocarbons, nitrogen oxides (NO_x), sulfur dioxide (SO_2), suspended particles, and ozone (O_3). Almost all disastrous smog episodes observed have occurred during certain unfavorable weather conditions such as cloud, dense fog, temperature inversion and dead calm lasting several consecutive days. In sufficient concentrations, accumulation of these substances leads to poor air quality, and affects human health, living matter and other materials. Considering health effects during smog episodes, increased morbid-

ity and mortality rates (an unusually large number of deaths) have been reported among vulnerable population groups – premature infants, newborns, the elderly, the infirm, and those with chronic pulmonary and/or heart diseases. Commonly registered diseases and complaints are as follows: a) acute upper respiratory tract illnesses, and complaints – nasal and throat irritation; b) lower respiratory tract illnesses (bronchitis, asthma, pneumonia), and corresponding symptomatology like chest constriction and pain, cough, shortness of breath; c) ocular mucous membrane symptomatology – eye irritation and lacrimation; and d) other complaints – headache, nausea and even vomiting.

Smoking

► Tobacco Consumption

Smoking Behavior

Synonyms

Nicotine use; Tobacco use

Definition

Cigarette-smoking leads to an increased risk of heart disease, cancer, both leading causes of death in Northern Europe and the United States. Although smoking declined steadily in the 1970s and 1980s, it levelled off in the 1990s. Men are more likely to smoke than are women – 27 per cent and 22% respectively in the United States although those rates are changing. Smoking is so addictive that fewer than 20 per cent who desire to quit are successful in doing so. Nausea, constipation or diarrhoea, drowsiness, lack of concentration, insomnia, headache and irritability are withdrawal symptoms frequently occurring in nicotine dependence who quit smoking. The prescription of bupropion has shown some success in helping smokers quit. This drug does not contain nicotine and was originally developed as an antidepressant drug. Other alternatives to alleviate withdrawal symptoms and craving include nicotine replacement therapy in the form of gum, patches, nasal sprays, and oral inhalers.

Smoking and Family Health

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Synonyms

Tobacco and Family Health

Definition

The health and financial impact of tobacco use on families.

Basic Characteristics

Worldwide, nearly half of middle-school students report being exposed to secondhand tobacco smoke from others in their home. Students in Meghalay, India, report the highest exposure in the home at 79.8 percent (Global Youth Tobacco Survey Collaborative Group 2002). In the United States, where public policy has largely eliminated exposure to secondhand smoke in public places, 43% of children continue to live with at least one smoker (CDC 2003). Parental smoking results in numerous negative consequences on child and family health, as well as on the financial welfare of families.

Smoking and Pregnancy

Smoking reduces the fertility of women. Studies have shown that smokers take longer to conceive than non-smokers, and this includes women exposed to passive smoke. Smoking impairs the normal function of the fallopian tubes, alters the normal physiological levels of the reproductive hormones, reduces the chances of embryo implantation and increases the risk of pelvic inflammatory disease by altering the immune function. In men, some research has shown that cigarette smoking is associated with modest reductions in ► semen quality including sperm density (the total number of sperm cells per ml of semen) and motility (USDHHS 2004).

If a smoker does become pregnant, the rate of ► ectopic pregnancy doubles as well as the likelihood of many other pregnancy complications, including decrement in

birth weight, low birth weight and premature labor. In the US, some 20 percent of ► low birth weight births, eight percent of ► preterm deliveries, and five percent of all prenatal deaths are linked to smoking during pregnancy, making smoking the most important modifiable cause of poor pregnancy outcome (USDHHS 2004).

Non-smoking women exposed to tobacco smoke during pregnancy also are at risk for complications. Secondhand tobacco smoke is causally associated with decrement in birth weight, low birth weight, and preterm delivery. Other perinatal health effects that are possibly associated with secondhand smoke exposure are ► intrauterine growth retardation, congenital malformations and spontaneous ► abortion (IARC 2004).

Impact of Smoking on Child Health and Behavior

For young children, the major source of tobacco smoke is smoking by parents and other household members. Maternal smoking is usually the largest source of tobacco smoke exposure because of the cumulative effect of pregnancy and close proximity to the mother during early life. Furthermore, children of smokers are more likely to take up the habit themselves because they copy the behavior of adults and will perceive smoking as the norm if they grow up in a household where adults smoke (USDHHS 2000).

Exposure to tobacco smoke results in numerous childhood illnesses. Maternal smoking during and after pregnancy is causally associated with ► sudden infant death syndrome (SIDS), otherwise known as cot-death – the unexpected death of a seemingly healthy infant while asleep (USDHHS 2004). Infants of mothers who smoked during pregnancy are three times more likely to die of SIDS than those whose mothers were smoke-free; exposure to secondhand smoke doubles a baby's risk of SIDS. Investigations throughout the world have also shown significant increases in the frequency of bronchitis and pneumonia during the first year of life of children with parents who smoke (IARC 2004). Data from numerous surveys demonstrate greater frequency of the most common respiratory symptoms: cough, phlegm, and wheeze in the children of smokers (IARC 2004).

Exposure to tobacco smoke also reduces the rate of lung function growth during childhood. Having parents who smoke across the childhood years is estimated to reduce the maximum level of lung function reached by several percent. Evidence also indicates that exposure to tobacco smoke causes the onset of new asthma among children. Studies have found a significant excess of childhood asthma if the mother or both parents smoke. Exposure to tobacco smoke also worsens the severity of asthma in children already with it. In this regard, exposure to smoking in the home has been shown to increase emergency room visits and medication use by asthmatic children. There is also a causal relationship between exposure to tobacco smoke and otitis media (middle-ear disease or glue-ear) in children. Exposure to secondhand smoke has been evaluated as a risk factor for childhood cancers, however the evidence is limited and does not yet support conclusions about the nature of the observed associations between exposure and any childhood cancer (IARC 2004).

Impact of Passive Smoking on Spouse

► Active smoking by a parent also has negative health consequences for the non-smoking spouse. The first major studies that reported on ► passive smoking and lung cancer in non-smoking adults were based on studies of nonsmoking women married to cigarette smokers (USDHHS 1986). The excess risk of lung cancer in non-smokers married to smokers is currently estimated at 24% (IARC 2004). Besides lung cancer, exposure to tobacco smoke is also associated with coronary heart disease and data suggest that exposure may play a role in the genesis of chronic respiratory symptoms and produce small, but measurable, decrements in pulmonary function (IARC 2004).

Impact of Active Smoking on Smoker

Smoking is now identified as a major cause of heart disease, stroke, several different forms of cancer, and a wide variety of other health problems (USDHHS 2004). The vast majority of deaths caused by smoking occur through development of heart disease and lung cancer, followed by chronic bronchitis, stroke, peripheral vascular disease and other circulatory diseases, and cancers other than lung (USDHHS 2004). If cigarette smokers commence smoking as teenagers and do not quit, then eventually about half of them are killed by tobacco in middle or old age. This excess burden of death falls particularly heavily upon the 45–64 year old age group. Smokers between these ages are three times more likely to die prematurely than lifelong non-

smokers of the same age, and in the 65–84 age group, smokers are around twice as likely to die compared to lifelong non-smokers (WHO 2002). Illness and death caused by active smoking during these key years in which individuals are typically involved in raising children result in direct financial and emotional distress in families.

Impact of Smoking on the Family Finances

Smoking results in multiple financial costs for families. Money spent on cigarettes represents resources that could have been spent on other products for the family, such as food or education. Health care costs also rise in families with at least one smoker. Studies from the US indicate that the expected health care costs related to respiratory symptoms for children from households where one person smoked increase by 13% while if 2 or more smoked, the health care costs are 25% higher than non-smoking households. In total, exposure to parent smoking is estimated at $4.6 billion in annual direct medical costs (Aligne, Stoddard 1997). Health care costs for the smoker also rise dramatically. Family income is also reduced due to lost wages from absenteeism caused by illness. In many countries smokers must also now pay more for life insurance.

Smoke-Free Homes

In many countries, public policy has successfully reduced exposure to second-hand smoke, especially among working adults (USDHHS 2002). Public policy and educational campaigns have also resulted in an increasing number of households implementing voluntary bans. However, homes remain a primary location of tobacco smoke exposure for many children and non-smoking adults. Second-hand smoke in the home is a major source of exposure because children spend most of their time at home and indoors. Unlike adults who can choose whether or not to be in a smoky environment, children have little choice. They are far less likely to be able to leave a smoke-filled room if they want to: babies cannot ask; some children may not feel confident about raising the subject; and others may not be allowed to leave even if they do ask. Public education and interventions, in addition to stronger public smoking restrictions, can be implemented in order to improve family health.

Cross-References

- ▶ Abortion
- ▶ Active Smoking
- ▶ Ectopic Pregnancy
- ▶ Intrauterine Growth Retardation (IUGR)
- ▶ Low Birth Weight
- ▶ Passive Smoking
- ▶ Preterm Delivery (PTD)
- ▶ Semen Quality
- ▶ Sudden Infant Death Syndrome (SIDS)

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SNP (Single Nucleotide Polymorphism)

Definition

Any polymorphic variation at a single nucleotide (single base substitution). Although the term polymorphism is used, SNPs are considered to be the most important genetic basis of complex (multifactorial) diseases. Thus, the term variant instead of polymorphism would be more appropriate.

Social Action Theory

Definition

The social action theory attempts to integrate social contextual factors which builds on social cognitive learning theory, models of self regulation, processes of social interdependence, social interaction, and underlying biological processes to predict health-protective behaviors and outcomes. It views the person as influenced by environmental contexts or settings to which he or she brings a particular temperament and biological context. Thus, a person's capacity to practice healthy eating habits and to exercise is influenced by access to health-enhancing foods and safe places to exercise and by internal goal structures, self-efficacy beliefs, and problem-solving skills.

Social Anxiety Disorder

► Social Phobia

Social Anxiety Disorder of Childhood

Definition

In this disorder, there is a wariness of strangers and social apprehension or anxiety when encountering new, strange, or socially threatening situations. This category should be used only where such fears arise during the early years, and are both unusual in degree and accompanied by problems in social functioning. This is an avoidant disorder of childhood or adolescence.

Social Capital

► Social Resources

Social Causation

► Health Determinants, Social

Social Cognitive Theory

► Social Learning Theory

Social Control

Definition

The social processes that govern individual actions such that they are consistent with group norms, values, and rules. In addition to explicitly institutionalized rules and governing structures (e. g. a criminal justice system), social control is maintained through the interpersonal interactions as part of social monitoring and social reinforcement. Individuals in relative positions of power (e. g. parents, teachers, peer leaders) display appropriate behavior and attitudes, monitor the extent to which other group members display similar behavior and attitudes, and reinforce behavioral norms and accepted values and attitudes through positive reinforcement (social sanctioning) and negative reinforcement (social stigma).

Social Determinants

► Social Factors

Social Determinants of Health

► Health Determinants, Social

Social Development

► Social Transition

Social Diseases

► Sexually Transmitted Diseases

Social/Emotional Support

Synonyms

Mentoring; Caretaking; Advising; Providing

Definition

There are three primary categories of social support: emotional support, guidance support, and tangible support. Emotional support includes behaviors that express physical affection and concern for well-being. Guidance support is the provision of knowledge, advice, or mentoring on how to achieve a goal. Tangible support is the provision of any type of resource including money, food, housing, transportation, etc.

Social Factors

Synonyms

Social determinants

Definition

Health is influenced by genetic, psychological, and social factors, in addition to factors related to health care provision. Social factors are defined as influences produced by macrosocial and/or microsocial environments that are mediated either by health-related behaviors or by emotional and stress-related reactions. A macrosocial environment is characterized by societal features such as class structure, labor market, income distribution, and social integration. A microsocial environment relates to settings of everyday life, including family and neighborhood, social networks, schools, and workplaces. These influences impact on health by either protecting or promoting health, or by deteriorating well-being. In general, health adverse social factors follow a social gradient, with poorer health among people with lower socioeconomic status, as measured by education, income, or occupational standing.

Social Health

Definition

Social health refers to the ability of an individual to form relationships with his or her social environment, including parents, peers, superiors and society.

Social Health Insurance

Definition

The term social health insurance refers to health insurance schemes that are heavily regulated (most importantly premium rate restrictions, standardized benefits, and mandatory coverage) in order to avoid problems of ► adverse selection and provide comprehensive coverage. Premiums in social health insurance are either community-rated, income-dependent, or a mix of both.

Social Identity

Synonyms

Group identity

Definition

Social identity refers to psychological and sociological elements of behavior and attitudes derived from belonging to a particular group. Each individual has both social and personal identity, each informing the individual of who he is and what this identity entails. Which of these many identities is most salient for an individual at any time will vary according to the social context. Social identity may explain when and why individuals identify with, and behave as part of, social groups.

Cross-References

► Cultural Identity

Social Inequalities in Dentistry

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Definition

Social inequality refers, on the one hand, to a distinction between sections of the population according to typical features: education, income and professional status. These features also permit a subdivision of the population into a "top section" and a "bottom section" (so-called vertical social inequality). With these data a relatively correct estimate of the "socio-economical status" of an individual is possible so that this individual can be categorized in a hierarchical scale or a "social stratum". On the other hand, the population can be classified according to further features: age, sex, marital status and nationality. Between these two groups, too, social inequalities may exist. Where the differentiation between these groups crosses the differentiation of the vertical social inequality, an estimation of an individual's status can be made; the term horizontal social inequality is used in this respect (Mielck 2005). Social inequality has a lifelong impact on people's general health and, therefore, on their oral health: lower socio-economical status equates with more susceptibility to (oral) diseases, less (oral) health and shorter life expectancy.

Basic Characteristics

General Background

To What Extent is this a Problem in Germany? In Germany approximately 9% of the population live below the ► poverty line. The Advisory Council on the Assessment of Developments in the Health Care System states in the "Socio-economical Status and Health" chapter of its report dated 2005:

If the population living in Germany is classified into five strata equal in size according to the features Income, Education and Professional Status (Quintile), the group of the population of the lowest "quintile" of each age – from birth to death – has, at a rough guess, a double risk to fall seriously ill compared with the group of the population of the top "quintile". This refers to all major diseases, including ► oral diseases, except breast cancer, alcoholism and allergies. The social inequalities in matters of health chances, (oral) health, and life expectancy decrease continually the lower the income and education and the lower the social status of the individual are (SVR 2005).

However, it becomes rather evident that even the lowest social stratum benefits from the overall increase in the population's health, e. g. a longer life expectancy which is per decade a bit more than a year. In addition, the lowest social stratum also benefits in that the elderly, in general, now maintain better health as they grow older. But these so-called benefits in health have an unequal distribution within the population and the social inequality continues to increase in most European countries (Rosenbrock 2006 with further evidences).

Specific Background

The Social Determinants of Oral Health (SDOH) For a long time the (oral) health status of the population has mainly been defined by the delivery and financing of medical care. However, scientific surveys show that in highly developed countries the groups which have the highest risk of falling ill or dying young have:

- the lowest income;
- the lowest education level;
- the least possibilities to structure their lives;
- the lowest social assistance by small social networks (social support); and
- the lowest political influence – as an individual and also as a group (Rosenbrock 2006; Mielck and Bloomfield 2001).

In short: the poor have a shorter life and fall ill more frequently than the rich. Due to this finding science and politics are more and more interested in the fact that health, including *oral diseases*, reacts very seriously to social environmental influences, the so-called *social determinants of oral health (SDOH)* (Bund, 2005). The most important SDOHs with a lifelong impact on health are (WHO 2004):

- education and care in early life,
- social exclusion/inclusion,
- job security and working conditions,
- income inequality,
- stress,
- social support,
- general access to medical care,
- housing and food security,
- physical environment.

Thus, socio-economical conditions influence the health status of individuals more than personal health behaviors and medical care. However, not only the objective stresses on an individual need to be considered but also the individual's possibilities and capacities to accept

these strains and to deal with them need to be considered (Sense of Coherence). Thus, the health strain per se is not the important factor: it is the individual's coping resources that matter. In this context, the personal health behavior of an individual is influenced by this interaction and also by the kind of health care provided. Marmot and Wilkinson (1999) have written an extensive and recommendable paper on Social Determinants of Health.

Social Inequality and Oral Health Many surveys on the prevalence of oral disease in the population have been made in Germany and internationally and they show that ► dental caries is the most investigated dental disease, particularly in children and young adults. Comparative cross-section studies carried out in the industrialized countries of western Europe and in the USA show that since the 1970s there has been a continual decrease in the frequency of caries (caries decline). Of particular interest is the improvement in the oral health of the 12-years-age group in Germany. This is a real success story of the efforts made in dental prevention in children and young adults. The scientific studies show that, in addition to the effects of poor eating habits and poor oral hygiene, there is a series of biopsychological and behavioral disease risks which support the formation of caries. The vertical as well as the horizontal social inequality has visible influence on the caries prevalence in the population. Thus, the vertical social risks (poor education, low income) are, amongst others, the cause of – in comparison with other countries of similar standard – poor dental health in the lower social stratum, compared to the upper stratum of the population. This example of the 12-year-olds in Germany shows that the major caries frequency is concentrated in a relatively small group of individuals. In 1997, 61% of all DMF-Teeth (► DMFT-Index) of the 12-year-olds were diagnosed at 22% of the children of this age group (IDZ 1999). In 2005, 10% of the 12-year-olds had 61% of all DMF-Teeth. Although these figures indicate that the risk group has decreased, in fact – on the contrary – the polarization of caries has increased (IDZ 2006). Table 1 shows the influence which social strata (here: school education of the parents) exerts on the oral health of children and young adults. The proportion of naturally healthy dentition in children and young adults in the upper class is quite above the proportion in the social underclass.

Social Inequalities in Dentistry, Table 1. Percent naturally healthy dentition in 12-year-olds dependent on the school education of the parent

Year	Naturally healthy dentition by 12-year-olds (%) School education of the parents		
	Low	Average	High
1989 (First German oral health study DMS I)	9.5%	13.0%	28.6%
1997 (Third German oral health study DMS III)	44.8%	34.3%	50.1%
2005 (Fourth German oral health study DMS IV)	68.0%	67.3%	75.4%

Source: German oral health surveys 1989, 1997, 2005

For dental public health these findings are of great political significance regarding the prevention and care of a very high proportion of children and young adults of lower social class (caries polarization). An analysis carried out in connection with the Third German oral health study made clear that caries is particularly frequent in the young adult age group:

- who do not see a dentist for regular check-ups;
- who do not brush their teeth twice per day after the meals; and
- who have never had a professional instruction on correct tooth brushing (IDZ 1999).

However, caries polarization is not only observed in children and young adults. This socio-medical problem exists in all age groups and at different levels of severity. The second major oral disease, periodontal disease (periodontitis), shows clear stratum-specific differences with regard to its frequency in the population (Micheelis 2001). Thus, in the group of the 35–44-year-olds 32.9% of low education level, 19.1% of average education level and only 13.4% of high education level in the population suffer from a severe periodontitis (► CPI level 4) (IDZ 2006).

It is also evident that although the bottom social strata profits from prevention measures, these advantages and benefits of oral health care are, of course, less marked and significant than in the top social strata.

Consequences

Strategies Oral health promotion strategies can be orientated either towards the population as a whole or

towards groups or individuals at risk of disease. The risk of suffering from many chronic diseases can be reduced by actions to reduce smoking and alcohol consumption and improve diets. These approaches also have an impact on the prevalence and severity of oral diseases. In addition, the use of fluorides reduces the prevalence of tooth decay. This strategy focuses on the whole population with an additional emphasis on some of the more vulnerable groups (e. g. ► setting concepts). The absolute objective is to reduce inequalities in oral health. On the one hand, it is, therefore, of great importance in public health research to draw the attention to societal responsibility, i. e. that a multitude of economical and social decisions also include very important decisions concerning health matters. On the other hand, the health resources of the population must be strengthened. The most important ressources are self-consciousness and self-confidence, self-efficiency, education, income, participation, involvement in social networks and possibilities for relaxation and recovery. Reducing stress and increasing resources are potential strategies to reduce social inequalities in oral health matters and life chances. Generally formulated strategies to strengthen the social determinants of health are: Promotion of employment, job security and healthy working conditions; protection of universal access to a quality health system; expansion of early childhood education and care programs; provision of adequate housing and food; reduction of income disparities; support of social networks.

Conclusion

Poor oral and general health are more common in areas of relative deprivation and poverty. The wider social determinants of health have, of course, an impact on oral health. All fields of politics, explicit health policies, primary and secondary prevention as well as health promotion and the curative and rehabilitation fields, are influenced by the interaction and correlation of social situation and health status. Therefore, those involved in politics, public health research, health care research and prevention and health care in Germany must deal with the social determinants of oral health (SDOH) in order to analyze the causes of health deficits and to develop strategies orientated per se towards better general and oral health. Priority should be given to social inequality as a primary determinant of health status.

Cross-References

- ► CPI (Community Periodontal Index)
- ► Dental Caries
- ► DMFT-Index
- ► Oral Diseases
- ► Poverty Line
- ► Setting Concept

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Socialization

Synonyms

Acquiring social identity

Definition

Socialization is the process by which individuals learn to adopt the behavior patterns of the community in which they live. This process is typically thought to occur during the early stages of life, during which individuals develop the skills and knowledge necessary to function within their culture and environment. However, this also includes adult individuals moving into an environment significantly different from one(s) in which they have previously lived and must thus learn a new set of behaviors. Socialization for social agents refers to all learning regardless of setting or age of the individual. In every group one has to learn the rules, expectations, and knowledge of that group, whether the group is your family, the army, or the state (nation). Socialization is the process whereby people acquire a social identity and learn the way of life within their society.

Social Justice

Definition

In the field of public health social justice refers to reducing differences in current health status and ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. It is a big concern in as much as increased costs of health care have brought along disparities in its distribution and accessibility within a specific population and at global level.

Social Learning Theory

Synonyms

Social cognitive theory; Cognitive social learning; Cognitive learning theory

Definition

The social learning theory, also called Social Cognitive Theory, not only explains how people "learn" and maintain certain behavioral patterns, but also explicates factors influencing health behaviors and thereby provides the basis for intervention strategies for the promotion of behavioral change. Human behavior is explained in terms of a triadic, dynamic, and reciprocal model, in which behavior, personal factors (including cognitions), and environmental influences all interact.

The Social Learning Theory is widely used since its concepts are easy to operationalize for health promoting interventions: role models can be used to model positive outcomes, to correct misconceptions, to demonstrate self-reward, to reflect mastery, to point out opportunities, to signal social support, etc.

Social Marketing

Definition

The term "social marketing" is defined as "the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence voluntary behavior of target audiences in order to improve their personal welfare and that of their society". Social marketing began as a formal discipline in 1971, with the publication of "Social Marketing: An Approach to Planned Social Change" in the Journal of Marketing by marketing experts Philip Kotler and Gerald Zaltman. Speaking of what they termed "social change campaigns", Kotler and Roberto introduced the subject by writing "A social change campaign is an organized effort conducted by one group (the change agent) which attempts to persuade others (the target adopters) to accept, modify, or abandon certain ideas, attitudes, practices or behavior". Social marketing is distinguished from other management approaches by six basic principles: (1) the marketing conceptual framework is used to design behavior change interventions; (2) there is recognition of competition; (3) there is a consumer orientation; (4) formative research is used to understand consumers' desires and needs; (5) there is a segmentation of populations and careful selection of target audiences; and (6) continuous monitoring and revision of program tactics help to achieve desired outcomes.

Social Maturation

► Social Transition

Social Networks

Definition

Social networks are the social relations and links between individuals which may provide access to or mobilization of social supports for health. They are long-lasting but non formalized structures and relations between individuals and/or groups. As opposed to the cooperation of organizations and institutions, social networks provide support to the individual who needs to cope with stressful living circumstances (e. g. diseases), and promotes health at an individual level. Social networks can be divided into primary social networks (e. g. family, relatives and friendships), secondary social networks (e. g. self help organizations) and tertiary social networks (professional advice centers, hospitals, physicians, etc.).

Social Phobia

Synonyms

Social anxiety disorder

Definition

Social phobia is characterized by a permanent and exaggerated fear of one or more social situations in which a person might be confronted with strangers or might be evaluated by other people. Transition to social anxiety, a common phenomenon known by virtually all people, is smooth. Characteristically, people fear to show a behavior (e. g. trembling, blushing, sweating) that could be humiliating or embarrassing to them. Other typical fears are that people could notice halting or rapid speech. Fears of fainting, losing control of bowel or bladder function, or having one's mind going blank are also not uncommon. Social phobias generally are associated with significant anticipatory anxiety for days or weeks before the dreaded event, which in turn may further handicap performance and heighten embarrassment. This fear occurs when anticipating a situation that is perceived as threatening, usually leading to avoidance of the situation.

Cross-References

► Anxiety Disorders

Social and Physical Factors Influencing Human Health

► Health Determinants, Environmental

Social Policy

► Social Welfare Policy

Social Psychiatry

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Synonyms

Cross-cultural psychiatry; Psychiatric sociology; Community psychiatry

Definition

Social psychiatry is concerned with the relationships between mental disorders and sociocultural processes. Social psychiatry has the aim to view the patient and the context in which he or she lives or works as a field in which one element affects all others in circular fashion. One of the main goals of social psychiatry is to reintegrate the patient into society (► socialization). The label social psychiatry is often used to include other labels, i. e., transcultural psychiatry; cross-cultural psychiatry; crossnational, transnational, or international psychiatry; intercultural psychiatry; ethnopsychiatry, and comparative psychiatry. ► community psychiatry is practiced social psychiatry.

Basic Characteristics

Introduction

At the turn of the 19th century, the "moral treatment" for hospitalized psychiatric patients in Europe was introduced. The positive relations among the patient's environment and humane social interactions, on the one hand, and an improvement in patients' functioning on the other hand, were recognized. The importance of social psychiatry became obvious in the United States

at the beginning of the 20th century with the work of A. Meyer. He became well-known for emphasizing many important social factors and integrating social work into his psychiatric treatment settings (Brady 1975). Many American psychiatrists and other mental health professionals followed in Meyer's footsteps: Among them, K. Horney, who wrote about personality as it interacts with other people (1937); E. Erikson, who discussed the influence of society on life development (1950); and Cornell University's Midtown Manhattan Study, which looked at the prevalence of mental illness in Manhattan (e. g., Srole 1975). In Germany, Fischer stated in 1919 that there is no psychiatry without social psychiatry (Berger 1999). However, ► euthanasia of mentally ill patients (>100,000 patients were killed) destroyed all social psychiatric developments in Germany for a long time. World War II and the psychiatric casualties from trauma made worldwide the influence of social stress more apparent. The success of crisis resolution on the war front and in other outpatient interventions, along with a moral concern over hospital warehousing, led to ► deinstitutionalization and a new social system of care in the guise of the community mental health care movement of the 1960s in the U.S.A. and England (Bühring 2001). Franco Basaglia is widely recognized as the Italian leader of the democratic psychiatry movement in Europe. His political and social agenda involved, for example, decriminalizing mental illness and the importance of voluntary psychiatric treatment. In Germany, dehospitalisation started late as a consequence of the "Psychiatrieenquete" 1975 (a fundamental report of the situation of psychiatry in Germany). By the 1980s, social factors had a presence in the Diagnostic and Statistical Manual of Psychiatric Disorders III (DSM-III) in the Axis IV and V categories.

Severe and Persistent Mental Illness

People with severe and persistent mental illnesses (SPMI) have been a special target population for social psychiatry and public mental health. People with SPMI suffer from major mental illnesses such as schizophrenia or major affective disorders (with psychotic symptoms). Severe mental illnesses cause their sufferers dismal functional impairment. People affected with schizophrenia might have difficulties in thinking coherently, interacting with others normally, problems in managing of work, strange beliefs, extraordinary physical complaints, carrying out responsibilities and expressing emotions appropriately. Even simple everyday tasks like personal hygiene can become unmanageable and neglected. Thus, the disease can impact every aspect of affected people's work, family, and social life. Though not affected directly, family members also frequently become distressed and overwhelmed by the difficulties involved in providing care and in coming to terms with the transformation of their relatives into patients suffering from serious chronic illness.

Principles and Goals of Social Psychiatry

The goals of social psychiatry were always broad, for example: To include all social, biological, educational, and philosophical considerations which may come to empower psychiatry in its striving towards a society which functions with greater equilibrium and with fewer psychological casualties (Jones 1968). For social psychiatrists, it was obvious that the individual could not be treated as separate from the society and that the society contributed greatly to mental disorders. Social psychiatry is a scientific approach that is influenced by different historical dimensions. Hence, social psychiatry criticizes traditional psychiatric concepts and has a social theory of mental disorders. Social psychiatry consists of different treatment dimensions and therapy strategies (e. g., social network, medical treatment, structuring of daily activities, complementary care in the living and work area).

Carleton and Mahlendorf (1979) summarized the principles of social psychiatry in six postulates:

1. Human behavior can only be understood in the context of the total social and other energies (including living and inert physical matter) of this universe.
2. A person should always be a subject and never an object of an interpersonal transaction.
3. There is meaningful interrelationship, a relativity, between the behaviors of one individual and all social and mythological institutions and groups.
4. Social problems, including individual, institutional and group deviant behaviors, cannot be solved without collaboration between all the institutions and disciplines of human knowledge, influence, and action.
5. Values of compassion, caring, and consideration for all human beings are essential to the operations of social psychiatry.

6. Human behavior acquires purpose and meaning in reference to and by virtue of adherence to these postulates.

Those aims of social psychiatry are still up to date. In Germany, mental health care research clearly dominates social-psychiatric research. While in the beginning, most research was devoted to the conceptualization and description of psychiatric services, in recent years more studies on outcome evaluation and quality assurance were carried out. More and more the subjective perspective of patients and relatives becomes relevant. Topics such as treatment satisfaction, subjective illness theory, and subjective quality of life enjoy growing interest. The same holds for *stigmatization* of mentally ill people. By contrast, studies investigating psycho-social influences on the development and the course of mental disorders are still very rare (Holzinger and Angermeyer 2002). Another important related field are the treatment costs of severe and persistent mental illnesses. The prevalences rates of psychotic disorders are significantly lower than those of affective or anxiety disorders. However, Löthgren showed in a recent published literature review that more research has been conducted across Europe for schizophrenia than for the mood disorders. There are marked differences in variation among European countries regarding service provision, resource use, and costs for schizophrenia treatment, for example range the direct and non-direct medical cost estimates per patient per year from €2152 in Spain to €8188 in Italy and €14 927 in Denmark (Knapp et al. 2002).

Last, research in transcultural psychiatry with potential clinical or social applications has covered such themes as, for example, similarities and differences in the form, course, or manifestation of mental illness in different societies and cultures; the occurrence, incidence, and distribution of mental illness in relation to sociocultural factors; sociocultural factors predisposing to mental health or to optimal function or to increasing vulnerability to or perpetuating or inhibiting recovery from mental illness or impaired function; the relationship between culture; and the psychological and social adaptation of migrants, voluntary or involuntary, within or across national boundaries especially insofar as their cultural traits or those of the receiving society are significantly involved.

There is a broad consensus on principles and aims of social psychiatry in European countries. However, the implementation of mental health reforms has been slow. According to Cooper (2001), progress is subject to constraints imposed by service infrastructures, reductions in state responsibility, changing public attitudes, and growth of relative poverty. Much inferential evidence has accumulated on the importance of social risk factors such as unemployment and socio-economic deprivation, but most studies have had to rely on analysis of ecological correlations, based on administrative data. There is an urgent need for more direct research in the field of social psychiatry making use of case-control and cohort study designs.

Cross-References

- ▶ Community Psychiatry
- ▶ Deinstitutionalization
- ▶ Euthanasia
- ▶ Socialization

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Social Regulation

► Cross-Sector Efforts

Social Relations

Synonyms

Communication; Interpersonal relations

Definition

Social relation refers to a multitude of social interactions, regulated by social norms between two or more people. It may be relation between individuals, groups of people or between an individual and group of people. Group in this context, refers to an ethnic group, social institution or organization, nation, gender, etc. Social relations form the basis of concepts such as social structure, social organizations or social system. By "social" is understood association, co-operation, mutual dependence and belonging.

Cross-References

► Human Relations

Social Resources

Synonyms

Social capital

Definition

These are goods that derive from inter-personal relationships with other individuals. There are direct psychological goods, such as social support that develop from inter-personal relationships. In addition, there are the material goods (e. g. money) that individuals are provided the right to request in light of the nature of the inter-personal relationship and history of returning similar requests. Inter-personal relationships through which exchange relationships develop are based on friendship, family ties, political connections and other social relations.

Social Stigma

Definition

An organized process by which a group denies material and psychological privileges to individuals who do not display – or are not considered by the group to display – the characteristics, beliefs and behavior the group has defined to be important to group membership.

Social System and Organization

► Health Setting

Social Transition

Synonyms

Social maturation; Social development

Definition

Social transition is characterized by the adolescent's expansion of their social circle of significant others from parents/family to include peers and other adults.

Social Welfare Policy

Synonyms

Social policy

Definition

A broad term encompassing a range of government policies enacted to protect citizens from economic risks, insecurities, and dependency. These policies include income support policies, educational systems, treatment of mentally ill, rehabilitation of criminals, provision of health care and health insurance, and the care of destitute adults.

Societal Perspective

Definition

The most comprehensive perspective of health economic analysis is the societal perspective. From the perspec-

tive of the society, all costs and benefits of a health care intervention or illness are taken into account. With regards to the costing process in a calculation from a societal perspective, the direct medical and non-medical costs (► direct cost) for all health care payers and the patient as well as the ► indirect cost due to lost productivity are included. Most recommendations for ► health economic evaluation studies suggest choosing the societal perspective at least in addition to other perspectives.

Society

Definition

In general, society is seen as life within a living community. On closer examination, society means structures with organized systems in which human beings live and work together.

Cross-References

► Nation

Socio-Cultural Barriers

Definition

In health care settings, socio-cultural barriers prevent specific population groups such as migrants from utilizing services sufficiently and efficiently. A lack of local language skills can create a socio-cultural barrier. Gender issues, differing knowledge and information systems and problems with interpreting subtle, non-verbal signs in the context of health, disease and therapy might act as further barriers that can hinder migrants from making competent and appropriate use of available services.

Socio-Cultural Definitions of Old Age

Definition

Old age is a biological fact and a socio-cultural construct. In different cultures, the classification of old age can vary substantially and be at variance to a person's actual age. In some ethnic groups, for instance, to belong to the group of the aged is defined by having grandchildren, independent of a person's actual age. For several decades, gerontological research has held the belief that modernity created negative images of old age whereas so-called traditional societies valued persons of old age. Currently, the picture of inter- and intracultural variation regarding concepts of old age is more diverse. Appreciation and discrimination may coexist in societies with regard to gender, economic power or other status indicators such as education.

Sociodemography

Synonyms

Population characteristics

Definition

The study of populations, especially with reference to size and density, ► fertility, ► mortality, growth, age distribution, migration, and vital statistics, and the interaction of all these with social and economic conditions.

Sociodental Indicators

Synonyms

Socio-dental indicators

Definition

Sociodental indicators are measures for the psychological and social impact of dental diseases. They assess the extent to which dental and oral disorders disrupt normal social functioning. Sociodental indicators reflect the quality of life of the individual and the well-being of society. They are subjective measures, related to a biopsychosocial model of health. They should be used to supplement clinical (normative) measures like the ► DMFT, which depend on professional opinions of what constitutes a disease. Sociodental indicators relate to the following biophysical and sociomedical parameters: Death, disease, impairment, functional limitation, discomfort, disability and disadvantage. The majority of sociodental indicators are "problem indices" that can be used to understand the population's experiences and perceptions and to demonstrate the need for oral health promotion. Sophisticated new needs assessment tools

integrate normative and subjective estimates of treatment need, taking into account the severity of diseases and the willingness of the respective patient to get treatment.

Socioeconomic Environment

Synonyms

Socioeconomic status; Socioeconomic position

Definition

The social and the economic characteristics of both the work environment and the home environment, for given person or a group of people. Some examples of social characteristics include literacy level, ► social support, physical safety, and connectedness in the community. Economic characteristics include income and the distribution of income within a community. Some researchers believe that the health of a community is dependent upon a relatively equal distribution of wealth among its individuals.

Socioeconomic Indicators

Definition

Socioeconomic characteristics include measures that affect health status, such as income, education, employment, household conditions, lifestyles, and environment, and measure the proportion of the population represented by various levels of these variables.

Socioeconomic Influences

► Health Determinants, Social

Socioeconomic Position

► Socioeconomic Environment

Socioeconomic Status

► Socioeconomic Environment

Sociopolitical Culture

Synonyms

Welfare culture

Definition

The health care systems of the industrial nations differ appreciably in their funding models, levels of benefits and forms of organization. The reasons for this situation are studied by the methodological approach of sociopolitical culture, which describes and analyses the historical and cultural place of social security systems within a country's prevailing body of social values. In the context of international comparative welfare state research – specifically, research on health care systems – the genesis, development and configuration of national welfare state institutions are traced back to a society's prevailing attitudes, norms and interpretative patterns (such as ideas of social justice). The importance of the sociopolitical culture emerges in particular in relation to the social acceptance of reform measures in the field of social security.

Socrates

Definition

A highly regarded philosopher, recognized as one of the main contributors to Greek history within wider Europe.

SODIS

► Solar Disinfection (Sodis)

Soft Chancre

► Ulcus Molle

Soil Cleanup

► Georemediation

Soil Contamination

► Soil Pollution

Soil Degradation and Erosion

Definition

Types of soil degradation are erosion, desertification, acidification, and salination. Desertification is a natural process of ecosystem degradation in arid regions. It can result from continued human land abuse during droughts. Increased population and livestock pressure on marginal lands also accelerates desertification. Erosion of the soil is caused by wind, water, ice, and land movement in response to gravity. Erosion is an intrinsic natural process, but in many places, it is increased by human exploitation. When the total ground surface is stripped of vegetation and then seared of all living organisms, the upper soils are vulnerable to both wind and water erosion. One of the main causes of soil erosion is slashing and fire treatment of tropical forests. Poor land use practices include deforestation, overgrazing, and improper construction activity. Improved management can limit erosion by using techniques like restricting the disturbance during construction, avoiding construction during erosion prone periods, intercepting runoff, terrace-building, use of erosion-suppressing cover materials, and planting trees or other soil binding plants. Soil acidification is a problem in many regions of the world due to acid rain deposits, which change the chemical properties of the soil. Soil salination might be a natural process that results from high levels of salt in the soil, features that allow salts to become mobile, or climatic trends that favor salt accumulation.

Soil Genesis

► Pedogenesis

Soil Pollution

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Synonyms

Land pollution; Soil contamination

Definition

Pollution of the soil is physical, chemical, biological, or radiological modification of the surface layer of the earth's crust by accumulation of a large quantity of natural materials or occurrence of new synthetic materials that disturb the composition of the soil, influence the natural balance of the ecological system, and disable the ► purification process (self-cleaning) of the soil. The consequences of soil pollution depend on the kind, quantity, and dynamics of disposal of harmful materials, and also on soil composition, structure, and its physical and chemical characteristics.

Basic Characteristics

Characteristics of the Soil Pollutants

Soil pollution may be the result of disposal of solid waste materials, overflowing waste water, or deposition of air pollution sediments. According to the source of emission, soil pollution can originate from communal and industrial environments, and according to the nature of pollutants from inorganic or organic chemicals, radioactive nuclides or infective agents. It is also possible that the soil is polluted with combinations of pollutants from different sources.

Pollution with organic waste, especially components of animal and human tissues and excreta, bears a high risk due to the possibility of microbiological contamination and infections in humans and animals. Pollution of cultivable soil represents a serious hazard, and pesticides and fertilizers carry the risk of intoxication of people and animals through contaminated food.

Among industrial waste materials, the most dangerous are synthetic organic compounds, due to their biopersistence (resistance to degradation), accumulation in biological species, and even ► bioconcentration in the food chain.

Characteristics of the Soil

In most cases, pollution of the soil is reversible, and decomposition of the pollutants is continuous, occurring simultaneously with decomposition of the soil. The self-cleaning ability of the soil mostly depends on the mechanical structure of the soil, physical and chemical

characteristics (such as oxygen and moisture, pH), and composition of microflora, flora and fauna (types and quantities), which often become damaged as a result of excessive pollution. It is important that there are zones of unpolluted soil from which the living species may recolonize a damaged area and initiate the natural process of purification. The process of decomposition of waste in the soil depends on the type and quantity of natural or artificial waste substrate (carbohydrates, fats and proteins, chemical products). If the soil is polluted with large quantity of organic waste materials, there are adverse conditions for their decomposition, and they can leave by-products and gases of unpleasant odor.

The structure of the upper layers of the soil is constantly being changed by physical factors:

1. sun radiation, warming, and cooling, which causes mechanical weathering of bedrocks
2. atmospheric influences and the influence of the climate, especially heavy precipitations cause ► soil degradation and erosion
3. deep layer movements and earthquakes

Formation of the soil or ► pedogenesis is also a permanent geobiological process influenced by all living organisms and humans, particularly by anthropogenic pollution important in soil degradation. The structure and texture of soil depends on the size, shape, and type of connection of particles. Within the solid structures of soil, cavities can be found which result from the activity of atmospheric water, and even the activity of animals. The porosity of soil determines the quantity of water and air that the soil can absorb. Air contained in the pores of the soil determine the physical and chemical characteristics, plant growth, activity of bacteria, and self-cleaning properties of the soil.

Out of all the chemical elements that make up the surface of the earth's crust, oxygen and silicon are present in the highest proportion (over 80%), followed by aluminum, calcium and iron. Minerals originating from the soil are classified into two main groups according to quantity and physiological function in the human organism:

- ► major elements (macronutrients) constitute up to 80% of the minerals in the human body, as well as 99% of the minerals in the soil (O, H, C, N, Ca, Na, K, P, S, Cl, Mg)
- essential ► trace elements, like micronutrients (Fe, Se, Cu, Zn, Co, F, I, Mn, Cr), are found in concentrations of about 10–100 ppm, some with known physiological functions and others without.

Deficiency of some trace elements (such as iodine, fluorine, and selenium) in regions with naturally anomalous distribution of them is manifested in the disturbance of health in the form of enzootic and/or endemic disease; this area is investigated by ► geomedicine. The global problem of shortage or reduced bioavailability of some trace elements in the soil is slowly spreading to many regions of the world due to acid rain (deposited sulfates and nitrates) changing the chemical properties of the soil.

Health Effects of the Soil Pollution

There is a very large set of health consequences from exposure to soil contamination, which depend on pollutant type, pathway of spreading, and vulnerability of the exposed population. In cases of pollution with organic waste from hospital and laboratory environments, the highest risk is due to possible microbiological contamination. The most frequent and widely spread microbiological agents that can be found in the soil are those that cause typhoid fever, cholera, tularemia, leptospyrosis, tetanus and gaseous gangrene, and anthrax, and parasites like Trichocephalus, Ankylostoma, and Ascaris. Pollution of cultivable soil represents a serious danger, especially for agricultural workers. In communal environments, the people who are in direct contact with polluted soils such as in residences, parks, schools, and playgrounds (children) have the greatest health risk. Other contact mechanisms include contamination of drinking water or inhalation of soil contaminants that have vaporized.

Heavy metals like chromium and a number of pesticides are carcinogenic to all populations. Lead is especially hazardous to young children, a group with a high risk of developmental damage to the brain and nervous system. Mercury is known to induce higher incidences of kidney damage, and PCBs and cyclodienes are linked to liver toxicity. Chronic exposure to benzene is known to be associated with a higher incidence of leukemia. Many chlorinated solvents induce liver and kidney changes and depression of the central nervous system. Organophosphates and carbamates can induce acute intoxication, leading to neuromuscular blockage.

Assessment and Control of Soil Pollution

Soil pollution can be investigated by means of toxicological, radiological, bacteriological, and parasitological methods, while the final evaluation and conclusions are made on the basis of data analysis of the results from all of the mentioned methods. Chemical methods test the quantity of materials belonging to the normal composition of the soil, which occur in excess during decomposition of waste (organic nitrogen and carbon, ammonium, nitrates, and chlorides), and also test qualitatively synthetic materials that are unusually present in the soil like heavy metals and pesticides. Bacteriological tests consist of determination of the total number of bacteria, number of coliform bacteria, and *Clostridium perfrigens* in a volume unit of the soil.

Large projects related to the prevention of chemical pollution of the soil include implementation and control of the production process, aiming at a decrease in production, and increase in recycling and neutralization (dechalogenation and burning of the plasma of dangerous PCBs, for example), as well as efficient disposal and protection of non-decomposable waste materials. The next large project is implementation of a program of disposal of and protection from infectious waste materials (from veterinary and public service facilities). Continued measures of maintenance of quality of the soil are also important, as follows: building of facilities for waste disposal and permanent collection and removal of waste, construction of corresponding water supply and sewerage systems, waste water purification, construction of drainage systems for precipitation, and growing plants on all cultivable surfaces. Strategies for reducing soil degradation and erosion in some regions include planting of cover crops, establishment of windbreaks, strip cropping, terracing, and minimum-tillage farming. Recent projects have developed successful new methods in artificial purification of the soil like ► georemediation (accelerated geochemical remineralization) ► phytoremediation and ► bioremediation (by natural plants and micro-organisms stimulated with additional nutrients).

Cross-References

► Bioconcentration
► Bioremediation
► Geomedicine
► Georemediation
► Major Elements (Macronutrients)
► Pedogenesis
► Phytoremediation
► Purification
► Soil Degradation and Erosion
► Trace Elements

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Soil Remediation

► Georemediation

Solar Disinfection (Sodis)

Synonyms

Water disinfection by direct sunlight; SODIS

Definition

The heat of the sun and its UV radiation can be used to make water sterile or, at least, considerably reduce the number of pathogens. If plastic bottles (PET bottles) are filled with contaminated water, sealed and put into the bright sun for a couple of hours, germs are killed and the water achieves drinking water quality. The effect can be increased when half of the bottle is painted black. Solar disinfection is a worthy method of water treatment for households in warm and sunny

regions when there is no sufficient supply of drinking water.

Solar Radiation

► Insolation

Solid-Phase Soil Treatment

► Composting

Somatization Disorder

Definition

The main features of somatization disorders are multiple, recurrent, and frequently changing physical symptoms of at least two years duration. Most patients have a long and complicated history of contact with both primary and specialist medical care services, during which many negative investigations or fruitless exploratory operations may have been carried out. Symptoms may refer to any part or system of the body. The course of the disorder is chronic and fluctuating, and is often associated with disruption of social, interpersonal, and family behavior.

Somatoform Autonomic Dysfunction

Definition

Symptoms are presented by the patient as if they were due to a physical disorder of a system or organ that is largely or completely under autonomic innervation and control, i. e. the cardiovascular, gastrointestinal, respiratory, and urogenital systems. The symptoms are usually of two types, neither of which indicates a physical disorder of the organ or system concerned. First, there are complaints based upon objective signs of autonomic arousal, such as palpitations, sweating, flushing, tremor, and expression of fear and distress about the possibility of a physical disorder. Second, there are subjective complaints of a nonspecific or changing nature such as fleeting aches and pains, sensations of burning, heaviness, tightness, and feelings of being bloated or distended, which are referred by the patient to a specific organ or system.

Somatoform Disorders

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Definition

Somatoform disorders refers to the preoccupation with multiple physical complaints suggestive of a somatic disease (together with persistent requests for medical investigations) for which a clear physical etiology and an adequate medical explanation cannot be found. Those physical symptoms are repeated in spite of negative findings and reassurances by medical doctors that the symptoms have no physical basis. If any physical disorders are present, they do not explain the nature and extent of the symptoms or the distress and preoccupation of the patient. Symptoms of somatoform disorders may include frequent headaches, back pain, abdominal cramping, and pelvic pain (► somatoform autonomic dysfunction). Other symptoms include pain in the joints, legs and arms, or chest, or abdominal pain. Somatoform disorder may also present with gastrointestinal problems, such as nausea, bloating, vomiting, diarrhea, and food intolerance. Somatoform disorders are divided into ► somatization disorder, pain disorder (► persistent somatoform pain disorder), conversion disorder, hypochondriasis (► hypochondriacal disorder), and body dysmorphic disorder. Other syndromes may not reach the diagnostic threshold for somatization disorder but may be clinically significant.

Basic Characteristics

Introduction/Etiology

Somatoform disorders account for a high proportion of consultations in primary care. A large variety of etiological hypotheses of somatoform disorders have been proposed, ranging from somatization as a somatic expression of psychological distress to biological

abnormalities. A heightened awareness of normal body sensations may be paired with a cognitive bias to interpret any physical symptoms as an indicator of medical illness. However, with current research methods no single mechanism can be shown to cause somatoform symptoms. It is obvious that many different pathways exist, and etiological factors interact in a very complex way. Those etiological factors are, for example, biological factors, unconscious intrapsychic conflicts, sexual abuse, and conversion. This situation is not different from almost all other mental disorders.

Epidemiology

Somatoform disorders are among the most prevalent forms of mental disorders. Whereas pain disorders (► persistent somatoform pain disorder) start mostly in childhood and early adolescence, dissociative disorders and conversion disorders seem to develop predominantly in the second decade of life. ► Somatization disorder is the most severe form of somatoform disorders. The prevalence of somatization disorders is between 1.1% (Italy; Favarelli et al. 2004) and 2.1% (Norway; Kringlen et al. 2001). Other forms of somatoform disorders (e. g., pain disorder, conversion disorder) show higher prevalence rates than somatization. It is estimated that the 12-month prevalence of somatoform disorders in European countries is 11%. Women are twice more likely to be affected than men (15.0% versus 7.1%) (Wittchen and Jacobi 2005). Accordingly, the estimated number of subjects suffering from somatoform disorders within 12 months in the general EU population is 18.9 million people.

Consequences

Somatoform disorders are frequently associated with other mental disorders. Patients with pain disorders very often show comorbid major depression (OR 4.34, 95%CI [2.33–8.08]), panic disorders (OR 8.55, 95%CI [3.29–22.20]), and posttraumatic stress disorder (OR 4.54, 95%CI [1.23–16.67]). Conversion disorders and dissociative disorders are strongly associated with eating disorders (Lieb et al. 2000). Somatization disorder patients show impaired quality of life and higher levels of emotional distress. Patients with somatoform disorders show increased rates of healthcare utilization and disability days (Ladwig et al. 2001).

Treatment

Treatment of patients suffering from somatoform disorders is often difficult, as patients do not accept that their symptoms are due to mental factors. Patients have relevant, real medical complaints; hence, a psychological origin of those complaints is similar to the allegation that they only imagine their problems. Patients may become angry or irritated with their doctors when they cannot determine the (physical) cause and correlate for their problems. Another difficulty that doctors may face is that people with somatization disorder, like everyone else, will develop new (comorbid) physical diseases at some point. Therefore, every new symptom is a challenge for a medical professional to know how far to investigate. Many people with a somatoform disorder also have other mental health problems and comorbid mental disorders, such as depression, anxiety, or substance abuse. These may be partly a result of having distressing physical symptoms. Treatment of these other mental health problems may improve the situation. In contrast to other mental disorders, somatoform disorders mostly need an interdisciplinary treatment, and treatment concepts may have a clear focus on the patients' somatic complaints (and not the psychological problems). If patients with somatoform disorders can be convinced that mental factors may contribute to, or cause, their physical symptoms then those patients may accept a psychiatric and/or psychotherapeutic treatment. Talking treatments may help patients to understand the reasons behind their symptoms, and aims to change any false beliefs that they may have and teach them how to identify and deal with emotional issues. A psychopharmacological treatment (e. g., antidepressants) can be indicated as well.

Cross-References

► Hypochondriacal Disorder
► Persistent Somatoform Pain Disorder
► Somatization Disorder
► Somatoform Autonomic Dysfunction

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Sound

Definition

Sound is a form of mechanical energy produced by vibration of a gaseous, liquid, or solid elastic medium. It is transferred away from the source by a series of pressure changes referred to as sound waves. If these pressure changes are of higher magnitude than 20 µPa and in the frequency range from 16 Hz to 20 kHz, they will evoke physiological responses in the human ear and auditory pathways. Sound waves pass through the outer ear and set the eardrum into vibration. Three small bones in the middle ear, the hammer, anvil and stirrup, transfer the vibration of the eardrum to the liquid-filled cochlea – a part of the inner ear. Liquid disturbance distorts the basilar membrane in the cochlea; this is registered by extremely sensitive hair cells and transformed into nerve impulses that are transmitted to the brain through auditory pathways. Psychologically, sound is a mental event evoked by nerve impulses in the auditory brain.

Source of Infection

Definition

The source of an infectious agent is the person, animal, substance, or object from which the host acquires the infection. When a person or animal is the source, they may be sick, convalescent, or long-term carriers of the infection.

Source of Injury

Definition

The source of injury is identification of the object, substance, or bodily motion which directly caused an ► occupational injury. For example, if the worker lost a finger by cutting it with a saw, the saw is the source of injury. There is a direct relationship between the source and the nature of the injury. In contrast to the cause of injury, the source is always obvious. National and international agencies have developed different classifications of injury sources in order to enhance statistical analysis.

Source of Potential Harm

Synonyms

Hazard

Definition

In the context of ► risk assessment a hazard is a source of potential harm. Risk assessment estimates the risk to humans of a specified hazard, based on the availability of exposure data.

Cross-References

► Hazards

South American Health

► Indigenous Health, South America

Sovereignty

► Self-Determination

Spasmodic Croup

Synonyms

Acute spasmodic laryngitis; Pseudo-croup; Stenosing laryngotracheitis

Definition

Stenosing laryngotracheitis or pseudo-croup is a disease, which is primarily seen in babies and small children; in children of school age it is very rare. A viral infection of the respiratory tract causes a swelling of the mucous membranes in the subglottic area (in the region of the vocal chord). Pseudo-croup usually occurs at night and is characterized by hoarseness, barking cough and loud, noisy breathing (inspiratory stridor). In more severe cases children have difficulties in breathing (dyspnea) and show jugular or thoracal retractions. The parents, who are often very excited, have to be calmed. The prognosis in stenosing laryngotracheitis is excellent. After administering prednisolone (rectally), supplying fresh air and, if necessary, epinephrine inhalation the symptoms soon decrease and – in most cases – vanish within a few hours.

Specialized Health Services

► Secondary Care

Specific Building- and Home-Related Illnesses

Synonyms

SBRI

Definition

Specific building-related illnesses (SBRI) are specific, well-defined human illnesses (medical entities with objective physical signs and laboratory findings) caused by indoor environmental factors that can be identified, measured, and quantified, inside certain indoor spaces. Wide scientific interest in indoor air quality is now quite understandable because of (a) a variety of indoor environmental contaminants and problems; (b) an increasing amount of time spent indoors; and (c) numerous adverse health consequences. Environmental contaminants cause SBRI through five major mechanisms, which will be described in detail (1–5): (1) Immunologically induced inflammation (e. g. hypersensitivity pneumonitis, humidifier fever, asthma, and urticaria, etc.). Hypersensitivity pneumonitis or allergic alveolitis (HP/AA) presents as pneumonia with pulmonary infiltrates, gradually progressing to pulmonary fibrosis. Antigens of fungi, bacteria and insects, associated with very small suspended particles, are the main cause of HP. (2) Infections (e. g. Legionnaire's disease, Pontiac fever, influenza, the common cold, rubella, varicella). Legionnaire's disease is a severe form of pneumonia caused by *Legionella pneumophila*, a ubiquitous bacterium with transmission almost exclusively by the airborne route from contaminated water sources (e. g. cooling towers, humidifiers, whirlpools, and even showerheads). (3) Irritation is a third mechanism that can lead to SBRI. Even low concentrations of common irritants induce ill effects due to high acidity, desiccation, or through skin and mucous membrane stimulation. (4) Intoxication by a low level of air contaminants is another mechanism that can cause SBRI, and the main toxins in buildings are pesticide residues, combustion by-products, and mycotoxins. (5) Cancerogenesis (e. g. due to radon or asbestos) may be also included in the mechanisms of SBRI induction, though the latent period between cause and disease appearance is usually much longer than for the other four mechanisms (► Radon).

Specific Categories

Definition

Specific rates pertain to some homogeneous subgroup of the population such as an age, gender, race, or ethnic group. For example, gender-specific rates provide separate estimates of rates for males and females in the population. Age-specific rates refer to the number of events occurring in each specified age category. These rates are calculated to show how a risk factor, occurrence of death, or incidence of a disease change with age, sex, etc.

Specific Developmental Disorder of Scholastic Skills

► Arithmetical Skills Disorder
► Reading and/or Spelling Disorder

Specificity

Definition

The specificity is the operating characteristic of a diagnostic test that measures the ability of a test to exclude the presence of a disease (or condition) when it is not present. In contrast to sensitivity, specificity is the proportion of non-diseased patients for whom there is a negative test, expressed as: [true negatives ÷ (true negatives + false positives)].

Cross-References

► Screening

Specific Phobia

Synonyms

Simple phobia

Definition

A specific phobia is diagnosed if a person fears clearly defined objects (e. g. spiders, dogs, snakes) or situations (e. g. exams, heights, injections). It is important to distinguish between the fear triggered by the actual confrontation with the phobic stimulus and the fear that occurs when thinking about this stimulus. This so-called fear of fear adds to the problem. Exposure to the object of the phobia, either in real life or via imagination or video, invariably elicits intense anxiety, which may include a situationally bound panic attack. Adults generally recognize that this intense fear is irrational. Nevertheless, they typically avoid the phobic stimulus or endure exposure with great difficulty.

Cross-References

► Anxiety Disorders

Specific Rates

Definition

Specific rates refer to a particular subgroup of the population defined. For example, the rate can be evaluated in terms of race, age, or some other subgroup, or may be specific to some single cause of death or illness. Specific rates can be used to correct factors that may influence crude rates. Age-specific disease incidence rates evaluate the occurrence of disease in proportion to a specified age group. Age-specific Death Rates are also referred to as age-specific mortality rates. This is a rate that evaluates the number of deaths in a specified age population against the total number of persons within that age population for a particular time period.

Spectrum of Activity

► Spectrum of Efficiency

Spectrum of Efficiency

Synonyms

Spectrum of activity; Range of efficiency; Range of activity

Definition

The spectrum of efficiency includes the entirety of microorganisms sensitive for an antibiotic drug. It can be supposed that germs with similar characteristics can be treated with the same antibiotic. One of the criteria to distinguish between different bacteria is the way they react on Gram's stain. Bacteria, which accept the dye, appear blue when they are looked at under the microscope. They are called gram positive. In gram negative germs the dye is washed out, after a second coloring with another dye they appear to be red under the microscope.

Speech and Language Developmental Disorders

Synonyms

Language retardation

Definition

Children acquire language at different rates. Determination of when the normal process is so much delayed as

to constitute a disorder is arbitrary. Language retardation is not directly attributable to neurological or speech mechanism abnormalities, sensory impairments, mental retardation, or environmental factors. Specific developmental disorders of speech and language are often followed by associated problems, such as difficulties in reading and spelling (► reading and/or spelling disorder), abnormalities in interpersonal relationships, and emotional and behavioral disorders during school age.

Speech Therapy

Synonyms

Logopaedics; Phoniatrics

Definition

Speech therapy aims to treat speech, communication, and swallowing disorders. The specific therapeutic approach depends on the disorder. Potential practices include physical exercises to strengthen the muscles used in speech, speech drills to improve clarity, and sound production practice to improve articulation.

Spinal Cord Injury

Definition

Spinal cord injuries usually involve a sudden, traumatic blow to the spine that fractures or dislocates vertebrae. The damage starts as soon as the injury occurs, and displaced bone fragments, disc material, or ligaments bruise or tear into spinal cord tissue. In most cases, the spinal cord is not completely severed but the injury usually causes fractures and compression of the vertebrae. This then results in crushed and destroyed axons, which are extensions of nerve cells that carry signals up and down the spinal cord between the brain and the rest of the body. Depending on the extent of the damage, the prognosis may range from almost complete recovery to complete paralysis. The latter might include respiratory complications for severe cases, and they may require help with breathing and respiratory support. Aggressive treatment and rehabilitation can reduce the damage to the nervous system and in some cases even restore limited abilities.

Spiritual

Synonyms

Immaterial; Religious

Definition

Spiritual concerns with matters of the spirit or soul, involves notions and explanations of the overall nature of humankind. It also includes emotional experience. Spirituality may involve perceiving life as higher, more complex or more integrated with one's world view; as contrasted with the merely sensual. An important distinction exists between spirituality in ► religion and spirituality as opposed to religion. In recent years, however, spirituality is less dogmatic, more open to new ideas and myriad influences, and more pluralistic than the doctrinal faiths of established religions. Religion can not be identified with spirituality, it may only be one of the ways to express ones spirituality. Spirituality, according to most adherents of the idea, forms an essential part of an individual's holistic health and well being. Science takes as its basis empirical observations, and thus generally regards any appeal to the unseen, unmeasurable spirit as either beyond the purview of science, or as a pseudoscience.

Spiritual Concerns

► Psychological Distress and Palliative Care

Spiritual or Faith Healers

► Indigenous Health Care Services

Spirituality

► Religion

Sponsor

Definition

The term sponsor refers to a regulatory entity that is an essential component of regulated competition models.

The sponsor lays down the ground rules of competition and provides information in order to enhance consumer choice. In practice, the sponsor is often a conglomerate of government agencies rather than a single institution.

Sporadic

Definition

Occurring irregularly, haphazardly from time to time, and generally infrequently.

Sport

► Physical Activity

Sport and Exercise

Definition

Planned, structured and repetitive bodily movements, performed to improve or maintain one or more components of physical fitness. Exercise may be classified in one of two categories, anaerobic and aerobic, depending on where energy is derived from depending on intensity and duration.

Spurious Association

Synonyms

Artifactual association

Definition

A spurious association is a false or factitious association, which can be due to chance occurrence or to some bias in the study method.

Stages of Change Model

► Transtheoretical Model

Stages of Change Theory

► Transtheoretical Model

Stakeholders

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Synonyms

Interest groups

Definition

In the last decades of the 20th century, the meaning of 'stakeholder' has evolved from the old concept in law of a person holding money or property to a person or organization having an interest or 'stake' in a project or entity. In this broader sense, stakeholders are defined as "individuals or organizations who stand to gain or lose from the success or failure of a system" (Nuseibeh, Easterbrook 2000).

In the area of Health Policy and Health Care, stakeholders are any governmental entity, organization, company or individual that has a stake or may be impacted by a given health care system or health policy approach to provision, benefits or regulation of health care in a country. In the Unites States, according to the American Agency of Healthcare Research and Quality "stakeholders include patients, providers, and policymakers, as well as health care scientists, clinical practice organizations, quality improvement groups, and purchasers of ► health care plans" (United States Department of Health & Human Services 2006).

Basic Characteristics

Description of Stakeholders

Stakeholders can be categorized in providers, beneficiaries, payers and decision makers. Providers of health care or ► medical devices are doctors, ► hospitals, laboratories, pharmaceutical companies, and in some countries the governmental agencies as public providers of health services. Beneficiaries of health care are the patients. Payers of health care are health insurances, individuals, employers and in some countries the gov-

ernment. The government is the decision maker and sets the regulatory framework for providers, payers and beneficiaries of health care. In the context of national health policy and health care, each stakeholder plays a different role according to the category he belongs to.

Government The government acts mainly as a decision maker to set the rules for a health care system that fulfills the values and ideals of the country (i. e. liberal market economy; social market economy; communism). Within the defined framework the government may regulate volume and quality of the health care services, be responsible for legislation on health care financing, corporate negotiations, major professional regulations and public health measures such as prevention and health promotion. In countries like the UK with a national health service, the government acts not only as a decision maker but also as a payer and provider of health care services (► public health services).

Doctors Doctors are providers of ► outpatient health care based in independent doctors' practices or medical centers or ► inpatient health care based in hospitals. They need to pass a specific university examination and be registered to practice. According to the existing health care system and the particular educational background, the payment of doctors varies from ► fee-for-service payment to a ► per capita payment or a monthly salary.

Hospitals ► Hospitals provide inpatient health care on a public or private basis. Hospitals either provide necessary health care for all kinds of diseases or specialize in a given medical area. The hospital sector is in most countries strongly regulated by government laws.

Health Insurances Health insurance companies are payers of health care for individuals in case of sickness or injury. Among other types of financing health care (for example taxation and direct payments), the insurance principle is employed in many countries in various forms. The organization of health insurances, their membership and funding mechanisms as well as their scope of financing varies from country to country.

Pharmaceutical Industry The pharmaceutical industry provides ► drugs and ► medical devices for the patients. Drugs are either delivered to the patient through pharmacies or directly through hospitals. The pharmaceutical industry invests regularly in research and development in order to meet continuous need for new pharmaceuticals while working as for-profit organizations.

Patients Patients are individuals who benefit from health care services. They also play a role as payers if they contribute to a health insurance or a tax-based health care system or if they spend money directly or as co-payers for health services.

Stakeholder Analysis

The stakeholder approach is a theory with the premise that firms which are managed to satisfy all stakeholders in an optimal way do better than firms which only maximize the profits or interests of the firm's shareholders. There is an increasing amount of management literature which deals with the identification of organizational key stakeholders, the analysis of their influence on the decision making process and ways to manage them (Freeman 1984; Post et al. 2002).

In the area of public health policy the stakeholder analysis has also become increasingly popular during the last decade.

Stakeholder analysis can be used to generate knowledge about the roles, relationships, behavior and interests of the stakeholders – individuals, groups, organizations – and how they influence the decision making process. This information is a necessary step to develop strategies for managing these stakeholders to facilitate the implementation of specific decisions or organizational objectives within the context of existing policy. The stakeholder approach may result in higher public health care performance if the value of health care is appraised collectively by the stakeholders of a health care organization and all stakeholders have the best available evidence on which to make decisions about health care and services. However, it cannot be ignored that stakeholders in the area of health policy have cooperative and competitive interests and that policy development is a complex process taking place in a continuously changing context. Therefore, the utility of stakehold-

er analysis for predicting future policy developments is limited.

Interaction and Conflicts

Analyzing the different stakeholder interests in quality of care may serve as an example to demonstrate that the interaction between stakeholders in a health system leads inevitably to conflicts.

Providers tend to view quality in a technical sense meaning accuracy of diagnosis, appropriateness of therapy and the resulting health outcome. Payers focus on cost-effectiveness and patients as the beneficiaries demand compassion, skill and clear communication. This leads to the following two types of conflicts:

a) conflict of interest between providers and payers of health care:
   - In order to provide the best service, providers tend to use the most accurate and newest tests and treatments which are also likely the most expensive.
   - Payers prefer a clear, evidence based, diagnostic plan which will provide accurate diagnosis and treatment with the fewest visits and least number of tests.

b) conflict of interest between patients and payers of health care:
   - Patients expect the payers (insurance companies, employers and the government) to offer a wide variety of options for health coverage that can be customized to their specific needs. They look to the employer to fund the majority of the cost of health insurance with the least out-of-pocket cost to themselves.
   - Payers want to maintain or lower their cost contribution. They want the patient to seek only needed care, follow providers' instructions, and recover quickly. Patients should also seek to reduce their health risk behaviors through, for example, diet, exercise and smoking cessation.

Stakeholders in the Context of Rising Health Care Costs and Limited Resources

The rising costs of health care due to technological progress and demographic aging has been a challenge to the majority of countries with developed health care systems. "Collaborative arrangements among stakeholders" in the health care system have been suggested as a way to improve health care performance and to contain health care costs (Young DW et al. 2001). In this context, a number of measures aiming to reduce medical expenses have affected and are continuing to affect all stakeholders:

Government:
- As a decision maker: regulation of financial framework
- As payer and provider: increase of resources to cover growth in health care cost

Health insurers:
- Increase in insurance fees to cover growing medical need
- Restriction of benefit packages

Hospitals:
- Limitation in numbers
- Budget control
- Manpower control
- Introduction of ▶ treatment protocols
- Performance management: reduction in the lengths of stay

Doctors:
- Controls on entry to medical education
- Change of payment method (from payment per item of service to ▶ capitation payment)
- Change in the relative value-scale under fee-for-service systems
- Influencing prescribing behavior by the promotion of the use of ▶ generics

Pharmaceutical industry:
- Direct or indirect control of prices and profits
- Price approval for reimbursement
- Control of the use of expensive equipment

Patients:
- Co-payments that may concern ▶ drugs, dentistry charges, spectacles and charges for visits to doctors, laboratory test
- Higher contributions for health insurances

Cross-References

▶ Drugs
▶ Fee-for-Service Payment
▶ Generics
▶ Health Care Plan (US)
▶ Health Care Quality
▶ Hospitals
▶ Inpatient Health Care

- ► Medical Devices
- ► Outpatient Health Care
- ► Per Capita Payment
- ► Public Health Services
- ► Treatment Protocol

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Standard Deviation

Definition

Standard deviation is the square root of the ► variance, and therefore it is expressed in the same units of measurement as the original observations. The formula for sample standard deviation is:

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n-1}}$$

where x_i is an individual value, $\bar{x}$ is the mean, n is the sample size, and $n - 1$ is the number of the degrees of freedom.

Standard deviation is the most commonly used ► measure of the dispersion. Standard deviation is a base for calculating the ► z-score (standard score). When the standard deviation is divided by the mean and this ratio is expressed as a percentage it is the coefficient of variation, which is a relative measure of variation and independent of the units of measurement.

When the empirical distribution is nearly normal then the interval of one standard deviation above and below the mean includes approximately 68% of all observations. The interval of two standard deviations above and below the mean, includes approximately 95% of all observations, and the interval of three standard deviations above and below the mean includes almost all observations (99.7%).

Standard Error

Definition

The standard error (SE) or as it is commonly called, the standard error of the mean (SEM), is a measure of the extent to which the sample mean deviates from the true but unknown population mean. It is the standard deviation (SD) of the random sampling distribution of means (i. e., means of multiple samples from the same population). As such, it measures the precision of the statistic as an estimate of a population. The (estimated) SE/SEM is dependent on the sample size. It is inversely related to the square root of the sample size.

Standard Gamble

Definition

Standard gamble is a method to measure individual preferences for health outcomes under the condition of uncertainty. Standard gamble is the methodological approach for estimating utilities that is most based on utility theory. The preference is expressed by choosing between two alternatives. The outcome of one alternative would be received with certainty. The outcome of the second alternative would be received with a certain probability and would not be received with the inverse probability. The probability is varied until the individual is indifferent between the two choices. The utility is derived from the indifference probability.

Standardization

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Synonyms

Adjustment; Controlling; Stratified analysis

Definition

Statistical method for deriving measures that are comparable across populations that differ in age and other demographic variables. Standardization methods are used to adjust for the effects of age and sex, and possibly other factors, in the comparison of disease rates between two or more populations.

Basic Characteristics

One of the most frequently occurring problems in epidemiology and vital statistics is comparison of the ► rate for some events, characteristics across different populations, or for the same population over the time. If the populations were similar with respect to factors associated with the event under study – factors such as age, sex, race, or marital status – there would be no problem in comparing the ► overall rates (total or crude rates) as they stand.

If the populations are not similarly constituted, however, direct comparison of the overall rates may be misleading.

History

Standardization methods have a long history, and rank among the earliest statistical tools developed. Keiding has traced their origins to eighteenth century actuarial mathematicians, though they were re-invented a century later by Neison and Farr. These two eminent men recognized that comparisons of crude death rates were not sufficient for examining mortality patterns over time or between geographical areas. They also showed that the average age at death was not an appropriate index for assessing differences in mortality.

Reasons for Standardization

Bearing in mind that there is no substitute for examining the ► specific rates themselves, there are some reasons for considering standardization:

1. A single summary index for a population is more easily compared with other summary indices than are entire schedules of specific rates.
2. If some strata are comprised of small numbers of people, the associated specific rates may be too imprecise and unreliable for use in detailed comparisons.
3. For small populations, or for some groups of especial interest, specific rates may not exist. This may be the case for selected occupational groups and populations from geographic areas especially demarcated for a single study. In such cases, only the total number of events (e. g., deaths) may be available and not their subdivision by strata.

Direct Standardization

► Direct standardization may be applied only when the schedule of specific rates for the given population is available. The data necessary for its implementation are:

1. The schedule of specific rates for the population being studied, say $c_1, \ldots, c_i$.
2. The distribution across the various strata for a selected standard population, say $p_{S1}, \ldots, p_{Si}$.

The direct adjusted rate is then simply

$$C_{\text{direct}} = \sum c_i p_{Si}$$

The term "direct" refers to working directly with the specific rates of the population being studied, in distinction to what has to be done in the method of ► indirect standardization.

Indirect Standardization

The second and third reasons given for standardization, the unreliability and possibly even the unavailability of some specific rates, lead to another method of standardization, the so-called indirect method. The data necessary for its implementation are:

1. The crude rate for the population being studied, say c.
2. The distribution across the various strata for that population, say $p_1, \ldots, p_i$.

3. The schedule of specific rates for a selected ► standard population, say $c_{S1}, \ldots, c_{Si}$.
4 The crude rate for the standard population, say c_S.

The first calculation in indirect standardization is of the overall rate that would be obtained if the schedule of specific rates for the standard population were applied to the given population. It is

$$c' = \sum c_{Si} p_i$$

The indirect adjusted rate is then

$$c_{\text{indirect}} = c_S \times c/c'$$

that is, the crude rate for the standard population, c_S, multiplied by the ratio of the actual crude rate for the given population, c, relative to the crude rate, c', that would exist if the given population were subject to the standard population's schedule of rates.

Standardized Mortality Ratio (SMR)

When deaths are the subject of the study, the indirectly standardized ratio is widely known as the ► standardized mortality ratio (SMR). The SMR, like other forms of standardization is used to create summary mortality statistics that can be used to compare populations with differing distributions of individuals in age, gender, and race categories. Sometimes, only one age will be categorized and single gender and racial groups studied. For example, an age-adjusted SMR for white males could be created.

Example

Comparing neonatal mortality rates in two hypothetical hospital groups in a region: one group is comprised of tertiary care hospitals with neonatal intensive care units; the other is comprised of community hospitals that appropriately transfer the majority of high-risk pregnant women for delivery at a tertiary center. The birthweight distribution in the two groups is considered a potential confounder since the tertiary care hospitals by definition serve higher risk pregnant women than the community hospitals do and birthweight is also known to be the major predictor of neonatal mortality. All live births in the state is used as the standard population.

The crude relative risk of neonatal death (not accounting for the birthweight distribution) when the two hospital groups are compared is 1 (5.8/5.8). Standardizing by birthweight will help determine if this relationship is a fair reflection of the neonatal mortality experience in the two hospital groups.

Standardization, Table 1 Hospital Group A: Community Hospitals

Birthweight Strata	Deaths	Births	% of Total	Stratum Specific Rate per 1000	Crude Rate per 1000
< 1500	61	200	1	305.0	
150–2500	19	850	4	22.3	
> 2500	37	18950	95	2.0	
	117	20000	100		5.8

Standardization, Table 2 Hospital Group B: Tertiary Care Hospitals

Birthweight Strata	Deaths	Births	% of Total	Stratum Specific Rate per 1000	Crude Rate per 1000
< 1500	79	400	2	195.0	
1500–2500	18	1450	7	12.4	
> 2500	20	18150	91	1.0	
	117	20000	100		5.8

Standardization, Table 3 Standard Population: All Live Births in the State

Birthweight Strata	Deaths	Births	% of Total	Stratum Specific Rate per 1000	Crude Rate per 1000
< 500	1217	5000	1	243.4	
1500–2500	480	34000	7	14.1	
> 2500	424	461000	92	1.0	
	2121	500000	100		4.2

► Direct standardization applies the stratum specific rates of each population to the number of individuals in the corresponding stratum in the standard population. This method yields an adjusted relative risk. The method is called "direct" because it uses the actual morbidity or mortality rates of the populations being compared.

Directly standardized relative risk is calculated as follows:

Adjusted Rate for the Community Hospitals:

$$= (5000 \times 305.0 + 34000 \times 22.3 + 461000 \times 2.0)/500000 = 6.4$$

Adjusted Rate for the Tertiary Care Hospitals:

$$=(5000 \times 195.0 + 34000 \times 14.1 + 461000 \times 1.0)/ 500000 = 3.8$$

Crude relative risk $= 5.8/5.8 = 1$

Standardized relative risk $= 6.4/3.8 = 1.7$

In the process of calculating an adjusted relative risk, it is necessary to calculate what appear to be ► adjusted rates for each population. They do not reflect the real mortality risk in the two hospital groups. They are byproducts of the standardization procedure and should not be used as stand-alone measures. The adjusted relative risk of 1.7 shows that the community hospitals have elevated neonatal mortality compared with tertiary care centers even though the adjusted relative risk was 1. Without adjustment, the better survival of neonates born in the tertiary care centers was masked due to the disparity in the birthweight distribution.

► Indirect standardization applies the stratum specific rates of the standard population to the number of individuals in the corresponding stratum in each of the populations being compared. This method is called "indirect" because it does not use the actual morbidity and mortality rates of the populations being compared. This method yields standardized morbidity or mortality ratios (SMRs), one for each population being compared.

SMRs are calculated as follows:

For the Community Hospitals:

$$\text{SMR} = (117/20000 \times 1000)/ ((200 \times 243.4 + 850 \times 14.1 + 18950 \times 1.0)/20000) = 5.8/4.0 = 1.4$$

For the Tertiary Care Hospitals:

$$\text{SMR} = (117/20000 \times 1000)/ ((400 \times 243.4 + 1450 \times 14.1 + 18150 \times 1.0)/20000) = 5.8/6.8 = 0.9$$

With indirect standardization, each SMR is itself an adjusted relative risk; the numerator is the observed crude rate in a population and the denominator is its expected rate given the mortality experience in the standard population. An SMR $>$ 1 indicates higher rates than expected and an SMR $<$ 1 indicates lower rates than expected. The two SMRs in this example lead to the same conclusion as the adjusted relative risk values – after accounting for birthweight, the community hospitals have higher neonatal mortality than the tertiary care centers.

Discussion of Methods

Over the years, many methods of standardization have been proposed. No single method has emerged on top and a variety of methods are in use. Direct and indirect standardization are undoubtedly the most popular, but other methods such as the Proportional Method have to be employed in certain circumstances. The Proportional Method is a method analogous to SMR and which calculates the ► proportional mortality ratio (PMR). In each age group, the population size is replaced by the number of all-cause death. Thus, the rates are replaced by the proportions of all deaths due to the cause of interest. Increasingly, mortality rates are being modeled using regression techniques. Many methods of estimating standard errors and deriving confidence intervals are also in widespread use.

As a final note, we must be aware that in any standardization procedure we lose something. Much of the debate about which methods to use is due to the fact that no standardized measure can replace analysis of the age-specific rates themselves.

Cross-References

► Adjusted Rates
► Direct Standardization
► Indirect Standardization
► Overall Rates (Total or Crude Rates)
► Proportional Mortality Ratio (PMR)
► Rate
► Specific Rates
► Standardized Mortality Ratio (SMR)
► Standard Population

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Standardized Mortality Ratio (SMR)

Definition

Indirectly standardized ratio when deaths have been studied. With indirect standardization, each SMR is itself an adjusted relative risk; the numerator is the observed crude rate in a population and the denominator is its expected rate given the mortality experience in the standard population. An SMR > 1 indicates higher rates than expected and an SMR < 1 indicates lower rates than expected.

Standardized Rate

Synonyms

Adjusted rates

Definition

Standardized rates are a summary type of rate that account for the difference between populations. Age and sex are variables for which adjustment is most often required, but it is possible to apply adjustment procedures for other variables such as occupation, socioeconomic status, marital status, etc. As adjusted rates are not true population-based rates, they do not accurately measure the health status of a population. However, they can be compared across populations because the problem of different age, sex, etc. patterns has been removed. There are two methods of standardization: direct and indirect. They are equally applicable to incidence and mortality rates, and prevalence.

Standard Operating Procedures

Definition

Standard operating procedures (SOP) are formal documents which describe the procedures that have to be followed to accomplish repetitive standard tasks. Usually in regulated areas (e. g. by current guidelines and regulations on GCP) like clinical trials, laboratory or animal or in-vitro experimentation all repetitive standard activities undertaken have to be described in SOPs.

Standard Population

Definition

A specific population whose age (and sex) distribution is used in the calculation of standardized rates. For example, in trying to summarize age-specific rates for geographic regions within a country, the national population could be used as a standard. When examining rates for a variety of countries, a world population or population of the appropriate continent would be suitable standards. However, different choices of standard population can give rise to different results. Thus, identifying a suitable standard is a prerequisite for applying standardization methods.

Standards

► Ethical Principles

Standard Sanitary Operating Procedures (SSOP)

Synonyms

Good Hygienic Practice

Definition

Procedures which include good employee hygiene – proper hand washing, clothing, prevention of transition of bacteria, viruses and parasites from food handlers to food – are called SSOP. SSOPs are written procedures designed to achieve and maintain an effective sanitary condition in the facility: practicing and monitoring effective handwashing and gloving for safe hands,

restricting eating, smoking, and drinking in food preparation areas, using hair restraints, wearing clean uniforms, and restricting the wearing of jewelry. SSOPs are prerequisites to HACCP and all food producing, selling and serving facilities must employ good SSOP programs. SSOPs are designed to generate and maintain an environment to enable HACCP to concentrate on issues related to ► food safety.

Standby Therapy of Malaria

► Self-Therapy of Malaria

Staphylococcal Toxic-Shock Syndrome (TSS)

Synonyms

Toxic-shock syndrome; Tampon disease

Definition

Staphylococcal toxic-shock syndrome is the life-threatening result of a staphylococcal infection. It first occurred in the 1980s. As it was associated with the use of tampons, for some time it has also been called "tampon disease". After an improvement in the quality of the tampons, the incidence of tampon associated TSS has rapidly declined. Nevertheless, due to the release of toxins, a septic course can occur in other forms of a generalized staphylococcal infection. In most cases, TSS appears in formerly healthy persons between the age of 20 and 50 years. In children younger than 5 years, particularly in newborn babies, staphylococcal scalded skin syndrome (SSSS) is found. It is characterized by bright red patches of skin, which peel away in jagged sheets.

Staphylococcus aureus

Synonyms

Cluster-forming cocci

Definition

Staphylococcus aureus (Staph. aureus) is a gram-positive bacterium, which often grows as clusters. As it is quite insensitive to drying out, it can survive on objects and surfaces for a long period of time. Staphylococci can be a part of the natural skin flora, they are especially found in the groin and the front parts of the nose. Their colonization of the skin or the mucous membranes presents no threat of infection and thus cannot be an indication for antibiotic therapy. However, when staphylococci penetrate deeper into the tissue they can cause severe purulent infections. They cause, besides furuncles, wound infections, abscesses, pneumonia, osteomyelitis, endocarditis and sepsis.

State

► Country

Stated Preference Analyses

► Willingness-to-Pay Analyses

Stateless Person

Definition

The term "stateless person" designates a person who is not considered being a national by any state. This definition has been provided by the Convention Relating to the Status of Stateless Persons of 28 September 1954. The term "stateless person" does not apply to persons who are receiving protection or assistance from organs or agencies of the United Nations other than the United Nations High Commissioner for Refugees; neither does it apply to persons who have committed a crime against humanity or international humanitarian law. The convention details that contracting states shall apply to stateless persons lawfully staying in their territory the same treatment with respect to public ► relief and assistance as is applied to their nationals, and that they shall not expel a stateless person.

State Liability

Synonyms

Liability of public authorities; Government liability

Definition

State liability is the state's obligation to compensate and pay damages to any individuals or other legal entities (e. g., companies) for harm to their personal or property rights caused by or attributable to the state. State liability is a fault-based liability. For state liability, a violation of public duties by the state institutions or their officials or private actors authorized to provide public services must have led to the harm/infringement. State liability can apply if public health agencies negligently fail to react adequately to health threats or disproportionately encroach personal or economic rights. In many jurisdictions, the state is privileged by certain exemptions from liability.

Statistic

Definition

A statistic is a summary value (numerical quantity measuring some aspect of a sample values) calculated from the observations in a sample (e. g. the sample mean, the sample variance, the sample proportion, the sample correlation coefficient). Statistic is usually used as an estimator of some population parameter. They are represented by Roman letters ($\bar{x}$, s^2 or sd^2, p, r, respectively). In general, if we use a statistic (sample information) to make an inference about a population parameter (in one of two ways: estimate its value, i. e. provide a point or interval estimate; or make decisions about its value, i. e. test a hypothesis about its value), we introduce an element of uncertainty into our inference. Consequently, it is important to report the reliability of each inference we make. Typically, this is accomplished by using a probability statement that gives us a high level of confidence that the inference is true. Reliability of the estimate is measured with confidence coefficient (in interval estimates), and the reliability of the hypothesis testing is measured by the probability of making an incorrect decision.

Statistical Analysis

Definition

Statistical analysis is the use of statistical tests to strengthen effects (with respect to data) observed in studies. Statistical tests are mathematical formulas (or functions) used to determine if the difference in outcomes of a treatment and control group are great enough to conclude that the difference is statistically significant. Statistical tests generate a value that is associated with a particular P value. The choice of a test depends upon the conditions of a study, e. g. what type of outcome variable was used, whether or not the patients were randomly selected from a larger population, and whether it can be assumed that the outcome values of the population have a normal distribution or other type of distribution.

(Statistical) Dependence

► Association

Statistical Genetics

► Genetic Epidemiology

Statistical Literacy

Definition

Statistical literacy involves understanding and using the basic language and tools of statistics: knowing what statistical terms mean, understanding the use of statistical symbols, and recognizing and being able to interpret representations of data.

Statistical Method

► Statistical Procedure

Statistical Model

Definition

A statistical model is a simplified or idealized description of random phenomena, in probabilistic terms, that is a basis for inferences and predictions. The aim is to explain available data, thereby learning about the underlying processes that have formed these data sets. Most

frequently used statistical models are regression models that describe the variation in one (or more) variable(s) when one or more variable(s) vary, i. e. a model of relationships between some covariates (predictors) and an outcome. There are two principal aspects of the use of statistical models – exploratory and confirmatory. In the exploratory phase, models are used to describe various characteristics of the data that may be important for understanding it. Confirmatory use is the attachment of probabilities to the characteristics observed to assure that a conclusion is not merely due to chance. Statistical models are built through three key steps: 1) certain assumptions are made when we fit a model; 2) consideration of how well the model fits the data and 3) model validation that involves an assessment of how the fitted statistical model will perform in practice – that is, how successful it will be when applied to new or future data.

Statistical Packages

► Biostatistical Software

Statistical Power

Definition

Statistical power represents the likelihood of rejecting a false null hypothesis. It is determined by subtracting the value beta from 1 (i. e., power $= 1 - \beta$).

Statistical Power Analysis

► Power Analysis

Statistical Procedure

Synonyms

Statistical method

Definition

Statistical procedure is a method of analyzing or representing statistical data; a procedure for calculating a statistic. Parametric and nonparametric are two broad classifications of statistical procedures. Parametric tests are based on assumptions about the distribution of the underlying population from which the sample was taken. The most common parametric assumption is that data are approximately normally distributed. Nonparametric tests do not rely on assumptions about the shape or parameters of the underlying population distribution.

Statistical Reasoning

Definition

Statistical reasoning is the way people reason with statistical ideas and make sense of statistical information. Statistical reasoning may involve connecting one concept to another (e. g. center and spread) or may combine ideas about data and chance. Reasoning means understanding and being able to explain statistical processes, and being able to fully interpret statistical results.

Statistical Software

► Biostatistical Software

Statistical Tests

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Synonyms

Inferential statistical tests

Definition

A statistical test is a procedure for deciding whether an assertion (e. g. a hypothesis) about a quantitative feature of a population is true or false. We test a hypothesis of this sort by drawing a random sample from the population in question and calculating an appropriate statistic on its items. If, in doing so, we obtain a value of the statistic that would occur rarely when the hypothesis is true; we would have reason to reject the hypothesis. The choice of the statistical test depends on the research

aim, research plan, statistical model, and the variables' measurements procedure, its power and efficiency.

Basic Characteristics

Once collection of the data for a study is complete, the next step in the hypothesis testing procedure is to evaluate data using an appropriate ► inferential statistical test. The decision on whether to accept or reject the null hypothesis is based on contrasting the observed outcome of an experiment with the outcome expected if, in fact, the null hypothesis is true. This decision is made by using the appropriate statistical test.

The choice of the statistical test depends on:

- the criteria based on which the statistical test will be chosen (kind and type)
- the optimal choice in cases when alternative statistical tests are an option for the same research design (and consequently, the research question); this depends on the power and efficacy of the statistical test.

First of the many criteria is the research question, i. e. the previously chosen study plan:

a) Are difference(s), similarities of distributions, or correlations to be tested that fully determine the kind of the statistical test to be used?
b) What is the number of available or necessary samples (1, 2, or more)?
c) What is the sample relation (paired or unpaired samples) (► unpaired groups design; ► paired groups design)?
d) Which descriptive statistical measures – if existing or needed at all – that have differences, similarities, or tested relations will be used that partially determine the choice of statistical test and its test statistics?

The second criterion is related to defining the statistical model (determination of the nature of the population used to derive the sample and the way the sample will be chosen), as well as the variable(s) in stake measurements procedures (one of the four measurements' scales). This criterion, together with the previous one, then fully determines the type of the statistical test to be used and its test statistics.

An inferential statistical test is essentially an equation describing a set of mathematical operations that are to be performed on data obtained in a study. The end result of conducting such a test is a final value which is designated as the ► test statistic. A test statistic is evaluated in reference to a sampling distribution, which is a theoretical probability distribution of all the possible values the test statistic can assume if an infinite number of studies were to be conducted employing a sample size equal to that used in the study being evaluated. The probabilities in a sampling distribution are based on the assumption that each of the samples is randomly drawn from the population it represents.

Scientific convention has established that in order to declare a difference statistically significant, there can be no more than a 5% likelihood that the difference is due to chance. If a researcher believes that 5% is too high a value, they may elect to employ a 1% likelihood before concluding that a difference is significant. The notation $p > 0.05$ is employed to indicate that the result of an experiment is not significant. This notation indicates that there is an above 5% likelihood that an observed difference or effect could be due to chance. On the other hand, the notation $p < 0.05$ indicates that the outcome of a study is significant at the 0.05 level. This indicates that there is less than a 5% likelihood that an obtained difference or effect could be due to chance. The notation $p < 0.01$ indicates a significant result at the 0.01 level (i. e., there is less than a 1% likelihood that the difference is due to chance).

Parametric Versus Nonparametric Inferential Statistical Tests

Inferential statistical procedures are categorized as being **parametric** or ► nonparametric tests. According to some sources, ► parametric tests are distinguished from nonparametric tests on the grounds that parametric tests make specific assumptions regarding one or more of the population parameters that characterize the underlying distribution(s) for which the test is employed. The same sources describe nonparametric tests as providing no such assumptions about the population parameters. Basically, nonparametric tests are really not assumption free, and bearing this in mind, some sources suggest that it might be more appropriate to use the expression "assumption freer" rather than nonparametric.

As a general rule, inferential statistical tests that evaluate categorical/nominal data and ordinal/rank-order data are categorized as nonparametric tests, while those tests that evaluate interval data or ratio data are cat-

egorized as parametric tests. Although the suitability of employing the level of measurement as a criterion has been debated, its usage provides a reasonably simple and straightforward schema for categorization that facilitates the decision-making process for selecting an appropriate statistical test.

There is general agreement among most researchers that as long as there is no reason to believe that one or more of the assumptions of a parametric test have been violated, when the level of measurement for a set of data is interval or ratio, the data should be evaluated with the appropriate parametric test.

In the final analysis, the debate concerning whether a parametric or nonparametric test should be employed for a specific experimental design turns out to be of little consequence in most instances. The reason for this is that when a parametric test and its nonparametric analog are employed to evaluate the same set of data, they generally lead to identical or similar conclusions. In those instances where the two types of test yield conflicting results, the importance of adequate choice of a suitable test depends on the sample size.

Selection of the Appropriate Statistical Procedure

Test-statistic choice – i. e. choosing an adequate statistical test – can be shown as a function of the research aim and measurements' characteristic (chosen measurements' scales) as follows (Table 1):

Example

In two random samples, the lowest hearing frequency that a human ear can hear was measured. The first sample consisted of 24 men, below 30 years, and the mean frequency they heard was $x_1 = 18.83$ Hz with a variance $SD_1{}^2 = 58.8$. The second sample consisted of 17 men, over 30 years, and the mean frequency they heard was $x_2 = 15.94$ Hz with a variance $SD_1{}^2 = 100.81$. Is there a difference in sound perception of low frequency sounds between men below and over 30 years?

To test the significance of the difference of arithmetic mean, the t-test for two independent samples can be used:

$$t = (x_1 - x_2) / \sqrt{(n_1 SD_1{}^2 + n_2 SD_2{}^2)} / (n_1 + n_2 - 2) \times (n_1 + n_2)(n_1 \times n_2)$$

The calculated value of the t-test, $t = 1.02$, is lower than the critical value $t_{(0.05;30)} = 2.75$, so there is no reason to reject the null hypothesis. There is no difference in

Statistical Tests, Table 1 Selecting a statistical test

Goal	Type of Data: Measurement (from Gaussian Population)	Rank, Score, or Measurement (from Non- Gaussian Population)	Binomial (Two Possible Outcomes)
Describe one group	Mean, SD	▶ Median test, interquartile range	Proportion
Compare one group to a hypothetical value	One-sample *z* or *t* test	Kolmogorov-Smirnov test	▶ Chi squared test or Binomial test
Compare two unpaired groups	Unpaired *z* or *t* test	▶ Mann Whitney (U) test	▶ Fisher's test (chi-square for large samples)
Compare two paired groups	Paired *z* or *t* test	▶ Wilcoxon matched pairs signed rank test	▶ McNemar's test
Compare three or more unmatched groups	One-way ▶ ANOVA	▶ Kruskal-Wallis test	Chi-square test
Compare three or more matched groups	Repeated-measures ▶ ANOVA	▶ Friedman test	▶ Cochran's Q Test
Quantify association between two variables	Pearson correlation	Spearman correlation	Contingency coefficients
Predict value from another measured variable	Simple linear regression or Nonlinear regression	Nonparametric regression	Simple logistic regression; Log-linear models

S

low frequency sounds' perception between men below and over 30.

Cross-References

- ▶ Analysis of Variance
- ▶ Biostatistics
- ▶ Bonfferoni Correction
- ▶ Chi-Square Test
- ▶ Cochran's Q Test
- ▶ Covariance Models
- ▶ Degrees of Freedom
- ▶ Fisher LSD
- ▶ Fisher's Test
- ▶ Friedman Test
- ▶ Inferential Statistical Tests
- ▶ Interaction
- ▶ Kruskal-Wallis Test
- ▶ Mann Whitney (U) Test
- ▶ Mantel-Haenszel χ^2 Test
- ▶ McNemar's Test
- ▶ Median Test
- ▶ Nonparametric Test
- ▶ Paired Groups Design
- ▶ Parametric Test
- ▶ Statistical vs. Clinical Significance
- ▶ Student's t-Test
- ▶ Test Statistic
- ▶ Unpaired Groups Design
- ▶ Wilcoxon Matched Pairs Signed Rank Test
- ▶ Yates's Correction

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Statistical Thinking

Definition

Statistical thinking involves an understanding of why and how statistical investigations are conducted. This includes recognizing and understanding the entire investigative process (from question posing to data collection to choosing analyzes to testing assumptions, etc.), understanding how models are used to simulate random phenomena, understanding how data are produced to estimate probabilities, recognizing how, when, and why existing inferential tools can be used, and being able to understand and utilize the context of a problem to plan and evaluate investigations and to draw conclusions.

Statistical Visualization Techniques

Definition

Statistical visualization techniques is a method of analyzing or representing statistical data. Sophisticated techniques to display a two dimensional image of more complex phenomena, for instance, a three dimensional image – specialized statistical plots. Relevant functions accept grouping variables for the simultaneous visualization of different data groups. Interactive features allow you to explore data sets and experiment with different data models. Due to the powerful graphic interface in modern computers, visualization techniques have become more and more popular for data exploration. As a preliminary investigation, visualization is a greatly useful tool to lead to further statistical analysis and modeling.

Statistical vs. Clinical Significance

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Synonyms

p value; Significance probability; Clinical relevance; Size of effect

Definition

Statistical methods enable estimation of probabilities of noted or of a higher degree of connection between independent and dependent variables in comparison to null hypotheses. Based on the estimate, on a sample of a given size, statistical significance of the results can be established. Usually, the level of statistical value is expressed as a *p* value. The obtained statistical significance – i. e., the fact that the obtained result is probably not the consequence of coincidence – does not mean that the result is either important or of interest.

Basic Characteristics

The ► *p* value is probably the most ubiquitous statistical index found in the applied sciences literature, and is particularly widely used in biomedical research. It is also fair to state that the misunderstanding and misuse of this index is equally widespread. To understand the meaning of *p* value and statistical significance, the process of testing the hypothesis must be previously understood.

Hypothesis testing is a process of statistical deduction of whether the results of the research depict only coincidence or the real effect at the given level of probability. Testing hypotheses presents articulation of the research question in the form of a ► null hypothesis (H_0) and an ► alternative hypothesis (H_A). The null hypothesis is an assumption that there is no difference between assumed and hypothetical value and the parameter is non-existing, while the alternative hypothesis states that a difference is present. It should be taken into account that – by convention – when treatment effects are tested, the null hypothesis is defined as an assumption that the effects are equal (i. e. that the difference between them is zero). However, the frame of hypothesis testing is much wider. It allows any difference – not just the null one – to be defined as the null hypothesis.

The result of hypothesis testing can be in the form of the ► two-sided test: the null hypothesis will be rejected disregarding whether the assumed value is above or below the real parameter's value; or the ► one-sided test: the sample value is a priori expected to be either below or above the population value. For example, two-sided testing would include $H_0: \mu = 21$ points and $H_A: \mu \neq 21$ points, while one-sided testing would include $H_A: \mu < 21$ points and $H_A: \mu > 21$ points (where μ is population mean).

In the process of testing a hypothesis, selection of an adequate statistical test is made for the given hypotheses, considering the fact that each test statistic has variability of distribution.

The next step comprises choosing the level of significance of the statistical test; the α value or probability of inappropriate rejection of the null hypothesis when it is actually true. As it is not a desired option, it should be small – usually 0.05. The other concept related to significance is the *p*-value, which is the probability of obtaining a result equal to or greater than the observed one if the null hypothesis is correct. Some interpret the *p*-value as a probability that the obtained result is only the consequence of coincidence. The *p*-value is obtained after application of the statistical test and if it is less than the α value, the null hypothesis is rejected.

Then, the value that the test statistic must have in order to be considered significant is determined. This value is an important value, a borderline value, or a critical value of the test statistic. Establishing a critical value is a simple procedure where every test statistic has its distribution (its distribution is divided into a surface that determines that the hypothesis is accepted and the remainder, which determines its rejection). These surfaces are determined by the chosen α value.

The next stage is test statistic calculation, followed by statistical decision making or forming a statistical conclusion; determining whether the observed value of the test statistic is above or below the critical value of the statistic, i. e. to which of the two surfaces it belongs. Four outcomes are possible in terms of conclusion accuracy.

The wrong conclusion means that the results say there are no correlations or differences when there actually are and *vice versa*, meaning that it is claimed a difference or correlation exists when it does not. The first situation represents a bigger problem because, colloquially, it is a bigger issue to find a needle in a haystack or note a signal in the presence of noise than to see things that are not actually there. The signal is the relationship the researcher is trying to find, while the noise denotes all the factors making it impossible to see things clearly. The sources of the noise can be: low liability of the measurements or measures (wrong questions, or bad instrument design or recording), accidental events in the research neighborhood (everything that disturbs the investigator or the investigated), or accidental heterogeneity of the subjects. All these are compiled in ► sta-

Statistical vs. Clinical Significance, Table 1 Statistical decision making

	In reality	
Our conclusion	**Null hypothesis is correct (no correlation, no difference, no fit, theory is wrong)**	**Null hypothesis is wrong (there is a correlation, there is a difference, there is a fit, theory is correct)**
We accept the null hypothesis	$1 - \alpha$ (most often 0.95)	β (most often 0.20)
	Confidence level	Type 2 error
	A chance to say that there is no correlation, difference, or effect when one does not actually exist	A chance to say that there is no correlation, difference or effect when there actually is
	A chance to not confirm the theory in a correct manner	A chance that the theory is not confirmed when it is actually true
	95 times out of 100 when there is no effect, it will be found that there is none	20 times out of 100, when there is an effect, it will not be recognized
We reject the null hypothesis	α (most often 0.05)	$1 - \beta$ (most often 0.80)
	Type 1 error	power
	Level of significance	Chance that there is a correlation, difference, or effect when one actually does exist
	A chance to say that a correlation, difference, or effect exists when it actually does not	A chance to confirm the theory in a correct manner
	5 times out of 100 when there is no effect, it will be stated that there is none	80 times out of 100, when there is an effect, it will be confirmed

tistical power. Determining the validity of the conclusion is achieved by good statistical power (at least 0.80), which, in turn, is achieved with good sample size and/or lowering the level of significance and/or changing – i. e., enlarging – the size of effect.

Once discovered and shown, a statistically significant difference still does not mean that the difference is relevant to research or health or clinically relevant. The importance of calculating sample size prior to data collection lies in the necessity that statistically confirmed research results are also relevant to research. Therefore, besides statistical significance, it is necessary to evaluate the clinical significance (size effect), i. e., the size of the difference or correlation observed within the data, as well as the social and clinical significance of the "effective" factor. The size of the effect identified by research shows the real size of differences observed among the groups or the strength of relationship among the variables. It is important to emphasize that although statistical significance might be reached, the size of the effect might be clinically insignificant.

Research significance according to statistical significance can be depicted using the results of the research which reached statistical significance, but also by asking the reasonable question "so, what?" if the proven difference between the factor categories is low and vice versa, if results of the research showed no statistical significance but it is clear to the researcher that an important difference does exist.

For example, focusing on the following two situations:

a) Statistically significant difference – "so, what?"

Number of subjects N_A	Blood pressure Drug A Mean pressure	Number of subjects N_A	Blood pressure Drug B Mean pressure
500	130.4 mmHg	500	130.5 mmHg
	$p < 0.01$		

b) Clinically important difference – statistically non-significant

Number of subjects N_A	Blood pressure Drug A Mean pressure	Number of subjects N_A	Blood pressure Drug B Mean pressure
10	125.4 mmHg	10	151.6 mmHg
	$p > 0.05$		

Both results (statistically significant difference of 0.1 mmHg = 130.5 – 130.4 and statistically non-significant difference of 26.2 mmHg = 151.6 – 125.4) are the consequence of lack of understanding regarding an adequate number of subjects, which means the size of

effect is not defined or poorly defined. This means that the important difference the research should confirm, if one exists (and it is shown with an appropriate formulation of the alternative hypothesis), is not confirmed.
Usually, these three values: ► Type I errors, ► Type II errors, and the size of effect, define the power of the research to discover possible differences; i. e., the power implies:

1. defining the effect size, i. e., the size of the difference needed to be discovered (clinically significant difference that should not be ignored)
2. the choice of probability that is needed to confirm the difference if it is present – the power of the method – difference between 1 and the probability of Type II error ($1 - \beta$)
3. the decision of risk size that the researcher is willing to take in declaring its presence – when a difference does not actually exist – the level of significance – the probability of Type I error – α value.

Cross-References

► Alternative Hypothesis
► Null Hypothesis
► One-Sided Test
► p Value
► Statistical Power
► Two-Sided Test
► Type I Error
► Type II Error

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Statistics

Definition

Statistics is a mathematical science pertaining to the collection, analysis, interpretation or explanation, and presentation of data. It is applicable to a wide variety of academic disciplines.
Statistics is a science of generating information and knowledge through the collection, analysis and interpretation of data that are subject to random variation. Statistics has its origins in three branches of human activity: first, the study of mathematics as applied to games of chance; second, the collection of data as part of the art of governing a country; and third, the study of errors in measurement, particularly in astronomy. At first, the connection between these very different fields was not obvious, however it came to be appreciated that data are governed to a certain extent by chance, that decisions have to be made in the face of uncertainty and that errors in measurement have a random component.

Statistics in Health-Related Fields

Synonyms

Biostatistics

Definition

Biostatistics is the application of statistics in health-related fields, including public health, medicine and biology, and the development of new tools to study these areas. Biostatistics constitutes the quantitative foundation for public health practice and research. It comprises the reasoning and methods for using data as evidence to address public health and biomedical questions. The domain of biostatistics includes: statistical aspects of public health and biomedical research design (how and why the data have been collected), descriptive statistics (description or summarization of a collection of data) and inferential statistics (the drawing of inferences about a pool of data when only a part of the data are observed). The latter can also be seen as the modeling of patterns in the data, in a way that accounts for randomness and uncertainty in the observations, to draw inferences about the process or population being studied.

Statutory Health Insurance

Definition

Statutory health insurance is a form of sickness insurance organized by the government. To prevent an illness from becoming a financial risk, statutory health insurance funds cover members and their families in the event of illness. As a community based on solidarity, the statutory health insurance system has the task not only of restoring the health of insured persons, but also of providing measures for maintaining and improving health. For the most part, statutory health insurance finances itself mainly through the contributions of employees and employers. The amount of the contribution depends on the individual income of the insured person.

St. Augustine

Definition

One of the main authorities and teachers of religion in the Christian church. He had a definite view about moral standards.

STDs

► Sexually Transmitted Diseases

Stem Cell Research and Therapy

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Definition

Stem Cell Research consists of the investigation of different types of stem cells and their origin, as well as the characterization of their in vivo and in vitro properties. Stem Cell Therapy, on the other hand, deals with the application of stem cells in a clinical setting in order to regenerate injured tissues or, in more general terms, to improve a pathological condition.

Basic Characteristics

Classification

Stem Cells are defined by
(1) their capacity for long-term self-renewal
and
(2) their multilineage potential.
These properties allow them to self-replicate for indefinite periods without loss of proliferation capacity after any cell division, and yet to give rise to many different cell types.

Embryonic Stem Cells

Embryonic stem cells (ESC) are derived from the inner cell mass of ► pre-implantory blastocysts. ESC are clonogenic (► clonogenicity) and able to give rise to differentiated cell types of the three primary embryonic germ layers (endoderm, mesoderm, ectoderm) (Kirschstein and Skirboll 2001). Hence, they are considered to be omnipotent (► omnipotency). In vitro, spontaneous differentiation occurs when feeder layers or leukemia inhibitory factor (LIF) are removed from the growth medium, resulting in aggregation of suspended ESC to embryoid bodies (EB) (Dimmeler and Zeiher 2005). Differentiation into a particular cell lineage, e. g. cardiomyocytes, can be enhanced by modifiying culture techniques and adding defined growth factors or cytokines (Wobus et al. 1991).
Embryonic germ cells (EGC) with ES cell-like properties are derived from primordial germ cells. They can only be isolated from fetal tissue which raises ethical concerns besides limiting their availability. Few EGC data from animal experiments have been reported, yet it is generally assumed that compared to ESC their range of potential fates is rather limited (Chapman et al. 1999).
ESC are ► immune privileged, and their most promising use is transplantation therapy. In addition, ESC provide new insights into genetic, molecular and cellular events during early development. They represent a useful model to test candidate therapeutic drugs, extending information of animal model testing. ESC can be injected into blastocysts generating ► chimeras or even replacing inner cell mass, forming a new embryo. If administered without in vitro pre-commitment, they hold the risk of giving rise to tumours like ► teratomas.

Adult Stem Cells

Adult Stem Cells (ASC) are a heterogenous population of cells that reside in mature organs. It has been known for a long time, that any tissue contains progenitor cells which maintain its integrity and replace lost cells (Kirschstein and Skirboll 2001). ASC are able to give rise to different cell types by generating progenitor cells which are already committed to a specific cell lineage. Depending on the tissue of their origin, ASC vary in their morphology and characteristics. In general, they are localized at a special site within the tissue, termed a "niche", that is created by supporting cells and extracellular environment. Although they can cross the boundaries of germ layer derivation, ASC are supposed to have limited ► plasticity compared to ESC. ASC may originate from undifferentiated remnants of ESC-like cells in development, or they may represent ► bone marrow cells of peripheral blood after homing to the particular organ.

As an ► autologous cell source, ASC can be obtained from the same patient who is to be treated. Potential therapeutic use of ASC is mainly limited by their scarcity. Only 1 of 10,000 to 15,000 cells in bone marrow is a ► hematopoietic stem cell (HSC), which is probably the most studied cell type among ASC. Many tissues were shown to contain ASC, e. g. brain, heart, peripheral blood, dental pulp, liver, epithelia and skeletal muscle. Even adult germ cells were recently reported to be pluripotent (► multipotency) (Guan et al. 2006). The ability of ASC of preventing senescence and their capacity for self-renewal seem to be limited in comparison to ESC.

Stem Cell Biology

The capacity of self-renewal and the multilineage potential are encoded by a shared set of genes, including for instance the Pou5f1-gene. This gene encodes the transcription factor Oct-4, the expression of which is required for the maintenance of self-renewal and pluripotency (Kirschstein and Skirboll 2001). Another important mechanism is the LIF-STAT3 pathway. By binding to its receptor, LIF activates the latent transcription factor STAT3 necessary for continued proliferation (Marshak et al. 2001). Thus, when the balance between the various signaling pathways is shifted, cells are diverted from proliferation to differentiation. In vitro experiments try to mimic biological conditions and to induce certain differentiation processes by adding adequate growth factors or cytokines.

In general, cell fate between continued proliferation and the beginning of differentiation is surveyed at several checkpoints during the cell cycle, that are under the control of genes, paracrine factors or cell-cell interactions. In this respect stem cells resemble tumour cells which can return to an undifferentiated proliferating stage by skipping these cell cycle check points (Kirschstein and Skirboll 2001).

Stem Cell Research

ESC can be obtained from a 4–5 days old embryo, whereas EGC are collected from the gonadal ridge of aborted fetuses at a later stage of development. ASC, however, can be enzymatically isolated from tissue biopsies of adult individuals.

Therapeutic stem cell administration requires pre-commitment in vitro in order to avoid the risk of tumour formation. Depending on which cell lineage is required, specific culturing protocols have to be used (Wobus et al. 1991). Differentiation can be verified by evaluation of mRNA and protein expression using RT-PCR, Western blot, immunofluorescence or histological stainings, as well as by functional tests such as electrophysiological measurements or enzymatic assays. Further cell culture protocols aim to build three-dimensional tissue patches used in transplantation (Zimmermann et al. 2006).

Any stem cell population to be used for therapeutic purposes should be characterized by its surface marker profile in order to ensure sufficient enrichment and to prevent contamination with unwanted cells. The techniques for cell sorting include centrifugation, magnetic bead labelling, FACS analysis, mechanical filtration or the transfer of a neomycin resistance gene.

Therapeutical Applications

Stem cell therapies have been used experimentally and clinically to improve the function of several organs (Kirschstein and Skirboll 2001; Balana et al. 2003; Dimmeler and Zeiher 2005). However, it is not clear, whether the benefit is due to (trans)differentiation, angiogenesis or paracrine factors.

Residing stem cells can be induced to proliferate and to differentiate. This procedure offers biological safety and few ethical restrictions. Isolated stem cells can be

applied either directly by implantation into an injured area, or by injection into a blood vessel supplying the organ. Tissue used in transplantation therapy can also be engineered in vitro, as an example cardiomyocytes embedded in a collagen substrate that can be stitched onto an infarction scar in order to support the myocardium during systolic contraction (Zimmermann et al. 2006).

All of these methods require to solve 2 basic problems: 1) to find a suitable cell source and 2) to prevent immune response. ► Therapeutic cloning may provide a solution because it involves the transfer of the nucleus from a somatic cell into an unfertilized oocyte (Balana et al. 2003). Cell replacement therapy with genetically modified cells could overcome the immune response and regulate specific protein expression often associated with disease.

Up to now, only few therapies have been tested in clinical trials, but the results appear to be promising. Obviously, autoimmune disorders may be treated with blood cells, including T- and B-lymphocytes derived from HSC. Stem cell replacement has been shown to yield reestablishment of tolerance in T-cells (Kirschstein and Skirboll 2001), thereby decreasing the likelihood of disease reoccurrence. After mobilization of HSC from bone marrow to peripheral blood, cells are harvested repeatedly and returned after elimination of the mature immune cells. Subsequently, HSC differentiate and restore immune-competent cells.

New findings and increasing knowledge about ASC in differentiated tissues raise hope of amending defects so far incurable. In the central nervous system, therapies are heading to cell implantation and stimulation of the endogenous repair with growth factors and hormones. Human trials with fetal tissue transplants to replace the lost dopamine-releasing neurons in Parkinson's Disease, however, were so far disappointing because patients did not show significant benefit in quality of life.

Ethical Considerations and Legislation

Stem cell research provokes intensive public discussion and ethical concerns. Although stem cell research and therapy pursue sophisticated aims, there is no unanimous position with respect to ethical issues. Researchers and their financial supporters should look at the problem from both conflicting sides (Hug 2006) in order to act responsibly. Human life must be basically unviolable, and there is no general notion regarding gradual differences in human identity starting from conception, development, birth and maturation into adulthood. Human ESC are able to develop into individual human beings. Nevertheless, a blastocyst does not yet fulfill characteristics associated with personhood, like physiology, psychology, emotions and intellectual properties. A blastocyst is able to divide and give rise to two individuals. An arbitrary definition of what makes a human being is the gain of conscience and self-awareness. However, loss of these properties in old-age and disease does not implicate loss of human dignity. Therefore, also an embryo at the very beginning of its existence should be equally protected as more developed fetuses or adults.

Stem cell research is well funded. To find a consensus for the experimental handling of stem cells, governments enacted certain laws and guidelines. In Germany, similar to Ireland, Austria, Switzerland, Norway, Italy and Luxembourg, the "law of protection of embryos" (since 2002) is rather restrictive, prohibiting or limiting the production and import of embryonic stem cells (Dimmeler and Zeiher 2005). For research and therapeutic purposes, ASC are to be preferred to ESC also with respect to funding (DFG 1999).

Other countries permit investigations that do not provide an advantage for the embryo itself, but for society in general (France, Denmark, Sweden). Finland, Greece, Great Britain, Netherlands and Spain only restrict the usage of cells beyond the 14-day embryonic stage (Dimmeler and Zeiher 2005). The European Union, in general, prohibits the production of human embryos for research purposes. The United States of America also do not support research with embryos produced for this purpose, but experimentation with ESC lines or ESC isolated before 2001 is legal.

Cross-References

► Autologous
► Bone Marrow Cells
► Chimera
► Clonogenicity
► Hematopoietic Stem Cells
► Immune Privilege
► Multipotency
► Omnipotency

- ▶ Plasticity
- ▶ Pre-implantory Blastocysts
- ▶ Teratoma
- ▶ Therapeutic Cloning

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Stenosing laryngotracheitis

- ▶ Spasmodic Croup

Stereotypes

Definition

Stereotypes are beliefs. They represent notions of groups of persons. Recalling stereotypes does not implicate the agreement that those stereotypes are valid.

Sterility

- ▶ Infertility

Sterilization

Synonyms

Sterilization; Asepsis; Complete elimination of germs; Removal of viable microorganisms

Definition

Sterilization is a method of killing or eliminating any microorganisms, no matter if they are pathogenic or not. Asepsis is achieved when the number of germs is reduced by a factor of 10^{-6}, that means, only one in one million microorganisms survives. Mechanical sterilization is performed by the use of filters. Physical sterilization methods include dry heat, wet heat (steam) and radiation (UV-light, accelerated electrons, X-rays or gamma radiation). For heat-sensitive-items chemical sterilization might be suitable. Fractional sterilization, or tyndallization, is a procedure in which organisms are destroyed by exposure to heat for a definite period on each of several days – incubation periods between the intervals of exposure bring about a reactivation of the spores so that they can be eliminated by the next heat exposure.

Sterilization is the process that destroys all forms of microbial life, including bacterial spores, on inanimate surfaces. Sterilization is required for medical devices penetrating an already sterile part of the body, as well as for all parenteral fluids and medications. In healthcare settings, sterilization is usually accomplished by the use of physical (wet or dry sterilization) or chemical (ethylene oxide gas, hydrogen peroxide gas, or liquid chemicals) means.

Steven's Classification System

► Level of Measurement

Stewardship

Definition

Stewardship in the public health context, implies that stakeholders should exercise social responsibility and good use of common resources.

Stigma of Mental Disorders

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Synonyms

Labeling of mental disorders

Definitions

Stigma means a mark or sign of shame, disgrace or disapproval, of being shunned or rejected by others. ► Public stigma is the reaction of the general population for example towards people with mental illness. Three different public stigma components can be distinguished: ► prejudice, ► discrimination, and ► stereotypes.

Basic Characteristics

Introduction

For centuries, mental disorders have been associated with stigma and shame. Stigma is a part of culture, and there are different levels of stigma towards mental illness in different populations. Individuals may view people with mental illness in a negative stereotyped manner. People who have identities that society values negatively are said to be stigmatized. Stigma is a reality for people with a mental illness, and they report that how others judge them is one of their greatest barriers to a normal life. Usually, mental illness is not seen like other illnesses such as heart disease and cancer. Due to inaccuracies and misunderstandings, people have been led to believe that an individual with a mental illness has a weak character or might be dangerous. Those misconceptions could be shown by media analyses of print and film. The media often stress a history of mental illness in the backgrounds of people who commit crimes of violence. The Royal College of Psychiatrists (http://www.rcpsych.ac.uk) carried out a survey of about 1,700 people's attitudes towards the six most common mental disorders (Anxiety disorders, Depression, Schizophrenia, Alzheimer's disease and dementia, Anorexia nervosa and Bulimia nervosa, and Substance use disorders; 1999). They showed, for example, that about 75% of people rate drug addicts as dangerous while about 70% think schizophrenics are a threat and 65% believe persons with alcohol dependence are a danger, 16% of people believe depression cannot be treated, compared with 15% for schizophrenia, 14% for panic attacks, 12% for drug addiction, 11% for alcoholism and 10% for eating disorders. The Royal College of Psychiatrists (RCP) found out that many people still think it is difficult to communicate with people with mental illness. However, the survey had also positive signs, for example, it showed that over half of the people questioned had personal experience of mental illness and the public was mostly accurate when predicting the outcome of mental illness (exception: anorexia nervosa). In a German telephone-survey more than 7,000 people were asked about their knowledge in regard with schizophrenia and individuals suffering from schizophrenia, respectively. The results indicated that about one third of the interviewees were able to name causes of schizophrenia. More than 75% believed that people with schizophrenia often or very often needed prescription drugs to control their symptoms. Last, the major part of the interviewees (81.1%) believed that most people would pass over the job application of a former mental patient in favor of another applicant. Stigmatization can create a vicious circle of ► discrimination leading to social isolation, drug abuse, unemployment, and institutionalization, all factors that further decrease the chances of recovery and reintegration into society.

Public Stigma, Self-Stigma of Mental Illness and Effects of Labeling

Most individuals have stigmatizing attitudes about mental illness and people suffering from mental disorders, respectively. Studies suggest that even health care

professionals show stigmatizing views about mental illness. The effect of labeling of mental disorders has been discussed controversially. Labeling might have positive effects because if the mental disorder is seen as an illness, the privileges of the patient role might be granted and patients will not be held responsible for their illness. Labeling can introduce positive consequences through treatment. By contrast, through labeling the negative stereotype and stigmatization of the mentally ill could be triggered as well. Stigma not only causes individuals with mental disorders to feel isolated and unhappy, but may also prevent them receiving effective help and treatment (e. g., Goffman 1963). Angermeyer and Matschinger (2003) showed that labeling has, especially in people with schizophrenia, negative consequences. Labeling in those cases was positive correlated with the endorsement of the belief that individuals suffering from schizophrenia were dangerous (i. e., increase of fear and social distance). In the same study, labeling had no effect on those attitudinal components with major depression.

Moreover, individuals suffering from mental disorders might be also diminished by ► self-stigma and low self-esteem, or they might be angry because of the ► prejudice and stigma they have experienced by the public. Hence, self-stigma often is paradoxically associated with both low self-esteem and righteous anger. ► Self-stigma seems to be a quite complex and still not well known phenomenon.

Prevention of Stigmatization

Understanding the dimensions of mental illness stigma is one of the first steps to prevent stigmatization. However, there is no simple or single remedy to eliminate the stigma associated with mental illness. According to Corrigan and Watson (2002), change strategies for stigma have three approaches: protest, education, and contact.

- Protest is a reactive strategy that attempts to diminish stereotypes and negative attitudes about individuals with mental illness.
- Education programs provide information about mental disorders with the goal that the public makes more informed decisions about mental illnesses. Educational and training programs can improve knowledge of mental illness and modify negative attitudes in the general population as well as in specific target groups, such as those employed in mental health care (e. g. "Open The Doors"; Gaebel and Baumann 2003). Broader knowledge may redress public fears. In addition, to providing information about the nature, causes, and treatment of mental disorders, interventions should place special emphasis on achieving a more positive media portrayal of people with mental illness and on promoting personal contact with them. Information on the disorder and on the factors underlying its stigmatization should reach relatives, friends, colleagues, and superiors, as well as physicians, therapists and nursing staff.
- As research has shown, there is an inverse relationship between having contact with a person suffering from mental illness and endorsing psychiatric stigma. Hence, opportunities for the public to meet individuals with (severe) mental may reduce stigma.

Overall approaches to the reduction of stigma involve programs of advocacy, public education, and contact with persons with mental illness through schools and other societal institutions. The determination of causes and effective treatments for mental disorders is also an effective way to eliminate stigma. There is little knowledge, how long the effects of an anti-stigma intervention are maintained over time. The associations between social structures and the maintenance of stigma need to be investigated to plan effective intervention programs. Over the past 15 years, attitude research towards people suffering from mental disorders made considerable progress (Angermeyer and Dietrich 2006). However, to provide an empirical basis for evidence-based interventions to reduce stigmatization, there is still more research needed.

Cross-References

► Discrimination
► Prejudice
► Public Stigma
► Self-Stigma
► Stereotypes

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Stimulants

► Psychostimulants

Stratification

Definition

Stratification is a technique to control confounding in the analysis of a study that involves the evaluation of the association within homogeneous categories or strata of the confounding variable. If for example sex is a potential confounder, an estimate of the association between the exposure and the disease would be calculated for men and for women separately.

To examine the possible association between urban atmospheric pollution and lung cancer, the population may be divided into strata according to smoking status, because smoking is known as risk factor for lung cancer. The association between air pollution and cancer can then be estimated separately within each stratum.

Stratified Analysis

Definition

A stratified analysis (also referred to as contingency analysis) is a tabular or graphic representation of a research outcome differentiated by demographic, social or other relevant parameters (e. g. age, sex, class, migration status). When carrying out a stratified analysis, the researcher assumes that the outcome of his research is not independent of the stratification variables but rather varies systematically across their properties. Frequently, the associations examined are bivariate but a stratified analysis may also include more than one stratification variable simultaneously (e. g. sex *and* age). Furthermore, it can pursue a systematic multivariate research strategy of sequenced tabulations. The associations observed in stratified contingency tables can be assessed by calculating association and significance measures.

Cross-References

► Standardization

Stratosphere

Definition

Earth's atmosphere is usually divided into four layers that are, in order of increasing elevation, the troposphere, the stratosphere, the mesosphere, and the thermosphere (or ionosphere). The stratosphere is the atmospheric layer from about 16 km above Earth's surface near the equator (about 9 km near the poles), up to 50 km. One of the main characteristics of the stratosphere is the presence of ozone gas, which has its highest density at about 20 to 25 km above the Earth. Shortwave solar ultraviolet radiation is effectively absorbed by this ozone layer in the stratosphere, protecting all life forms on Earth against this harmful radiation (ozone shield). During the second half of the 20th century, considerable deterioration in the ozone layer has been observed, known as ozone holes. Air temperature increases with altitude in this layer, due to high absorption of UV ► radiation by stratospheric ozone. However, on the top level (upper boundary) of the stratosphere, the temperature value is almost the same as the average air temperature on the Earth's surface (15 °C). Finally, inside the stratosphere there is now a considerable collection of radioactive dust produced by numerous detonations of nuclear devices during the second half of the 20th century.

Streptococcal Toxic-Shock Syndrome (STSS)

Synonyms

Toxic strep syndrome

Definition

In cases of soft tissue injuries (also after insect bites), varicella infections or following a blunt trauma (muscle hematoma) there can be a superinfection by streptococci. When toxins are set free, a phlegmon, a myositis or a necrotizing fasciitis can be result. In the case of necrotizing fasciitis, parts of the skin and the subcutis become necrotic. A quick surgical intervention is necessary. Lethality is about 30%. Similar to toxic-shock syndrome, toxic strep syndrome most frequently occurs in formerly healthy persons between the age of 20 and 50.

Stress

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Synonyms

Stress factors; Stress-related disorders; Acute stress reaction; Reaction to severe stress

Definition

Stress can be seen as a pattern of specific and unspecific reactions of a person to events which disturb the person's homeostasis (equilibrium) and call for, or even overextend, the person's ability to cope. These events comprise a range of external (e. g. a traffic accident, an argument) and internal conditions (e. g. an illness, worry, boredom), which are all called "stressors" and demand adaptation. Whether and to what extent an event is experienced as a stressor depends on the person's perception and evaluation of the event and the (perceived and deployed) ability to cope with it.

Basic Characteristics

History and Models

It is characteristic of stress that a (critical) event has multiple effects on a person's life and perception. Hans Selye first used the term "stress" approximately 50 years ago to describe a state of tension of the body which is necessary to mobilize the body's defenses. In his biological-medical theory of stress, Selye (1974) assumed that stress would lead to a disorganization of behavior which would make a complex process of readaptation necessary. According to this theory, stress is an unspecific reaction of the organism to any kind of demand. According to Selye, the stress reaction as such consists of three phases: an alarm state, a resistance state and an exhaustion state. In a situation of danger, the body switches to vegetative processes, because rationally assessing the situation and reacting to it could be dangerously slow. An external stimulus (a noise, a fast movement, a change of light intensity, etc.) puts the body in an alarm state. Adrenaline (epinephrine) and other hormones are released, blood pressure and blood glucose level are raised. In order to increase the reaction speed, the cognitive processes stored in the cerebrum are switched off for a brief moment in favor of the fast reaction processes stored in the brain stem. When the dangerous situation has been dealt with successfully, the stress hormones will be broken down and exhaustion sets in. The body has to regenerate. Seyle describes here a normal and rather positive process. The program described was of vital importance for human beings in a time when they were still threatened by wild animals. Today, this mechanism is often triggered when fight or flight is either useless or even wrong. Problems therefore often occur when the stressor appears repeatedly at short intervals or over a longer period of time: this leads to adaption. After the alarm state described above, the body falls into a kind of shock during which the stress hormones have to be either broken down or countered by other hormones. If the stress persists, however, the body switches to the state that Selye called resistance state during which the body is in a permanent state of alert. This means that the stress hormones are not broken down. If the influence of the stressors is still not reduced or stopped, the exhaustion state sets in. The body slows down all systems. Metabolism, immune functions, etc. are slowed down, the need for sleep increases, the organism falls ill and can sustain lasting damage or even die.

Another important differentiation was also introduced by Selye (1986), that of "▶ eustress" and "▶ distress". The loss of balance is called eustress when the person experiences an equivalence of demand and available resources. This so-called "positive" stress is seen as a challenge the person can cope with. Distress, on the other hand, describes psychic states or processes in which, at least temporarily, the relation between

demand and resources is disturbed in favor of the demand.

A newer definition, by Richard Lazarus (1974; 1993), assumes that it is not the stimulus causing the stress that is of importance, but the individual's reaction to it. The decisive question, therefore, is: "Can I cope with the situation with the resources available to me?" Accordingly, Lazarus sees stress as a transactional process, that is a process of interaction between a person and the environment that starts with the appraisal of an event and one's possibilities of coping with it. In the first place, the primary appraisal, people assesses whether the situation is relevant to their goals and wishes. Secondly, the secondary appraisal, people check whether the available resources are sufficient to cope with the situation. If that is not the case, the result will be stress. The coping strategy or adaptive reaction depends on the situation as such as well as on the personality and cognitive structures of the individual (e. g. attack, flight, search for alternatives, re-evaluation). The next step is the reappraisal, as the inner and/or outer conditions have been changed as a result of the coping strategy. Stress, according to this model, is not a static condition, but a dynamic process which occurs in a constant and reciprocal interaction (= transaction) between an individual and the environment.

The process of successful or failed adaptation depends on a number of other factors. The intensity of the stress reaction and the way the stress is dealt with largely depend on the evaluation and appraisal process with regard to controllability and attribution of causes. The coping process as such is further modified by personality factors, coping tendencies and coping styles and variables of social support. Depending on further circumstances, these personality and social features can reduce or intensify the stress reduction.

Stress may result in psychological disorders: an ► acute stress reaction is the consequence of an exceptionally stressful life event. Whereas, an ► adjustment disorder is the result of a significant life change leading to continued unpleasant circumstances. The mental disorder category "*reaction to severe stress and adjustment disorders"* (International Classification of Disease: ICD-10) differs from others in that it includes disorders identifiable on the basis of not only symptoms and course but also on the existence of one or other of two causative influences. The disorders of this category are thought to arise always as a direct consequence of acute severe stress or continued trauma (i. e. maladaptive responses). According to ICD-10, there are four stress-related mental disorders: reaction to severe stress, adjustment disorder, acute stress reaction, and ► post-traumatic stress disorder.

Stress Research

Stress Research and Life Event Research, whose methods and subjects match to a large extent, share a basic principle, namely that a person is in interactional exchange with the environment. A Life Event is an event which leads to a disorganization of behavior and a psychological disorder. According to Holmes and Rahe (1967), decisive events during a person's life, e. g. death of one's partner or a serious illness, represent particular strains which make a substantial reorientation necessary and can lead to illness or psychological disorder. But also smaller events like moving house or changing jobs, trouble with the boss, a holiday or taking out a loan can be a (stressful) burden and make an adaptation necessary. Most of the time, it is not the critical life events, but insignificant troubles and worries, the so-called "daily hassles", that are perceived as chronic stress events (e. g. noise, pressure of time). This is based on the assumption that a person's health is not so much affected by the few, important life-changing events but by continuous daily hassles and everyday mishaps. The respective diagnostic findings suggest that it is their frequency and their anticipated unavoidability which makes these daily hassles the greater danger to a person's health because, contrary to the more infrequent life events, they often occur many times over a long period of time. If a person thus experiences chronically stressful living conditions, a single, insignificant event can be the last straw if the person is sufficiently vulnerable.

Another characteristic that the Stress Research has in common with Life Event Research is its non-specificity: an analysis of the effects of stress or life events does not usually determine any specific kinds of psychological disorders or reactions that could be expected as a result of a critical life event or stress experience (e. g. depression, schizophrenia, high blood pressure, coronary heart disease, etc.).

From the earlier works about adaptation syndrome (Selye 1936) to the Life Event Research, a common, central model is used according to which stress is seen

as an organism's reaction to stressors that are, in a manner of speaking, objective. Efforts were made to make these stressors objective for research-methodological reasons; firstly by measuring physical influences on the organism (noise, light, etc.), and later by estimating the narrowness of the social living space. Psycho-diagnostically, efforts prevail to render stressors objective by operationalizing critical life events and daily hassles and worries. A number of event-checklists, ratings, questionnaires and interviews have been developed for this purpose (e. g. the *Life Events and Difficulties Schedule*, Brown and Harris (1989) or the *Daily Hassles- and Daily Uplifts-Scales* by Lazarus and Folkman (1989)).

Coping with Stress

Apart from investigating the causes and effects of stress, a major focus of research has always been the question of coping strategies. Here, an individual's ability to deal with stress plays a major role. Lazarus distinguishes between two kinds of coping with stress, the problem-oriented coping and the emotions-regulating coping. In problem-oriented coping, a person tries to change, overcome or adapt to a problematic situation by a targeted search for information and ensuing action (or inaction). Strategies belonging to this group are clarifying talks, changes in time management, delegating tasks, etc. In emotions-regulating coping, also called "intrapsychological coping", on the other hand, people try to either reduce the emotional agitation caused by the stress (e. g. by using relaxation techniques, positive self-instruction or reassessment of the situation) or increase their resilience without dealing with the cause of the stress.

Cross-References

- ► Acute Stress Reaction
- ► Adjustment Disorders
- ► Distress
- ► Eustress
- ► Post-traumatic Stress Disorder (PTSD)

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Stress Factors

► Stress

Stress-Related Disorders

► Stress

Stress at Work

► Job-Related Stress

Strict Liability

Synonyms

Liability without fault; Absolute liability in tort

Definition

The term indicates a particular form of liability under private law. In contrast to most private law liabilities, no fault is required to become liable under strict liability schemes. To claim damages under strict liability, a claimant does not have to prove that the tortfeasor acted at fault when causing the harm. Strict liability is an important liability subtype under tort law. It is imposed as a deviation from fault-liability in fields of activities that are inevitably associated with potential risks. Product liability is a typical area of strict liability.

Strongyloidiasis

Synonyms

Infection with Strongylodes stercoralis

Definition

Strongyloidiasis is caused by an infestation of the 1.8–3.2mm long roundworm *Strongyloides stercoralis*. After ingestion the worm settles in the upper part of the small intestine. The symptoms are malaise and diarrhea, which can sometimes be bloody.

Struma

► Goitre

Student's t-Test

Definition

A parametric test for the significance between means (two independent sample t-test or paired samples t-test) or between a mean and a hypothesized value (one-sample t-test). T-tests generally require the data to be normally distributed and from populations having equal variability unless samples sizes are approximately equal.

Study

► Ethics, Aspects of Public Health Research

Study Protocol

Synonyms

► Investigational Protocol

Definition

A protocol is a study plan which is legally required for answering all specific research questions. Having the safety of participants as one of the focal points of reference, a protocol also determines:

- Who can participate.
- The schedule for tests, dosages and other details of the study.
- The study duration.

Cross-References

► Investigational Protocol

Sub-Acute Care

► Short-Term Rehabilitation

Subsidiarity Principle

Definition

The subsidiarity principle involves ensuring that decisions are made as closely as possible to the citizen, i. e. at the lowest possible administration level. Only when tasks cannot be performed effectively at a lower level are they dealt with at a higher level.

Subsidy

► Health Subsidies

Subspecies

► Race

Substance Abuse

Synonyms

Harmful substance use; Excessive substance use

Definition

Substance abuse is the excessive use of a substance, especially alcohol or a drug. The DSM-IV (Diagnostic and Statistical Manual of Mental Disorders issued by the American Psychiatric Association 2000) definition is as follows:

"A maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by one (or more) of the following, occurring within a 12-month period:

- Recurrent substance use resulting in a failure to fulfil major role obligations at work, school, or home (e. g. repeated absences or poor work performance related to substance use; substance-related absences, suspensions or expulsions from school; neglect of children or household)
- Recurrent substance use in situations in which it is physically hazardous (e. g. driving an automobile or operating a machine when impaired by substance use)
- Recurrent substance-related legal problems (e. g. arrests for substance-related disorderly conduct)
- Continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance (e. g. arguments with spouse about consequences of ► intoxication, physical fights)

The symptoms have never met the criteria for ► substance dependence for this class of substance."

Cross-References

► Drug Addiction
► Substance Related Disorders

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American Psychiatric Association (2000) Diagnostic and Statistical Manual of Mental Disorders, (4th edn) Text Revision, Washington, DC: American Psychiatric Association

Substance Dependence

Synonyms

Drug dependence; Drug addiction

Definition

In 1964, the World Health Organization concluded that the term drug addiction is no longer a scientific term and recommended substitution with the term drug dependence. The concept of substance dependence has had many officially recognized and commonly used meanings over the decades. Two concepts have been used to define aspects of dependence: behavioral and physical. In behavioral dependence, substance-seeking activities and related evidence of pathological use patterns are emphasized, whereas physical dependence refers to the physiological effects of multiple episodes of substance use.

Substance dependence is according to the diagnostic criteria for in DSM IV (American Psychiatric Association 2000, p. 197) characterized by "a maladaptive pattern of alcohol or substance use leading to clinically significant impairment or distress, as manifested by 3 or more of the following, occurring at any time in the same 12-month period:"

(1) tolerance (need for increased amounts of the substance to achieve the same desired effects);
(2) withdrawal (unpleasant somatic and cognitive effects after reduction or termination of use);
(3) loss of control on duration and amount of use;
(4) persistent, but unsuccessful efforts to control further use;
(5) spending a lot of time for acquisition and use;
(6) neglect of social and occupational activities; and
(7) continued use despite negative consequences.

Cross-References

► Substance Related Disorders
► Substance Use Disorders

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American Psychiatric Association (2000) Diagnostic and Statistical Manual of Mental Disorders, (4th edn) Text Revision, Washington, DC: American Psychiatric Association

Substance Induced Disorders

Synonyms

Psychotic disorder; Amnesic syndrome; Residual and late-onset psychotic disorder

Definition

Substance induced disorders are disorders directly caused by the use of substances. They cover ► intoxication and withdrawal as major syndromes, but also more rare complications like delirium, dementia and amnesia.

Substance Related Disorders

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Synonyms

Addiction; Drug dependence; Substance use disorders; Substance abuse; Substance dependence

Definition

"The Substance-Related Disorders include disorders related to the taking of a drug of abuse (including alcohol), to the side effects of a medication and to toxin exposure" (American Psychiatric Association 2000, p. 191). These substances have psychoactive properties which affect the central nervous system and impair perception, cognition, emotions and behavior. They can be grouped according to their profile of either predominantly sedating, stimulating or hallucinogenic effects: e. g., alcohol, cannabis, opioids, amphetamines, nicotine and hallucinogens. Substance related disorders are divided in two groups: (1) ► substance use disorders (SUD) with ► substance dependence and ► substance abuse as long-term negative consequences. Persons involved usually have lost their control on onset, duration and amount of substance use, despite significant negative consequences. (2) ► Substance induced disorderscover ► intoxication and withdrawal as major syndromes, but also more rare complications like delirium, dementia and amnesia.

Basic Characteristics

History

Marks of use and abuse of substances can be found in all periods of human history; heavy daily alcohol use was normal in the Middle Ages. The disease concept for alcohol abuse came up at the end of the 18th century, first inebriate asylums around 1870. Not before the beginning of the 20th century the modern understanding as a complex biopsychosocial disorder was developed. Over centuries and still today we have a controversial discussion on the relevance of individual responsibility for onset and cessation of use disorders: dependence as a "lack of willpower" or "lack of competences", as "vice" or "disease" (Valverde 1998).

Epidemiology

Prevalence figures for SUD vary extremely between world regions, based on cultural and religious traditions (e. g. low alcohol use in Islamic countries) and public access regulations (e. g. degree of prohibition, enforcement policy, store opening hours, taxation). In Europe about 3.4% of the adult population (men: 5.6%; woman: 1.3%) meet criteria for alcohol *dependence*, 0.3% for dependence on illicit drugs (Wittchen and Jacobi 2005). Inclusion of substance *abuse* will roughly double these figures. Worldwide about 76 million have a diagnosed alcohol use disorder (WHO 2004). Prevalence for tobacco use disorders vary around 20–60%, with a decline in most Western countries and very high figures in developing areas (worldwide about 1.3 billion smokers; Shafey, Dolwick and Guindon 2003).

Consequences

► Intoxication as the major acute impairment after heavy alcohol and drug use episodes increases the risk for (1) work and road accidents and (2) violence, (3) in severe cases even for fatal consequences (e. g. apnoea after heroin use). Long-term consequences for most substances occur on the somatic (e. g. various kinds of cancer and cardiovascular diseases, HIV and hepatitis after intravenous drug use), mental (depression) and social level (loss of work and social contacts, family problems). Alcohol attributable "► disability adjusted life years lost" (DALYS), combining premature death and life years in disability, account for 3–14% of all disease related DALYS (depending on sex and the country developing status). The corresponding figures for tobacco are 1–17%, for illicit drugs 0.2–2% (WHO 2004, Table 17). Annual costs of alcohol use disorders in Europe amount to 57 billion or about 24% of all mental disorders (Andlin-Sobocki, Jönsson, Wittchen and Olesen, 2005). Often forgotten are health and social consequences for victims, e. g. newborn of substance using mothers (alcohol-embryopathy), family members (rapes) and road casualities.

Classification

Diagnostic criteria for ► substance dependence in DSM IV (American Psychiatric Association 2000, p. 197) are (1) tolerance (need for increased amounts of the substance to achieve the same desired effects), (2) withdrawal (unpleasant somatic and cognitive effects after reduction or termination of use), (3) loss of control on duration and amount of use, (4) persistent, but unsuccessful efforts to control further use, (5) spending a lot of time for acquisition and use, (6) neglect of social and occupational activities and (7) continued use despite negative consequences. ► Substance abuse is defined as a maladaptive pattern of use leading to clinically significant impairment or distress like: failure to fulfil major social obligations, use in hazardous situations (e. g. driving), legal and other social problems, but without meeting the criteria for dependence.

Screening and Diagnostic Instruments

A broad range of established population ► screening instruments like the Alcohol Use Disorder Identification Test (AUDIT) or the Fagerström Test for Nicotine Dependence (FTND) are available in many languages (Babor, Sciamanna and Pronk 2004; McPherson and Hersch 2000). On the clinical level severe cases of SUD (with obvious somatic symptoms and social problems) can be identified without sophisticated diagnostic instruments. But many cases in medical and social services are not diagnosed, as these patients (1) did not yet recognize early signs of their problems or (2) try to hide their behavior. Alcohol related biological markers like y-GT, AST, ALT, MCV and CDT (Allen, Litten, Strid and Sillanaukee 2001), markers for drug use in urine, hair and other body material (Dolan, Rouen and Kimber 2004) as well as the standardized Composite International Interview – Substance Abuse Module (CIDI-SAM, Robins et al. 1990) are tools for clinical identification. Instruments are also available for detailed diagnostic purposes and for treatment planning like the Addiction Severity Index (ASI; McLellan et al. 1992). Important: The assessment of highly prevalent comorbid mental disorders is essential for treatment purposes.

Aetiology

SUD emerge as a complex interplay of person, drug and environment specific conditions which increase or decrease the probability for onset, continuation or cessation of such problems. Early vulnerability factors (e. g. family genetics, perinatal and adverse childhood complications, affect lability, personality traits like impulsivity and mental disorders) determine a general neuropsychopathological liability and interact with more proximal risk factors like availability of drugs, peer group behavior, social support network and negative life events. But little is known (1) about the underlying processes of change from first use to progression, early cessation or development of severe disorders, (2) about mechanisms for cessation or continued us after the same exposition to the effects of a drug (e. g. experimental smoking) and (3) about the time specifity of increased risk for SUD (e. g. nicotine and illicit drugs: adolescence and early adulthood; West 2006).

Prevention

Two distinct strategies to reduce the incidence of substance related disorders are available: (1) ► supply reduction aims to restrict the availability of substances by prohibition, taxation, store opening hours or minimum drinking age and strict law enforcement of all regulations. (2) ► Demand reduction achieves to educate the population at risk (e. g. adolescents, drivers, pregnant women) to use substances adequately or to stay abstinent. Interventions include risk information, motivation enhancement and skills training. Recent meta-analysis seem to demonstrate superior effects for supply reduction (Babor et al. 2003, for alcohol use disorders).

Treatment

(1) Lack of motivation for change, (2) high relapse rates after interventions (Tims, Leukefeld and Platt 2001) and – for long-term alcohol, cocaine and heroin use – (3) severely impaired health status and social functioning, are major challenges for treatment. Many try for decades to overcome their dependence, some never will reach that goal; but many stop their SUD without formal treatment (Klingemann and Sobell 2001). Pharmacological "► maintenance therapies" for heroin and nicotine are available to at least reduce the negative effects of long-term use. Further effective interventions are cognitive behavior therapies (CBT) and ► community reinforcement programs. Treatment abstinence rates vary between 20/25% for heroin and nicotine and 40/50% for alcohol use disorders (for reviews and

guidelines see Fiore et al. 2000; Berglund, Thelander and Jonsson 2003; Miller and Wilbourne 2002; Strain and Stitzer 2005).

Cross-References

- ► Community Reinforcement Programs
- ► Demand Reduction
- ► Disability Adjusted Life Years (DALYs)
- ► Intoxication
- ► Maintenance Therapy
- ► Screening
- ► Substance Abuse
- ► Substance Dependence
- ► Substance Induced Disorders
- ► Substance Use Disorders
- ► Supply Reduction

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Substance Use Disorders

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Synonyms

Drug abuse; Substance dependence

Definition

Substance use disorders (SUD) are a subgroup of the *Substance related disorders*. The use or abuse of psychoactive substances (e. g., alcohol, nicotine, cannabinoids, opioids, amphetamines, cocaine, hallucinogens, sedatives or hypnotics) results in significant adverse consequences. The group SUD compromises substance abuse and substance dependence. The clinical states that may occur, though not necessarily with all psychoactive substances, include ► acute intoxication, ► harmful use, ► dependence syndrome, withdrawal syndrome (state), ► withdrawal state with delirium

(► delirium tremens), ► psychotic disorder, late-onset psychotic disorder (► residual and late-onset psychotic disorder), and ► amnesic syndrome.

Basic Characteristics

Prevalence and Costs of Substance Use Disorders

Substance abuse accounts for one of the major disease groups in Europe within mental health in terms of prevalence (e. g. European estimate (point prevalence) of alcohol dependence: 3.7%; European estimate (point prevalence) of illicit drug dependence: 0.6% (Rehm et al. 2005; nicotine dependence point prevalence rates are between 5.5% (Portugal) and 12.7% (Slovakia)). Substance abuse disorders show a high public health relevance, but overall there is not sufficient information on the prevalence of these disorders (the biggest gap exists for EU admission countries), and existing studies are plagged with methodical differences. Bergmann and Horch estimated the total costs of alcohol dependence per patient per year as 11,984€ . Their study takes cost of crime-related outcomes into account (Bergmann and Horch 2002). Healy et al. (1998) carried out a bottom-up study in 1075 patients, and they took both opioid and cannabinoid dependence into account (direct healthcare costs, costs of crime-related outcome). The costs per patient with drug dependence are estimated to 18,064€ per year. Last, the estimated costs per patient with nicotine dependence were estimated to about 850€ per year (direct and indirect healthcare costs) (Rasmussen et al. 2000; Ruff et al. 2000).

Treatment of Substance Use Disorders

Patients suffering from substance dependence who achieve sustained abstinence have the best long-term outcomes. A reduction of the substance use only to a "controlled" level (i. e., substance use without apparent functional consequences) is unrealistic for most patients. In all substance use disorders a multimodal treatment approach is typically required, since patients suffering from substance abuse are functionally and clinically heterogeneous. There are different treatment settings that have to be considered depending on the patient's constitution (e. g., hospitalization for individuals with a drug overdose or with co-occuring severe medical conditions; outpatient treatment for patients with stabil medical conditions). Medical detoxification is only the first stage of addiction treatment and by itself does little to change long-term drug use. Medical detoxification safely manages the acute physical symptoms of withdrawal associated with stopping drug use. While detoxification alone is rarely sufficient to help addicts achieve long-term abstinence, for some individuals it is a strongly indicated precursor to effective drug addiction treatment.

To be effective, treatment must address the individual's drug use and any associated medical, psychological, social, vocational, and legal problems. Treatment needs to be readily available. Because individuals who are addicted to drugs may be uncertain about entering treatment, taking advantage of opportunities when they are ready for treatment is crucial. Potential treatment applicants can be lost if treatment is not immediately available or is not readily accessible. Pharmacological treatmant may be used for patients with intoxication states, to decrease withdrawl symptoms (i. e., substitution of an agonist) or to promote abstinence (e. g., disulfiram in patients suffering from alcohol abuse). Methadone and levo-alpha-acetylmethadol (LAAM) are effective in helping individuals addicted to heroin or other opiates stabilize their lives and reduce their illicit drug use. There are also controlled trials with prescribed heroin in addicted patients. The findings of those recent studies support the hypothesis that prescribed heroin could be safely delivered. Also, in physical health, HIV risk behavior, street heroin use, and days involved in crime, heroin plus methadone was more efficacious than methadone alone (e. g., March et al. 2006). Naltrexone is also an effective medication for some opiate addicts and some patients with co-occurring alcohol dependence. For persons addicted to nicotine, a nicotine replacement product (such as patches or gum) or an oral medication (such as bupropion) can be an effective component of treatment. An individual's treatment and services plan must be assessed continually and modified as necessary to ensure that the plan meets the person's changing needs. A patient may require varying combinations of services and treatment components during the course of treatment and recovery. Remaining in treatment for an adequate period of time is critical for treatment effectiveness. The appropriate duration for an individual depends on his or her problems and needs. Research indicates that for most patients, the threshold of significant improvement

is reached at about 3 months in treatment. After this threshold is reached, additional treatment can produce further progress toward recovery. Because people often leave treatment prematurely, programs should include strategies to engage and keep patients in treatment. Counseling (individual and/or group) and other behavioral therapies are critical components of effective treatment for addiction. In therapy, patients address issues of motivation, build skills to resist drug use, replace drug-using activities with constructive and rewarding nondrug-using activities, and improve problem-solving abilities. Behavioral therapy also facilitates interpersonal relationships and the individual's ability to function in the family and community. Treatment does not need to be voluntary to be effective, but strong motivation can facilitate the treatment process. Sanctions or enticements in the family, employment setting, or criminal justice system can increase significantly both treatment entry and retention rates and the success of drug treatment interventions.

Addicted or drug-abusing individuals with coexisting mental disorders (e. g. ► psychotic disorders) should have both disorders treated in an integrated way. Because addictive disorders and mental disorders often occur in the same individual, patients presenting for either condition should be assessed and treated for the co-occurrence of the other type of disorder. Treatment programs should provide assessment for HIV/AIDS, hepatitis B and C, tuberculosis and other infectious diseases, and counseling to help patients modify or change behaviors that place themselves or others at risk of infection. Counseling can help patients avoid high-risk behavior. Counseling also can help people who are already infected manage their illness. Recovery from drug addiction can be a long-term process and frequently requires multiple episodes of treatment. Objective monitoring of a patient's possible drug and alcohol abuse might be helpful in preventing a relapse. Monitoring also can provide early evidence of drug use so that the patient's treatment plan can be adjusted. As with other chronic illnesses, relapses to drug use can occur during or after successful treatment episodes. Addicted individuals may require prolonged treatment and multiple episodes of treatment to achieve long-term abstinence and fully restored functioning. Participation in self-help support programs during and following treatment often is helpful in maintaining abstinence.

Even occasional use of drugs can inadvertently lead to addiction. For this reason, most prevention programmes are primary prevention programmes (in adolescents or young adults) with the aim to prevent the onset of substance use, and also to reduce the transition from experimental use (first use) to addiction.

Cross-References

► Acute Intoxication
► Amnesic Syndrome
► Delirium Tremens
► Dependence Syndrome
► Harmful Use
► Psychosis
► Residual and Late-Onset Psychotic Disorder
► Withdrawal State

Cross-References

► Substance Related Disorders

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Substitution of Fluids

► Rehydration
► Rehydration Solution

Substitution Therapy

► Maintenance Therapy

Sudden Infant Death Syndrome (SIDS)

Synonyms

Cot death ; Crib death

Definition

SIDS refers to the unexpected death of a seemingly healthy infant under the age of one while asleep. The cause of SIDS is still unknown. Autopsies do not show any explainable cause of death. Risk factors for SIDS include prone sleeping position, soft bedding, exposure to secondhand smoke, prematurity, multiple birth babies, and the wintertime.

Suicide

Synonyms

Intentionally killing oneself

Definition

Suicide has occurred since the beginning of recorded history, with attitudes toward it varying from condemnation to tolerance, depending on the time and the culture. Today, suicide is viewed as neither a random nor a pointless act in developed countries. Suicide is often associated with unfulfilled needs, feelings of hopelessness and helplessness, ambivalent conflicts between survival and unbearable stress, a narrowing of perceived options, and a need for escape. Risk factors may include: psychiatric disorder, previous suicide attempt, coincident drug use and mental disorder, family history of suicide, impulsive or aggressive behavior, loss of significant relationships, loss of job, physical illness and lack of access to mental health treatment.

Summary Measures of Population Health

Synonyms

Health indexes

Definition

Summary measures of population health are health indexes derived from other ► indicators to represent the health of a particular population. They are widely used for comparisons of health status between populations or of the population at different points in time, identifying and quantifying overall health inequalities within populations, identifying priorities for health service delivery, research and development, and analyzing the benefits of health interventions. Summary measures should be comprehensible and practicable to calculate, and should preferably be linear aggregates of the other measures of health events. Ideally, they must reflect the changes of health status of the population, i. e. if the state of health of a given population worsens then a summary measure should get worse, or if mortality or morbidity rates decrease, a summary measure should improve. The most widely used summary health indexes are: disability-adjusted life years (DALY), quality-adjusted life years (QALY), healthy life expectancy (HALE), and years of potential life lost (YPLL), etc.

Summative Evaluation

Synonyms

Outcome evaluation; Product evaluation; Program evaluation

Definition

Product evaluation is carried out after completion of a measure or intervention. The result of this evaluation is often addressed to external an audience or decision maker. It summarizes the program's performance, validity and outcomes in comparison to alternative programs by using quantitative methods.
The systematic collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future program development.

Superior Good

Synonyms

Positive income elasticity

Definition

Microeconomic household theory distinguishes between goods for which demand rises with increasing income levels (superior goods) and those for which demand falls as incomes go up (inferior goods). Whereas staple foods are as a rule inferior goods, medical goods and services are generally regarded as superior goods, whose social valuation tends to increase with time. The effect of an increase in incomes on the demand for specific goods can be analyzed by means of the "income elasticity of demand". In the case of absolutely superior goods, the income elasticity exceeds zero – that is, the demand for the good increases absolutely. If the income elasticity is greater than 1, the relative share of household income accounted for by the good also increases; for this reason the term "relatively superior goods" is also used. The characterization of health goods as relatively superior is confirmed macroeconomically by the phenomenon whereby the proportion of the economy accounted for by health spending increases with the general level of prosperity of a society. A knowledge of specific income elasticities is very important for estimating the market potential of medical and dental goods and services.

Supernutrition

► Overnutrition

Supplier-Induced Demand

Synonyms

Supply-side moral hazard

Definition

Supplier-induced demand is the change in demand of health care services that is associated with the discretionary power of health care professionals – most importantly physicians – over their patients. Additional health care services provided as a consequence of supplier-induced demand are in the self-interest of health care professionals rather than in the interest of their patients.

Supply Reduction

Definition

Supply reduction is a strategy to reduce the incidence of ► substance related disorders. It aims to restrict the availability of substances by prohibition, taxation, store opening hours or minimum drinking age and strict law enforcement of all regulations.

Supply-Side Moral Hazard

► Supplier-Induced Demand

Supporting Measures

► Humanitarian Relief Operations

Suppressive Therapy of Malaria

► Malaria Chemoprophylaxis

Supraglottitis

► Epiglottitis

Surface Water

Definition

Surface water are rivers, lakes and ponds which are mostly used as water sources in cases when there are no other safe sources of water available.

Surgical Site Infections

Definition

Surgical site infections (SSI) are a major source of morbidity and mortality for patients undergoing operative procedures. According to the CDC (► Centers for Disease Control and Prevention) definitions, these infections are classified into incisional, organ, and other organs and spaces manipulated during an operation.

These definitions should be followed universally for ► surveillance, ► prevention, and control of surgical site infections. The risk of developing an SSI is affected by the degree of microbial contamination of the operative site. Infections may be caused by endogenous sources (e. g., bacteria on the patient's skin) or exogenous sources (e. g., personnel, the environment, or materials used for surgery). Most SSIs are caused by the patient's own bacterial flora. The pathogens isolated from infections differ, primarily depending on the type of surgical procedure.

Surroundings

► Environment

Surveillance

► Public Health Surveillance

Surveillance Methodology

Synonyms

Watching over

Definition

It is a methodology used for monitoring something. In health it is applied to monitor health related issues. One way of doing so is to get information from physicians about specific conditions; depending on the process put in place, there can be passive, active or ► sentinel surveillance.

Surveillance of Transmissible Diseases

► Outbreak Management and Surveillance of Infectious Diseases

Surveillance of Working Environment

Definition

Surveillance of the working environment is a generic term which includes the identification and evaluation of environmental factors which may affect workers' health. It covers assessments of sanitary and occupational hygiene conditions, factors in the organization of work which may pose risks to the health of workers, collective and personal protective equipment, exposure of workers to hazardous agents and control systems designed to eliminate and reduce them. From the standpoint of workers' health, the surveillance of the working environment may focus on, but not be limited to, ergonomics, accident and disease prevention, occupational hygiene in the workplace, work organization, and psycho-social factors in the workplace.

Surveys (Statistical)

Definition

Surveys are used to collect quantitative information about items in a population. Surveys of human populations and institutions are common in political polling, healthcare, social science, and marketing research. A survey may focus on opinions or factual information, depending on its purpose, and many surveys involve administering questions to individuals. When the questions are administered by a researcher, the survey is called a structured interview or a researcher-administered survey. When the questions are administered by the respondent, the survey is referred to as a questionnaire or a self-administered survey. The questions are usually structured and standardized. The structure is intended to reduce bias and to ensure reliability, generalizability, and validity.

Survival

► Life Expectancy

Survival Analysis

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S

Synonyms

Survival analysis; Time-to-event analysis

Definition

Survival analysis is the study of distribution of life times, i. e. the times from an initiating ► event to some terminal event. Clinical trials commonly record the length of time from study entry to a disease endpoint for a treatment and control group. Time to event analysis provides a method of including patients who fail to complete the trial or do not reach the study end-point (censored data) by making comparisons between the numbers of survivors in each group at multiple points in time.

Basic Characteristics

If the outcome is an "► event" that may happen over time, then the trial is frequently called a survival trial. Survival analysis must be applied to any clinical trial that is concerned with the prevention of some untoward "event" (or "endpoint") that may eventually affect some or all of the patients. If these events may not occur for some time after starting treatment, it is worth looking at the times at which the events occur as well as counting patients. The sort of untoward events that could be studied in such a clinical trial include myocardial infarctions, leukemia relapses, strokes, metastatic developments, death from one of a certain set of specified causes (ignoring deaths from other causes), transplant rejection episodes, and so on. In each of these studies, it is usually possible to do a more informative analysis than a simple tabulation of the numbers of patients on each treatment who suffered the event of interest. Whether this event is death, local solid tumor recurrence, or something else, the design principles and statistical methods are virtually the same: the times at which each patient who suffers the event of interest does so are observed and analyzed.

With a survival-type event, an important consideration is whether one is interested in comparing the times to an event or only the proportions surviving at a specified time. If the follow-up is "long enough", crude survival can be used if the follow up on every patient treated meets both of two criteria. First, every patient must have been treated an adequate number of years before the analysis. Second, at the time of analysis the patient must be known to either have suffered the outcome of interest or must be known to be alive and without the outcome. What constitutes an adequate number of years varies according to the disease being studied.

These conditions are rarely met. Commonly, some patients die of unrelated causes or are lost to follow-up. If even a single patient has died of unrelated causes before an adequate number of years have passed since treatment then it is no longer appropriate to use crude survival. When absolute survival analysis (number alive divided by number treated) is no longer possible, estimated survival analysis must be performed.

In this situation, each patient has a different length of follow-up. It is difficult to assign meaning to the term "proportion surviving" without specifying a fixed period of observation common to all patients. One can estimate the probability of surviving when patients have differential lengths of follow-up using a life table or the ► Kaplan–Meier method.

Every patient is followed until failure occurs or the patient is ► censored. Patients who suffer the outcome of interest are scored as ► failures. Patients who do not suffer the outcome of interest are scored as censored. If the patient failed, the length of follow-up is the time between diagnosis and failure. If the patient is censored, the length of follow-up is the time between diagnosis and last follow-up visit.

"Actuarial" Life Table Analysis

► Life table analysis involves stratifying patients by length of follow-up. Within each time stratum, a probability of failing is computed as the number at risk at the beginning of the interval. For each time stratum, the probability of surviving is one probability minus the probability of failing. The estimated probability of surviving to a particular time is the product of the probability of surviving each of the preceding time strata.

It may be noted that the life table estimate of the chance of surviving any particular number of days from randomization is thus the product of the life table estimate up to the previous day and the observed survival rate for the particular day.

The Kaplan–Meier (or Product Limit) Method

The ► Kaplan–Meier method is used to recalculate the percentage of survivors at each death time. The key to understanding how it is possible to derive estimates of

survival percentages using incomplete follow-up information lies in the very obvious statement that in order to survive a whole year, the patient has to survive each of the 365 individual days comprising it. The chance of surviving one year is therefore

$$S_{365} = C_1 \times C_2 \times C_3 \times \ldots \times C_{364} \times C_{365}$$

C_1 is the chance of surviving the first day,
C_2 is the chance of surviving the second day having already survived day one,
C_3 is the chance of surviving the third day having already survived days one and two,
And so on to …
C_{364} is the chance of surviving day 364 having already survived days one to 363, and
C_{365} is the chance of surviving day 365 having already survived days one to 364.
We do not know the value of any of these individual Cs but we could estimate any particular one of them, C_{365}, for example, by calculating what proportion of patients who are at risk on day 365 actually survived it. This is termed observed survival. The individual probabilities (Ps) would be 1, but nevertheless the quantity obtained by multiplying them together provides the best mathematically possible estimate of S_{365}, the Kaplan–Meier chance of surviving one year. It should be noted that if we have already estimated S_{365}, then the estimate of S_{366} is just P_{366} times it. In practice, we do not need to perform calculations on days on which no deaths occurred because on those days $P = 1$ and the estimate of S will be unchanged. Very often in survival analysis, we report ► median survival time. Median survival time is the time at which 50% of cases are resolved.

Standard Errors of Survival Percentages The percentages in the Kaplan–Meier method are subject to sampling variation and if the number of patients is small, this variation can be appreciable. Furthermore, if a life-table method is used, the sampling variation becomes progressively larger as the survival percentages at later times are based on fewer and fewer patients. Knowledge of the sampling variation is important, since it is a measure of the range of survival percentages that are likely to be encountered if the study could be repeated under identical circumstances with different groups of patients.
For a survival percentage, S_t, calculated using the Kaplan–Meier method, the standard error (SE) is the square root of the variance, which is found from the expression:

$$SE_{(S_t)} = \sqrt{\sum \frac{d_i}{r_i(r_i - d_i)}} \quad \text{where}$$

d_i = number of deaths on day i
r_i = number at risk on day i.
We have seen that the percentage of survivors is recalculated at each death time so that when plotted on the ► Kaplan–Meier survival plot, the curve takes on a characteristic appearance of horizontal and vertical lines.

The Logrank Test

This involves counting the number of deaths observed in each group, O, and comparing it with E, the extent of exposure to risk of death in that group. The general definition is that the extent of exposure to risk of death among a subgroup of patients on a particular day is the total number of deaths on that day in the whole study population, multiplied by the proportion of patients at risk on the particular day that are in the subgroup of interest. The ► logrank test comparing treatment A with treatment B during a certain period involves:

1. Counting the total number of group A deaths observed during that period, calling this O_A;
2. Counting the total number of group B deaths observed during that period, calling this O_B;
3. Calculating the extents of exposure of the A patients to risk during each day of the period, adding them all up to get the total extent of exposure to risk of death suffered by the A patients during this period, calling this E_A;
4. Deriving similarly the total extent of exposure to risk of death suffered by the B patients during this period, calling this E_B;
5. Comparing O_A with E_A and O_B with E_B, to see if there are any marked discrepancies.

This method can be instantly generalized for the comparison of several groups of patients with each other: for each group, the extent of exposure to risk of death on a particular day is still the proportion who are in that group on that day multiplied by the number of deaths on that day. The total exposure in one group over an extended period is the sum of the separate exposures in that group on the separate days comprising the period. In any one period, the sum of all the Os will equal the

sum of all the Es. For example, if we were comparing four groups, A, B, C, and D, $O_A + O_B + O_C + O_D$ should equal $E_A + E_B + E_C + E_D$ at the end of the analysis.

Logrank significance levels or p-values may be estimated by comparing the sum of $\frac{(O-E)^2}{E}$ with an appropriate chi square distribution. We can calculate $\frac{(O-E)^2}{E}$ for each group and add up the results, one term from each group. The sum of all the $\frac{(O-E)^2}{E}$ calculations is termed $\chi 2$. If the symbol k denotes the number of groups being compared with each other, this has $\chi 2$ distribution with $df = k - 1$.

Cox Proportional Hazards Regression

The ► cox proportional hazards regression model is used to analyze survival or failure time data. The technique may also be used when survival is influenced by a large number of factors, some of which may be correlated, and the aim is to identify those features of the patient or the disease that are of independent prognostic significance. This model is a regression method for survival data and provides an estimate of the hazard ratio and its confidence interval. The ► hazard ratio is an estimate of the ratio of the hazard rate in the treated versus the control group or between two different treated groups. In a clinical trial where disease resolution is the endpoint, the hazard ratio indicates the relative likelihood of disease resolution in treated versus control subjects at any given point in time.

The Cox proportional hazards model is an appealing analytic method. The hazard ratio, which is derived from this model, provides a statistical test of treatment efficacy and an estimate of relative risk of ► events of interest to clinicians. The hazard ratio may be used for purposes of statistical hypothesis testing and as one indication of the amount of benefit (an increase in the odds of healing), but other measures must also be applied to understand the full importance of the study.

Example

Consider a randomized trial of two treatments A and B, where the outcome is survival time from treatment.

Survival Analysis, Table 1 Illustration of calculations for logrank test and Kaplan–Meier survival curve in a clinical trial of 16 patients (Campbell MJ, Machin D (ed) (1999) Medical Statistics: A Commonsense Approach. John Wiley&Sons Ltd, New York)

i	Order survival time t_i	Treatment	Total number at risk n_i	Number of events at time $t_i - d_i$	Probability of survival in t_{i-1}, t_i $\frac{1-d_i}{n_i}$	Cumulative survival probability	Number at risk in A n_{Ai}	Expected number of events in A e_{Ai}
0	0	-	16	0	1	1	8	0
1	21	A	16	1	0.94	0.94	8	0.5
2	33+	A	15	0	1	0.94	7	0
3	42	B	14	1	0.93	0.87	6	0.43
4	55	A	13	1	0.92	0.8	6	0.46
5	69	A	12	1	0.92	0.74	5	0.42
6	100+	B	11	0	1	0.74	4	0
7	130	A	10	2	0.8	0.59	4	0.8
8	130	A						
9	210	B	8	1	0.875	0.52	2	0.25
10	250+	B	7	0	1	0.52		See not 9 in text
11	290+	A	6	0	1	0.52		
12	310+	A	5	0	1	0.52		
13	365+	B	4	0	1	0.52		
14	365+	B						
15	365+	B						
16	365+	B						

+ = alive

Some patients will be lost to follow-up, or will only have been observed for short periods of time and so their observations are censored.

Kaplan–Meier Survival

Order the survival times for both groups combined. Censored observations usually follow death times of the same value.

1. The number at risk (n_i) is the number of patients alive immediately before an event at time t_i.
2. An event is death. A censored observation has no associated event.
3. Calculate the probability of survival from t_{i-1} to t_i as $\frac{1-d_i}{n_i}$.
4. Calculate the cumulative survival probability of surviving from 0 up to t_i as follows:

$$\left(\frac{1-d_i}{n_i}\right) \times \left(\frac{1-d_{i-1}}{n_{i-1}}\right) \times \ldots \times \left(\frac{1-d_1}{n_1}\right).$$

5. Note that a censored observation at time t_i reduces the number at risk by one but does not change the cumulative survival probability at time t_i.

The Logrank Test

6. Under the null hypothesis, the expected number of events at time t_i is

$$e_{Ai} = \frac{(d_{Ai} n_{Ai})}{n_i}.$$

7. The expected number of events should not be calculated beyond the last event (at time 210 days in this example).
8. The total number of events expected for treatment A, assuming the null hypothesis of no difference between treatments, is $E_A = \Sigma e_{Ai}$.
9. The number expected for treatment B is $E_B = \Sigma d_i - E_A$.
10. Calculate $X^2 = \frac{(O_A - E_A)^2}{E_A} + = \frac{(O_B - E_B)^2}{E_B}$.

This has χ^2 distribution with $df = 1$. This gives $p = 0.1$.

Cross-References

- ▶ Censored (Patient)
- ▶ Cox Proportional Hazards Regression
- ▶ Event
- ▶ Failure (Patient)
- ▶ Hazard Ratio
- ▶ Kaplan–Meier Method
- ▶ Kaplan–Meier Survival Plot
- ▶ Life Table Analysis
- ▶ Logrank Test
- ▶ Median Survival Time

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Survival Curve

- ▶ Kaplan–Meier Survival Plot

SUSAR

Definition

Abbreviation for suspected unexpected serious adverse reaction, in the US: SADR = suspected adverse drug reaction. An Adverse reaction is considered as unexpected if the nature, seriousness, severity or outcome of the reaction(s) is not consistent with the reference information for the investigational medical product (IMP). For "non-authorized" drugs or devices the reference document is the investigators brochure (IB), in all other cases the summary of product characteristics (SPC).

All suspected adverse reactions that occur within the concerned trial and are related to an investigational medicinal product (the tested investigational medicinal products *and* comparators) which occur in the concerned trial, and that are both unexpected and serious

("SUSAR") are subject to expedited reporting to the competent authorities. If such a reaction is included into the IB or SPC it becomes part of the body of knowledge and is thereby no longer unexpected and needs thereby no longer expedited reporting.

Susceptibility

Definition

Susceptibility is the degree of response or sensitivity to a given disease like microbial disease or malignancy. It is tested in various ways. One classical example of a susceptibility testing is the mixing of a minimal amount of a drug with micro-organisms to see if inhibition of growth or death of the micro-organisms occurs. It is tested genetically by making use of biomarkers that can identify predisposition to risk factors. Susceptibility markers may be genetic traits, pre-existing diseases, differences in metabolism, variation in immunoglobulin levels, etc.

Generally, susceptibility is described in a variety of fields including:

- ► Occupational and Environmental Health
- Pharmacology
- Medical diagnostics and Therapy
- ► Radiation biology
- Toxicology and ► epidemiology.

Cross-References

► Individual Susceptibility
► Vulnerability Concerns

Suspended Particles

Synonyms

Airborne particles ; Particulate matter (PM); Suspended particulate matter (SPM)

Definition

Suspended particles are any small bits of solid material or liquid that can become airborne. If they are of sufficiently small diameter to maintain stability in air or any other gas then they form an aerosol (particulate phase of aerosol). Solid particles are either nonviable, such as dust, fumes and smoke, or viable, such as microorganisms; liquid particles are mist and fog. Airborne suspended particles can range from less than 0.005 µm (e. g. small molecules) to 100 µm in diameter. Larger and even visible dust particles in the range up to 1000 µm tend to deposit very quickly. Respirable particles are those in the range of 0.005–10 µm but only those in the range of 0.1–10 µm are of larger interest because inhaled particles less than 0.1 µm can be easily exhaled. Sampling techniques and suitable devices that allow separation of airborne particles such as fine respirable particles less than 2.5 µm ($PM_{2.5}$) and large respirable particles less than 10 µm (PM_{10}) have now been introduced. Fine particles are emitted during various burning processes (motor vehicles and industry), while large particles are emitted particularly in mining, the construction industry, and during fires and windstorms. Having a small diameter and larger total surface relative to weight, fine particles are very harmful; they can penetrate lungs much deeper and can exist in air for weeks and even months. Suspended particles are among the most harmful air pollutants and health consequences of their inhalation include bronchitis, asthma, chronic obstructive pulmonary disease, and decreased lung functions. Some particles are even carcinogenic (e. g. asbestos, tobacco smoke, and silica crystalline, etc.). Finally, dangerous chemical substances, either gases or liquids, are often adsorbed on the surface of particles – e. g. some of polycyclic aromatic hydrocarbons (benzo[a]pyren) or sulfur-dioxide; these increase the harmful effects. Children are the most at risk in the general population because they inhale air deeper into their lungs than adults do, they spend more time outside, and they are more physically active (during activity breathing is deep and frequent).

Suspended Particulate Matter (SPM)

► Suspended Particles

Sustainability

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Synonyms

Sustainable development

Definition

Sustainable development is defined in the WHO Health Promotion Glossary as follows: as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Basic Characteristics

Sustainable development contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987). Sustainable development does not focus solely on environmental issues. More broadly, sustainable development policies encompass three general policy areas: economic, environmental and social. It incorporates many elements, and all sectors, including the health sector, which must contribute to its achievement.

The term sustainability is derived from the field of forestry and was first mentioned by ► Hans Carl von Carlowitz in the context of Sustained Yield Forestry. During the 1980s the idea of sustainability was fundamentally embraced by the ecological movement at a time when environmental pollution had become an issue of increasing importance. The term was also introduced into political debate by the ► Brundtland-Commission in 1987. This commission stated that the term sustainable development should not be restricted to the field of forestry, as Carlowitz mentioned, but should be a matter of general concern for the whole of society. The concept of sustainability contains the following three aspects:

- Ecological sustainability
- Economic sustainability
- Social sustainability.

The concept of ecological sustainability has appeared frequently in official documents over the last 15 years, e. g. in the Convention on the Climate and the Kyoto Protocol. Sustainability opposes the wasting and short term plundering of resources, and promotes the respectful and responsible treatment of human resources with consideration given to future developments and generations.

Occasionally, ecological and economic sustainability may be at odds. For instance, a further population growth is counterproductive since it would increase the usage of resources and be detrimental to ecological sustainability. Whereas, from the economic point of view, a further population growth is desired in order to counteract the demographic imbalance brought about by an aging population. Thus the concept of sustainability has become a discussion theme of enormous importance to many scientific disciplines.

The term sustainability, over time, has acquired positive connotations and is frequently used as a synonym for eco friendly or spoken of in terms of success or innovation.

In the context of health promotion (► health promotion, actors; ► health promotion, fields of action; ► health promotion, models; ► evaluation, models) and disease prevention, the sustaining of health is linked to the development of a healthy environment and support for individual health-conscious decisions. The current health program of WHO, "Health 21," is supported by the program of sustainable development set out in ► Agenda 21.

The promotion of healthy lifestyles is closely related to environmental issues, and environmental issues, as laid out in Agenda 21, are closely linked to the concept of sustainability. However, a definition of sustainability has not been specified in any health promotion literature to date (Lawrence 2004). More evaluation is needed to assess the sustainability of health promotion projects with regard to their long term effects; health promotion intervention can be classified as sustainable if its aims are achieved by the end of a given project and if the processes developed in the intervention continue to have lasting effects. At best, each health promotion project should have sustainable effects, not only effects during the project's course.

Therefore, implementation of sustainability in health promotion interventions depicts also a part of ► quality assurance and evaluation (► evaluation, models) in projects. Sustainability of projects can be achieved through their ability to stimulate replication of successful health promotion projects. The use of the media can enhance the public's awareness of these projects and stimulate the social acceptance of health promot-

ing ideas. This leads to a continuation of the process of a health promotion intervention.

When planning a health promotion project, various essential factors, necessary for the implementation and sustainability of the project, have to be considered. This kind of sustainability can be assured through implementing the following structure and elements:

- Dissemination of the techniques of health promotion (empowerment, measures of equal opportunities, organizational development, management of projects).
- Development of networks, e, g. help desks and consistent patient counseling services (consumer protection and self help organizations, public health service institutions, coordination centers, various associations, societies and trusts).
- Services for special ► target groups (employees, families, day release for organizational development in companies) and establishment of educational seminars using new Medias.

The success of health promotion projects that have the above structures and elements established can be measured by comparing them with projects that do not have such structures and elements.

Cross-References

► Agenda 21
► Brundtland-Commission
► Evaluation, Models
► Carlowitz, Hans Carl von
► Health Promotion Actors
► Health Promotion, Fields of Action
► Health Promotion Models
► Quality Assurance
► Target Group

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Sustainable Development

Synonyms

Environmental substainability

Definition

Development where the present generation fulfils its need without compromising the ability of future generations to meet their needs.

Sustainable development is a strategy to meet the needs of the present world population without causing adverse effects on health and on the environment, and without depleting or endangering the global resource base, hence without compromising the ability of future generations to meet their needs, as was defined at the Rio Summit. It is a concept proposed in opposition to the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development. It is meant as a degree of development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Four aspects are considered: environmental sustainability, economic sustainability, social sustainability and political sustainability. Sustainable development represents both a goal and a process. As a goal, sustainable development implies development which equitably meets the needs of today's and future generations. As a process, it means setting policies in such a way that they take into account not only economic factors but environmental and social factors as well.

Sustainable development describes the process of modification of the environment that remains ecologically in balance, so sufficient resources can be used without degrading the environment or irreversibility damaging the ecosystem, which remains intact and can continue indefinitely.

Cross-References

► Sustainability

Sweat House

► Sweat Lodge

Sweat Lodge

Synonyms

Sweat house

Definition

Any of various permanent or portable structures typically heated by fire or by pouring water over hot stones and used by certain Native American peoples to induce sweating, as for medicinal, spiritual, or social purposes.

Swimmer's Itch

► Cercarial Dermatitis

Symptomatic Cancer Palliation

► Cancer Palliative Care

Symptomatic Therapy

Synonyms

Treatment of the symptoms of a disease

Cross-References

► Therapy of Infectious Diseases

Symptom Relief in Palliative Medicine

Synonyms

Improvement by symptomatic therapy

Definition

Symptomatic treatment is defined as a medical therapy that only affects symptoms. It does not influence the cause or etiology of a disease. It is usually directed at reducing signs and symptoms in order to improve the quality of life of the individual patient. Typical symptomatic treatments are: a) Analgesics, for pain; b) Anti-inflammatory agents, for arthritis; c) Antitussives, for cough; d) Antihistamines, for allergy; e) Brain shunts, to alleviate hydrocephalus; f) Laxatives, for obstipation, etc. Symptomatic treatment itself may cause adverse effects, and may not be devoid of iatrogenic consequences such as allergic reactions, gastrointestinal bleeding, central nervous effects (nausea, dizziness, headache, etc.).

Synergism

Definition

Synergism is a situation in which the combined effect of two or more factors is greater than the sum of their solitary effects. It would be assumed that any joint effect that is more than additive as synergistic.
Antagonism, the opposite of synergism, occurs if there are persons who will get the disease when exposed to one of the factors alone, but not when exposed to both. Under these definitions two factors may act synergistically in some persons and antagonistically in others.

Syntactic Aspect of Data/Information

Definition

The syntactic aspect refers to the format of the carrier of information – its language, type of image, or biosignal. This format or structure is known as the syntax for the description, storage, or transmission of messages.

Syntactic Errors

Definition

A syntactic error is a type of ► data error referring to the format in which data is stored.

Syphilis

Synonyms

Venereal disease

Definition

Syphilis is a chronic sexually transmitted disease caused by *Treponema pallidum*. Primary lesion devel-

ops on the genitals or anus. Several weeks later generalized infection occurs, with fever and rash. Afterwards the infection may be dormant for years. Nodules form in skin and mucous membranes and cause ulcers. Both cardiovascular and nervous system become affected. If untreated it may be fatal. It is more common in undeveloped countries with poor sanitation and hygienic habits.

Syriacs (Aramaens, Maronites, Assyrians, Syriacs, Chaldeans), (Southwest Asia)

► Indigenous Health, Asian

Systematic Error

► Bias, Confounding and Interaction

Systematic Literature Review

Definition

A systematic review is a literature review focused on a single question, and which tries to identify, appraise, select, and synthesize all high quality research evidence relevant to that question. These reviews help overcome the problems associated with large numbers of published research studies and variations in quality between studies. Unlike the traditional approach to reviewing literature, they utilize the same principles and rigor that is expected of primary research. As the name suggests, they are systematic in their approach and use methods that are pre-planned and documented in a systematic review protocol.

Systematic Reviews

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Synonyms

Research review; Integrative research review; Research synthesis

Definition

Systematic reviews locate, appraise, and synthesize evidence from scientific studies in order to provide informative, empirical answers to scientific research questions.

Basic Characteristics

The Problem Formulation Stage

All empirical work must begin with careful consideration of the research problem. Systematic reviews are a scientific tool that can be used to summarize, appraise, and communicate the results and implications of otherwise unmanageable quantities of research. The choice of topics in research synthesis is influenced by the interest of researchers and social conditions that surround them. The research synthesist should undertake literature searches with the broadest possible conceptual definition in mind. They should begin with a few central operations but remain open to the possibility that other relevant operations will be discovered in the literature. More often than not, the cumulative results of studies are much more complex than the results of any single study. The synthesist's capacity for uncovering variables that explain why results differ in different studies and ability to generate notions that explain these higher-order relations are the most creative and challenging aspects of the research synthesis process. Both primary researchers and research synthesists must choose a conceptual definition and degree of breadth for their problem variables. Both must decide how likely it is that an event represents an instance of the variable of the interest. To complement conceptual broadness, synthesists should be thorough in their attention to the distinctions in study characteristics. Any suggestion that a difference in study results is associated with a distinction in study characteristics should receive some testing by synthesist, if only in preliminary analysis.

The next step is to construct a ► coding sheet. The coding sheet is used to collect information from the primary research. Information that should be included on the coding sheet is:

1. Report identification: This includes the authors of the report, the source of the report, when the report was published, and what information channel led to the report's discovery.
2. Setting of study: The place where the study was conducted. It should be noted whether the setting

and participants of the primary studies would reduce generalizability.

3. Subjects: Characteristics of the participants included in the primary research. Any restrictions placed by the primary researchers on who could participate in the study should be identified.
4. Methodology : In this part, the synthesist retrieves information concerning study design used in the primary research.
5. Treatment characteristics: The synthesist will need to describe carefully the details of how the independent variables were manipulated or measured. Equally important are characteristics of how control or comparison groups were treated. Differences in any of these variables among studies would be prime candidates for being the causes of differences in study outcomes.
6. Statistical outcomes or effect sizes: The synthesist retrieves the relevant outcomes, which should be measured to determine ► effectiveness. This may include factors such as characteristics of the patients and settings, choice of measurement of outcomes, or difference in the nature or delivery of interventions, all of which influence the estimates of effectiveness of the intervention under investigation. It is important that these ► "effect modifiers" are identified as they may explain apparent differences in the findings of the primary studies. Another series of possible "effect modifiers" relate to study design. The existence of differences between studies in these factors will have implications in the analysis of the results. If quantitative synthesis or meta-analysis of results is envisioned, the synthesist will also need to record more precise information on the statistical outcomes of studies.
7. Coding process: The coding sheet will be standardized to accommodate information about the main comparisons of interest. A general coding sheet will never capture the unique aspects of all studies; perfection is never achieved. The synthesist can view these occurrences as failures or as targets of opportunity, highlighting the diversity of research in their topics.

The Literature Search Stage

Literature search is a vital component of any systematic review. The aim of the search is to provide as comprehensive a list as possible of primary studies, both published and unpublished, which may fit the inclusion criteria and hence be suitable for inclusion in the review. As the precision of the estimate of ► effectiveness depends on the volume of information obtained, it is important that the search for primary studies is extensive. We can group search channels under the following headings:

► Informal Channels These channels of communication are distinguished by a lack of explicit rules governing the contact between the primary researcher and the literature searcher, without restrictions on the kinds of information that can be exchanged. The five principal forms of informal communications are personal contacts, solicitation letters, traditional invisible colleges, electronic invisible colleges, and the World Wide Web.

► Formal Channels These channels of communication have explicit rules that primary researchers must follow to enter information into channels. The major formal channels are:

1. Professional conference paper presentations. The selection criteria for meeting presentations is usually not as strict as that required for journal publication. An advantage of papers given at meetings is that they are more likely to be current than journal articles because the researcher may present a paper before a publishable manuscript has been written.
2. Personal journal libraries. Journals published in paper form are the traditional link between the primary researcher and the research synthesist. There would be some serious ► bias in a search based on personal libraries as the only or major source of research. Given that personal libraries are likely to include journals in the same network, it would not be surprising to find some bias associated with network membership. The appeal of using a personal journal library as a source of information lies in its accessibility. The existence of ► bias against non-significant results and confirmatory bias mean that peer-reviewed journal articles should not be used as the sole source of information for a research synthesist, unless the synthesist can convincingly argue that these biases do not exist in the specific topic area.
3. Electronic journals (e-journals). Two characteristics of e-journals are a source of bias. First, many electronic journals do not use peer-review proce-

dures. The synthesist must therefore assess both the methodological rigor of studies in the e-journal and the likelihood of publication bias. Second, e-journals have much shorter publication lags.

4. Research report reference lists. This route involves synthesists examining the research reports they have already acquired to see if they contain references to studies still unknown. It should not be used as a sole means of finding studies but they are generally a productive source of relevant research.

► Secondary Channels Secondary channels provide information about primary research documents and some even contain the documents. The major secondary channels are bibliographies, research registers, and reference databases, including citation indexes.

Recall of a database search depends on the search strategy that was used. Searches with high recall may have low precision, but the same conclusion may be reached with sources of information that are not identical. Synthesists should be explicit about how studies were gathered, including information on the reference database searched, for what years, and with what search terms. The synthesist should also present indices of potential retrieval bias if they are available. They should summarize the same characteristics of individuals used in separate studies.

The Data Evaluation Stage

Data evaluation requires the investigator to establish criteria for judging the adequacy of the procedures used to gather the data. The researcher must examine all the potential errors or irrelevancies that might have influenced each data point and then determine whether these influences are substantial and whether the data should be dropped from the inquiry.

Approaches to Categorizing Research Methods The synthesist must decide what methodological characteristics of studies need to be coded. This decision will depend on the nature of the question under scrutiny and the types of associated research. In the past, research synthesists have employed two approaches to coding to help them capture differences between good and bad studies.

1. The threats-to-validity approach requires the synthesist to make judgments about threats to validity (► validity, study) that exist in the study. There are two broad classes of validity threats in this approach; threats to internal validity related to the direct correspondence between the experimental treatment and the experimental effects and threats to external validity related to the generalizability of research results. Later, the notions of construct validity and statistical conclusion validity were added to this approach.
2. The methods-description approach to study evaluation requires the synthesist to code exhaustively the objective characteristics of each study's methods as they are described in the primary research.
3. The mixed-criteria approach is the optimal strategy for categorizing studies and appears to be a mix of two a posteriori approaches. It does not remove all problems from study evaluation, it is another step toward explicit, objective decision making in an area previously rife with subjective and arbitrary judgments.

Problems in Data Retrieval There are three problems:

1. Problems in library retrieval involve the inability of libraries to ensure that all documents of potential relevance are available to the synthesist.
2. Incomplete and erroneous research reports involve the incomplete or careless reporting of data by primary researchers. Reports can be missing information on *statistical outcomes*, preventing the meta-analyst from estimating the magnitude of the difference between two groups, the relationship between two groups, or the relationship between two variables. Primary research can be missing information on *study characteristics*, preventing the meta-analyst from determining if study outcomes were related to how the study was conducted.
3. Unreliability in coding study results involves the less-than-perfect information processing skills of the people who retrieve information from studies.

Identifying Independent Comparisons Important decisions must be made during the data evaluation stage involving how to identify independent comparisons or estimates of relationship strength. A single study may contain multiple tests of the same comparison or relation because more than one measure of the same construct might be employed and each measure analyzed separately or because different samples of people might

be used in the same study and their data analyzed separately. Several alternatives can be suggested regarding the proper ► unit of analysis in research syntheses: laboratories, studies, samples, comparisons, shifting unit of analysis, and statistical adjustment.

The Data Analysis Stage

In this stage, the researcher orders, categorizes, and summarizes data. These aims can be achieved through a narrative overview, sometimes complemented by the use of formal statistics techniques.

Qualitative Overview A broad ► qualitative overview is necessary to assess the overall evidence and the influence of various factors on the likely ► effectiveness. Key elements of the qualitative approach for assessing effectiveness include consideration of the following characteristics: people who were part of the study, intervention delivered, setting where the technology was applied, and other modifying factors such as personal skills, environmental factors that may influence compliance, and nature of the outcome measures used, their relative importance and robustness, and their comparability. The total number of research reports, studies, and independent samples that contributed to the tests of comparison or relationships (descriptive statistics) should be detailed. Effect size estimates should be calculated if these studies contained the necessary data but the effect sizes should not be combined statistically. The synthesist should give the total number of effect sizes that were positive and statistically significant, positive but non-significant, negative and significant, and negative but non-significant.

A narrative synthesis is unlikely to report an estimate of the average effect of the treatment but, in some circumstances, it may be able to conclude quite reliably whether or not the treatment appears to be beneficial or harmful and indicate the possible range of effect size.

Very often synthesists have faced problems when considering the variation between the results of different studies. Synthesists may find distributions of results for studies sharing particular procedural characteristics but varying on many other characteristics. Due to this, synthesists have to use quantitative synthesizing techniques in many circumstances.

The Interpretation and Presentation Stage

Systematic research reports are divided into four basic sections: introduction, methods, results, and discussion; this division highlights the types of information that need to be presented in order for readers to evaluate adequately the validity and utility of the synthesis.

The *introduction section* must contextualize the problem under consideration. It should include a general description of any prior synthesis, the controversies these syntheses have created or left unresolved, and which of these will be the focus of the new synthesis effort.

The *Methods section* involves details of the literature search, such as criteria for including studies, methods used in primary research, determination of independent findings, details of study coding, statistical procedures, and conventions.

The *results section* involves results or a qualitative overview including ► descriptive statistics, vote counts, and combined significance levels. Overall effect size should be included and should begin with a description of the range, average, and median effect size and a 95% confidence interval around the estimate of central tendency. The results of the overall test for homogeneity of the entire set of related effects should also be presented here. Analyses of influences on effect size should describe the results of analyses meant to uncover study characteristics that moderated the size of the effect. The synthesist should devote a subsection to interaction effects found in single studies.

The *discussion section* should contain at least five components. First, the synthesist should present a summary of the major results of the synthesis. Second, they should describe the magnitude of the important effect sizes found in the synthesis and interpret their substantive meaning. Third, the synthesist should examine the results in relation to the predictions and other prior assertions made about relationships. Fourth, an assessment of the generality of any findings should be included, especially with regard to limiting conditions. Fifth, new questions raised by the outcomes of the synthesis and old questions left unresolved because of ambiguous synthesis results or a lack of prior primary research should be discussed.

Example In our research synthesis (assembly of primary studies and synthesis of information from them for a doctoral dissertation), we want to evaluate the efficacy of selective decontamination of the digestive tract (SDD) as a prophylactic method against nosocomial infections. SDD has become both the most criticized

and, paradoxically, the best-evaluated intervention in intensive care medicine. Controversies center upon four issues: the effect of SDD on infection morbidity; the impact on mortality; the emergence of resistant bacteria; and cost-effectiveness. We searched the MEDLINE database for the years 1992 to 2005 using the following key words: selective decontamination of the digestive tract and intensive care units. We also reviewed the reference lists of all available review articles and primary studies to identify references in the computerized searches. We used the following criteria to select studies for inclusion: population included adults in an ICU; intervention (SDD) defined as use of oropharyngeal and/or nasogastric nonabsorbable antibiotics, with or without systematic antibiotics; outcomes-mortality; nosocomial infections; length of mechanical ventilation and ICU stay; resistance; and costs. The methodological quality of the primary studies was evaluated using a scoring system as a product mix criteria approach. A total of 5964 patients was included in the 25 randomized trials. Descriptive statistics and combined significance levels were used to determine the effect of treatment on mortality or the appearance or disappearance of disease, as well as overall relative risk.

We found that SDD reduces the total number of nosocomial infections, pneumonia rates, bacteremia, tracheobronchitis, urinary infection, and intrabdominal infection. Mortality was significantly reduced with the use of SDD. The length of mechanical ventilation and ICU stay were not different in the group of patients treated with SDD versus the group of patients not treated with SDD. There was no difference in emergence of resistance between the two groups. In our meta-analysis, no difference in cost between the SDD-treated and control groups was identified. These data suggest that the use of SDD should be limited to those populations in whom infection contributes notably to adverse outcome. Additional studies are required to further define appropriate indications and limitations of this preventive strategy.

Cross-References

- ► Bias
- ► Coding Sheet
- ► Effectiveness
- ► Effect Modifiers
- ► Formal Channels
- ► Informal Channels
- ► Qualitative Overview
- ► Secondary Channels
- ► Unit of Analysis
- ► Validity Study

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Systemic Bilharziasis

► Katayama Fever

Systemic Health Effects

Definition

A systemic effect occurs at a location different from the point of exposure. Blood circulation and the digestive system are the principal routes by which hazardous agents travel from the point of exposure to other locations in the body.

Systemic Inflammatory Reaction

► Bloodpoisoning

Systemic Inflammatory Response Syndrome (SIRS)

► Bloodpoisoning

Systemic Schistomoniasis

► Katayama Fever

Tabes mesenterica

► Tuberculosis

Taeniasis

► Intestinal Tapeworms

Taiwanese Aborigines (the Island of Taiwan), (East Asia)

► Indigenous Health, Asian

Target Group

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Definition

In the field of health promotion and disease prevention, a target group is a group of individuals with identical characteristics who are the objective of a health promotion or diseases prevention intervention.

Basic Characteristics

The term target group is borrowed from communication science and advertising and describes a group of individuals who are the objective of advertising and marketing measures. In addition, a target group shares designated characteristics or properties. Target groups are important elements of all ► health education and information measures in health promotion and disease prevention. A clear and well thought-out definition of the group which is the objective of an intervention is an important condition for formulating realistic objectives for reaching these objectives as well as for reaching the group itself. Strategies and measures have to correspond to the ► lifestyles of target groups if lasting individual or structural changes are to be achieved. If interventions are planned for a particular setting it is best to consult the stakeholders in that ► setting (Health Promotion Switzerland).

Target group orientated work is regarded as standard in health promotion activities and ensures ► sustainability of an intervention for changing ► health risk associated lifestyles and ► health determinants. A lack of target orientation is associated with an undifferentiated and inefficient appeal to all and sundry.

In order to evaluate the attainability of target groups, projects have to be structured to fit the characteristics of the participants, recipients and their social culture. The following criteria may be acquired:

- Social demographic determinants: income, education, marital status, residence, native language, etc.
- Characteristic lifestyle and habits.
- Number of people in the target group.
- Social attributes (social situation, lifestyle).
- Values and attitudes.
- Compliance (willingness to cooperate adherence into the brackets) and
- ► Motivation
- Definition and selection rules for delimiting target groups (FCHE 1999).

The following are examples of typical target groups:

- Health education campaign about the risks and hazards of smoking (target group: smokers).

Target Group, Table 1 Summary of certain characteristics of target groups

Characteristic of the target group	Examples
Sex	male, female
Age	children, adolescents, pensioner
Marital status	single, married, widowed
Lifestyle	degree of health conscious
Educational background	secondary modern school, primary school, A-level, master degree
Vocational training	employee, worker
Residence	rural vs. urban region
Health risks	alcohol consumption, non physical activity habits, smoking

- Health education campaign about sexually transmitted diseases (target group: adolescents with health risk related sexual behavior).
- Health promotion and disease prevention interventions in migrant population (target group: migrants).

The number of different characteristics possible show that a detailed definition should consider more than one social demographic determinant. A detailed description of the target group helps to make concrete the objectives of the health promotion activity and reduce the number of people who need to be targeted by the intervention. In planning a health promotion intervention, whether aimed at specific individuals or the general population, it is necessary that the defined target group has the correct balance of complexity and commonality. For this reason, it is helpful that representatives of the target group are involved in the planning phase as their interests, needs and wishes can be taken into consideration and inserted into the structure of the intervention; questionnaires and other research methods can be utilized to this end. In order to increase the efficiency of an intervention, widespread involvement is of considerable importance in reaching a definition of an appropriate target group.

The efficacy and efficiency of an intervention in the field of health promotion and disease prevention in a given population depends on the comprehensive and exact definition of the chosen representative target group. It is, therefore, important to avoid using only one ► risk factor as a defining factor of a target group since this will only reflect an incomplete picture of the target population and defeat the purpose of a general approach to health education (Lehmann, Sabo 2003).

► Evaluation and ► quality assurance of health promotion and disease prevention interventions will always look at the way target groups have been determined. The definition of target groups is one of the most important factors in health promotion that determine whether the planned measures will or will not reach the intended target population (Ovretveit 1998).

Cross-References

► Health Determinants
► Health Education
► Health Risk
► Lifestyle
► Motivation
► Quality Assurance
► Risk Factor
► Sustainability

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Target Population

Definition

Target population is the collection of individuals, items, measurements, etc., about which inferences are desired. The term is sometimes used to indicate the population from which a sample is drawn and sometimes to denote any "reference" population about which inferences are required.

Tariff Autonomy

Synonyms

Collective bargaining autonomy

Definition

Tariff autonomy denotes the right and freedom of employers and employees to build unions for safeguarding their respective interests, collective bargaining of wages and collective agreements (tariff agreements) and to create a body of autonomous collective bargaining law.

Taxonomy of Data/Variables

► Level of Measurement

TB

► Tuberculosis and Other Mycobacterioses

Tbc

► Morbus Koch (Koch's Disease)

TBE Immune Globulin

► TBE (Tick-borne Encephalitis)-Vaccination, Passive

TBE Immune Prophylaxis

► TBE (Tick-borne Encephalitis)-Vaccination, Passive

TBE Immunization, Active

Synonyms

TBE immunization, active; CEE vaccination, active; CEE immunization, active

Cross-References

► Immunization, Active

TBE (Tick-borne Encephalitis)-Vaccination, Passive

Synonyms

Application of TBE immune globulin; TBE immune prophylaxis

Definition

The administration of TBE-immune globulin as pre-exposure prophylaxis can be carried out directly before traveling into an endemic area. The protective effects start immediately and last for four weeks. As a post exposure prophylaxis passive TBE-vaccination is seldom performed.

Technological Risk

► Hazards, Technological

Technology Assessment

Definition

Health care technology assessment is a multidisciplinary field of ► policy analysis. It studies the medical, social, ethical, and economic implications of the development, diffusion, and use of technologies. In general, technology assessment is based on the conviction that new developments within, and discoveries by, the scientific community are relevant for the world at large rather than just for the scientific experts themselves, and that technological progress can never be free of ethical implications.

Telecare

Definition

Telecare describes health care at a distance. Telecare is a branch of ► telemedicine where the patient is located in the community (for example, their own home).

Telecommunication

Definition

Telecommunication is the process of exchange of information between users (human or automated) using electronic media.

Telecommunication Systems

► Telemedicine

Teleconsultation

Synonyms

Teleconsulting

Definition

Teleconsultation literally means consultation at a distance. It refers to clinical consultations carried out using a telemedical service.

Teleconsulting

► Teleconsultation

Telehealth

Definition

Telehealth is the process of integration of ► telecommunication systems into the practice of protecting and promoting health. The meaning and use of telehealth is more complex than ► telemedicine. Unlike telemedicine, where telecommunications are used for clinical purposes only, telehealth applies telecommunication technologies and electronic information to support long-distance clinical health care, patient and professional health-related education, or public health and health administration.

Telematics Platform

Definition

The term 'telematics platform' describes the participation of all stakeholders and users in health care: patients, health professionals, providers of health services (primary health care centers, hospitals, pharmacies, laboratories, and emergency units), professional organizations (nurses or physicians unions, etc), insurance companies, social services, the ministry of health, and the media. The role of this platform is to provide communication and support between all health users in order to ensure quality of health data.

Telemedicine

Synonyms

Telepreventive medicine; Telecommunication systems

Definition

Telemedicine describes the use of telecommunications technology, such as audio and video, for different kinds of health care services. It includes medical consultation, diagnosis, therapeutic services and treatment when the provider and patient are separated by distance. Telemedicine is also used to deliver medical information for education purposes, follow-up services and remote monitoring of patients. The advantages of telemedicine are improved provision of health care services, especially in isolated locations, and easier access for people with ► chronic diseases needing ► continuity of care.

Telemedicine literally means delivery of medicine at a distance. It refers to the delivery of health care services between geographically separated individuals, using ► telecommunication systems e. g. wire, radio, optical, or electromagnetic channels, transmitting voice, data and video. Telemedicine can be simultaneous (for example, telephone or videoconference), or store and forward (for example, an email with an attached image). Telemedicine facilitates medical diagnosis, patient care, and distance learning. Some medical disciplines have already implemented telecommunication methods into delivery of their services: telepreventive medicine, teleepidemioliogy, teledermatology,

teleoncology, telepathology, telepsychiatry, teleradiology, telecardiosurgery, and teleophthalmology, etc.

Telepreventive Medicine

► Telemedicine

Telescopic Crown, Double Crown

Definition

An (secondary) artificial crown constructed to fit over a (primary) coping. The secondary coping is often integrated into a (partial) removable dental prosthesis in order to retain it.

Teleservices

Definition

The term teleservices refers to health services that are provided by the use of ► health telematics and ► telemedicine. These services include clinical observation of chronic patients in their homes – ► telecare or telemonitoring. Other services provided at a distance are ► teletherapy, ► teleconsultation, and telerescue, etc.

Teletherapy

Definition

Teletherapy is a branch of ► telemedicine that provides therapeutic services for patients in a home setting. Examples are language teachers for speech training of patients after strokes, and home trainers for cardiology patients.

Temperature Curve in Malaria

► Fever Attacks in Malaria

Teratoma

Definition

A teratoma is a benign tumour consisting of cells from the three embryonic germ layers. The malignant variant is the teratocarcinoma. If ESC are implanted into an organ without in vitro pre-commitment, there is a risk of teratoma or teratocarcinoma formation. In adults, teratomas arise spontaneously, and preferentially in the testis or ovaries. Morphologically, teratomas consist of cystic structures with predominance of epidermal cells.

Terminal Care

► Palliative Care

Terminal Disease Stadium

► End Stage Disease

Terrorism

Definition

The vicious attacks carried out by politically motivated terrorists groups to strike fear and cause distraction amongst the people with the sole intention of bringing about a political change.

Tertiary Care

Definition

Tertiary care comprises medical services provided in specialized hospitals or medical centers equipped with specific diagnostic or therapeutic facilities usually not available in general local hospitals. This includes, for example, centers for organ transplants, specialist cancer treatment, trauma, burn treatment, etc. Patients are referred from primary or ► secondary care settings to the tertiary care facilities for special investigation or treatment.

Tertiary Dental Care

Definition

Tertiary dental care services are provided by specialist hospitals, universities or regional centers equipped with diagnostic and treatment facilities which are not generally available in local hospitals. Here often dentists work together in a cross-disciplinary way with other medical specialist groups in multi-professional teams. Tertiary dental care includes trauma centers, burn treatment centers, oro-maxillo-facial surgery, organ transplants, radiation oncology, etc.

Tertiary Guidelines

Definition

A guideline is a statement or other indication of policy or procedure by which to determine a course of action. In medicine, tertiary healthcare is specialized consultative care, usually on referral from primary or secondary medical care personnel. It is provided by specialists working in a centre (i. e. a hospital) that has personnel and facilities for special investigation and treatment. Consequently, tertiary guidelines are guidelines for the healthcare professionals employed in tertiary care.

Test of Homogeneity, Chi-Square

Definition

A test of homogeneity compares the proportions of responses from two or more populations with regards to a dichotomous variable (e. g., male/female, yes/no) or variable with more than two outcome categories. The chi-square test of homogeneity is the nonparametric test used in a situation where the dependent variable is categorical. Data can be presented using a ► contingency table in which populations and categories of the variable are the row and column labels. The null hypothesis states that all populations are homogeneous regarding the proportions of categories of categorical variable. If the null hypothesis is rejected, it is concluded that the above proportions are different in the observed populations. The chi-square test of homogeneity statistic is computed in exactly the same manner as chi-square ► test of independence statistic. The difference between these two tests consists of stating the null hypothesis, the underlying logic, and the sampling procedures.

Test of Independence, Chi-Square

Definition

A test of independence evaluates the existence of association between two categorical variables (e. g., gender and smoking status). Data for these two variables are observed for each ► unit of analysis. Data can be presented using a ► contingency table in which the two categorical variables are the row and column labels. The null hypothesis states that the variables are independent (uncorrelated, unrelated); if the null hypothesis is rejected, it is concluded that there is an association between the variables (dependent or correlated variables). The chi-square test of independence statistic is computed in exactly the same manner as chi-square ► test of homogeneity statistic.

Several measures of association can be calculated for data in contingency tables, such as phi coefficient, contingency coefficient, and Cramer's V (see essay Analysis of frequencies). These measures are interpreted like the ► Pearson's correlation coefficient.

Test Statistic

Definition

The end result (final value) of conducting a statistical test. A test statistic is evaluated in reference to a sampling distribution, which is a theoretical probability distribution of all the possible values the test statistic can assume if an infinite number of studies were to be conducted employing a sample size equal to that used in the study being evaluated. The probabilities in a sampling distribution are based on the assumption that each of the samples is randomly drawn from the population it represents.

Tetanus

Synonyms

Infection with *Clostridium tetani*

Cross-References

► Acute Life-Threatening Infections

Tetanus Immune Globulin

Synonyms

Tetanus immunization, passive; Tetanus vaccination, passive; Tetanus immune prophylaxis

Cross-References

► Tetanus Vaccination, Passive

Tetanus Immune Prophylaxis

► Application of Tetanus Immune Globulin
► Tetanus-Vaccination, Passive

Tetanus Immunization, Passive

► Application of Tetanus Immune Globulin

Tetanus Vaccination

Synonyms

Tetanus immunization

Definition

Tetanus vaccination, which was introduced in 1927, can be administered from three months of age. For active inoculation leading to basic immunization, 2 ► vaccines (or 3 in the case of concomitant pertussis vaccination) with inactivated toxins are necessary at intervals of at least four weeks, plus a further vaccination after 4–12 months. In general, the first booster is given at the age of 5–6 years. Further boosters should follow over the whole lifetime at intervals of 10 years. The vaccine can be administered alone (monovalent) or in combination with other vaccines, especially diphtheria toxoid. Tetanus vaccination leads to 99% disease protection. Vaccinations are also possible during pregnancy. Passive tetanus vaccination with tetanus immunoglobulins is implemented immediately following injury if medical history is not available or if immunization has either not taken place or is incomplete. In such cases, simultaneous immunization is implemented, meaning passive immunization together with active vaccination.

Tetanus Vaccination, Active

Synonyms

Tetanus immunization, active

Cross-References

► Immunization, Active

Tetanus-Vaccination, Passive

Synonyms

Application of tetanus immune globulin; Tetanus immune prophylaxis

Definition

In most cases, tetanus immune globulin is given simultaneously with active vaccination in acute injuries when the status of immunization is not known or when there is no completed basic immunization. For tetanus immune prophylaxis human tetanus immune globulin (HTIG) is used.

Cross-References

► Application of Tetanus Immune Globulin

Theological Ethics

Definition

The Bible provided the source for the development of traditional church values and for theological discourse, with its Christian ethos on matters such as custom, habit, and practice.

Theology

Definition

Someone who practices the teaching of God's life and way, particularly regarding the religious methods that often reflect the Christian way of life.

Theory of Health Behaviors

► Planned Behavior Theory

Therapeutic Cloning

Definition

In reproductive medicine, cloning refers to transferring the nucleus of an adult somatic cell to an unfertilized, non-nucleated oocyte. Under this condition, formerly silenced genes of the terminally differentiated somatic cell-DNA are re-activated. When the oocyte becomes diploid, it starts to proliferate thereby producing a clone of genetically identical cells. This artificial blastocyst is able to develop and give rise to an embryo. If implanted into an uterus, the embryo can develop into a fully differentiated organism. The first cloned mammal was the Scottish sheep Dolly, which did not grow old. Since DNA-containing mitochondria of the oocyte are not replaced by the donor's mitochondria, the resulting clone is genetically not completely identical to the donor.

Therapeutic Measures for Infectious Diseases

► Therapy of Infectious Diseases

Therapeutics Against Worm Infections

► Anthelminthic Therapy

Therapeutics for Infectious Diseases

► Therapy of Infectious Diseases

Therapy of Hansen Disease

► Treatment of Leprosy

Therapy of Infections with Mycobacterium leprae

► Treatment of Leprosy

Therapy of Infectious Diseases

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Synonyms

Treatment of infectious diseases; Therapeutics for infectious diseases; Therapeutic measures for infectious diseases

Definition

The therapy of infectious diseases summarizes all measures, which are carried out to help the individual to overcome the disease. On the one hand, drugs can be given which eliminate or at least moderate the effects of the disease, on the other hand, general measures can be taken to support the healing process or prevent complications.

Basic Characteristics

Approaches of Therapy/Kinds of Therapy

The treatment of diseases can be differentiated into symptomatic and causal types of therapy. A symptomatic therapy is not directed against the cause of a disease but aims at its effects on the organism. A causal therapy combats the disease-causing agent itself. Which kind of treatment is used depends on several factors. To begin with, the strength of therapy should be correlated to the severity of the disease. The circumstances of the medical care system have to be considered – including the personnel situation and the

availability of therapeutics. The latter might be the limiting factors, particularly in the developing countries.

Symptomatic Therapy

The symptoms of pathogenic infection can vary; ► fever, interference with the ► body fluid balance or even the failure of organic functions. In the following these different factors are described in more detailed. Some infectious diseases are accompanied by ► itching, which can be moderated by antihistamines.

Fever

Very often, infectious diseases are accompanied by fever. A physical reduction of fever can be achieved by cooling. On the one hand, bathing in slightly warm water can cool the whole body; on the other hand, cooling can be applied locally. Compresses around the legs, a well-known household remedy, are only useful in warm extremities as temperature drop over the skin can only take place when the skin's blood vessels are widened. It is much more effective to cool more central parts of the body, like the chest, the area of the kidneys or the inguinal region. As the body proportions of a child are different from those of an adult, cooling of the head can be an effective measure particularly in young children. An elevated body temperature can be reduced by different drugs called analgesics-antipyretics (or ► non-steroidal anti-inflammatory drugs (NSAIDs)). As the name already makes clear, these drugs are not only used to reduce fever but are also effective against pain; they are widely used for this purpose.

Electrolyte and Fluid Balance of the Organism

Loss of body fluid is another symptom of an infectious disease. Particularly, in gastrointestinal infections with diarrhea and vomiting extreme deficits of body fluids may result. Often, the problem is not only the loss of fluid volume but also an imbalance of ► serum electrolytes, especially sodium and potassium. If an individual is not able to ingest enough food and the resorption by the bowel wall is insufficient, malnutrition results. Starving leads to reserves being used up and – due to acidic metabolic products – systemic acidosis. In a mild or moderate case of diarrhea the administration of an oral ► rehydration solution (ORS) may be sufficient to stabilize the metabolic situation. When the loss of fluids is progressive parenteral fluid replacement becomes necessary. If acidosis is severe, compensation with sodium bicarbonate ($NHCO_3$) may be needed.

Intensive-Care Therapy of Infectious Diseases

When an infectious disease takes a severe course, intensive care measures may be necessary. These measures consist of intubations, mechanical ventilation and a number of other procedures. In sepsis the administration of plasma proteins (fresh frozen plasma = FFP) or thrombocyte concentrates may be required; in anemia blood transfusion may be necessary. A patient suffering from tetanus usually has to be sedated and may require mechanical ventilation. (It is also important with tetanus to avoid visual and acoustic stimuli.) For all immobile patients regular changes of the posture are essential for the prevention of bedsores. Physical therapeutic measures, like breathing exercises or percussion (knocking massage) of the chest may help to prevent pulmonary complications like pneumonia.

Causal Therapy

A causal therapy is directed specifically against a specific pathogen. Its aim is to kill or at least weaken the pathogens and thus enable the patient's own defense mechanisms to overcome the infection. Pathogens can belong to different groups: bacteria, viruses, prions, fungi or parasites.

Antibiotic Therapy

Antibiotics are used to combat bacterial infections. The history of antibiotic treatment goes back to the discovery of ► penicillin by the British bacteriologist Alexander Fleming in the year 1928/1929. As a drug penicillin was used for the first time in 1939. Antibiotics are metabolic products of bacteria, fungi, algae and higher plants or synthetic or partly synthetic copies of these metabolic products. This kind of drug is able to act specifically against microorganisms by either killing them (bactericidal antibiotics) or impeding their growth (bacteriostatic antibiotics). Since the introduction of penicillin a great number of antibiotics with different spectra of efficiency (► spectrum of efficiency) have been discovered or developed. Besides penicillin there are, for example,

► cephalosporins, macrolides (► macrolide antibiotics) and aminoglycosides (► aminoglycoside antibiotics). An antibiotic substance is not effective against every kind of bacteria and, due to the characteristics of certain pathogens, a number of ► resistances have evolved. For some infectious diseases a combination of antibiotics is advisable to achieve the optimum effect. A side effect of all systemic antibiotic treatments is diarrhea. This is due to the drugs not only fighting against the pathogens but also the natural intestinal flora. Further side effects, which have to be mentioned, are the possible impairment of organic functions (for example ototoxic or nephrotoxic effects) and allergic reactions.

Virustatic Therapy

While most viral infections can only be treated symptomatically, specific virustatic agents (► virustatics) are available. These virustatics have to kill viruses or at least impede their growth without causing damage to the normal cells of the macroorganism. In 1977, aciclovir was licensed as the first specific antiviral drug. It is directed against infections caused by the herpes-simplex or varicella virus. Other virustatic drugs are available, for example for treatment and prophylaxis of ► influenza-A infection or severe courses of cytomegaly infection. Today, antiviral therapy plays a very important role in the treatment of ► AIDS, the HI-virus infection.

Antimycotic Therapy

Fungal infections can appear as a local infection, concerning the skin or the mucous membranes, or as a systemic mycosis, which affects organs, organ systems or the whole organism. A variety of antimycotic agents (► antimycotics) are available. Yeasts (like *Candida* species) belong to the natural microorganisms of the human intestines. They only become pathogenic when the balance between microorganism and macroorganism is disturbed. Such a disturbance may be due to antibiotic therapy or treatment with steroids. In comparison with other pathogens, especially bacteria and viruses, fungal infections only play a minor role in severe diseases.

Therapy of Parasitic and Zoonotic Infections

A number of parasites cause diseases in humans, such as protozoa (for example *Plasmodium*, which cause ► malaria), worms (helminthes), lice and mites. The ► parasitic and zoonotic infections are described elsewhere as well as the treatment and prophylaxis of malaria. Drugs to treat worm infections (anthelminthic agents) belong to various groups of substances. They kill the worm by interference with different metabolic

Therapy of Infectious Diseases, Table 1 Therapeutics of parasitic infections (Gorbach et al. 2004; Frölich and Kirch 2006)

Parasite/disease	Therapeutics
Ascariasis (*Ascaris lumbricoides*)	Pyrantel, mebendazole
Beef tapeworm (*Taenia saginata*)	Praziquantel, niclosamide, mebendazole
Pork tapeworm (*Taenia solium*), cysticercosis	Praziquantel, niclosamide, mebendazole
Pinworm, enterobiasis (*Enterobius vermicularis*)	Pyrantel, mebendazole, pyrvinium
Hymenolepiasis (*Hymenolepsis nana*)	Praziquantel, niclosamide, mebendazole
Broad fish tapeworm (*Diphyllobothrium latum*)	Praziquantel, niclosamide, mebendazole
Hookworm (*Ankylostoma duodenale*)	Pyrantel, mebendazole
Whipworm, trichuriasis (*Trichuris trichiura*)	Pyrantel, mebendazole
Strongyloides	Ivermectin, mebendazole, albendazole
Onchocerciasis (*Onchocercus volvulus*)	Ivermectin, suramin
Schistosomiasis	Praziquantel
Liver fluke, fascioliasis (*Fasciola hepatica*)	Praziquantel
Lung fluke, (*Paragonimus westermani*)	Praziquantel
Head lice	Malathion, pyrethrum, permethrin
Pubic lice	Malathion, pyrethrum
Body lice	Pyrethrum
Mite, scabies (*Sarcoptes scabiei*)	Malathion, lindane, benzylbenzoat
Chagas disease (*Trypanosoma brucei*)	Nifurtimox, benznidazole
Sleeping sickness (*Trypanosoma gambiense*)	Pentamidine, erflornithine, suramin
Leishmaniasis	Pentamidine
Pneumocystis pneumonia (*Pneumocystis jiroveci*)	Pentamidine

processes. Among the anthelminthic drugs are pyrantel, praziquantel, mebendazole, niclosamide and ivermectin; their indications are shown in Table 1. Drugs against mites and lice are only suitable for external use as these substances are neurotoxic. As long as these drugs are used correctly and on intact skin, only a little amount of their substance is resorbed and the drug is tolerated well; but if they are applied on inflamed parts of the skin resorption is much higher and neurotoxic effects may occur. If they reach the systemic circulation, the drugs may cause side effects in the central nervous system, like tiredness or dizziness or even seizures. Mites are treated with lindane, malathion and benzylbenzoat. Lice can be treated with malathion, pyrethrum and permethrin; the advantage of permethrin is that it only has to be used the once.

Cross-References

- ► AIDS
- ► Aminoglycoside Antibiotics
- ► Antimycotics
- ► Body Fluid Balance
- ► Cephalosporins
- ► Fever
- ► Influenza
- ► Itching
- ► Macrolide Antibiotics
- ► Malaria
- ► Non-steroidal Anti-inflammatory Drugs (NSAIDs)
- ► Parasitic and Zoonotic Infections
- ► Penicillin
- ► Rehydration Solution
- ► Resistance
- ► Serum Electrolytes
- ► Spectrum of Efficiency
- ► Virustatics

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Therapy of Leprosy

► Treatment of Leprosy

Thick Drop Method

Synonyms

Diagnostics of malaria

Definition

In the diagnosis of malaria by thick drop method a drop of blood is put on a slide, dried and afterwards colored by Giemsa stain. By this method, the erythrocytes are destroyed and the plasmodia are set free. It is difficult to identify the various species of plasmodia by the thick drop method; expertise is required.

Third-Party Payer

Definition

The term third-party payer refers to the fact that, in most health care systems, the patient-physician relationship is augmented by a third party. Third-party payers may be private or social health insurers as well as public institutions.

Thoracic Surgery

Definition

Thoracic surgery is the field of surgery that is concerned with the repair of organs located in the thorax or chest. Thoracic surgery restores diseased or injured organs and tissues in the thoracic cavity, for example disorders of the lungs and esophagus.

Thought Disturbances

► Psychotic Disorders

Three-Day Measles

► Rubella

Three-Day Measles Immune Globulin

► Rubella-Vaccination, Passive

Three-Day Measles Immune Prophylaxis

► Rubella-Vaccination, Passive

Threshold

Definition

The threshold is the minimum acceptable result of a health economic evaluation, e. g. the incremental cost-effectiveness ratio. Within these limits (which are so far arbitrarily set), the costs per outcome gained are regarded as acceptable for a society.

Threshold Concentrations of Hazardous Substances

► Low-Level Exposure

Throwing Away

► Disposing

Thyreomegaly

► Goitre

Tibetans (Central Asia)

► Indigenous Health, Asian

Tick-Borne Encephalitis (TBE)

Synonyms

Central European encephalitis (CEE)

Definition

The TBE-virus can be found in small vertebrates, primarily in mouse-like rodents, which do not fall ill themselves, and in ticks. The virus is transmitted to humans by tick bite. Ten to thirty percent of the infections are symptomatic and take a biphasic course. During the first phase there are flu-like symptoms with fever, headache, vomiting and dizziness. After a symptom free interval there is a reoccurrence of fever. Later, the patients develop central nervous system symptoms, like tonic-clonic seizures, neurological impairment, apathy and coma. Frequently, the severe courses of TBE-infection show long-term damage or even have a lethal outcome. As a specific therapy is not available, the most important prophylactic measure is the active TBE vaccination (► immunization, active).

Cross-References

► Zoonotic and Parasitic Infections

Tick-Borne Encephalitis (TBE) Vaccination

Synonyms

TBE immunization

Definition

The vaccination containing inactivated TBE viruses is recommended for residence in certain regions: among others, for parts of Germany, Austria, Hungary, the Czech Republic and Slovakia. The TBE ► vaccine has been administered in Austria since 1974. Vaccination should preferably begin in autumn. Between 3 weeks and 3 months following the first inoculation, a second one should be given. The protective effect starts to be present a few days after the second dose. A third vaccination is given 9–12 months after the second, and a fourth 3–5 years after the third. Booster shots should be given at intervals of 3–5 years, as long as the patient

is still at risk of infection. Contraindications for the FSME vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccine.

Time-to-Event Analysis

► Survival Analysis

Time-to-Event Curve

► Kaplan–Meier Survival Plot

Time Horizon

Definition

The time horizon of a health economic study describes the time to a fixed point of time in the future that will be the endpoint to the estimation of costs and outcomes. The time horizon can be seen as the equivalent to the follow-up time in a clinical trial. The time horizon in economic evaluation studies should be as long as any differences in costs or outcomes between the alternatives can occur.

Timeliness of a Surveillance System

Definition

The timeliness of a surveillance system reflects the delay between steps in a system. It can best be assessed by the ability of the surveillance system to allow appropriate public health action. The need for timeliness (rapid reporting to a surveillance system) depends on the urgency of the problem under surveillance and the nature of the public health response. Computer technology integrated into surveillance systems may promote timeliness of reporting.

Time Preference

Definition

A preference to receive benefits today, rather than in the future, and to incur costs in the future, rather than in the present.

Time Series Analysis

Synonyms

Time series modelling

Definition

Time series analysis comprises a broad spectrum of exploratory and hypothesis testing methods that have two main goals: (a) identifying the nature of the phenomenon represented by the sequence of observations, and (b) forecasting (predicting future values of the time series variable). Both of these goals require that the pattern of observed time series data is identified and formally described. A time series is a sequence of observations made over time. For example, annual infant mortality rate, weekly admissions to an emergency center, or daily carbon monoxide concentration. Time series analysis accounts for the fact that data points taken over time may have an internal structure (such as autocorrelation, trend, or seasonal variation) that should be accounted for. Three broad classes of models for time series data (that depend linearly on previous data points) of practical importance are the autoregressive (AR) models, the integrated (I) models, and the moving average (MA) models. Time series analysis tools include: consideration of autocorrelation and the spectral density function, performing a Fourier transformation to investigate the series in the frequency domain, use of a filter to remove noise, use of a time-frequency analysis technique, use of ► artificial neural networks, and chaotic analysis.

Time Series Modelling

► Time Series Analysis

Time Trade-Off

Definition

Time trade-off is a method to measure individual preferences for health outcomes and to estimate utility. Individuals are asked to choose between two alternative health care interventions. The outcome of one alternative would be less preferable, received with certainty,

and last unchanged for the remaining lifetime. The second alternative would lead to perfect health but also to a decreased life expectancy. The remaining duration of life in the second alternative is varied until the individual is indifferent between the two choices. The utility is derived from the lost lifetime and the improved health state.

Tip

► Landfill

Titular Nation of Altai Republic

► Indigenous Health, Asian

TNO

Definition

Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek or TNO (The Netherlands Organization for Applied Scientific Research) is a non-profit organization in the Netherlands that focuses on applied science. It is a knowledge organization for companies, government bodies, and public organizations. The daily work of TNO is to develop and apply knowledge. The organization also provides contract research and specialist consultancy as well as granting licenses for patents and specialist software. TNO tests and certifies products and services, and issues an independent evaluation of quality.

Tobacco Consumption

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Synonyms

Smoking; Cigarette smoking

Definition

Tobacco consumption is the use of tobacco products in different forms such as cigarettes, cigars, pipes, waterpipes or smokeless tobacco products. Cigarettes and tobacco products containing tobacco are highly engineered so as to create and maintain dependence. Many of the compounds they contain and the smoke they produce are pharmacological active, toxic, mutagenic, carcinogenic and tobacco dependence is separately classified as a disorder in major international classification of diseases.

Basic Characteristics

Levels and Trends

Currently more than one billion of people around the world are using tobacco products. The World Health Organization considers the tobacco epidemic as a global problem with serious consequences for public health worldwide. Assuming constant tobacco use is prevalent, WHO projects that from 2000 to 2025 the number of smokers will arise approximately from 1.2 billion to more than 1.7 billion and the annual number of death which is currently estimated about 5 millions will double in 20 years to 10 millions. (World Health Organization Tobacco Free Initiative 2004). The international community is concerned about the worldwide health, social, economic and environmental consequences of tobacco consumption and exposure of tobacco smoke. The increase in the worldwide consumption and production of cigarettes and other tobacco products, particularly in developing countries, as well as the burden this places on families, on the poor and on national health systems led to the agreement of UN member states to establish the first health convention in the history of mankind, the Framework Convention on Tobacco Control (World Health Organization 2003). Most of today's smokers are male and most live in developing countries. Nearly a third (300 million) live in China. The highest rates of tobacco use are found in Cambodia, Djibuti, Indonesia, Myanmar, Papua-Neuginea and Viet Nam. Trends in both developed and developing countries show that smoking rates among males are slowly declining. Better educated males are tending to give up smoking, so tobacco use is becoming a habit of poorer less educated males. If smoking remains prevalent, it is estimated that the number of males smoking worldwide will rise from one billion in 2000 to 1.4

billion in 2025. Among females, the tobacco epidemic started later. In developed countries it is estimated that 22% of females smoke tobacco and in developing countries 9% smoke tobacco, totaling about 230 million females worldwide. Cigarette smoking among females is declining in many developed countries, but this trend is not found in all developed countries: In several southern, central and eastern European countries, cigarette smoking is either still increasing among females or has not shown any decline. As social traditions change and incomes increase the number of females smoking could double to 460 million by 2030. It is well known that the greatest public health challenge in primary prevention (► prevention, primary) in the next 30 years will be the prevention of a rise in the level of smoking amongst girls and women in developing countries, especially in Asia.

WHO Framework Convention on Tobacco Control

The idea of an international instrument for tobacco control was initiated with the adoption of a resolution of the World Health Assembly in May 1995 (WHA 48.11) requesting WHO to develop an international convention on tobacco control together with member states. It took an ongoing process spread over several years for the convention to be negotiated. Finally on 21 May 2003 the 56th World Health Assembly unanimously adopted the WHO Framework Convention on Tobacco Control and the convention was opened for signature to member states. Up to August 2007 168 countries have signed and 148 countries have ratified the convention.

Individual and Economic Costs of Tobacco Consumption

Scientific evidence has unequivocally established that tobacco consumption and exposure to tobacco smoke causes death, diseases and disability, and that there is a time lag between the exposure to smoking, or other uses of tobacco products, and the onset of tobacco related diseases. Tobacco consumption is deathly in any form as WHO noted on World No Tobacco Day 2006 (World Health Organization 2006). Among the leading diseases that are caused by tobacco are cardiovascular diseases, chronic obstructive lung diseases, cancer in different sites, the most deadly being lung cancer. Premature death costs a smoker an average of 10 years of his life (Doll et al. 2004). The costs to individuals and their families include also the loss of money spent on buying tobacco, the loss of income through illness and premature death, the cost of illness or death of family members exposed to passive smoke in the home, the cost of the time spent by other family members looking after smokers or taking them to hospital, which may sometimes be measured in days in developing countries, health care costs induced by tobacco related illnesses, higher health insurance premiums, miscellaneous costs such as increased fire risk.

The economic burden of tobacco use on governments and societies is huge: Governments often have to bear the burden of caring for chronically sick and terminally ill smokers and providing for their spouses and children in the event of social incapacity or premature death. In countries where tobacco is not grown or is insufficient to meet national demand, the importation of cigarettes could lead to a net loss of foreign currency. Tobacco growing countries have a loss of agrarian areas that could otherwise be used to grow food. Companies have higher costs for employers due to absence from work, decreased productivity, higher accident rates and higher insurance premiums: Absence from work is often higher among smokers due to illness. In addition, cleaning and maintenance cost rise for buildings where smoking is permitted. Also the environmental costs are huge: Rainforests are destroyed because of tobacco growing and tobacco curing so that tobacco is contributing to deforestation worldwide (Geist 1999).

The Role of the Tobacco Industry

With the setting up of a unique data base, former secret tobacco industry documents are now publicly available (the result of the Master Settlement Agreement (MSA) between the tobacco companies and 46 United States territories and states) and information is now obtainable about the industry's formerly secret tactics and plans to deter effective measures to control tobacco use (British American Tobacco Documents Archive 2006; Legacy Tobacco Document Library 2006; Tobacco Documents Online 2006). For decades the tobacco industry has been acting on national as well as international levels against effective interventions to reduce tobacco consumption. The globalization of tobacco manufacturing, trade, marketing and industry influence poses a major threat to public health worldwide. WHO characterizes the tobacco industry as a "global force" that considers

the world as "its operating market by planning, developing and marketing its products on a global scale" (Yach, Bettcher 2000). Ensuring and increasing the profits are the main aims of the tobacco industry. The industry uses a variety of strategies to buy influence and power and penetrate markets so that their aims will be reached. To break this trend governments and public health authorities have to consider effective tobacco control intervention.

Effective Tobacco Control Strategies

The World Bank (World Bank 1999) and World Health Organization Tobacco Free Initiative (World Health Organization Tobacco Free Initiative 2004) have identified effective strategies to combat the tobacco epidemic on national and global levels. These strategies are summarized and recommended in WHO Framework Convention on Tobacco Control (World Health Organization 2003). Previously, governments and public health planners tended to leave tobacco control in the hands of medical practitioners. Although the role of health professionals is vital, it is well known that the medical model alone is not enough. Tobacco control requires a comprehensive approach, using a strategic mix of policies, legislation and program interventions and the involvement of other partners in society. In *low- and middle-income countries*, price measures are the most cost-effective way of reducing consumption, especially among young people, followed by non-price measures such as comprehensive bans on tobacco advertising and promotion, bans on smoking in public places including work places and the hospitality industry, strong warning labels on packages, information and research. Pharmaceutical products are relatively more expensive. In *high income countries*, price increases are still the most cost-effective measure, followed by pharmaceutical assistance with quitting and non-price measures. Governments and legislators are duty bound to increase the prices of tobacco and tobacco products, primarily through taxes on tobacco. The following non-price measures are effective interventions that reduce demand: Comprehensive bans on tobacco product advertising and promotion, legislation to prohibit smoking in public places and work places, use of prominent, strongly worded and pictural health warnings on cigarette packages, information and advocacy campaigns as well as cessation programs to assist those who want to quit smoking. As interventions that reduce supply the following strategies are effective: Control of smuggling, restricting access of minors to tobacco, crop substitution for tobacco farms and elimination of government subsidies for tobacco farming.

Conclusion

Tobacco consumption led during the last century to a tobacco epidemic as a global problem with serious consequences for public health. The international health community is concerned about the devastating worldwide health, social, economic and environmental consequences of tobacco consumption and exposure to tobacco smoke. WHO and member states established the Framework Convention on Tobacco Control as answer to the tobacco epidemic. International cooperation and the participation of all countries in an effective, appropriate and comprehensive international response on the way and the implementation of successful tobacco demand reduction strategies are in process.

Cross-References

► Prevention, Primary

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Tobacco and Family Health

► Smoking and Family Health

Tobacco Use

► Smoking Behavior

Tooth Decay

► Dental Caries
► Oral Diseases

Top-Down Approach (For Cost-Estimation)

Definition

A top-down approach divides the total national costs for illnesses between different illnesses according to main diagnosis. The risk of double-counting is avoided but diagnoses may be underreported. Moreover, the national illness register show not all important cost items.

TORCH Serology

Synonyms

Screening for congenital infections

Definition

When a newborn child is suspected of having a congenital infection, serologic tests can be carried out to evaluate the titers of the most common germs. This is called TORCH serology, ***T****oxoplasma gondii*, **o**thers (varicella zoster, hepatitis B, parvovirus B 19), **r**ubella, ***C****ytomegalovirus* (CMV), **h**erpes-simplex virus (HSV) type 1 and 2.

Torres Strait Islanders (Australia)

► Indigenous Health – Australooceaninan

Tort

Definition

Tort is a term of civil law and, here, it means a wrongful, unlawful and harmful act of a person or a legal entity (i. e., the tortfeasor) which causes an injury of life, body, health, property or other protected right of another person or legal entity.

Tortfeasor

Synonyms

Offender

Definition

Any person, company, other organization or legal entity, including state institutions, who has committed a tort. Tortfeasors are subject to liability under tort law. ► Tort.

Tort Law and Public Health

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Synonyms

Torts law; Law of torts; Law of delict

Definition

Tort law is one of the fields of private law. It encompasses the legal rules that attribute legal responsibility and compensation duties (liability) for damages resulting from torts. The term tort describes a wrongful, unlawful act injuring or affecting life, body, health, property or other protected right of another person. Tort law provides the prerequisites and limits of liability of tortfeasors and the extent of their obligation to compensate claimants. Main forms of tort liability are fault-based liability, strict liability and state liability.

Basis Characteristics

Background and Function

Tort law is one of the fields of private law with the highest practical relevance. The term tort law is mainly used in common-law countries, whereas the term "law of delict" prevails in civil law countries (*See* in Germany, where the respective part of private law is known as "*Deliktsrecht*" (translation: "Delicts Law") or "*Unerlaubte Handlungen*", which translates as "Unlawful Acts").

► Tort is a term of private law. Here, it means a wrongful, unlawful and harmful act of a person or a legal entity (i. e., the tortfeasor), which causes an injury of life, body, health, property or other right of another person or legal entity. Therefore, to classify an act as a "regular tort", the harmful act must have been unlawful and committed with fault (i. e., intentionally or negligently). These acts can regularly – but not always – also be classified as criminal acts and may be punishable under criminal law. Thus, tort litigation (a civil lawsuit) may be complementary to a criminal prosecution. However, tort liability is also possible without fault if the harm falls under the scope of so-called strict liability.

Tort liability must not be confused with liability under contract law. Tort law is not part of contract law. A tort leads to a statutory and not contractual legal relationship between the tortfeasor and the injured. This legal relationship determines the liability of the tortfeasor and his duty to pay ► damages to the injured person. Therefore, a person may have a tort liability together with a contractual liability if the tort additionally represents a breach of a contract.

Tort law as part of private law is not aimed at criminal punishment. Tort law has the objective of attributing responsibility for tortious acts and providing compensation to the injured subjects. The award of damages to compensate those injured by torts is one main goal of tort law. Correspondingly, tort law – like criminal law – has a retrospective perspective on tortious acts, whereas in public health law the *ex ante* prevention of harm is the primary goal. As a secondary objective, tort law is determined to protect community interests and persons from tortious acts. Thus, a court may release injunctive orders against tortfeasors based on tort law to omit the tortious act for the future. Affected persons may file a motion or ask for (preliminary) injunctions at court, based on tort law, to achieve relief from a tortious act (e. g., a nuisance). In such constellations, tort law can be used as a preventive public health tool. Finally, tort law protects the interests of the injured persons by convicting tortfeasors and awarding damage payments so that a financial restitution is achieved.

Principles of Tort Law

Tort law provisions define the legal elements of tortious acts. A regular type of liability under tort law is ► fault-based liability. However, tort law also encompasses ► strict liability and ► state liability as well as employer's liability, among others. Tort law as a general part of private law applies to everybody tortiously causing damage regardless of whether it is an individual causing a traffic accident, a medical doctor held liable for medical malpractice or a product manufacturer liable for injuring consumers by placing defective or extraordinary dangerous products on the market. Tort law is very far-reaching, which is one of the reasons for its practical relevance.

As a classic example of a fault-based liability, the central delicts law provision of German private law (§ 823 of the German Civil Code) can be cited, particularly as the provision is representative for tort provisions in some other jurisdictions (McClurg et al. 2007). § 823 of the German Civil Code provides in its first subsection: *"Anyone who unlawfully injures the life, body, health, liberty, property or any other right of another, either wilfully or negligently, is liable to such other person to compensate for any such damages resulting therefrom"* (translation by the author).

As such, in the realm of public health, fault-based liability also applies to medical doctors and hospitals injuring patients. The core elements of a "regular tort" (fault-based liability) are the causation of harm by a faulted and unlawful act. ► Fault includes wilful or negligent acts. Negligence plays the major role in the practice of tort litigation. Most tort claims are based on negligence. The tortfeasor must have acted without due care and in breach of a duty of care leading to the injury.

In addition to fault-based liability, strict liability plays an important role in tort law. Under strict liability, a claimant does not need to prove that the ► tortfeasor acted at fault when causing the harm. Strict liability is a liability scheme without fault. Product liability is a typical area of strict liability. As strict liability is regardless of fault, it provides a substantial enhance-

ment for claimants. Strict liability is grounded in the idea that a company that places dangerous products on the market must be responsible for harm resulting from the use of these products even if a fault is not proven. As the marketing of many products is inevitably linked with consumer risks, the legal system only allows such product marketing if the manufacturer accepts his fault-independent liability for the risks resulting therefrom (Koyuncu 2004). In many jurisdictions, environmental liability is also subject to strict liability. In Germany, car drivers' liability is also governed by strict liability.

State liability is also relevant for public health. This liability scheme applies to injuries caused by public health practitioners or administrative agencies and is fault-based. It may apply, if, for example, public health agencies negligently fail to react adequately to safeguard the public's health from a threat; an injured person may claim damages from the agency due to a breach of the agency's duty of care. Therefore, deficiencies in providing public health services may result in state liability of the agency. The same is true in cases of disproportionate and excessive public health actions unduly impacting personal or economic rights and interests.

Compensations in Tort Law

Tort law dictates the conditions, type and amount of damages, i. e. *compensation or other payments* resulting from tort liability. The possible compensation elements vary throughout jurisdictions. However, a general and widely accepted objective and principle of tort law is that the tortfeasor has to pay damages in order to make the injured person "whole again". This means that he has to pay damages "to restore the person, as nearly as possible, to the position" the claimant "would have been in but for the tortious conduct" (McClurg et al. 2007). Where possible, the tortfeasor has to "make whole" (restitution in kind) and restore or otherwise "make up" by paying compensation.

In addition to the economic compensatory damages, noneconomic *damages for pain and suffering* play an important role in tort law. In the common-law jurisdictions, particularly in the U.S. and the United Kingdom, so-called punitive damages are also relevant for the practice of tort law. Tort cases can also result in a court order to the tortfeasors to stop the tortious conduct. Such injunctive relief may be combined with damage payments. In some jurisdictions, e. g., the U.S., consequences of torts can include civil penalties and sanctions with a remedial nature like cleanup costs and liens on property (Grad 1990).

Practical Aspects of Tort Law

Tort law cases are handled by specialized civil law courts, which complement the court system, together with administrative and criminal law courts. Tort cases are private actions between private parties. Civil lawsuits are governed by civil procedure laws. These prescribe the way the case is handled at court as well as the rules for evidence and involvement of witnesses or experts. One important element of civil lawsuits is the *burden of proof*. The party bearing the burden of proof must provide the court/jury with the necessary facts to substantiate its assertions. If it fails to provide these facts, the case will very likely be lost. In civil lawsuits, there is no rule similar to the criminal procedure "benefit of doubt" rule (*in dubio pro reo*). In civil lawsuits, each party must provide the facts that are necessary to substantiate their legal assertions. Because of these procedural burden-of-proof rules, it is not surprising that the outcomes of civil lawsuits differ from those of criminal proceedings even if both were initiated because of the same act.

In most jurisdictions, many tort cases are finalized with consensual settlements between the parties. In entering a settlement, both parties agree on a compromise in order to find a consensual solution without waiting until the final court decision. Finally, there are relevant differences between procedural rules of civil lawsuits throughout jurisdictions. Among others, parties in the U.S. are entitled to file class actions. The discussion of these differences would extend the scope of this essay. Andrew McClurg and his co-authors (McClurg et al. 2007) discuss many of the relevant differences in practical tort litigation (e. g., procedure rules, juries, expert witnesses, damages, court and attorney fees).

Tort Law and Public Health

Tort law and public health have several intersections. With respect to their objectives, both fields are to a considerable extent consistent (Gostin and Jacobson 2006). The following points of contact between tort and public health law are highlighted in brief:

- Public health laws may – even though they are part of administrative law – provide compensation in cases of violations. Thus, they may include elements of tort laws. Several other intersections between tort law and public health law are – similar to the intersections between criminal law and public health – based on various indirect effects and interrelations between both legal fields. Overall, tort law has enhanced the level of protection in many public health fields.
- There may be a direct interaction between tort law and public health. This is the case where public health laws set forth compensations to infringed persons if they were harmed due to a violation of rules that protect public health. Then, the compensation is based on the applicable public health laws and not on tort law. Here, the public health laws form the legal basis for the claims.
- Another type of direct interaction between tort and public health law exists in jurisdictions (e. g., in Germany) where the compensation is based on general tort law but where the injury was due to a violation of (protective) public health laws (e. g., damages due to violations of occupational safety rules or infectious diseases control laws). In these cases, public health laws are not the basis of the claim. The basis of the claim remains in the general tort law. However, the applicability of tort law rules are linked with the violation of the public health law rules.
- Tort law also applies to public health officers and (in the manifestation as state liability) administrative agencies if they have violated their public health obligations. Individuals may claim damages from the agency or their officers asserting that they have failed to provide appropriate public health services.
- Tort law has increased the protection level in many public health fields. Tort law adjudication has developed particular rules and doctrines for the interaction between patients and medical doctors (e. g., informed consent rules). This has significantly promoted patient autonomy and empowerment. Similarly, product liability litigation has increased the awareness of consumer safety aspects and – in addition to deterrence – the courts have developed manufacturer obligations with respect to product marketing, instruction and consumer information, as well as good construction quality assurance duties (McClurg et al. 2007). Particularly, the tobacco industry has been subject to extensive tort litigation, which influenced this industry and its marketing in the interest of the public's health (Pamet and Daynard 2000; Gostin 2000; Teret 1986). Asbestos litigation is an example of occupational safety related litigation. As a consequence of the increased attention obesity is receiving as a public health issue, in the recent past individuals have filed lawsuits against fast food companies (e. g., Pelman v. McDonald's Corporation, U.S. District Court, S.D. New York, 2003. 237 F.Supp.2d 512). Such "obesity litigation" and similar forms of litigation are also intersections between tort law and public health.
- As already noted, tort law (comparable to criminal law) has a deterrent and protective effect in the interest of the public's health. This conclusion is supported by the author's own experience as a practicing medical doctor as well as a lawyer providing legal counsel to companies and medical doctors on consumer/patient safety aspects. The potential damage payments for injuring consumers/patients through non-compliance have significant impact on the decision-making process of these actors. Tort law and its potential consequences have a behavior-influencing effect in favor of legal and public health compliance.
- Public health standards set by the government and the administration also form an intersection between tort law and public health. Such standards regularly describe the present "state of the art" for the pursuit of the activities governed by the standard (e. g., occupational safety standards). As negligence in tort law is determined by the owed duty and standard of care, which are also influenced by the "state of the art", such standards have relevance as they reflect the state of the art. Public health standards can therefore provide evidence for a negligent act as they define the tortfeasor's "duty of care" and "standard of care" (Koyuncu and Kamann 2007). In this respect, public health law standards influence the outcome of tort claims.
- A violation of public health laws and standards may also affect civil lawsuits by influencing the civil procedure rules. As demonstrated above, in civil lawsuits, burden-of-proof rules exist. Under consideration of certain facts, the burden of proof shifts from one party to the other. A shifted burden of proof is regularly decisive for the lawsuit. A violation of pub-

lic health laws and standards may be able to shift the burden of proof and, then, decide the case in favor of the claimant. This is an additional incentive for all potential tortfeasors to act in regulatory compliance with public health laws.

In summary, tort law and public health are interrelated in the interest of the public's health. The mechanisms of tort law have deterrent and preventive effects in favor of the population's health and influence the behavior of individuals and companies accordingly. Further, compliance or non-compliance with standards and rules of public health law influence the outcome of tort cases. Therefore, tort law is indeed an important component of public health law and public health practice (Reynolds 1995). The higher the tort liability risks and damages in a country are, the more important tort law is. Tort law has to be viewed as an indirect type of regulation in order to ensure and promote the public's health. As an indirect form of regulation, tort litigation is a potent tool with "enormous potential for improving the public health" (Gostin and Jacobson 2006).

Public health law is interwoven with tort and criminal law as well as with other legal fields like tax law, commerce law, social law or constitutional law. All intersections either directly protect the population's health or have indirect effects that safeguard and promote the population's health. This additionally supports the conclusion that the establishment and pursuit of a public health system is probably the central objective of the society. As demonstrated, law supports this overarching purpose in manifold ways with substantial impact.

Cross-References

- ► Criminal Law and Public Health
- ► Labor and Occupational Safety Law
- ► Legal Basis of Public Health
- ► Legal Regulation of Professions, Businesses, and Products
- ► Occupational and Environmental Health
- ► Public Health Law, Legal Means

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Torts Law

► Tort Law and Public Health

Total Fertility Rate (TFR)

Definition

Total fertility rate (TFR) is the most commonly used fertility measure and the best single measure to compare ► fertility across populations. The TFR is defined as the average number of live births a woman would have if she were subject to, throughout her reproductive life, ► age-specific fertility rates (ASFR) observed in a given year. The TFR is the sum of the ASFRs over reproductive ages. It is a synthetic measure of fertility that is independent of the age structure of a population.

Totipotency

► Omnipotency

Toxicogenomics

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Definition

Toxicogenomics aims to identify and understand every gene product that influences the biological effects of environmental stressors and toxicants. It combines gene, transcript, protein and metabolite profiling with conventional toxicology to investigate gene-environment interactions that influence toxic biological endpoints, and that might therefore be involved in disease causation. Toxicogenomics aims to provide a global, system-wide view of the genetic and biochemical machinery that protects cells, tissues and animals against toxic exposure (Aardema and MacGregor 2002; Waters and Fostel 2004).

Basic Characteristics

Beginnings of Toxicogenomics

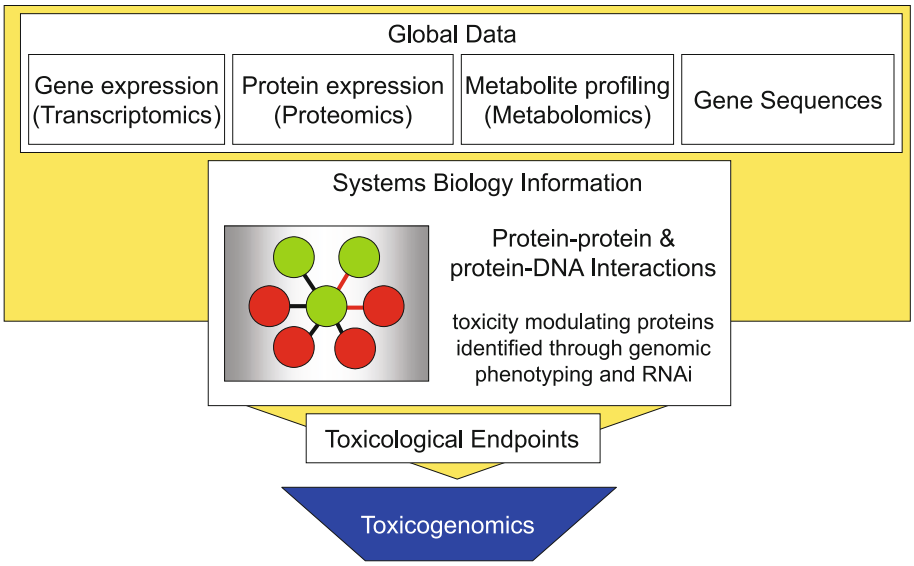
The foundation of toxicogenomics is in the field of toxicology, the study of toxic substances. In the past decade, advances in biotechnology and high-throughput genomic technologies have revolutionized all of the biological sciences and toxicology is no exception. Exemplary of these technologies is the ► DNA microarray, a solid surface onto which DNA molecules are arrayed at high density, enabling the monitoring of thousands of nucleic acids simultaneously. DNA microarrays enable detection of genome-wide transcriptional responses by measuring mRNA changes in organisms exposed to environmental agents and by detecting polymorphic variants in DNA (Aardema and MacGregor 2002; Hamadeh 2004). Also integral to the field of toxicogenomics has been sequencing of numerous organisms plus the associated gene and protein annotation. These data are instrumental in the application of gene-expression analysis to understanding the modes-of-action of toxic agents and other environmental stressors on biological systems. Together, these technological developments have been catalytic in the emergence of the field of toxicogenomics. The three overarching goals of the toxicogenomics field are: 1) to understand the relationship between environmental stress and human disease susceptibility, 2) to identify markers of disease and exposure to toxic substances, and 3) to elucidate the molecular mechanisms of toxicity (Waters and Fostel 2004).

Evolution of Toxicogenomics

The field has evolved from early gene expression studies involving the focused response of a biological system to a particular agent, towards more global investigations that integrate several different fields with toxicology and pathology. New families of technologies now enable global analysis of virtually all cellular molecules and these are termed "-omics" technologies. They are compiled from ► transcriptomics (the aggregate study of all mRNA transcript levels), ► proteomics (the aggregate study of all protein products) and metabonomics (► metabolomics, the aggregate study of metabolites). These multiple forms of complex data streams are integrated with information including gene sequences (single nucleotide polymorphic variants), protein-protein/protein-DNA interactions and toxicity modulating proteins (identified through genomic phenotyping of global gene deletion sets or through RNAi). Merging all of these datasets with endpoints of toxicological responses and histopathological data generate toxicogenomic data that can be mined to yield such information as toxicity biomarkers, disease causation, and mechanisms of toxicity (Fig. 1) (Waters and Fostel 2004; Fry et al. 2005; Merrick and Madenspacher 2005).

Applications of Toxicogenomics to Human Population Studies

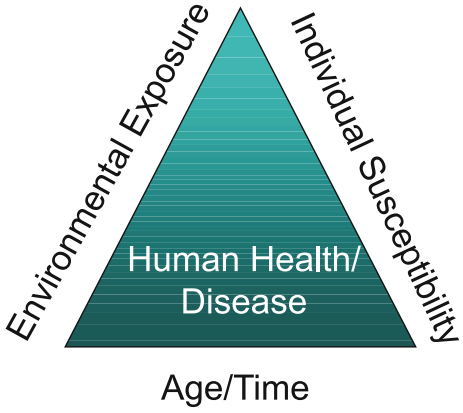
A major application of toxicogenomics will be the prediction of human susceptibility to disease. Prediction of human health risks from toxicant exposures is complicated by the diverse properties of toxic agents, the dose and time-specific response that influence the relationship between exposure and disease, and the genetic variation of human populations (Waters et al. 2003). Genetic differences between individuals can determine the relative sensitivities to environmental agents with some disease susceptibilities caused by a single inherited trait and other disease susceptibilities caused by multiple traits (Waters et al. 2003). No doubt, it is the



Toxicogenomics, Figure 1 Toxicogenomics combines global data from gene sequences (SNPs), transcript, protein and metabolite profiling and systems biology information with conventional toxicology

interaction between genetics and the environment that ultimately results in disease (Fig. 2).

Sequence differences (polymorphisms or mutations) also contribute to inter-individual differences in responses to drug treatment, the study of which is termed ► pharmacogenetics. Applications of toxicogenomics currently exist in the arena of drug discovery to identify safer drugs in a quicker, more cost-effective manner. Toxicogenomics has the potential to better identify and assess adverse reactions of new drug candidates (Yang et al. 2004). Toxicogenomics could contribute to early and reliable prediction of the toxic nature of compounds, avoiding extensive animal costs and time-consuming pre-clinical trials (Luhe et al. 2005). To date, various class prediction methods have successfully been used to identify genes that distinguish toxicological classes of agents (Maggioli et al. 2006).



Toxicogenomics, Figure 2 Interactions between environmental exposures and genetic variability ultimately influence disease status

The Future of Toxicogenomics

The evolution of truly ► predictive toxicology, where information from exposure to an agent in one species could be used to predict the impact of human exposure to that agent, will require the development of extensive knowledge-based databases. These databases must effectively integrate high quality genomic data with toxicological endpoint data. The power of such knowledge-based databases will depend on the quality of deposited data and recent work has highlighted the importance of improved methodologies in laboratory practice to obtain high quality genomics data (Bammler et al. 2005).

Moving forward in toxicogenomics, a systems approach will be required where the perturbation by toxicant and stressor, the molecular expression and conventional toxicological parameters are integrated. The further integration of global datasets built from genetic, proteomic and metabolomic data with frameworks established by genetic, protein-protein and protein-

DNA interactions will allow for sophisticated network modeling. Currently, global scale information of molecular interactions has been identified under non-perturbed conditions. In the future, structures of networks including protein-protein, protein-DNA and transcriptional regulatory mechanisms will need to be determined under a variety of different conditions to better understand cellular responses to stress (Fry et al. 2005). Combining the various -omics technologies (proteomics, toxicogenomics, and metabonomics) and integrating basal and toxicant- induced responses will increase our global understanding of cellular mechanisms of toxicity and disease generation.

Cross-References

- ► DNA Microarray
- ► Metabolomics
- ► Pharmacogenetics
- ► Predictive Toxicology
- ► Proteomics
- ► Transcriptomics

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Toxicology

Definition

Toxicology is the study of poisons (toxic effects of substances), their nature, harmful effects on humans, animals and plants and possible ways of their detection as well as their treatment. Toxicology is a multidisciplinary science involving medical and biological sciences to determine the relationship of the harmful effects to exposure and the mechanisms of action. Historically, progress in toxicology had served hunting and warfare and led to a better human adaptation to the environment. Today, toxicology emphasizes the detection and prevention of harmful effects of chemical or physical substances.

Toxic Waste

- ► Pollution

Toxoplasmosis

Synonyms

Infection with Toxoplama gondii

Definition

For the parasite *Toxoplasma gondii* humans are only intermediate hosts; the natural hosts are cats and catlike beasts of prey. Infectious oocytes are shed in cat feces and taken up by direct contact or contaminated food. The incubation period last 1–3 weeks. The infection, which is asymptomatic in more than 90%, induces a lifelong immunity. Possible symptoms are malaise, fever, headache, rheumatic pain and swelling of neck lymph nodes. In immunocompromised persons inflammation is usually localized to the brain, but other organs can also be affected. A primary infection during pregnancy leads to disease in 50% of the unborn children. The risk is highest between the 12th and the 27th week of gestation. An infection in early pregnancy may lead to a stillbirth or severe damage to various organs, especially the brain. Transmission in the last trimester has less extreme effects; nevertheless, up to 50% of the children may develop long-term damage with mental retar-

dation. Toxoplasmosis in pregnancy as well as congenital and symptomatic toxoplasmosis require an immediate antibiotic therapy.

Cross-References

► Infectious Diseases in Pediatrics

Trace Elements

Synonyms

Microminerals

Definition

Trace elements are needed in minute amounts. They act as catalytic or structural components of larger molecules. Marginal or severe trace element imbalances can be considered as risk factors for several diseases that are of public health importance. The same element can have quite different effects depending on the concentration in which it occurs in soil or water, or that is finally consumed. Benefits only increase up to a point, after which harmful effects may be derived from consuming higher levels. The best-documented example of a dose-dependent relationship between trace element intake and health is the effect of fluorine in reducing the incidence and severity of dental caries. When 2–8 times the normal dose of fluoride is consumed, teeth may become mottled with dark spots, and when the amount exceeds 20–40 times the normal dose, it may trigger bone sclerosis and calcification of ligaments. Iodine is necessary to the proper functioning of the thyroid gland; however, a lack of iodine leads to thyroid enlargement, known as goiter. For half a century, it has been common practice to prevent endemic goiter by iodizing table salt. Zinc-deficiency symptoms can take many forms, including dwarfism, dermatitis, loss of taste sensitivity, and delay in the rate at which wounds heal. Lack of selenium has been shown to cause abnormalities in many plants and animals. Selenium deficiency in the form of cardiomyopathy in humans has been documented in the Keshan region of southeastern China. On the other hand, selenium toxicity is reflected in many impairments in animals and humans, like the development of cancer, malformation of nails and hair, and other symptoms.

Trade Agreements

Definition

Trade agreements refer to the international trade of goods or services, usually aiming to reduce so called 'barriers to trade'. Such barriers can be governmental restrictions, quotas and tariffs, but also control measures maintained by business organizations or professional bodies. There are different free trade areas around the world, e.g. the European Economic Area or the Free Trade Area of the Americas. The World Trade Organisation (WTO), which has 150 member countries, established the WTO Agreement in 1995 as a progressive instrument. It includes the General Agreement on Trade in Services (GATS), which also concerns health and social services. On a sector-by-sector basis, member countries can decide to liberalize trade to certain degrees (mode 1–4). This may range from purchasing services produced on another member country's territory, to the presence of natural persons providing services on the territory of the receiving country.

Tradition

Definition

The continuation of known practices in discussion, convincing of faith, and the giving of ones self.

Cross-References

► Indigenous Culture

Traditional

► Ethnic

Traditional or Folk Music

► Indigenous Music

Traditional Food

Synonyms

Food typical for certain cultures

Definition

Traditional food is defined as food conforming to or in accord with tradition. It refers to food specific to a certain region, culture, race or nation. It is usually food that is easily available, e. g. grown or cultivated for purposes of nourishment, or according to experience or belief, used for prevention or treatment of various ailments in specific populations. For example, rice is traditional food in the far East, olive oil is traditional food in the Mediterranean, etc.

Traditional Healers

► Indigenous Health Care Services

Traditional Knowledge

Synonyms

Indigenous knowledge; Local knowledge; Inherited knowledge

Definition

Traditional knowledge generally refers to the traditions and practices of certain regional, indigenous, or local communities. Traditional knowledge includes the wisdom, knowledge, and teachings of these communities. In many cases, traditional knowledge has been orally passed for generations from person to person. Some forms of traditional knowledge are expressed through stories, legends, folklore, rituals, songs, and even laws. Traditional knowledge distinguishes one community from another and may be considered as the community's identity that reflects its interests.

Traditional knowledge is often perceived very differently by indigenous and local communities themselves. Western society has separated secular from spiritual knowledge. This is generally not the case for indigenous and local communities. Indigenous people say that their knowledge is holistic and an integral part of their lands and resources. While traditional knowledge may be acquired from a teacher, and improved through experience, it ultimately may be derived through direct communication with the spirit world.

Cross-References

► Indigenous Knowledge

Traditional Medicine

Synonyms

Alternative medicine; Holistic medicine

Definition

Traditional medicine refers to medical knowledge systems, which developed over centuries within various societies before the era of modern medicine. It includes herbal medicine, Ayurvedic medicine, acupuncture, traditional Chinese medicine and other different medical practices all over the globe.

Traditional medicine is defined by WHO as "the medicine that refers to health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being."

Traditional medicine is widely used in Africa, Asia and Latin America as part of primary health care. For example, in Africa almost 80% of the population uses traditional medicine as primary health care. In industrialized countries, the term "traditional medicine" is very often confused with the term "alternative medicine."

Cross-References

► Alternative Medicine
► Complementary Medicine
► Health Knowledge, Traditional
► Holistic Medicine
► Indigenous Health Care Services

Traditional Midwives

► Indigenous Health Care Services

Tranquilizers

► Hypnotics and Sedatives

Trans-Acting Gene

Synonyms

Transgene

Definition

In ► gene therapy, genetic elements are transferred into a patient. If the transferred gene is *not* integrated into the patient's chromosomal DNA (► deoxyribonucleic acid) it is termed "*trans-acting*".

Transcription

Synonyms

DNA transcription

Definition

Transcription is the process by which information contained in DNA within a gene is copied into a functional transcript made of RNA, to be used later as a template for the assembly of polypeptide chains leading to proteins. There are four central components to the process of transcription which are: 1) promoter recognition, 2) initiation, 3) elongation and 4) termination. A fifth component independent of transcription that prepares a transcript to be used as a template for the coding of proteins is post-transcriptional processing. The process of initiation begins after the enzyme RNA polymerase identifies a sequence in a gene from 20 to 200 bases in length and called a promoter, which is upstream (5′) of the transcription start site. After the polymerase binds to the promoter, it opens and separates (or 'denatures') the DNA into two separate strands in order to make the single strand which will be used as a template accessible. At a specific start site (identified as +1), transcription begins with the binding of a ribonucleotide complementary to the DNA nucleotides at +1. The RNA polymerase then moves along the template DNA strand, adding complementary ribonucleotides to the growing RNA strand in a 5′ to 3′ direction. When the RNA polymerase reaches a specific termination sequence, the RNA polymerase is unbound from the template strand and the single-stranded RNA transcript is released, allowing the separated DNA strands to rebind (or 'renature'). The released RNA transcript then undergoes post-transcriptional processing in order to be prepared for use by the ribosome to create polypeptide chains. The RNA transcript, also called a messenger RNA, or mRNA, is capped with a molecule called 7-methyl-guanosine cap at its 5′ end. At the 3′ end of the molecule, a length of as many as 200 adenosine nucleotides commonly called a poly-A tail is attached. The final step of mRNA post-transcriptional is RNA splicing: the removal and disposal of intermediate sequences of RNA which will not be used in polypeptide coding. The removed sequences are called introns, while the remaining sequences, which are ligated to form the mRNA transcript which will be translated, are called exons. This post-transcriptional splicing takes places in a protein complex in the nucleus called the spliceosome. From this point, the modified mRNA transcript is now ready for transport to the cytoplasm and the beginning of ► translation.

Transcriptome

Definition

The still frame capture of the complete set of transcripts (mRNA) for one or a group of cells for one time point under a specific condition. Due the fluctuating nature of gene expression, there are many possible transcriptomes the same cell or group of cells. This is used to monitor while genes are copied into mRNA for eventual translation in the cell.

Transcriptomics

Synonyms

Genomics; cDNA microarray hybridization and analysis

Definition

Transcriptomics is the collective study of all mRNA products from a ► genome. Using the high-throughput technology of ► DNA microarrays, messenger RNA samples are amplified, labeled and detected using automated image processing. The value of the expression intensity of a single transcript can be compared relative to other transcripts and to other samples resulting in gene expression profiles.

Transducing Vector

► Vector

Transfer

► Communication

Transition Country

Definition

Transition countries are countries emerging from a socialist-type command economy towards market-based economy, covering a wider range of countries in Central and Eastern Europe, as well as countries outside of Europe such as China. Transition refers not only to economy-related issues, but also to other aspects of life such as culture, health care services, education, etc.

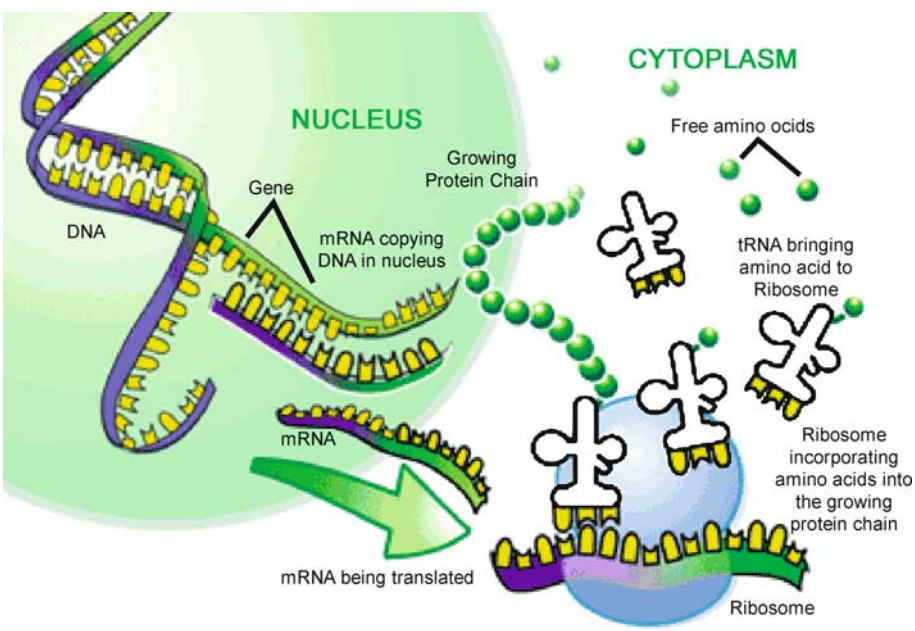
Translation

Synonyms

mRNA translation

Definition

Translation is the process by which an mRNA script is used as a template to identify specific amino acids and to link the amino acids in a polypeptide chain, which will subsequently be processed to form functional proteins (Fig. 1). The process of translation is composed of three processes: 1) initiation, 2) elongation and 3) termination. Elongation begins when an mRNA transcript, which has been transported to the cytoplasm is bound and encased by the two subunits (in eukaryotes, the 60S and smaller 40S subunits) of the ribosome. The ribosome is bound to the transcript by proteins called initiation factors (IFs) at the site of the first three nucleotide of the transcript which read AUG. At this site, a short RNA-based carrier molecule that is used to transport amino acids, called a transfer RNA or tRNA, binds to the AUG with a complementary RNA sequence of UAC. tRNAs are bound to the mRNA transcript only if they possess the correct complementary sequence; the three nucleotides to which a tRNA is bound is called a codon, whereas the three tRNA nucleotides used to complement the mRNAs codon is called an anti-codon. Because this tRNA is attached to an amino acid (in this case, the amino acid Methionine), it is called an aminoacyl-tRNA. After the first Methionine-carrying aminoacyl-tRNA has bound to the first AUG, the next three ribonucleotides (in other words, the next codon) in



Translation, Figure 1
Translation: mRNA transcription, transport, and translation into polypeptide (Illustration by Jane Wang, the Science Creative Quarterly, http://scq.ubc.ca/

Translation, Table 1 Degenerate RNA coding for amino acids

1st Position	2nd Position in Codon							
	U		C		A		G	
	Codon	Amino Acid	Codon	Amino Acid	Codon	Amino Acid	Codon	Amino Acid
U	UUU	Phenylalanine (Phe/F)	CUU	Leucine (Leu/L)	AUU	Isoleucine (Ile/I)	GUU	Valine (Val/V)
	UUC	Phenylalanine (Phe/F)	CUC	Leucine (Leu/L)	AUC	Isoleucine (Ile/I)	GUC	Valine (Val/V)
	UUA	Leucine (Leu/L)	CUA	Leucine (Leu/L)	AUA	Isoleucine (Ile/I)	GUA	Valine (Val/V)
	UUG	Leucine (Leu/L)	CUG	Leucine (Leu/L)	AUG	Methionine (Met/M) Start	GUG	Valine (Val/V)
C	UCU	Serine (Ser/S)	CCU	Proline (Pro/P)	ACU	Threonine (Thr/T)	GCU	Alanine (Ala/A)
	UCC	Serine (Ser/S)	CCC	Proline (Pro/P)	ACC	Threonine (Thr/T)	GCC	Alanine (Ala/A)
	UCA	Serine (Ser/S)	CCA	Proline (Pro/P)	ACA	Threonine (Thr/T)	GCA	Alanine (Ala/A)
	UCG	Serine (Ser/S)	CCG	Proline (Pro/P)	ACG	Threonine (Thr/T)	GCG	Alanine (Ala/A)
A	UAU	Tyrosine (Tyr/Y)	CAU	Histidine (His/H)	AAU	Asparagine (Asn/N)	GAU	Aspartic acid (Asp/D)
	UAC	Tyrosine (Tyr/Y)	CAC	Histidine (His/H)	AAC	Asparagine (Asn/N)	GAC	Aspartic acid (Asp/D)
	UAA	Ochre Stop	CAA	Glutamine (Gln/Q)	AAA	Lysine (Lys/K)	GAA	Glutamic acid (Glu/E)
	UAG	Amber Stop	CAG	Glutamine (Gln/Q)	AAG	Lysine (Lys/K)	GAG	Glutamic acid (Glu/E)
G	UGU	Cysteine (Cys/C)	CGU	Arginine (Arg/R)	AGU	Serine (Ser/S)	GGU	Glycine (Gly/G)
	UGC	Cysteine (Cys/C)	CGC	Arginine (Arg/R)	AGC	Serine (Ser/S)	GGC	Glycine (Gly/G)
	UGA	Opal Stop	CGA	Arginine (Arg/R)	AGA	Arginine (Arg/R)	GGA	Glycine (Gly/G)
	UGG	Tryptophan (Trp/W)	CGG	Arginine (Arg/R)	AGG	Arginine (Arg/R)	GGG	Glycine (Gly/G)

the mRNA transcript binds to another aminoacyl-tRNA with the corresponding complementary RNA sequence. With the assistance of proteins called elongation factors (EFs), the process of elongation begins, whereby the first aminoacyl-tRNA carrying methionine has the bond to its amino acid broken, and that methionine is bonded via a 'peptide' bond to the amino acid attached to the tRNA matching the second codon. The mRNA transcript shifts down one codon, and the first tRNA, now devoid of an amino acid is released. The second amino acid moves into the position of the former first tRNA, the third codon is read, and an aminoacyl-tRNA is matched to it. The amino acid chain is bound to the new amino acid on the third tRNA, and so the process proceeds, first matching codons with anticodons of the appropriate aminoacyl-tRNAs, then releasing used tRNAS, while elongating a chain of amino acids called a polypeptide chain. Each codon, with four possible bases (U, C, A, G) and ($4^3 =$) 64 possible combinations, binds to a unique tRNA; however, as there are only 20 different amino acids, different tRNAs, usually sharing the same first and second nucleotide in the anti-codon, are attached to the same amino acid variant (Table 1). Because multiple codons can encode the same amino acid, the RNA is said to be 'degenerate'. The elongation process ceases and termination begins when one of three codons, UAA, UAG, or UGA is read. These three nucleotide sequences do not have corresponding aminoacyl-tRNAs, and as a result, the unoccupied codon is bound to a termination factor (TF), which releases the polypeptide chains once the last amino acid is bound, and triggers the disassembly of the ribosome from around the mRNA transcript. The mRNA transcript is eventually degraded, and the resulting polypeptide chain undergoes post-translational processing, where the chain is folded and other bonds and superstructures are formed in order to construct a functional protein.

Transmissible Diseases

Synonyms

Infectious diseases; Communicable diseases

Definition

Communicable diseases are illnesses caused by microorganisms and transmitted from an infected person or animal to another person or animal. They may be transmitted directly through contact, or indirectly through contaminated food or water, or may be introduced into the body by animal or insect carriers. There are also human disease carriers: healthy persons who may be immune to microorganisms they carry, but represent source of transmission. For some infective organisms specific circumstances are required for their transmission, for example sexual contact in syphilis and gonorrhea, injury in the presence of infected soil or dirt in tetanus, infected transfusion blood or medical instruments in serum hepatitis.

Cross-References

► Communicable Diseases
► Infectious Diseases

Transmission

► Communication

Transplant Surgery

Definition

Transplant surgery addresses the removal of an organ, tissue, or blood product from a donor and surgical placement or infusion into a recipient. It is usually the ultimate treatment option for diseases or conditions where other medical treatments have not resulted in improvements but have caused organ failure or injury.

Transtheoretical Model

Synonyms

Stages of Change Theory

Definition

The Transtheoretical Model (TTM), also called Stages-of-Change-Theory, differentiates phases through which people, groups, or organizations go when changing – both for eliminating an old and for adopting a new behavior or condition. This theory provides a time dimension for the change process. The TTM of intentional behavior change describes change as a process that unfolds over time and progresses through six stages: precontemplation (not ready to take action); contemplation (getting ready); preparation (ready); action (overt change); maintenance (sustained change); and termination (no risk of relapse). In addition to these temporal stages, the transtheoretical model encompasses the concepts of decision criteria, self-efficacy, and change processes. The transtheoretical has been influential in research on smoking and has been extended to other health risk behaviors.

Trash

► Communal and Industrial Waste

Traumatic Brain Injury

Synonyms

Intracranial injury; Head injury

Definition

Traumatic brain injury (TBI) is a brain damage caused by a sudden trauma. The leading causes of death from TBI are injuries related to firearms (among persons aged 20–74), motor vehicles (among persons up to 19 years of age), and falls (among persons aged 75 and older).The parts of the brain that might be damaged include the cerebral hemispheres, cerebellum, and brain stem. Depending on the extent of the damage to the brain, the symptoms may range from mild to severe and the outcome may be complete recovery, permanent disability, or death. The abnormal states of consciousness that may result from a TBI are stupor, coma, persistent vegetative state, minimally conscious state, locked-in syndrome, and brain death.

Travelers Diseases

► Tropical Diseases and Travel Medicine

Treatment

► Healing
► Prevention, Tertiary

Treatment Effect

► Effect Size

Treatment Guidelines

Definition

A guideline is a statement or other indication of policy or procedure by which to determine a course of action. A medical guideline is a document with the aim of guiding decisions and criteria in specific areas of healthcare, as defined by an authoritative examination of current evidence (► evidence-based medicine). Guidelines usually include summarized consensus statements but, unlike these, they also address practical issues. Clinical guidelines briefly identify, summarize, and evaluate the best evidence and most current data about prevention, diagnosis, prognosis, therapy, risk/benefit, and cost-effectiveness. They then define the most important questions related to clinical practice and identify all possible decision options and their outcomes. Thus, they integrate the identified decision points and respective courses of action for the clinical judgment and experience of practitioners. Many guidelines place the treatment alternatives into classes to help providers in deciding which treatment to use.

Treatment of Infectious Diseases

► Therapy of Infectious Diseases

Treatment of Leprosy

Synonyms

Therapy of leprosy; Therapy of infections with mycobacterium leprae; Therapy of Hansen disease

Definition

There are two forms of leprosy, the paucibacillary (with a small amount of bacteria) and the multibacillary. In the case of paucibacillary leprosy, rifampin and dapsone are given for 6 months; if there is a break in therapy, the treatment should be recommenced where it broke off within a time interval of 6–9 months. Additional to rifampin and dapsone, multibacillary forms are treated with clofazimine; treatment should last for at least 2 years.

Treatment Monitoring

Definition

Treatment monitoring is implemented as part of ► infectious diseases control programs. It entails that the patient's treatment should be monitored, to make sure that an individual takes and carefully follows the prescription. The most typical example nowadays is the so called "DOTS" (Direct Observation of Treatment-Short course) for TB patients, which requires that the patient should be seen taking the tablets.

Treatment Options

► Management of Oral Diseases

Treatment Protocol

Synonyms

Clinical protocol; Medical guideline

Definition

A treatment protocol in health care represents a plan for a course of medical treatment. It aims to ensure the safety, efficiency and efficacy of a therapeutic intervention (medical guideline for further explanations).

Treatment of the Symptoms of a Disease

► Symptomatic Therapy

Trematodes

Synonyms

Infection with flukes

Definition

The symptoms, which are caused by various species of trematodes, depend on which organs are affected. Most frequently, flukes settle in the liver. There is a feeling of discomfort in the upper region of the abdomen due to swelling of the liver (hepatomegaly); hepatitis, inflammation of the gallbladder or the bile ducts or occlusions of the bile ducts can also occur. The liver trematodes involved are: the liver fluke (*Fasciola hepatica*), which is spread worldwide, the cat liver fluke (*Opisthorchis felineus*, causing ophisthorchiasis), which can be found in Russia, and the Chinese liver fluke (*Clonorchis sinensis*). Fasciolopsiasis is caused by the large intestinal fluke, which is predominantly found in Eastern Asia. The infection leads to abdominal symptoms like colicky pain, meteorism, nausea, vomiting, obstipation and diarrhea. Lung flukes are found in Eastern and Southeast Asia, tropical West Africa and Central and South America. These germs cause paragonimiasis, which is characterized by fever, cough, sputum production and chest pain.

Trial Protocol

Definition

The trial protocol is a planning document that has to be written prior to all trials or experiments involving human subjects, human materials or data. It has to describe the study design, including the choice of control groups (active comparator and/or placebo), all planned procedures/treatments (including dosage, timing and – if applicable – blinding), the criteria to be included or excluded (including prior and concomitant therapies, treatment compliance, necessary safety measures), the human subjects or materials or data involved in the described procedures and how they will be assigned to the treatment groups and the determination of the necessary sample size, the efficacy and safety variables to be evaluated, the primary and secondary endpoints as well as the statistical and analytical methods to be used to evaluate the data. Additionally, a risk–benefit evaluation of the planned project and a description of the quality assurance applied to the project data has to be included in the trial protocol.
The trial protocol is a major part of the documentation required to be evaluated by the competent authorities and ethics committees.

Tribal Characteristics

► Tribal Identity

Tribal Identity

Synonyms

Tribal characteristics

Definition

Tribal identity relates to characteristics of a tribe. The tribe builds its identity on the positive image of the collective self that is essential for the prosperity of the tribe. Tribe members are taught that their tribe is the smartest, the strongest, the most honest, etc.

Tribal Medicine

► Indigenous Health Care Services

Tribe

► Nation

Trich

► Trichomoniasis

Trichinellosis

► Trichinosis

Trichiniasis

► Trichinosis

Trichinosis

Synonyms

Trichiniasis; Trichinellosis; Infection with Trichinella nematodes

Definition

When insufficiently heated pork meat, contaminated with *Trichinella* larvae, is eaten, trichinosis can occur. In the intestines the larvae develop into adults (0.5 to 4mm in size), which release larvae into the mucous membrane of the bowel. The larvae then penetrate the intestinal wall, spread throughout the whole body and reach the muscles. The muscles concerned most frequently are the diaphragm and the muscles of the chest, the arms and the legs. Besides aching and swelling of the musculature, edema of the face and the eyelids can appear. Trismus (characterized by an impairment of the muscles responsible for breathing, chewing and swallowing) occurs. Possible complications are neurological symptoms, meningitis, encephalitis and cardio-circulatory failure. Inspections of meat are carried out in the food processing industry to avoid trichiniasis and, prior to consumption, meat should be sufficiently cooked.

Trichomoniasis

Synonyms

Infection with Trichomonas vaginalis; Trich; Ping pong disease

Definition

Trichomoniasis, which is caused by the flagellate protozoon *Trichomonas vaginalis*, is spread worldwide and primarily involves women. The risk of infection is about 70% in each case of unprotected sexual intercourse. Infections are asymptomatic in 50% of cases. The incubation period lasts 4–20 days. Detection of the pathogen is by culture. The main symptoms of the infection are vaginal discharge, itching, an inflammation of the urethra (urethritis) and painful micturition. Trichomoniasis can be treated with metronidazole.

Cross-References

► Sexually Transmitted Diseases

Trichuriasis

Synonyms

Infection with Trichuris trichiura; Whipworm infection

Definition

The whipworm, which is up to 5cm long, settles in the cecum and in other parts of the upper colon. Symptoms appear when there are more than 500 worms. These symptoms are abdominal pain, diarrhea and bleeding. The latter can cause anemia.

Tropical Diseases

Synonyms

Infectious diseases typical for tropical regions

Cross-References

► Tropical Diseases and Travel Medicine

Tropical Diseases and Travel Medicine

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Synonyms

Infectious diseases typical for tropical regions; Infectious diseases acquired on journeys; Contagious diseases acquired on travels; Travelers diseases

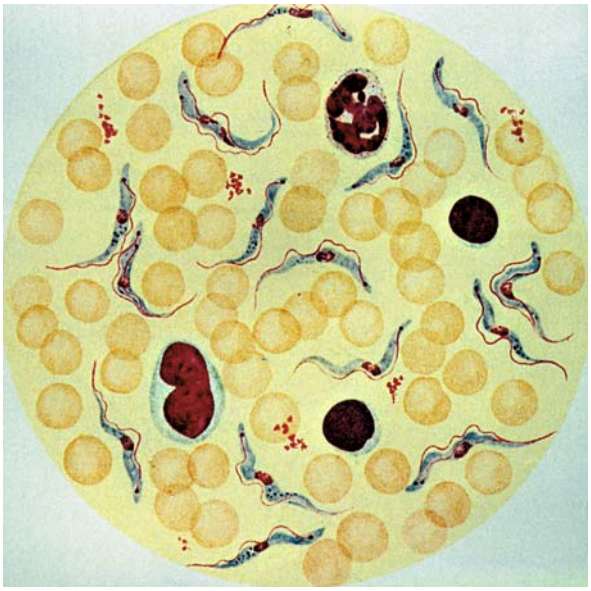
Definition

Tropical diseases are infectious diseases, which predominantly or exclusively appear in tropical or subtropical regions, due to the living conditions of the pathogens or their transmitters. With the increase in vacation travel of the populations of industrial countries, travel medicine has become a special medical subject. It aims at the registration of characteristics of different countries or regions – especially aspects of infection, in order to give recommendations to travelers concerning prophylactic and therapeutic measures. Moreover, travel medicine specialists can carry out, or at least support, diagnostic measures for, and therapy of, traveler's diseases.

Basic Characteristics

Characteristics and Transmitters of Tropical and Travelers Diseases

Pathogens can be spread worldwide or only be present in particular areas. Moreover, the virulence of one and the same germ can show regional variability. The spreading of microorganisms depends on different factors. On the one hand, the characteristics of the germ itself play a decisive role; on the other hand, the modes of transmission are important. If a pathogen is specialized to a particular host, it can only exist in the biosphere of that host. Some of the disease-transmitting insects are exclusively or predominantly found in tropical or subtropical regions. Among such insects are various mosquito species that, for example, transmit ► malaria, ► yellow fever, ► onchocerciasis, ► Japanese encephalitis or ► West Nile fever. Particular mites, which live in Southeast Asia and Northeast Australia, transmit Tsutsugamushi fever, predatory bugs, which are found in Central and South America, are responsible for Chagas disease. Tsetse flies transmit sleeping sickness (Fig. 1), which appears in Africa. Some mites live in the moderate climatic zone. Diseases, which are transmitted by these parasites, thus are primarily found in Europe, like ► tick-borne encephalitis (TBE) and ► Lyme borreliosis (LB). Parasitic infections, which are restricted to tropical regions, are – among others – bilharziasis (► schistosomiasis) and ► Guinea worm infection. A warm climate and bad hygienic conditions facilitate reproduction and spreading of many pathogens. Thus, several diseases primarily occur in warmer regions, like hepatitis A and typhoid or paratyphoid (typhoid fever). The number of cases of salmonellosis increases by 5–10% with every increase of surroundings temperature by 5°C. Climatic changes can cause a modification of the regional pathogens. Due to global warming, one has to fear a further spreading of germs, which up to now are only found in tropical regions.



Tropical Diseases and Travel Medicine, Figure 1 *Trypanosoma brucei rhodesiense* in blood slide with blue colored cytoplasma, red colored cell nucleus and undulating membrane; leucocytes; Giemsa stain; magnified 1100:1 (from Grönert and Koenig 1968) (Source: Lentze MJ, Schaub J, Schulte FJ, Spranger J (2002) Pädiatrie, Grundlagen und Praxis, 2nd edn. Springer, Berlin, p 823, Fig. 101.4)

Recommendations in Travel Medicine

Among the populations of industrial nations, there is a distinctive travel urge, and long-distance journeys have become very popular. Journeying in a number of countries involves great risk of contracting particular infectious diseases. To avoid unnecessary risks, it is essential for a traveler to be aware of necessary protective measures. Besides the family doctor, physicians, who are specialized in travel medicine, and institutions (like tropical institutes or public health departments), the internet provides plenty of information, which is useful for travelers (http://www.thirdworldtraveller.com/Disease/diseases_TropSAmer.html, http://www.cdc.gov/travel, http://dtg.org/). Recommended vaccinations, especially protection against tetanus, do not

only reflect the interests of the traveler, but are often a condition of entry to various countries; some countries demand a certificate of yellow fever vaccination (► yellow fever vaccination, active). Depending on the situation at the time of the journey, a TBE-vaccination (TBE-vaccination, active) may be recommended when traveling into endemic regions. As repeated vaccinations are necessary to achieve protection, sufficient time should set aside for completion of the immunization program. A great number of diseases are transmitted by the ingestion of contaminated food or polluted drinking water. Due to an accelerated reproduction rate of germs at higher temperatures, the risk of infection is greater in warm regions. Thus, a consistent compliance to hygienic rules is very important (► water quality and waterborne infectious diseases, ► food safety and fecal-orally transmitted diseases). Particular fecal-orally transmitted infectious diseases can be prevented by immunization: active hepatitis A-vaccination (► hepatitis A-vaccination, active) as well as an active typhoid-/paratyphoid vaccination (► typhoid fever/paratyphoid vaccination, active) is available. Tourists should be informed about further risks of infection in tropical and subtropical regions. When bathing in stagnant waters, infections with schistosomes (*Bilharzia*) (► schistosomiasis) or the Guinea worm can be transmitted. Several infectious diseases are transmitted by insects, especially mosquitoes. Thus, prophylactic measures, prophylaxis of insect bites, are of absolute importance. With regard to malaria, there are recommendations for chemoprophylaxis and therapy in the various endemic countries. If unexplained symptoms occur after a stay in a foreign country, particularly following a journey to tropical or subtropical regions, it is very important to inform the physician of that journey; thus tropical diseases can be taken into consideration, a diagnosis made more quickly and therapy started earlier. In this connection, cooperation with a specialized institute or laboratory might be necessary to allow the necessary diagnostic procedures to be carried out.

Hemorrhagic Fevers

Hemorrhagic fevers are infectious diseases that are accompanied by internal bleeding. By international agreement, they are named after the place of their first detection. Infections, which belong to this group of hemorrhagic fevers, are ► yellow fever, ► Ebola fever, ► Dengue fever, ► Lassa fever, ► Marburg fever and ► Hanta fever. The viruses causing hemorrhagic fever belong to four virus families: filoviruses, arenaviruses, flaviviruses and bunyaviruses. The infection is a zoonosis as, in general, it is transmitted from animals to humans. The main hosts are rodents and mosquitoes. Some of the hemorrhagic fevers can also be transmitted from one human to another. The pathogens are spread worldwide, but they are primarily found in Africa, South America and Southeast Asia. As they are easily transmitted and have high virulence, the viruses are very dangerous. Diagnostic measures have to be carried out in high security laboratories. Frequently, in developing countries, these measures, which are very expensive, are not available at all or cannot be performed in time. Thus a spread of the disease is easily possible. The average incubation time of hemorrhagic fevers is one week; in Ebola it ranges between 2 and 21 days. Characteristic symptoms are high fever, aching muscles and bones, joint pain, edema and an impairment of the function of the liver and the kidneys. Disruption of blood coagulation leads to internal bleeding. Possible neurological complications are pareses and cerebral seizures; moreover, shock and cardiocirculatory failure can occur. Lethality depends on the pathogen involved; in Ebola it can reach up to 80%. Quick therapy can considerably improve prognosis. Except for yellow fever, no vaccinations are available to prevent hemorrhagic fevers. Thus, prophylactic measures are of great significance. The best means of prevention is compliance to hygienic rules (► food safety and ► fecal-orally transmitted diseases), avoidance of contact with rodents (especially rats and mice) and prophylactic measures against insect bites. Furthermore, regulations concerning quarantine have to be followed. In hospitals contaminated material has to be disposed of properly, medical staff – and, if necessary, also relatives of the patient – have to wear protective clothing (gowns, glasses, gloves, mouth-nose mask). Careless behavior concerning contact with infected persons, even their dead bodies, is very dangerous; during funeral ceremonies pathogens have been transmitted by close contact with the corpse.

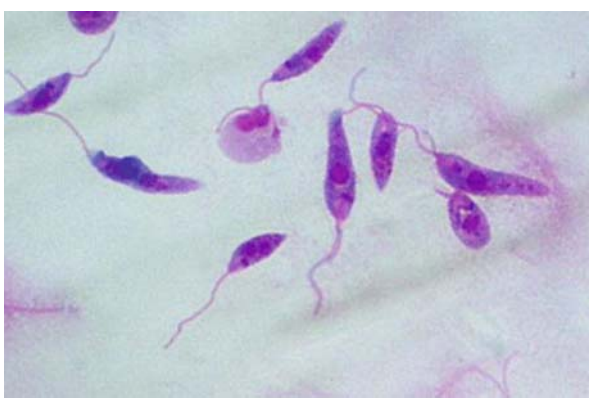
Black Plague (Black Death)

Black Death is a disease which has been feared since ancient times, and which had an important influence

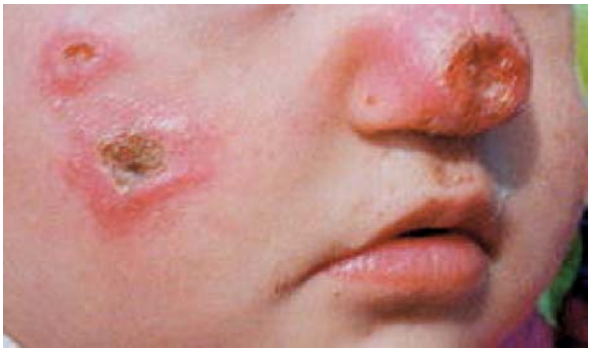
on the history of mankind. Plague is mentioned in the Bible in the book of Exodus as one of the 10 calamities God inflicted on Egypt. There are numerous representations of the disease in art and literature. Disastrous plague epidemics repeatedly occurred, and they are especially well-known from the Middle Ages. Today, plague is primarily found in parts of Southeast Asia, Iran, Congo, Tanzania and Madagascar as well as in the tropical regions of Central and South America. Four forms of plague can be differentiated: ► bubonic plague, ► plague sepsis, ► lung plague and ► abortive plague. The disease is caused by the bacterium *Yersinia pestis*; in general, it is transmitted by the bite of an infected rat flea, the incubation period ranges between a few hours and 7 days. Lung plague can also be transmitted from one individual to another by droplets. Therapy consists of the administration of antibiotics, with streptomycin, chloramphenicol or tetracyclines + sulfonamides being effective. An immunization is possible, but due to various reasons, it is hardly ever indicated: disease protection rate is not sufficient, the vaccine is not tolerated well, immunity only lasts for 3–6 months, and the overall risk of infection is low. Important prophylactic measures include improving hygienic conditions and rat extermination. *Yersinia pestis* has been considered as of use in biological warfare.

Leishmaniasis

Leishmaniasis is caused by different flagellate protozoa of the genus *Leishmania* (Fig. 2). It is transmitted by sand flies. Various vertebrates can serve as hosts, primarily dogs, foxes and small rodents. Leishmaniae have not been found beyond the 45th degree of latitude or 800m altitude. Except for Australia, they have a worldwide spread and cause about 12 million cases of disease each year. Due to global warming, an increasing incidence has to be feared. The incubation period of leishmaniasis varies considerably; it ranges from one week to several months or even years. The most dangerous form is visceral leishmaniasis (► leishmaniasis, visceral) or "kala-azar" (Hindi for "black water fever"), which – without treatment – takes a lethal course. Further forms of the infection are cutaneous (leishmaniasis, cutaneous) (Fig. 3) and mucocutaneous leishmaniasis (► leishmaniasis, mucocutaneous). The strains of leishmaniae cannot be distinguished morphologically; differentiation requires immunological or molecular biological methods. Prophylactic measures to avoid leishmania infection include the use of repellents (N-diethyl-m-toluamide, DEET) and permethrin-impregnated mosquito nets.



Tropical Diseases and Travel Medicine, Figure 2 Extracellular amastigote-like forms of *Leishmania* (L. Major). Monatsschrift Kinderheilkunde, 154, 2006; 221, Fig. 1



Tropical Diseases and Travel Medicine, Figure 3 Local cutaneous leishmaniasis (LCL), multiple skin lesions ("oriental sores") in an Iranian child (photo kindly provided by Dr. Ali Khamesipour, Teheran). Monatsschrift Kinderheilkunde, 154, 2006; 226, Fig. 4

Cross-References

► Abortive Plague
► Bubonic Plague
► Chagas Disease
► Dengue Fever
► Guinea Worm Infection
► Hanta Fever
► Hepatitis A Vaccination, Active
► Infection with Ebolavirus

- ▶ Japan Encephalitis
- ▶ Lassa Fever
- ▶ Leishmaniasis, Cutaneous
- ▶ Leishmaniasis, Mucocutaneous
- ▶ Leishmaniasis, Visceral
- ▶ Lung Plague
- ▶ Lyme Borreliosis (LB)
- ▶ Malaria
- ▶ Marburg Fever
- ▶ Onchocerciasis
- ▶ Plague Sepsis
- ▶ Prophylaxis of Insect Bites
- ▶ Schistosomiasis
- ▶ Sleeping Sickness
- ▶ Tick-Borne Encephalitis (TBE)
- ▶ Tick-Borne Encephalitis (TBE) Vaccination
- ▶ Tsutsugamushi Fever
- ▶ Typhoid Fever/Paratyphoid
- ▶ Typhoid Fever/Paratyphoid Vaccination, Active
- ▶ West Nile Fever
- ▶ Yellow Fever
- ▶ Yellow Fever Vaccination, Active

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Tsutsugamushi Fever

Synonyms

Infection with Rickettsia tsutsugamushi; Scrub typhus

Definition

Tsutsugamushi fever is caused by the bacterium *Rickettsia tsutsgamushi*, which is found in Central, East and Southeast Asia as well as in Northeast Australia, India, Pakistan and Oceania. The infection is transmitted by mites that live on low growing plants and in rice fields. Following an incubation period of 7–30 days, the infection starts with fever, headache and joint pain. Later a generalized rash develops. In severe cases, myocarditis or encephalitis can occur, the outcome might be lethal. Treatment consists of antibiotic administration, with tetracyclines and chloramphenicol being effective. The only prophylactic measure is to wear covering clothes to avoid mite bites.

Tuareg (Northern Africa, Sahara)

- ▶ Indigenous Health – Africa

Tubal Occlusion

Definition

Tubal occlusion is a blockage of the fallopian tubes that results from scarring or damage caused by untreated or severe reproductive tract infections. Tubal occlusion is a primary cause of infertility in sub-Saharan Africa (known as tubal factor infertility).

Cross-References

- ▶ Infertility

Tuberculin Skin Test

Synonyms

Mendel–Mantoux test

Definition

The tuberculin skin test or Mendel–Mantoux test was developed by Felix Mendel (in Germany) and Charles Mantoux (in France) in 1909. By means of the test, immunologic reactions are checked to reveal a prior contact with tubercle bacilli. For the test 0.1ml (5 units) of purified tuberculin are injected intradermally at the inner side of the forearm near the wrist. After a time interval of 72 hours, the reaction is judged by a skilled person. An induration of >5mm means a positive result, or >15mm in the case of a prior BCG vaccination, respectively. Falsely negative results are possible if the tuberculosis infection is recent, there is an infection with another mycobacteria or virus, or if only 6–8 weeks has elapsed since active vaccination. If a person cannot show an adequate immune response due to AIDS or other forms of immunodeficiency, the tuberculin test can be negative as well.

Tuberculosis

Synonyms

Mycobacterium tuberculosis complex; Phtisis ($\tau\iota\sigma\iota\sigma$); Consumption; Wasting disease; King's evil; White plaque; Morbus Koch (Koch's disease); Scrofula; Tabes mesenterica

Cross-References

► Morbus Koch (Koch's Disease)
► Tuberculosis and Other Mycobacterioses

Tuberculosis and Other Mycobacterioses

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Synonyms

TB; Mycobacterium tuberculosis complex; Consumption; Phtisis ($\pi\eta\tau\iota\sigma\iota\sigma$); King's evil; White plague; Wasting disease; Scrofula, Pott's disease

Definition

Tuberculosis (TB) is responsible for the most infectious diseases deaths worldwide. It is caused by mycobacteria and is most frequently transmitted by droplets. Tuberculosis primarily occurs under conditions of poor socioeconomic status, poor health or a compromised immunity.

Basic Characteristics

History

Tuberculosis is a very old disease. Remnants of skeletons from India and America, dated to 2000 BC, and Egyptian mummies from 3000–2400 BC, show evidence of tuberculosis. In 460 BC, the Greek physician Hippocrates described tuberculosis as the disease with the widest spread. The Greek term "phthisis" means consumption. In 1839, Johann Lukas Schönlein made clear that a variety of described symptoms were manifestations of the same disease. It was observed that there was a connection between insufficient nutrition and bad living conditions and the occurrence of TB. Due to this observation, tuberculosis sanatoria were founded (the first in Poland in 1859). With tuberculosis being understood as an infectious disease, the patients were isolated; furthermore, avoidance of contact with contagious sputum was recommended. To improve surveillance, tuberculosis became a notifiable disease in most of the European countries in 1880. In 1882, the German bacteriologist Robert Koch discovered that TB was caused by ► Mycobacterium tuberculosis. The technique of X-ray, invented at the end of the 19th century, became an important diagnostic measure. With the recognition that tuberculosis in cattle was similar to the disease in humans, untreated milk was identified as a source of infection. ► Pasteurization of milk considerably reduced the incidence of intestinal tuberculosis. The development of the ► tuberculin skin test, by Felix Mendel (in Germany) and Charles Mantoux (in France) in 1909, allowed people who had been in prior contact with the tubercle bacilli to be identified. In 1921, a vaccination against tuberculosis, the ► bacille clamette–guérin (BCG) vaccination, was introduced. By 1943, the first effective antibiotics against mycobacteria (streptomycin, PAC, conteben and neoteben) became available.

Significance of Tuberculosis (TB)

Since ancient times, tuberculosis has been of great significance for mankind. Without treatment, 50–60% patients die within 2–5 years. Due to their close contact living conditions in mass camps, tuberculosis was a common disease in soldiers of municipal armies during the 19th and 20th centuries. In the year 1815, tuberculosis was the cause of a quarter of all deaths; at the beginning of the 20th century every sixth person in France died from TB. The social relevance of tuberculosis was underlined by its representation in the arts, as in "Lady of the Camellias" by Alexandre Dumas and in "La Traviata" by Guiseppe Verdi. With the improvement of socioeconomic conditions in industrial countries (better living situations, improved hygienic standards and better nutrition), a decline of TB incidence was observed by the beginning of the 20th century. However, since the 1980s tuberculosis has gained significance again. On the one hand, multiresistant strains have developed; on the other hand, a dramatic increase in the incidence of tuberculosis has occurred along with the increased incidence of AIDS and the immunocompromised status of those infected with HIV. In 1993, the WHO declared tuberculosis a global emergency. TB has the highest worldwide mortality. Today, 95% of the disease appears in Asia, the South Pacific region and Africa. In the Western World, where the incidence of TB, once classified as low, has gained significance due to migration movements from countries with high TB-incidence. Worldwide, 8–9 million new TB-infections and 2 million deaths have to be expected every year. In new infections, 45% of the organisms can be detected in the sputum of infected people and TB has to be classified as highly contagious. One third of the world population is assumed to be infected with tuberculosis; 5–10% of these are expected to develop an active TB at sometime. With people between the age of 15 and 45 years being the most frequently involved, a great socioeconomic problem arises as this is the age-group with the highest productivity.

Classification and Different Forms of Tuberculosis

The term *Mycobacterium tuberculosis* complex summarizes infections that are caused by the mycobacteria *M. tuberculosis*, *M. bovis* and *M. africanum*. Other mycobacteria, except for *Mycobacterium leprae* (see below), are called ► MOTT (mycobacteria other than tuberculosis). Tuberculosis can be divided into ► primary complex of tuberculosis (when a person is first infected) and ► post primary tuberculosis (a fresh infection in a person who has had an earlier attack). Tuberculosis can also be classified as pulmonary and extrapulmonary. With a percentage of 85%, TB manifestation in the lungs is the most frequent form. Lymph node TB generally appears at the neck and in the armpits. In skin tuberculosis, there are small wounds, tears and warty, purulent efflorescences. Other organs that can be affected are: the intestines, the kidneys, the urinary tract, the meninges, the liver and the eyes. Moreover, the knees or other joints as well as bones, especially the spinal column, can be involved. Miliary tuberculosis is characterized by many small foci that can be spread over various organs. Tuberculosis can appear as open or closed. In closed tuberculosis, the pathogens are encapsulated and do not come into contact with the outside world. The open form of TB occurs when pathogens are present in the respiratory or the urinary tract and thus can be expelled by coughing or passed in the urine.

Transmission of TB

Tuberculosis can be transmitted from animals to humans; TB belongs to the zoonotic infections. Transmission from human to human occurs most frequently by droplets. The only contagious form is open tuberculosis. In this connection, is has to be mentioned that infection cannot only take place due to a breathing in of infectious droplets, but also by germ-containing dust particles or dried contagious secretions. Moreover, transmission is possible by ingestion (milk) or through the skin as a so-called inoculation tuberculosis. Other extrapulmonary forms of TB in general are caused by hematogenic spread of the pathogens.

Symptoms of Tuberculosis

In closed TB, the symptoms are nonspecific (tiredness, lack of appetite, loss of weight and swollen lymph nodes) and specific (a mild fever that occurs in the afternoon). Typical symptoms are: night sweats and a permanent little cough without much sputum. In open tuberculosis, cough persists for more than 3 weeks, with the cough causing chest pain; shortness of breath (dyspnea) can occur. The sputum of infected persons consists

of a yellow-greenish mucus and, in cases of lung damage, blood.

Diagnostics of TB

Diagnosis of tuberculosis can be done microscopically on direct preparation or by a culture of bronchial secretions (sputum) or gastric juice. The disadvantage of a culture is that the pathogens grow slowly, detection taking 4–6 weeks. However, fluid cultures with modern methods take 1–2 weeks. A direct identification can be done through PCR (polymerase chain reaction) or other molecular biological methods. Differentiation of species is achieved by gene probes. Diagnostic measures include X-ray and computed tomography (CT) of the lungs. X-ray of the chest shows round foci of calcification; in CT a moth-eaten pattern is seen.

Therapy of Tuberculosis (TB)

In earlier times, surgical intervention consisted of artificial collapse of the lung (pneumothorax) or the removal of parts of the lung (lobectomy) and, besides drugs and stays in health resorts, was the mainstay of treatment. Today, surgery is only resorted to in cases of resistant disease, which cannot be cured medicinally. Improving living conditions (hygiene, nutrition) still has an important supporting function regarding TB convalescence. As for medicinal treatment, uncomplicated and multiresistant tuberculosis (► medicinal treatment of uncomplicated tuberculosis; ► medicinal treatment of multiresistant tuberculosis) have to be considered separately. Therapy in uncomplicated TB lasts for 6 months; complicated TB 9 months, unless it coexists with HIV-infection when it can last up to 12 months; and multiresistant TB for 21–24 months. The medications have to be taken once daily. If the drugs are effective against the pathogen, the patient is no longer contagious after a therapy interval of 2 weeks.

Problems in TB-Therapy

The fight against tuberculosis proves to be extremely difficult. When there are increases in total populations, large refugee movements, regions of impoverishment with poor living conditions, insufficient nutrition, and lack of hygiene and medical care, the incidence of TB increases. Another complicating factor is the increasing spread of AIDS. As treatment of TB is long-lasting, a great deal of tolerance is required from patients. Despite having tuberculosis, many patients do not feel very ill. That is why they often do not see the need for consistent long-term therapy, especially when they lack any knowledge of the disease. This situation is most common in the developing countries, and elsewhere where there are difficult socioeconomic circumstances (homelessness, drug addiction). Due to ineffective therapy, there is a risk of resistant strains of mycobacteria developing. For various reasons, these resistant germs are a serious problem for a health care system. To begin with, therapy costs are much higher than those for standard therapeutics (about 100 fold); moreover, higher drug toxicity has to be expected. Last, but not least, the duration of treatment is much longer (21–24 months). Due to the longevity of the treatment, there is a high rate of dropout from therapy, resulting in a reduced healing rate and an increased mortality. To increase compliance with therapy, especially in the developing countries, observation of drug administration was established, the so-called DOTS (directly observed treatment, short-course)-strategy (http://www.who.int/tb/dots/en/).

Prevention of Tuberculosis (TB)

Besides isolation of infected persons and effective medical treatment, preventive measures, like good public health and conscientious surveillance, are of great significance. If control is neglected there is a risk of an increase in the incidence of TB. This was shown in the 1980s when there was a revival of tuberculosis in New York and in the 1990s a similar situation occurred in the former Soviet Union. In countries that are at high risk of tuberculosis, the BCG vaccination is a possible preventive measure. It has to be carried out quite early after birth. Unfortunately, the protective effect of the immunization is time-limited. Under certain circumstances, a ► chemoprophylaxis of tuberculosis can be indicated.

Leprosy

Leprosy is caused by *Mycobacterium leprae*. Like tuberculosis, it is a very old disease, which was already known in ancient times. The most famous historical description is found in the Bible (in the Old Testament). In antiquity, for fear of infection, people who fell sick with leprosy were isolated. However, the risk of infec-

tion is low as leprosy is only transmitted in long lasting close contact situations. Today, 75% of all cases of leprosy occur in South East Asia, primarily in India. Outbreaks of the disease increase in poor socioeconomic conditions (lack of nutrition, bad physical constitution, insufficient hygienic measures). Leprosy primarily involves the skin and the peripheral nervous system. Typical symptoms are a loss of hair, an impairment of sweat production and sensory disorders. Spots and nodules appear on the skin, indurations destroy the face and, later, other parts of the body. Due to damage of the nerve tracts, muscle weakness and muscular atrophy occur; eyelid closure disruption can lead to blindness. Due to the trophic impairment of the skin, even small injuries can cause abscesses and necroses, the enlargement of which can lead to mutilation of the extremities. People suffering from leprosy have always feared social isolation but, in 1984, WHO announced that antibiotic ► treatment of leprosy could cure the disease. Treatment lasts several months (http://dermatology.cdlib.org/92/reviews/leprosy/ishii.html).

In conclusion, tuberculosis is the infectious disease with the highest worldwide mortality. With the advent of AIDS, TB-incidence increased and the disease gained enormous significance. Poor socioeconomic conditions, a lack of knowledge and understanding of the disease, the necessity of long-term therapy and the development of multiresistant germs make the fight against tuberculosis – and against the other forms of mycobacterioses – very difficult.

Cross-References

► Bacille Calmette-Guérin (BCG) Vaccination
► Chemoprophylaxis of Tuberculosis
► Medicinal Treatment of Multiresistant Tuberculosis
► Medicinal Treatment of Uncomplicated Tuberculosis
► MOTT (Mycobacteria Other than Tuberculosis)
► Mycobacterium tuberculosis
► Pasteurization
► Post Primary Tuberculosis
► Primary Complex of Tuberculosis
► Treatment of Leprosy
► Tuberculin Skin Test

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Tubu (Western Africa, Southern Sahel)

► Indigenous Health – Africa

Tungus (North Asia)

► Indigenous Health, Asian

Tuskegee

Definition

Tuskegee Study of Untreated Syphilis in the Negro Male, started in 1932. Its purpose was to record the natural history of syphilis in black males with the hope of justifying treatment programs. It was conducted without any ► informed consent and without explaining to the participants the real purpose of the study. Researchers told the men they were being treated for "bad blood," a local term used to describe several ailments, including syphilis, anemia, and fatigue. Although originally projected to last 6 months, the study actually went on for 40 years. Participants did not receive the proper treatment, even after the discovery of penicillin. For taking part in the study, the men received free medical exams, free meals, and burial insurance. It is referred to as one of the most shameful scandals against human dignity.

Tuvans

► Indigenous Health, Asian

Twin Studies

Definition

Twin studies have been traditionally used to estimate the genetic contribution to disease development by comparison of monozygotic pairs, who share all their genes, with dizygotic twins, who share half their genes, using a concordance rate as a standard measure of similarity. Greater concordance rate in monozygotic twins compared to dizygotic twins favors genetic factors, while any discordance in monozygotic twins underline the role of environmental factors.

Two-Sided Test

Synonyms

Two-tailed test; Non-directional test

Definition

Test of statistical significance based on the assumption that the data are distributed at both sides of a central value.

Two-Tailed Test

► Two-Sided Test

Type I Error

Synonyms

Alpha error

Definition

A Type I error is an error when a true null hypothesis is rejected (i. e., it is concluded that a false alternative hypothesis is true). The likelihood of committing a Type I error is specified by the alpha (α) level a researcher employs in evaluating an experiment. The more concerned a researcher is about committing a Type I error, the lower the value of α the researcher should employ.

Cross-References

► Alpha Error

Type II Error

Synonyms

Beta error

Definition

A Type II error is when a false null hypothesis is retained (i. e., it is concluded that a true alternative hypothesis is false). The likelihood of committing a Type II error is represented by beta (β) and is inversely related to the likelihood of committing a Type I error.

Cross-References

► Beta Error

Typhoid Fever

Synonyms

Infection with Salmonella typhi

Cross-References

► Water Quality and Waterborne Infectious Diseases

Typhoid Fever Immunization, Active

► Typhoid Fever
► Vaccination, Active

Typhoid Fever/Paratyphoid

Synonyms

Infection with Salmonella typhi; Infection with Salmonella typhi murium

Cross-References

► Water Quality and Waterborne Infectious Diseases

Typhoid Fever/Paratyphoid Immunization, Active

► Typhoid Fever/Paratyphoid Vaccination, Active

Typhoid Fever/Paratyphoid Vaccination, Active

Synonyms

Typhoid fever/paratyphoid immunization, active

Cross-References

► Immunization, Active

Typhoid Fever Vaccination, Active

Synonyms

Typhoid fever immunization, active

Cross-References

► Immunization, Active

Typhoid Vaccination

Synonyms

Typhoid immunization; Enteric fever vaccination; Enteric fever immunization

Definition

The oral typhoid ► vaccine was developed between 1930 and 1943. It is administered in 3 doses at intervals of 48 hours, with a further dose given a year later if the risk of infection is still present. The vaccine is very well tolerated and provides a protection rate of 50–90%. A contraindication for the vaccination is immunodeficiency. As an alternative, a dead vaccine may be administered once parenterally. This vaccine is permitted after 2 years of age. Repeat vaccinations must be given after 3 years if the risk of infection is still present.

Typical Mycobacteria, Tubercle Bacilli

► Mycobacterium Tuberculosis

UK HTA Methodology Programme

Definition

The UK HTA Methodology Programme is a scientific program in the UK with the aim of promoting the identification, development, and use of appropriate research methods so that health and social care can be built on the best possible evidence base.

Ulcus molle

Synonyms

Chancroid; Chancroidal bubo; Inguinal bubo; Soft chancre; Simple chancre; Ducrey's chancre; Ducrey's disease

Definition

Ulcus molle, which is primarily found in tropical regions, is caused by the bacterium *Haemophilus ducreyi*. Following an incubation period of 3–7 days, a painful ulcer develops at the site of infection. Often, the disease spreads via the lymphatic vessels. Treatment consists of a single dose of azithromax orally or ceftriaxone intramuscularly. Possible alternatives are an oral erythromycin for a week or oral gyrase inhibitors for three days.

Ultraviolet Index

► UV Index

UN

► United Nations

Uncertainty

Definition

With uncertainty, a condition is described in which the true value of a parameter is unknown because the knowledge or the methods for measurement are not perfect or not available. Uncertainty is distinct from variability, which describes known differences in a parameter. The uncertainty around the true value of a parameter in health economic analysis should be identified, measured, and described. Common instruments to describe uncertainty are deterministic and probabilistic ► sensitivity analysis.

UN Charter

► United Nations Charter

Under-Five Mortality

Synonyms

Infant mortality; Child mortality

Definition

Infant and child mortality are deaths to children under age 1 and age 5. The infant ► mortality rate (IMR) is usually calculated by the number of deaths to infants under age one per thousand births in a given year. Despite its name, the IMR is not a rate; rather the

IMR approximates the probability of dying before age 1. Child mortality (often called under-five mortality) is measured as probability, or the proportion of children dying before their fifth birthday. Like the IMR, under-five mortality is often reported per-thousand births. Child mortality can be determined using mortality rates, where available, or indirectly based on census data. Although infant and child survivorship have greatly improved throughout the world, mortality remains high in many developing countries. In Africa, about 10 percent of all children born will die before their first birthday; by age 5 this proportion will exceed 17 percent.

Cross-References

► Infant and Child Mortality

Undernourishment

► Undernutrition

Undernutrition

Synonyms

Undernourishment

Definition

Undernutrition is an insufficient intake or poor absorption or poor biological use of nutrients consumed of food which leads to a lack of energy and nutrient needs (► nutrition).

Cross-References

► Malnutrition

Understanding of Good Health

Synonyms

Health literacy

Definition

Health literacy is defined in the context of Health Promotion by the WHO Heath Promotion Glossary as follows: Health literacy represents the cognitive and social skills that determine the motivation and ability of individuals to gain access to, understand, and use information in ways that promote and maintain good health. Health literacy is the degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions. However, health literacy goes beyond the individual. It also depends upon the skills, preferences, and expectations of health information providers like doctors, nurses, administrators, home health workers, the media, and many others. Health literacy arises from a convergence of education, health services, and social and cultural factors.

UNDP

► United Nations Development Programme

Undulant Fever

► Brucellosis

UNESCO

► United Nations Educational, Scientific and Cultural Organization

UN General Assembly

► United Nations General Assembly

UNHCR

► United Nations High Commissionerfor Refugees

UNICEF

► United Nations Childrens' Fund

Unicellular Organisms

► Protozoa

Unintentional Injuries

Definition

WHO defines unintentional injuries as '… a bodily lesion at an organic level resulting from acute exposure to energy (this energy can be mechanical, thermal, electrical, chemical or radiant) interacting with the body in amounts that exceed the threshold of physiological tolerance. In some cases a injury results from an insufficiency of any of the vital elements (in drowing, strangulation or freezing). The time between exposure and the appearance of the injury is short.' In contrast, intentional injuries are caused by external violence or they are self-inflicted.

Union Formation

Definition

The process of forming a partnership with another individual through which there are socially recognized rights and responsibilities. In the context of family studies, these rights and responsibilities typically extend to issues of sexuality as well as social and economic resources (► social resources). In this context, a union may involve the partnership of a same sex or opposite couple. The formation process may involve a legal or political process such as marriage or a commitment ceremony. Cohabitation is typical in the union formation process; however, union formation may also occur among non-cohabiting couples.

Unit of Analysis

Definition

The decision regarding a unit of analysis should be based on statistical considerations and the nature of the particular problems under study. This decision must be made during the data evaluation stage. This includes identification of independent comparisons or estimates of relationship strength. The unit of analysis in research synthesis must be laboratories, studies, samples, or comparisons. *Laboratories as units*: in this case, the synthesist conducts a synthesis within a synthesis because a decision about how to synthesize results must first be made within laboratories and then between laboratories. *Studies as units*: if a single study contains information on more than one test of the same comparison, the synthesist can calculate the average results and use these to represent the study (median results can be used). *Samples as units*: this permits a single study to contribute more than one statistical test if the tests are carried out on separate samples of people. *Comparison as units*: in this case, identification of independent units of analysis uses the individual comparison. *Shifting unit of analysis*: this method permits each statistical test to be initially coded as if it were an independent event.

United Nations

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Synonyms

United Nations Organization; UN; UNO

Definition

The United Nations is an international organization with, as of 2007, 192 member states. It was founded on 24 October 1945 by 51 countries ratifying the United Nations Charter. The organization is made up of administrative bodies including the General Assembly, Security Council, Economic and Social Council, Trusteeship Council, Secretariat, and the International Court of Justice. It intends to maintain international peace and security, to develop friendly relations among nations, to cooperate in solving international economic, social, cultural and humanitarian problems and in promoting respect for human rights and fundamental freedoms as well as to be a center of harmonizing the actions of nations in attaining these goals. Several agencies, programs, and bodies strive to realize these purposes.

Basic Characteristics

Structure

The international organization consists currently of 192 member states, communicating in six official languages – Arabic, Chinese, English, French, Russian and

Spanish. It was founded in 1945 after the end of the Second World War hoping that it would solve future political problems among countries in a peaceful way. The constituting instrument of the United Nations is the ► United Nations charter which spells out the rights and duties of member states and establishes the organization's organs and procedures. The organization is made up of six principal organs – ► United Nations General Assembly, ► United Nations Security Council, Economic and Social Council, Trusteeship Council, ► International Court of Justice and Secretariat. The most important organ for deliberation is the General Assembly to which all members belong. The Security Council's main responsibility is the maintenance of international peace and security. It consists of five permanent members (China, France, Russia, the United Kingdom, and the United States) and ten rotating members that are voted by the General Assembly for two-year terms. However, the United Nations family additionally consists of several agencies, programs, and bodies. United Nations programs and funds, such as the ► United Nations Children's Fund (UNICEF) and the ► United Nations Development Programme (UNDP), as well as specialized agencies, such as the ► World Health Organization (WHO) and the ► United Nations Educational, Scientific and Cultural Organization (UNESCO), aim at supporting economic and social endeavor.

The headquarters of the organization is in New York City but its land and buildings are international territory. In addition, several offices exist all around the world. The organization is financed from contributions by the member states.

Purposes

According to the Charter, the United Nations aims at the maintenance of international peace and security, the development of friendly relations among nations, the cooperation in solving international economic, social, cultural, and humanitarian problems and in promoting respect for ► human rights and fundamental freedoms and at being the centre for harmonizing the actions of nations in achieving these tasks.

Achievements

Human Rights The creation of a comprehensive body of human rights law is one of the great achievements of the United Nations. By the adoption and proclamation of the Universal Declaration of Human Rights in 1948 a basis was established for a universal and internationally protected code of human rights. Numerous expansions led to improvements creating a broad range of internationally accepted rights. Actually, the United Nations still continues to strengthen and coordinate the protection and promotion of them around the world.

Humanitarian Action For the first time the United Nations coordinated ► humanitarian relief operations in Europe after the end of the Second World War. Today, they are a major provider of emergency relief and longer-term assistance. In 2002 alone, the Office for the Coordination of Humanitarian Affairs launched 24 inter-agency appeals collecting more than $ 4.2 billion to support 35 million people in 18 countries and regions. Leading institutions to deliver humanitarian assistance are the ► United Nations High Commissioner for Refugees (UNHCR), the ► World Food Programme (WFP), the United Nations Children's Fund (UNICEF), and the United Nations Development Programme (UNDP).

The United Nations High Commissioner for Refugees supports every year millions of ► refugees, asylum seekers, internally displaced persons, stateless persons, and others of concern. The agency endeavors to protect them and to resolve their problems. It assists these people in finding safe refuge in another state. By the end of 2005, 20.8 million people had received help.

The World Food Programme saves millions of lives. It supports victims of wars and natural disasters with relief and reconstructive operations. The program helps people who are unable to produce or obtain enough food for themselves and their families. The WFP food aid reached 96.7 million people in 82 countries in 2005.

The United Nations Children's Fund pays particular attention to children. It strives to ensure the protection of children's rights and to expand their opportunities to reach their full potential. In cooperation with other ► humanitarian agencies, such as the ► International Red Cross and Red Crescent Movement, the fund provides children with drinking water, food and medicine. It provides vaccinations for children and organizes the buildings of schools. In 2005 the fund carried out programs for children and their families in 157 countries, areas, and territories.

Principal Organs

Trusteeship Council

Subsidiary Bodies

Military Staff Committee

Standing Committee and ad hoc bodies

International Criminal Tribunal for the former Yugoslavia (ICTY)

International Criminal Tribunal for Rwanda (ICTR)

UN Monitoring, Verification and Inspection Commission (Iraq) (UNMOVIC)

United Nations Compensation Commission

Peacekeeping Operations and Missions

Security Council

General Assembly

Subsidiary Bodies

Main committees

Human Rights Council

Other sessional committees

Standing committees and ad hoc bodies

Other subsidiary organs

Advisory Subsidiary Body

United Nations Peacebuilding Commission

Economic and Social Council

Functional Commissions

Commissions on:

Narcotic Drugs

Crime Prevention and Criminal Justice

Science and Technology for Development

Sustainable Development

Status of Women

Population and Development

Commission for Social Development

Statistical Commission

Regional Commissions

Economic Commission for Africa (ECA)

Economic Commission for Europe (ECE)

Economic Commission for Latin America and the Caribbean (ECLAC)

Economic and Social Commission for Asia and the Pacific (ESCAP)

Economic and Social Commission for Western Asia (ESCWA)

Other Bodies

Permanent Forum on Indigenous Issues (PFII)

United Nations Forum on Forests

Sessional and standing committees

Expert, ad hoc and related bodies

International Court of Justice

Specialized Agencies [6]

ILO International Labour Organization

FAO Food and Agriculture Organization of the United Nations

UNESCO United Nations Educational, Scientific and Cultural Organization

WHO World Health Organization

World Bank Group

IBRD International Bank for Reconstruction and Development

IDA International Development Association

IFC International Finance Corporation

MIGA Multilateral Investment Guarantee Agency

ICSID International Centre for Settlement of Investment Disputes

IMF International Monetary Fund

ICAO International Civil Aviation Organization

IMO International Maritime Organization

ITU International Telecommunication Union

UPU Universal Postal Union

WMO World Meteorological Organization

WIPO World Intellectual Property Organization

IFAD International Fund for Agricultural Development

UNIDO United Nations Industrial Development Organization

UNWTO World Tourism Organization

Secretariat

Departments and Offices

OSG [3] Office of the Secretary-General

OIOS Office of Internal Oversight Services

OLA Office of Legal Affairs

DPA Department of Political Affairs

DDA Department for Disarmament Affairs

DPKO Department of Peacekeeping Operations

OCHA Office for the Coordination of Humanitarian Affairs

DESA Department of Economic and Social Affairs

DGACM Department for General Assembly and Conference Management

DPI Department of Public Information

DM Department of Management

OHRLLS Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States

DSS Department of Safety and Security

UNODC United Nations Office on Drugs and Crime

UNOG UN Office at Geneva

UNOV UN Office at Vienna

UNON UN Office at Nairobi

Programmes and Funds

UNCTAD United Nations Conference on Trade and Development

ITC International Trade Centre (UNCTAD/WTO)

UNDCP [1] United Nations Drug Control Programme

UNEP United Nations Environment Programme

UNICEF United Nations Children's Fund

UNDP United Nations Development Programme

UNIFEM United Nations Development Fund for Women

UNV United Nations Volunteers

UNCDF United Nations Capital Development Fund

UNFPA United Nations Population Fund

UNHCR Office of the United Nations High Commissioner for Refugees

WFP World Food Programme

UNRWA [2] United Nations Relief and Works Agency for Palestine Refugees in the Near East

UN-HABITAT United Nations Human Settlements Programme

Research and Training Institutes

UNICRI United Nations Interregional Crime and Justice Research Institute

UNITAR United Nations Institute for Training and Research

UNRISD United Nations Research Institute for Social Development

UNIDIR [2] United Nations Institute for Disarmament Research

INSTRAW International Research and Training Institute for the Advancement of Women

Other UN Entities

OHCHR Office of the United Nations High Commissioner for Human Rights

UNOPS United Nations Office for Project Services

UNU United Nations University

UNSSC United Nations System Staff College

UNAIDS Joint United Nations Programme on HIV/AIDS

Other UN Trust Funds [7]

UNFIP United Nations Fund for International Partnerships

UNDEF United Nations Democracy Fund

Related Organizations

WTO World Trade Organization

IAEA [4] International Atomic Energy Agency

CTBTO Prep.Com [5] PrepCom for the Nuclear-Test-Ban-Treaty Organization

OPCW [5] Organization for the Prohibition of Chemical Weapons

NOTES: Solid lines from a Principal Organ indicate a direct reporting relationship; dashes indicate a non-subsidiary relationship.

[1] The UN Drug Control Programme is part of the UN Office on Drugs and Crime

[2] UNRWA and UNIDIR report only to the GA

[3] The United Nations Ethics Office and the United Nations Ombudsman's Office report directly to the Secretary-General

[4] IAEA reports to the Security Council and the General Assembly (GA)

[5] The CTBTO Prep.Com and OPCW report to the GA

[6] Specialized agencies are autonomous organizations working with the UN and each other through the coordinating machinery of the ECOSOC at the intergovernmental level, and through the Chief Executives Board for coordination (CEB) at the inter-secretariat level

[7] UNFIP is an autonomous trust fund operating under the leadership of the United Nations Deputy Secretary-General. UNDEF's advisory board recommends funding proposals for approval by the Secretary-General.

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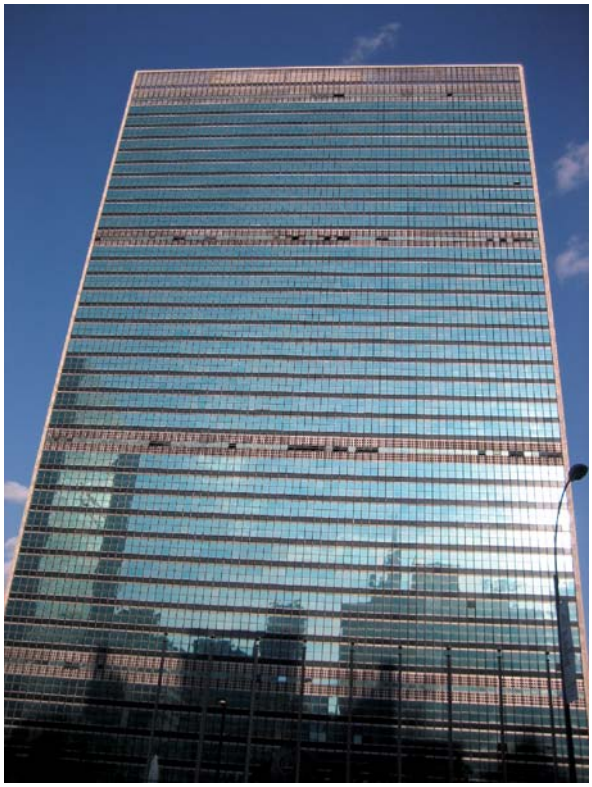
United Nations, Figure 1 Principal Organs of the United Nations System



United Nations, Figure 2 UN headquarter

However, the United Nations do not only help immediately after disasters. In form of the United Nations Development Programme the organization also assists disaster-prone countries for extended periods. The program is mandated to fight poverty. It fosters security, economic growth, good governance, and respect for human rights hoping to reduce man-made disasters.

The work of the World Health Organization (WHO) for the delivery of humanitarian assistance is essential as well. It concentrates on the health needs of people in poverty and misery. The organization arranges and coordinates appropriate relief operations, including measures to combat disease, especially infectious disease, provisions of vaccinations, and appropriation of drugs and medical equipment. One of the achievements the WHO is most proud of is the eradication of smallpox in the late 1970s. The organization coordinated the campaign to eradicate the deadly disease between 1967 and 1979. For the first and, so far, only time a major infectious disease has been completely eliminated. At the moment, the WHO is trying to eradicate polio worldwide. So far the Global Polio Eradication Initiative has reduced the number of cases of polio by more than 99%. In 2005 there were just a few hundred cases reported.

International Peace and Security One of the primary purposes of the United Nations is to maintain international peace and security. Since its foundation, the organization has helped to end numerous conflicts. It promotes activities of prevention and peacemaking, peacekeeping, peace-building and disarmament. As of February 2007, there have been 61 peacekeeping operations since 1948. For the last years more conflicts have taken place within, rather than between, states. Confronted with this problem, the Security Council has established complex and innovative peacekeeping operations. However, faced with the immense problems within some countries, the UN were unable to establish any operations between the years 1995 to 1997. More recently, new missions have shown just how important the work of the United Nations is in solving conflicts peacefully.

Criticism

The achievements of the United Nations demonstrate that the organization has improved the lot of many people and that conflicts can be resolved peacefully through their work. However, there are things that need criticizing and improving.

The weak spot of the United Nations is its lack of inherent authority. Due to the structure of the Security Council, the organization is often unable to act in a clear and decisive way when confronted with a crisis. The five permanent members often use their veto power to avert condemnation and sanctions against themselves or their friendly nations. Thus, many a time no action can be agreed upon. This vetoing system of the permanent members gives them powerful privilege and, therefore, sometimes, objective decisions cannot be reached.

Conclusions

It is difficult to meet all demands made on a world organization. The facts show that the United Nations have achieved a lot; however, theoretically, even more could be achieved. In the past, some good intentions have failed against the forces of human nature; it appears that for the most part people try to get the best for themselves forgetting the needs of others. For instance,

every year people still die in the developing countries as a result of hunger or diseases that are not treated sufficiently, whereas, in the industrialized countries, surplus food is thrown away every day and drugs are produced in abundance. In the light of such circumstances, the idea that some day these problems will be solved and that all people will live in peace seems indeed unrealistic. However, like in the United Nations, it is important that efforts to solve these contradictions continue.

Additionally, the task of the United Nations to find acceptable solutions for all is complicated by the different opinions and views of the many nations involved. The organization will still be faced with huge challenges in the future. Therefore, new ideas, further improvements, and reforms are necessary to optimize the work of the United Nations and to realize the concept of a functioning world organization.

Cross-References

- ▶ Humanitarian Agency
- ▶ Humanitarian Relief Operations
- ▶ Human Rights
- ▶ International Court of Justice
- ▶ International Red Cross and Red Crescent Movement
- ▶ Refugee
- ▶ United Nations Charter
- ▶ United Nations Childrens' Fund
- ▶ United Nations Development Programme
- ▶ United Nations Educational, Scientific and Cultural Organization
- ▶ United Nations General Assembly
- ▶ United Nations High Commissionerfor Refugees
- ▶ United Nations Security Council
- ▶ World Food Programme
- ▶ World Health Organization

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United Nations Charter

Synonyms

United nations organization charter; UN charter; UNO charter

Definition

The United Nations Charter is the constituting instrument of the United Nations appointing the rights and obligations of member states and establishing the organization's organs and procedures. It was signed at the United Nations Conference on International Organization in San Francisco on 26 June 1945 by 50 of the 51 original member states (Poland was not represented at the conference and signed it later) and came into force on 24 October 1945, after being ratified by China, France, the Soviet Union, the United Kingdom, the United States, and a majority of other signatories. By 2007 192 nations had ratified it.

United Nations Childrens' Fund

Synonyms

United nations international childrens' emergency fund; UNICEF

Definition

The United Nations Children's Fund is part of the United Nations family providing long-term humanitarian and developmental assistance to children. Among other things, it strives to achieve the immunization of all children against common childhood diseases and their proper nourishment. In addition, it works to prevent the spread of HIV/AIDS and it promotes girls' education.

Currently, the Fund supports children in 191 countries through country programs and National Committees.

United Nations Development Programme

Synonyms

UNDP

Definition

The United Nations Development Programme is the United Nations' global development network providing countries with knowledge, experience, and resources to help people build better lives. It fosters security, economic growth, good governance, and respect for human rights. Furthermore, the organization publishes an annual Human Development Report to measure and analyze developmental progress.

United Nations Educational, Scientific and Cultural Organization

Synonyms

UNESCO

Definition

The United Nations Educational, Scientific and Cultural Organization are a specialized agency of the United Nations founded on 16 November 1945. It promotes international cooperation in the fields of education, science, culture, and communication. It is financed by assessed contributions from its member states and voluntary contributions from donors.

United Nations General Assembly

Synonyms

United nations organization assembly; General assembly; UN general assembly; UNO general assembly

Definition

One of the six principal organs of the United Nations is the General Assembly. It is composed of representatives of all member states making it the most important organ for deliberation. Every member state has one vote. Decisions on important questions, such as those on peace and security, admission of new members and budgetary matters require a two-thirds majority. For decisions on other questions a simple majority is sufficient. The functions and powers of the organ are set out in the Charter of the United Nations. The General Assembly is empowered to make only non-binding recommendations. However, they initiated actions that have improved the situation of millions of people.

United Nations High Commissioner for Refugees

Synonyms

UNHCR

Definition

The United Nations High Commissioner for Refugees is an agency of the United Nations mandated to lead and coordinate international action to protect refugees and resolve problems of refugees worldwide. It supports everyone in seeking asylum and finding safe refuge in another county – with the option to return home voluntarily, integrate locally or to resettle in a third country.

United Nations International Children's Emergency Fund

► United Nations Children's Fund

United Nations Organization

► United Nations

United Nations Organization Assembly

► United Nations General Assembly

United Nations Organization Charter

► United Nations Charter

United Nations Organization Security Council

► United Nations Security Council

United Nations Security Council

Synonyms

United nations organization security council; Security council; UN security council; UNO security council

Definition

The United Nations Security Council is one of the six principal organs of the United Nations charged with maintaining peace and security among nations. It is made up of 15 member states. Five of them, China, France, Russia, the United Kingdom, and the United States, have permanent seats. The ten temporary members are voted by the United Nations General Assembly for two-year terms. Decisions are made by an affirmative vote of at least nine of the 15 members. In addition, the permanent five hold veto power over substantive but not procedural resolutions. That means that decisions on substantive matters require the votes of all five permanent members. In contrast to the other organs which only make recommendations, the United Nations Security Council has the power to take decisions, which member states are obligated to act on under the Charter.

Universalist Communitarians

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Universalist communitarians believe in a single true form of good society and its associated virtues. They believe that certain behaviors and cultural patterns, can be justified by their health consequences (e. g. not smoking in public) or regarded as rights (e. g. female literacy), and should be promoted in all societies, regardless of local cultural norms, as good in themselves, as part of a superior form of social organization.

Universal Prevention of Mental Disorders

Definition

Interventions that are targeted at the general public or to a whole population group that has not been identified on the basis of increased risk.

UN Millennium Declaration

Definition

International act adopted by 189 world leaders at the Millennium Summit in 2000. It contains plans of action to reach Millennium Development Goals.

UNO

► United Nations

UNO Charter

► United Nations Charter

UNO General Assembly

► United Nations General Assembly

UNO Security Council

► United Nations Security Council

Unpaired Groups Design

Synonyms

Independent groups design; Independent samples design; Between subjects design

Definition

Unpaired groups design is when different subjects serve in each of the experimental conditions.

UN Security Council

► United Nations Security Council

Up-Coding

Synonyms

Up-charging

Definition

Up-coding describes the fraudulent medical practice of shifting a patient's ► Diagnosis Related Group to one that yields a greater ► reimbursement from the health insurance. This practice may also be used by other professional providers of health care as a method to maximize revenues for their health care services. An example of up-coding would be when physicians intentionally use a higher reimbursement rate code than the actual health status of the patient allows.

Urban Environments

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Synonyms

Environmental hygiene; Environmental health; Housing

Definition

► Environmental health comprises those aspects of human health, including quality of life, that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that potentially can adversely affect the health of present and future generations.

Environmental health, as used by the World Health Organization (WHO) Regional Office for Europe, includes both the direct pathological effects of chemicals, radiation, and some biological agents, and their effects (often indirect) on health and well-being of the broad physical, psychological, social, and aesthetic environment, which includes housing, urban development, land use, and transport.

Environmental hygiene is defined as practical prevention and control measures used to improve the basic environmental conditions affecting human health; for example, clean ► water supply, human and animal waste disposal, protection of food from contamination, and provision of healthy housing, all of which are concerned with the quality of the human environment.

Basic Characteristics

Housing culture is a group of characteristics which represent the housing of a family, group of people, or population.

The types of housing culture are: semirural, rural, semiurban, urban, and ultra-urban. Urban housing is characterized by high level technical equipment with a central connection to electrical and water supplies, as well as heating. It creates the necessity to make some sort of specialized equipment for watching children, food preparation, laundry, ironing, etc.

It is important to notice that proper housing is important for health and well-being of the individual or family. Living on higher floors or living in inappropriately constructed and ill-maintained buildings (for example with ► humidity walls > 3%) could seriously affect the health of inhabitants.

The need for hygienic housing conditions includes a requirement for 30 m^3 of fresh air per hour for adults. This means that the height of the flat should be 2.8 m, or at least 2.6 m. It is necessary to provide 16 m^2 of room per individual (6 m^2 for bedrooms, 6 m^2 for dining rooms, 1.5 m^2 for the kitchen, 1.5 m^2 for sanitary facilities and 1 m^2 for communications per tenant).

The maximum level of ► noise from sources in the building that is allowed in flats with closed windows is 35 dB(A) during the day and 30 dB(A) during the night. The flooring in bedrooms and dining rooms should be parquet, while kitchen, bathroom and supporting rooms should have terrazzo material flooring, which is a good isolator and easy to clean.

It is important to have good ► illumination, both natural and artificial, with a photo-coefficient (relation between the surface of window glass and the ground) between 1:6 and 1:8 in flats. The requested illumination of resi-

dential environments range from 50 to 600 lx, depending on the purpose of the room (the bedrooms and bathroom should be 50–60 lx, the library and workingrooms should be 300–600 lx).

The children's room must have enough space for children to play or learn if they are schoolchildren. Children of different sexes should also have separate rooms: if they are of the same sex, there should not be more than two children in the same room.

Another important aspect of environmental hygiene is climate control (► climate and microclimate). Many facilities use air-conditioning or similar control systems to maintain proper ventilation, humidity, and temperature control. In facilities without air-conditioning, windows that can open from the top and bottom provide cross ventilation. In addition to maintaining a healthy climate, good ventilation is necessary in controlling and eliminating disagreeable odors. In cases where airflow does not control odors, room fresheners should be used discretely. Objectionable odors such as bad breath or perspiration are best controlled by proper personal hygiene and clean clothing.

All rooms should correspond according to needs and purposes, sufficiently correlated to number, arrangements, structure, and equipment.

► Sick building syndrome is also important as a consequence of modern construction of buildings with inappropriate ventilation and/or lamination as well as noncritical use of synthetic materials in interior design. This syndrome is frequently connected with increased incidence of respiratory infections, cardiovascular diseases, and mental disorders.

Cross-References

► Climate and Microclimate
► Environmental Health
► Humidity
► Illumination
► Insolation
► Noise
► Sewage Disposition
► Sick Building Syndrome
► Water Supply

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Urbanization

Definition

Urbanization refers to the process by which urban areas increase over time in population density and/or size. It can be planned or unplanned. Planned urbanization occurs when the urban infrastructure (houses, schools, public parks, sustainable drainage systems, roads etc.) is installed before urbanization occurs. The infrastructure can be extended as the need arises. Unplanned urbanization leads to overcrowding, establishment of shanty-towns, and a breakdown of existing infrastructure. These factors, in turn, can aggravate poverty and health problems.

U

Ureaplasma urealyticum Infection

Definition

Ureaplasma urealyticum is a bacteria-like germ without a cell wall, which belongs to the group of mycoplasmas. The incubation period lasts 10–20 days. *Ureaplasma* is one of the germs causing non-specific urethritis (NGU). Furthermore, this pathogen can lead to prostatitis and an inflammation of the pelvis of the kidney. During pregnancy, chorioamnionitis can be caused. In neonates disseminated infections are possible with the development of pneumonia, meningitis and abscesses. Adhesions in the urogenital tract can cause infertility.

Infections with *Ureaplasma urealyticum* can be treated with macrolides, tetracyclines or clindamycin.

Cross-References

► Sexually Transmitted Diseases

Urethritis Waelsch

► *Chlamydia trachomatis* Infection

Urinary Infections

Definition

The urinary tract is the most common site of hospital infection, accounting for more than 40% of the total number reported by acute-care hospitals. The CDC (► Centers for Disease Control and Prevention) has developed a set of ► surveillance definitions that aim to distinguish hospital-acquired from community-acquired infections. Hospital urinary tract infections include symptomatic urinary tract infection, asymptomatic bacteriuria, and other infections of the urinary tract. Urinary catheterization is the most common risk factor for these infections. Hospital urinary tract infections are caused by a variety of pathogens, including *Escherichia coli, Klebsiella, proteus*, enterococcus, *Pseudomonas, Enterobacter, Serratia*, and *Candida*. The origin of these microorganisms is endogenous (the patient's flora) in two thirds of cases, but they can also be acquired by cross-contamination from other patients or hospital personnel or by exposure to contaminated solutions or non-sterile equipment.

Urology

Definition

Urology is the medical and surgical specialty that deals with the urinary system and male reproductive organs. Urologists use bladder catheters, cystoscopes (to view the inside of the bladder), and various diagnostic imaging techniques. They treat prostatic disorders, they perform vasectomies, and they surgically remove stones in the urinary tract as well as cancers of the kidneys, bladder, and testicles.

Use of Resources

► Utility

U.S. Preventive Services Task Force

Definition

The U.S. Preventive Services Task Force is an independent panel of experts in primary care and prevention in the U.S. that systematically reviews evidence of effectiveness and develops recommendations for clinical preventive services.

Uta

► Leishmaniasis, Mucocutaneous

Utilitarianism

Synonyms

Rationing by exclusion; Consequentialism

Definition

Utilitarianism is a form of consequentialism. Proponents of utilitarianism appraise an action based on an analysis of its consequences. The criterion for appraisal is utility, implying the goal of maximizing the net-benefit for the highest number of people. Some utilitarians believe that wellbeing will best be achieved by following each individual's preferences, while other utilitarians favor planning for rational resource allocation. Utilitarianism is often accused of leading to unfairness because it does not offer any principle of justice beyond the basic idea that everyone's happiness counts equally. Health planning that is based on the principle of utilitarianism may lead to "rationing by exclusion" when health problems are neglected because they affect only a minority.

Different approaches guide public health stakeholders in dealing with ethical dilemmas. Those who follow an utilitarian approach would look at the consequences of a decision, specifically at its effect on the sum total of individual well-being, or at the greatest happiness of the greatest number of people.

Utility

Synonyms

Use of resources

Definition

Different approaches guide public health stakeholders in dealing with ethical dilemmas. The concept of utility implies that actions and the use of resources should do the greatest good for the greatest number of people.
Utility is equivalent to the satisfaction, happiness, or level of welfare of individual consumers. It is a function of various combinations of consumer goods. Utility is an important microeconomic concept because consumers are assumed to maximize individual utility by choosing between bundles of consumer goods within their individual budgetary constraints.

UVI

► UV Index

UV Index

Synonyms

Ultraviolet index; UVI; Global solar UV index

Definition

The UV index is a measure of the UV ► radiation level on the Earth's surface. A higher UVI numerical value means that a proportionally higher level of dangerous UV radiation reaches Earth's surface and, in other words, has a greater potential for damage to the skin and eye. The UVI was formulated on account of the ability of UV radiation to cause adverse health effects, such as erythema, in humans. A calculation for UVI was proposed in 1995 by the World Health Organization in collaboration with the World Meteorological Organization, the United Nations Environment Programme, and the International Non-Ionizing Radiation Committee of the International Radiation Protection Association. The value of the UV index may be in a range between zero (only at night time) and even up to 20 depending on Sun elevation, cloudiness, latitude, altitude, stratospheric ozone level, and ground UV reflection. UVI (and UV radiation level) always reaches a maximum around mid-day (solar noon) and, for example, in New Zealand the maximum summer value is about 12 (1 or 2 during the winter period), but in Northern latitudes rarely exceeds 8. In countries close to the equator and at high altitude, tropical sites, UVI can reach up to 20. UVI is an integral part of the weather forecast in newspapers, TV, and radio in many countries, allowing people a simple and useful way to plan everyday activities and personal protective measures. The most effective means of protection is staying out of the sun during the hours around solar noon, combined with appropriate clothing, broad hats, and sunglasses with UV filters and side panels. Five categories of UVI, their numerical values, and recommended protective measures are as follows: (a) *Low* (UVI range 0 to 2)—free exposure for the average person because danger is minimal; (b) *Moderate* (3 to 5)—some protective measures are needed such as appropriate clothing, hat, sunglasses, and sunscreen with an SPF of at least 15; (c) *High* (6 to 7)—sun exposure during the hours around midday should be minimized, and protective clothing, sunglasses, and sunscreen should be worn; (d) *Very high* UVI (8 to 10); and (e) *Extreme* UVI (11 and more)—extreme protective measures are needed, such as avoiding the Sun as much as possible.

Vaccination

Synonyms

Immunization

Definition

Vaccination refers to means of producing immunity against pathogens, such as viruses and bacteria, by the introduction of live, killed, or altered antigens that stimulate the body to produce antibodies against causative agent.

Vaccination is a protection of susceptible individuals from infectious diseases by administration of a living modified agent (measles), a suspension of inactivated microorganisms (whooping cough), inactivated toxin (tetanus) or by other various antigens prepared in specific procedures. The original use of the word was related to vaccination against smallpox. This was the first method of preventing a lethal disease by immunizing humans. It was introduced by Edward Jenner (1749–1823). This discovery led directly to the worldwide eradication of smallpox.

Immunization against 15 diseases is recommended for young children and adolescents: hepatitis B (HepB); diphtheria, tetanus, and pertussis, given together as DTaP; *Haemophilus influenzae b* (Hib); poliomyelitis (IPV); pneumococcal infections, including pneumonia, meningitis, and bacteremia (PCV and PPV); ► measles, mumps, and rubella, given together as MMR; chickenpox (varicella, Var); hepatitis A (HepA); ► influenza; and *Neisseria meningitidis* (meningococcal meningitis). Immunization against diseases such as yellow fever may be necessary before traveling to some countries.

Vaccination, Active

Synonyms

Immunization, active

Cross-References

► Immunization, Active

Vaccination Against Tuberculosis

► Bacille Calmette-Guérin (BCG) Vaccination

Vaccination, Passive

► Immunization, Passive

Vaccine

Definition

A vaccine is a dilution or suspension, which contains pathogens/antigens. It is introduced into the organism with the aim of making it unsusceptible to the disease in question – in other words, to immunize it. This is achieved through the build up of antibodies. One must distinguish between vaccines made from living or dead germs, from detoxified toxins (toxoid, anatoxin), or from antigen extracts. The latter contain immunologically potent subunits of the pathogen. Different vaccines can be combined. The most important vaccines, classified according to the type of vaccine, are:

1. Those made from living, weakened pathogens, i. e. pathogens which no longer cause illness, against:

yellow fever, polio, anthrax, plague, small pox, rabies and tuberculosis.
2. Those made from dead pathogens against: cholera, typhus fever, influenza, pertussis (whooping cough), polio, measles, rubella (German measles), typhus and paratyphoid fever.
3. Those made from detoxified (rendered harmless) pathogen toxins, against: diphtheria and tetanus.

Validity Measurement

Definition

Validity can be considered as the extent to which a measurement, test, or study measures what it purports to measure. Three major types of validity are content, criterion and construct validity. Content validity indicates whether the measuring instrument covers all areas under investigation. Criterion validity is empirically based, and relates to the correlation of the instrument with external criteria. Construct validity is applied when there is no adequate gold standard, existing instruments, criteria or other data against which results can be compared. The correlation coefficient between measures and criterion variable is sometimes referred to as validity coefficient. Construct validity assesses the existence of an association between a measure and other observed variables in a way that is consistent with the theory defined by the construct and its measurement.

Validity Study

Definition

The validity of a study is the degree to which the inference drawn from a study is justified. Internal validity is the degree to which the effect observed in a study can be attributed to the hypothesized effect under investigation. It is related to the direct correspondence between the experimental treatment and the experimental effects. Internal validity is usually highest in large randomized controlled trials, and decreases with decreasing scientific rigor. External validity (generalizability) is the degree to which the results of study hold true for situations other than those pertaining to the study, in particular in routine clinical practice. Construct validity refers to the possibility that the operations that are meant to represent a particular cause or effect construct can be constructed in terms of more than one construct. Statistical conclusion validity refers to the power and appropriateness of the data analysis technique.

Value, Human Life – Utilities

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Synonyms

Cost-utility analysis, preferences

Definition

The value of health gain or the value of human life can be expressed using the human capital approach, using a social preference approach, or by determination of the willingness to pay.
In health economics, utility is defined as a quantitative expression of individuals' preferences for (desirability of) a defined particular health state under conditions of uncertainty.

Basic Characteristics

Value of a Human Life

Discussions about the interpretation of the results of economic evaluation studies (► health economic evaluation) and the appropriate ► threshold value up to which a new health care technology should be reimbursed by public payers also opens the dispute about the value of a human life. There are three main approaches to estimate the value of health gain with respect to the value of human life.
The ► human capital approach (the human capital approach is also used to estimate indirect costs; see also ► labor market) estimates the maximum expected future earnings based on the average achievable gross income. Heavy criticism was made of the use of this measure for valuing a human life as it implies that the value of a human life is reduced to their productivity from a national economic point of view. This approach

discriminates against major parts of the population that do not work for payment such as children, housewives, the unemployed, the elderly, and people with chronic illnesses or disabilities. A second so-called social decisions approach uses decisions made in the public sector, like reimbursement decisions or legal acts. Values not necessarily measured directly and not necessarily from the health care sector are transferred to the health care system for the purpose of decision making by assuming a consistency and transferability. There are some major problems with transferring general findings ► resource allocation. The results are mainly useful for demonstrating inconsistencies in public decision making and creating hypotheses (Culyer 2005) rather than making resource allocation decisions in health care. The third approach is based on empirically created data on people's preferences. This can be done directly, by assessing the maximum amount an individual is willing to pay to acquire a defined good or to avoid a prospective loss (► willingness to pay). To estimate the value of a human life, the willingness to pay for a life year or a life-saving health care intervention can be determined directly or indirectly e. g. from surveys about the value placed by individuals on reduction of the risk of death due to a particular hazard. The third approach is currently regarded as the most appropriate as it reflects the individual preferences and uncertainty that is characteristic of such estimations (Culyer 2005).

Comparing the different approaches and the results of different studies using the same approach, an extremely wide variation is observed, from a few thousand EURO up to a few hundred thousand EURO. In surveys, a discrepancy between social valuations and decisions and individual preferences was demonstrated with regards to health changes (Gyrd-Hansen 2004). Currently, the methodological approaches are in an early stage of development and valid results will not be available for many years, if at all.

Health-Related Quality of Life

More abstractly, the value of a human life can also be described by the quality of the lifetime. Health-related quality of life is a theoretical construct combining a catalog of measures to evaluate the values, attitudes, perceived levels of satisfaction, and general wellbeing associated with specific health conditions or life as a whole from an individual's perspective. Health-related quality of life includes at least two of a number of dimensions, e. g. physical functioning, mental health, pain, cognitive functioning, etc. To create a measure for health-related quality of life, disease-specific or generic questionnaires are developed, tested, and validated according to the psychometric principles of test theory. To include health-related quality of life as an outcome measure in health economic evaluation studies, it is necessary to use an instrument that gives an index measure aggregating the different dimensions of health-related quality of life to a single number, usually the percentage of limitation compared with a perfect health state. The most common health-related quality of life instruments for health economic evaluation studies are the EQ-5D, the SF-6D, and the Health Utility Index (HUI). (Berger et al. 2003; Spilker 1996).

Utility Concept

In general, utilities are numbers or percentages that represent the strength of an individual's preference for defined health states under uncertainty. The utility scale give a utility of 0.0 for the worst possible health state, usually death, and a utility of 1.0 for complete perfect health. Utilities can be measured by direct techniques such as ► standard gamble or ► time trade-off. Another way to estimate utilities is to use health-related quality of life index instruments. In technical terms, only standard gamble involves ► uncertainty and therefore measures true utilities – the other methodological approaches measure values – but the term utility usually covers both preferences: utilities and values (Berger et al. 2003; Sculpher et al. 2005; Culyer 2005).

By far the most widespread and prominent utility measure is the quality-adjusted life year (► QALY). The other utility concepts of ► healthy years equivalent (=HYE) (Mehrez and Gafni 1991) and ► saved young live equivalent (SAVE) (Nord 1992) have not been implemented for practical use in decision making so far. The QALY is a generic measure of utility that combines both the quality and the quantity of life generated by health care interventions. A year spent in perfect health is, by definition, one QALY, and a year spent in less than perfect health with a lower health-related quality of life is worth less than one QALY, depending on the decrease of quality of life. Death or the poorest imaginable state of health is defined as "0". Aggregating the quality of life and the remaining lifetime, it has to be

taken into account that the quality of life fluctuates over time rather than remaining at a constant level. Therefore, either the quality of life has to be measured with ► generic instruments such as the EQ-5D, the health utility index, or the SF-6D repeatedly over time (the course between the point measures has to be estimated), or the quality of life over the total health state path is estimated at one time using techniques such as standard gamble or time trade-off (Dolan 2000).

There is a certain amount of controversial debate about the empirical robustness of the results of such measures and ethical implications of their possible use in resource allocation decisions. One central assumption of the concept is that a QALY is a QALY no matter if it is achieved mainly by improvement of quality of life or solely by an increased life expectancy, and no matter if it is achieved by saving the lives of a small number of children or a much larger number of elderly people. Furthermore, there are some practical constraints. It is certainly impossible to estimate the costs per QALY gained for all possible health care interventions at a time for a single health care system. However, it is feasible to use the QALY concept for a limited number of reimbursement decisions, as is current practice of the ► NICE in the UK.

Cost-Utility Analysis

Utilities offer a patient-orientated generic measure, which in theory allows comparison of the effects of all possible interventions influencing the health state. Cost-utility analysis can be seen as a special form of cost-effectiveness analysis in which the outcome measures are the units of utility gained. To use utilities as an outcome measure in health economic evaluations, the utilities of different health states have to be ranked on a ratio scale (Sculpher et al. 2005; Gold et al. 1996).

QALY League Table

One way of presenting the results of several cost-effectiveness or cost-utility analyses for decision makers is a ► league table. QALY league tables rank health technologies and interventions according to their relative cost-outcome ratio, starting with the lowest cost per QALY gained and ending with the most unfavorable cost per QALY ratio. In theory, league tables could be used by decision makers to allocate resources within a limited budget e. g. by reimbursing only technologies with costs per QALY gained below a defined threshold. There are major arguments for not making decisions about resource allocation in health care solely on the basis of league tables (Bleichrodt et al. 2004). The methodology can never be completely standardized and there are a number of factors that influence the absolute result of cost-effectiveness estimations, such as the measurement of utilities, the ► perspective taken, and methodological aspects of the ► costing process. The results of health economic evaluations can provide helpful additional pieces of information for the process of decision-making but decisions about allocation of health care resources have to be the result of a societal consensus and should never be made based on economic analyses alone.

Cross-References

► Costing Process
► Generic Instrument
► Health Economic Evaluation
► Healthy Years Equivalent (HYE)
► Human Capital Approach
► Labor Market
► League Table
► NICE
► Perspective
► Quality-Adjusted Life Years (QALY)
► Resource Allocation
► Saved Young Live Equivalent (SAVE)
► Standard Gamble
► Threshold
► Time Trade-Off
► Uncertainty
► Willingness to Pay

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Vancomycin

Definition

Vancomycin is an antibiotic, which is primarily used for infections with oxacillin-resistant staphylococci, enterococci, *Clostridium difficile* and *Corynebacterium jeikeium*. It safely can be given in the neonatal period. Only parenteral administration (as an infusion) is possible.

Variability

Synonyms

Variation

Definition

The degree to which the measurements of the same variable differ among each other.

The terms variability and variation are often used as synonymous in the literature. Precisely, the term variation refers to the differences that are actually present among the units (persons, objects) in a population or a sample. It can be directly observed as a property of a collection of items. In contrast, variability is a term that describes the potential or the propensity to vary. Variability thus belongs to the group of dispositional concepts, e. g. variability of a phenotypic trait describes its propensity to change in response to environmental and genetic influences. Covariation refers to the state that exists when two variables vary together.

Variable

Synonyms

Characteristic property

Definition

A variable is any characteristic (property) of the observational unit with outcomes (data) that vary from one observation to the other. A variable may have a different value out of a specified set of values in different people, in different places or at different times. Some examples of variables include the height of adult females, the gender of preschool children, and IQ test score of patients seen in mental clinics. The variables are often referred to as random variables when the value of a particular outcome is determined by chance (i. e. by means of random sampling). Types of variables refer to the several different and important classifications of variables that are most essential to know in order to understand and appropriately use the most important and frequently used applied biostatistical methods. Three main classifications of variables are: 1) quantitative or qualitative; 2) continuous or discrete; and 3) independent or dependent variables.

Variance

Definition

Variance is a mean square deviation from the mean. Estimation based on the sample data is obtained using the formula:

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = \frac{\sum x^2 - n\bar{x}^2}{n-1}$$

where x_i is an individual value, $\bar{x}$ is the mean, n is the sample size, and $n - 1$ is the number of the degrees of freedom. The formula for population variance, which is denoted as σ^2, is similar to the above but the denominator is n instead n–1. As the sample size increases the difference between these two values, sample and population variance, become minimal.

Variance is a matter of great importance in statistical theory. Variance reflects the dispersion of the values around the mean. Its value is always positive and can be zero only if all values are identical. The units

of measurement of the values of variance are different units from the original measured values. For example, if weight is measured in kilograms (kg), the variance units will be square kilograms (kg^2). In this sense then, the better measure of dispersion is the square root of variance – ► standard deviation, which is in the same units as the original values.

Varicella Immune Globulin

► Varicella Immunization, Passive

Varicella Immune Prophylaxis

► Varicella Immunization, Passive

Varicella Immunization

Synonyms

Application of varicella immune globulin; Varicella immune prophylaxis; Application of chickenpox immune globulin; Chickenpox immune prophylaxis

Definition

Following a contact with chickenpox the administration of varicella immune globulin is recommended for certain groups of people. These people are immunocompromized patients, extremely premature infants (less than 28 weeks of gestational age), premature infants whose mothers do not have any varicella immunity and newborn babies whose mothers become ill from chickenpox between five days before and two days after delivery.

Varicella Vaccination

Synonyms

Varicella immunization; Chicken pox vaccination; Chicken pox immunization

Definition

The varicella living ► vaccine was developed in 1970 in Japan. Its authorization in the United States took place in 1995. For patients between the ages of 11 months and 12 years, the vaccination is given as a single inoculation. For older children and adults, varicella immunization is recommended if the patient has not previously contracted the disease and if no vaccination has been carried out before. In these cases, the vaccine is administered twice, preferably at an interval of 4–8 weeks. The effectiveness in primarily healthy patients is 95–100%. In high-risk patients (e. g. patients with tumorous diseases), the success rate is much lower at 80–90%. Due to its damaging effect on the embryo, it must be taken into consideration that pregnant women may not be inoculated and that for four weeks following an inoculation, contraceptive methods must be practiced. Additional contraindications for the varicella vaccine are acute illness with fever, and a known severe allergic reaction to components of the vaccines or the carrier protein.

Variola

Synonyms

Smallpox

Definition

Variola is an acute infectious disease with high fever and successive stages of severe skin eruptions. The causative agent is a virus that may be airborne or spread by direct contact. It is common in childhood. After the incubation period of about two weeks, fever occurs with symptoms of respiratory infection followed by skin eruptions. Skin lesions become like blisters and pustular within a week. The lesions become open and a crust forms causing itching and pain. There is no specific treatment for smallpox. Antibiotic therapy may be administered to prevent secondary bacterial infections.

Vector

Synonyms

Gene vector; Transducing vector

Definition

The vehicle which is used to introduce the genetic element of interest to human cells is called the gene vector.

The gene vector may be either a viral vector or a non-viral vector.

Vendors

► Disease Management Organizations (DMOs) (U.S.)

Veneral Diseases

► Sexually Transmitted Diseases

Venereal Diseases

Synonyms

Sexually transmitted diseases

Definition

Venereal diseases include a wide range of infectious diseases usually transmitted by sexual contact. For example hepatitis B and C, syphilis, gonorrhea, herpes, chancroid, AIDS.

Cross-References

► Sexually Transmitted Diseases and Family Health
► Syphilis

Venereal Warts

► Condyloma

Veneric Diseases

► Sexually Transmitted Diseases

Very Low Birth Weight Infants

Definition

Very low birth weight infants are born weighing between 1000 to 1499 gm, measured within an hour of birth.

Vigorous Physical Activity

Definition

Intensive exercise.

Village

► Hamlet

Virus Load

Synonyms

Viral concentration

Definition

The virus load is a measure of the quantity of the HI-virus in one milliliter of blood. It is very high directly after infection – before antibodies have been built up – and in later stages of the infection. To detect the viral concentration, genomes (DNA-test) or genome equivalents (RNA) are measured. Controls of virus load during the course of the disease should always be performed with the same method. For modern tests the lowest level of detection is (20-)50 copies/ml. A low viral concentration is understood as a RNA-level < 1000 copies/ml, a high virus load means > 50.000 copies/ml. In HIV-infections viral concentration is an important value on which to base therapeutic decisions and control the therapy.

Virustatics

Synonyms

Antiviral therapy; Anitiviral drugs; Antiviral agents; Antiviral substances

Definition

Virustatics are drugs that can be used either for prophylaxis or therapy in some viral infections. The substances have to kill the viruses or at least impede their growth without causing damage to the human cells or their metabolic processes. They impede uptake of the virus into cells, influence intracellular replication or

viral release. In the treatment of AIDS, the very important enzyme, reverse transcriptase, is impeded by these antiviral agents.

Vital Statistics

Definition

Vital Statistics refer to all official information on births, deaths, marriages, divorces, fetal deaths and abortions within a population retained by a government. In most countries, vital statistics are published by the national ► health statistic centers dealing with a broader range of health related statistical information. Vital statistics are used as a basis for public health policy-making.

Voluntary Health Insurance

► Private Health Insurance

Vomiting Associated with Psychological Disturbances

Synonyms

Psychogenic vomiting

Definition

Psychogenic vomiting is repeated vomiting that occurs, for example, in dissociative disorders and hypochondriacal disorder, and that is not solely due to somatic conditions.

Cross-References

► Bulimia nervosa
► Eating Disorders

Voucher

► Health Subsidies

Vulnerability

► Individual Susceptibility

Vulnerability Concerns

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Synonyms

Susceptibility

Definition

Vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse changes. Vulnerability depends on three factors: exposure to changes (function of the character, magnitude, and rate of change to which a system is exposed), system sensitivity to these stimuli, and system adaptive capacity.

Basic Characteristics

Vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse changes. Vulnerability is a function of three factors: exposure to changes (function of the character, magnitude, and rate of change to which a system is exposed), system sensitivity to these stimuli, and system ► adaptive capacity. Prospects of ► adaptation to changes depend not only on the technical feasibility of certain adaptation measures but also the availability of required resources, the costs and side effects, implementability, perception, etc. Disasters, which involve violent changes, often happen in environments where distress is already present. Certain populations can be identified as being particularly at risk during disasters. Those who are unprepared for change, having neither the adaptive capacity nor economic resilience and lacking a secure support system, are predisposed to a complicated recovery. Vulnerable groups include the elderly and those of lower socio-economic status (unemployed, transients). Vulnerability concerns mean that suffering and dying is a function of poverty, underdevelopment, illiteracy, and lack of health care (► human health aspects of disasters).

Impacts of natural disasters (► hazards, natural) are not evenly distributed in relation to income status, age, or gender. Poorer communities are more likely to live in disaster-prone (e. g., flood-prone) areas. Low-income and high-density populations in low-lying coastal regions experience a high burden from weather disasters (► physical, environmental and social aspects of disasters).

Certain areas and groups of people in developed countries can also be vulnerable, as demonstrated by the European heat wave of summer 2003 and the hurricane Katrina disaster in 2005. In many disaster areas in the south of the USA, low-income individuals are numerous, including foreign migrant worker populations, and the unemployment rate is high. Many residents came from somewhere else (such as illegal immigrants), or are unskilled laborers or retirees, including elderly widows and widowers. Some areas in the south of the USA have a disproportionate number of individuals with little or no support system.

Many families are reluctant to evacuate and leave the remains of their homes (some being afraid of looting). Many do not have the money to move from their damaged apartments.

Disasters affect women and men differently. As shown by the 2004 Asian tsunami, male survivors outnumber females. The gender-related differences apply to exposure to risk, risk perception, preparedness behavior, warning communication and response (e. g. Muslim women staying at home in the absence of their husbands may ignore warnings), and ultimately to recovery and reconstruction. Gender interacts with race, income level, social class, and access to resources in the experience of disaster. Women are the providers of child care, which may put them at greater risk during and following a disaster. They may have limited mobility, restricted access to resources, and may be subject to social isolation.

Key vulnerabilities related to climate change merit particular attention because they endanger the lives or well-being of people or other valued attributes of climate-sensitive systems. Examples of vulnerable systems are low-lying islands or coastal cities and arid agricultural lands, where environmental refugees may occur. Some vulnerabilities of important systems are likely to be of high magnitude (interpreted as a scale – e. g., the area or number of people affected and intensity – the degree of damage caused in monetary and non-monetary measures), persistent and irreversible, expected to happen (relatively) soon, and with the potential to harm individuals, groups, and societies of low adaptation capacity.

Cross-References

- ► Hazards, Natural
- ► Human Health Aspects of Disasters
- ► Physical, Environmental,and Social Aspects of Disasters

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Vulnerable Groups

Definition

In research, by "vulnerable" we mean that a person or a group may be more than usually susceptible to exploitation in the process of research, either because they are more likely to be pressured into participating, or because they fail to understand the full implications of participation and may therefore be misled into taking part. The principle would also apply to those who are extremely poor and therefore would find it very hard to turn down a reimbursement for a study procedure despite of being informed of the risks. In these cases even the signed ► informed consent may not be meaningful.

Vulnerable Populations

Definition

Vulnerable populations are groups of people in whom the informed consent procedures need to be reviewed and controlled; all measures should be taken to ensure that their participation in medical experiments is truly voluntary. These groups include prisoners and military personnel on the one hand, and relatives and other persons dependent on the investigator (like employees of the institution) on the other hand, and their voluntary participation and freedom to make decisions have to be questioned; people who are legally not able to give informed consent (or to do so in the usual way) like minors, emergency patients, people with mental incapacity or unsound mind, or patients unable to write or read have to be included in this group.

It has to be ensured that vulnerable populations participating in a clinical trial or medical experiment do so in their own best interests (e. g. being treated for a previously untreatable medical condition, or potentially benefiting from a new treatment) and that no major or unforeseeable risks are taken and that their personal will is respected to the highest possible extent.

Waelsch's Disease

► *Chlamydia trachomatis* Infection

Wangkai (Western Australian Goldfields)

► Indigenous Health – Australooceaninan

Wanted and Unwanted Fertility

► Desired and Undesired Fertility

Waste Combustion

► Communal and Industrial Waste

Waste Management

Synonyms

Garbage management; Refuse management

Definition

Waste management is the collection, transport, processing (waste treatment), recycling or disposal of waste materials, usually ones produced by human activity, in an effort to reduce their effect on human health or local aesthetics or amenity. It is the process of dealing with waste. Waste management can involve solid, liquid or gaseous substances with different methods and fields of expertise for each. Managing municipal waste, industrial waste and commercial waste has traditionally consisted of collection, followed by disposal. Depending upon the type of waste and the area, a level of processing may follow collection. This processing may be to reduce the hazard of the waste, recover material for ► recycling, produce energy from the waste, or reduce it in volume for more efficient disposal.

Cross-References

► Communal and Industrial Waste

Wasting Disease

► Morbus Koch (Koch's Disease)
► Tuberculosis
► Tuberculosis and Other Mycobacterioses

Watching Over

► Surveillance Methodology

Waterborne Infectious Diseases

Synonyms

Infectious diseases due to polluted water; Infectious diseases due to contaminated water

Cross-References

► Infectious Diseases due to Contaminated Water
► Water Quality and Waterborne Infectious Diseases

Water Containing Germs

► Contaminated Drinking Water

Water Containing Infectious Agents

► Contaminated Drinking Water

Water Contamination

► Water Quality and Pollution

Water Disinfection by Direct Sunlight

► Solar Disinfection (Sodis)

Water Free Off Germs

► Drinking Water

Waterhouse-Friederichsen Syndrome

Synonyms

Waterhouse–Friderichsen syndrome; Meningococcal septicaemia; Septic course of meningococcal infection

Definition

The Waterhouse–Friederichsen syndrome is the septic course of a meningococcal infection, which is accompanied by a very high lethality (up to 95%). As the disease progresses an inappropriate acceleration of coagulation (DIC = disseminated intravascular coagulation) develops. DIC results in complex hemorrhagic disorders with micro thrombi in the blood vessels, hemorrhages into organs (especially the adrenal gland), widespread purpura of the skin, necroses and multiorgan failure. A profound shock develops. If Waterhouse–Friederichsen syndrome is not treated immediately, the outcome is fatal.

Cross-References

► Infectious Diseases in Pediatrics

Water Pollution

Synonyms

Water contamination

Definition

Water pollution results from an inflow of industrial and communal wastewater into water sources and soil. It is a man made contamination influencing water quality (► water quality and pollution).

Water Quality and Pollution

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Synonyms

Water standard; Water contamination

Definition

The quality of water is a standard for water intended for human consumption and household purposes, which means water free from organisms and from concentrations of chemical substances that may be a hazard to health. The water is polluted in cases when concentration of toxic substances and the number of pathogenic organisms exceed recommended standards and may cause adverse effects to health.

Basic Characteristics

Water Sources

Depending on its origin, natural waters have their properties, by which they differ. Those differences are mainly the result of specific physical, chemical and biological processes they are subject to, merging of waters of different qualities, change in geological composition of soil, as well as of various hydro-meteorological conditions.

Based on their origin, there are the following types of natural water:

- Atmospheric (rain, snow, etc.).
- Surface water (oceans, seas, rivers, lakes, etc.).
- Ground water (springs, wells, etc.).

The main ► water sources for water supplies and domestic use are ground and ► surface water, and only exceptionally, in water-poor areas, precipitation water.

The quality of ground water depends on the aquifer from which the water is drawn for the purpose of water supply. The most frequent ground water sources for water supply are: springs and dug wells.

Surface-water as a water source includes rivers, lakes, as well as artificial accumulations.

The quality of surface-water varies, mainly depending on the kind and quantity of precipitation and erosion in the watershed, degree of industrial development in the watershed area, as well as on the quantity of effluent water and industrial wastewater outfalling into surface-waters.

Water Quality

Many parameters must be taken into consideration in the assessment of water quality, such as source protection, ► water treatment efficiency and reliability and protection of the distribution network. However, water quality is determined by microbiological characteristics and the guideline value for chemical parameters, which represents the concentration of constituent that does not result in any significant risk to the health of the consumer over a lifetime of consumption. Guideline values are usually established as national standards which are harmonized with recommended guideline values for ► drinking water quality defined by WHO and EU.

Microbiological Quality

The greatest risk from microbes in water is associated with consumption of drinking water that is contaminated with human and animal excreta, although other sources and routes of exposure may also be significant. The waterborne pathogens (► pathogen organisms) that can be found in the water supply are: bacteria, viruses, protozoa, helminths and free living organisms.

Water intended for drinking and other household purposes must not contain waterborne pathogens, and must be free of human enteroviruses to ensure a negligible risk of transmitting viral infection. Also the protozoa and helminths should not be present in drinking water.

The organisms most commonly used as indicators of ► water pollution are *E. coli* and a coliforms group as a whole. Some organisms grow in pipe water distribution systems (e. g. *Legionellae*), whereas other occur in source waters (guinea worm *Dracunculus medinensis*) and may cause outbreaks and individual cases.

Chemical Quality

► Chemical substances that can be found in drinking water are mainly divided into two groups—organic and inorganic, with a separate group of pesticide, disinfectant and disinfectant by-products.

Regarding their influence on health, chemical substances can be divided into the following groups:

- Beneficial-substances that, when introduced into organism, take part in many oxido-reductive and metabolic processes; those substances include iron, copper, manganese, zinc, magnesium, and other trace elements.
- Toxic—if the concentration of those substances exceeds recommended guideline values in drinking water; those substances are heavy metals (mercury, lead, cadmium, etc.) and many of organic substances.
- Carcinogenic, teratogenic and mutagenic substances.

Chemical pollution of drinking water can be a result of soil and streamflow pollution with wastewater, soil pollution with pesticides and artificial fertilizers, as well as pollution with detergents, used motor oil etc.

Water Pollution and Health Risk

The most common and widespread ► health risk associated with drinking water is contamination, either directly or indirectly, by human or animal excreta, particularly feces.

Persistence of pathogenic bacteria, viruses, protozoa and/or parasites in drinking water leads to sporadic or epidemic cases of infectious diseases. The most frequent ► water related diseases in many countries in the world are bacterial diarrhea, shigelosis and hepatitis A.

Acute intoxication with chemical toxic substances through drinking water is rare, due to the low concentrations of those substances in water, although a daily intake of those substances in water, food and air, over a long period of time, can result in adverse health effects.

Monitoring and Surveillance

The monitoring of drinking water ideally consists of two components:

- Continual quality control on a routine basis to ascertain that treatment and distribution comply with the given objectives and regulation;
- Periodic microbiological and public health ► surveillance of the entire water supply system from source to consumer.

The continual control function is an integral part of the responsibilities of the water supply agency through which the waterworks management ensures the satisfactory performance of the treatment processes, the quality of the product water and the absence of secondary contamination within the distribution network. An independent body should verify that the waterworks correctly fulfills its duties. The surveillance is usually the responsibility of the health authorities at local, regional and national levels.

Cross-References

► Chemical Substances
► Drinking Water
► Health Risk
► Pathogen Organisms
► Public Health Surveillance
► Surface Water
► Water Pollution
► Water-Related Diseases
► Water Sources
► Water Treatment

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Water Quality and Waterborne Infectious Diseases

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Synonyms

Infectious diseases due to polluted water; Infectious diseases due to contaminated water

Definition

Waterborne infectious diseases are due, mostly, to drinking polluted water. In some cases, germs can penetrate the intact skin of a person who comes into contact with the water in which the germs live.

Basic Characteristics

Significance of Water

Water is essential for life. It is also called the "gold of the 21st century". The United Nations General Assembly, in December 2003, proclaimed the years 2005 to 2015 as the International Decade for Action, "Water for Life" (http://www.un.org.waterforlifedecade/background.html).

Water covers 75% of the earth's surface. Of this, 97% is seawater and only 3% freshwater. Two percent of the 3% freshwater is ice, 0.9% is ► ground water and 0.1% is surface water. Most probably, a sufficient supply of ► drinking water is one of the decisive factors guaranteeing health and the avoidance of infectious diseases and epidemics. Due to the rising world population and an excessive consumption of water, the average amount of water available for each individual is steadily decreasing. These calculations are for the world as a whole, not individual regions. As the actual amount of water available varies considerably, there are a number of regions which suffer from extreme water shortage. To survive a human needs 2–3 liters of water daily. In the developing countries the access to water has great significance. In many regions, obtaining water takes a lot of time and shapes the whole day. In general, in the developing countries it is the girls who have to col-

lect the water for their families and, due to this, they often do not have enough time to go to school.

Water as a Transmitter of Infectious Diseases

Every year about 4 million children die due to diseases caused by polluted drinking water and bad hygienic standards. In relation to the total number of pathogens that exist, the number of germs causing waterborne infection is quite low. To survive in water, the germs have to be extremely resistant to environmental influences. Moreover, a certain concentration of pathogens is needed to cause a disease. Most of the germs are fecal in origin and they get into the drinking water by pollution from sewage plant drains, sewers or storm water overflows. The spread of pathogens is facilitated where there are no effluent disposal units or toilets. Diseases, belonging to the classic waterborne infections and which are primarily transmitted by polluted drinking water, are: cholera (*Vibrio cholerae*), typhoid (*Salmonella typhi*), paratyphoid (*Salmonella paratyphi*) and bacterial dysentery.

In stagnant waters in tropical or subtropical regions there is the risk of a transmission of the Guinea worm and *Bilharzia*. Legionellae are also found in water. These infections are described in more detail below. A number of these pathogens can be transmitted by contaminated water, but are more frequently transmitted in other ways, especially fecal-orally (see food-safety and fecal-orally transmitted infectious diseases). Examples of such infections are: gastrointestinal infections with rotaviruses (► rotavirus infection) and Norwalk virus (► Norwalk virus infection), ► protozoa infections, like ► amebic dysentery (*Entamoeba histolyticum*), ► giardiasis (*Giardia lamblia*), ► cryptosporidiosis (*Cryptosporidium parvum*) and ► poliomyelitis.

Prophylaxis for Waterborne Infectious Diseases

In industrial nations, people take clean drinking water for granted. Water for drinking has to satisfy high quality standards; it is strictly separated from waste-water. In general, in the developing countries, a sufficient amount of clean drinking water is not available. Worldwide, more than one billion people do not have access to clean water, more than one third of the total population has to live without latrines and effluent disposal systems. To avoid spreading diseases via drinking water, the water has to be kept free of pollutants and germs. Drinking water must not contain any human or animal excrements. If water is contaminated, it has to be treated before consumption. A great number of pathogens can be eliminated by filters (like gravel-packed filters or carbon filters). The filters have to be intact (they must not show any fissures or tears) and they have to be cleaned and renewed regularly. Moreover, pathogens can be killed by chemical treatment; chemicals, however, are only suitable for optically clear water. In households without piped water, the water should be boiled or disinfected by other means such as ► solar disinfection (sodis) (http://almashriq.hiof.no/lebanon/600/610/614/solar-water/unesco/35-46.html). The latter method has certain value in poor regions. Unfortunately, cooling is not a suitable method of sterilization as a number of germ types are not destroyed by freezing; poor quality drinking water should not be used to make ice cubes. Pathogens in water are not killed by alcohol either.

Education of the population is a very important factor in the prevention of waterborne diseases. People have to know that contaminated water is a source of danger, and they have to understand the significance of hygienic rules. The raising of health-consciousness has to involve the whole population. For instance, where *Bilharzia* (*Schistosoma*), the fluke causing schistosomiasis, is endemic in a tropical or subtropical region, it is recommended that people should not bathe in places of stagnant water. Prophylactic measures include the elimination of snails, which are the intermediate hosts of schistosomas; snail poisons are used and river bank vegetation removed.

Cholera

Cholera is caused by the bacterium *Vibrio cholerae*. In India, the disease has been known since the 6th century BC. By the beginning of the 19th century cholera was spread throughout Europe; after the year 1826, the boom in steam navigation led to a worldwide spread of the disease. Historically 7 cholera epidemics have been described. *Vibrio cholera* was detected by Filippo Pacini in 1854; Robert Koch succeeded in growing a pure culture in 1883. After the consumption of cholera contaminated water, an incubation period occurs which lasts from a few hours up to a couple of days. The bacteria release toxins which cause severe diarrhea with a great loss of fluids and electrolytes. Due

to the loss of fluids, muscular cramps result, primarily in the calves. The diarrhea, with so-called rice-water stools, has a sudden onset; without treatment 60% of patients die due to hypovolemic shock and renal failure. Therefore, the treatment of cholera is ► rehydration, the replacement of lost fluid, either orally or intravenously. If therapy is carried out quickly and sufficiently, lethality can be reduced to less than 1%. Cholera is classified as one of the ► quarantine diseases, with an isolation period of 5 days. Even when cholera has been successfully treated, the pathogens can still be shed in the stool for weeks or even months. The most important prophylactic measure is compliance to hygienic rules; an active cholera vaccination (► cholera vaccination, active) is available, but a protective effect is only reached in 60%.

Typhoid/Paratyphoid

Typhoid and paratyphoid, caused by *Salmonella typhi* and *Salmonella paratyphi*, appear after an incubation period of 1–3 weeks (*S. typhi*) or 1–10 days (*S. paratyphi*), respectively. The onset is characterized by exhaustion and stomach ache. After a few days, high fever appears (40–40.5°C), which – without treatment – lasts 2–3 weeks. During the second week of illness, obstipation and diarrhea occur. The most important complications are bleedings in the gastrointestinal tract, and possible perforation. Further complications are shock, affection of the central nervous system, myocarditis and paralytic ileus. The highest mortality is seen in babies. Besides the fecal-oral mode of transmission, the germs can also be transmitted as a smear infection, particularly in children. The infections are contagious from the first week and usually remain so for 2 (*S. paratyphi*) to 3 weeks (*S. typhi*); a further shedding of the germs for some months is possible. Infected persons or those, who are suspected of infection, should be isolated. Treatment consists of stabilization of the ► body fluid and electrolyte balance, and antibiotic therapy. Drugs most commonly used in infections with *S. typhi* or *S. paratyphi* are: chloramphenicol, ampicillin, trimethoprim-sulfamethoxazole and chinolones (gyrase inhibitors). The most significant prophylactic measure is compliance to hygienic rules. Travelers to regions at risk of infection can have a typhoid vaccination (► typhoid fever vaccination, active) (http://www.who.int/water_sanitation_health/diseases/typhoid/en/).

Bacterial Dysentery

Bacterial dysentery, caused by *Shigella dysenteriae*, requires ingestion of only 10 pathogens (in drinking water or food). Following an incubation period of 1–3 days, fever and diarrhea appear. In the beginning, diarrhea is watery, later it becomes bloody-slimy-purulent. The course of the disease can be very serious, extreme fluid loss can lead to circulatory failure. The pathogens can be detected in the stool. Although bacterial dysentery is spread worldwide, a warm climate and bad sanitary conditions facilitate the appearance of the disease. To shorten the course of dysentery and to break the chain of infection, besides the replacement of fluid loss, antibiotic therapy should be given. Chinolones are the drugs of choice.

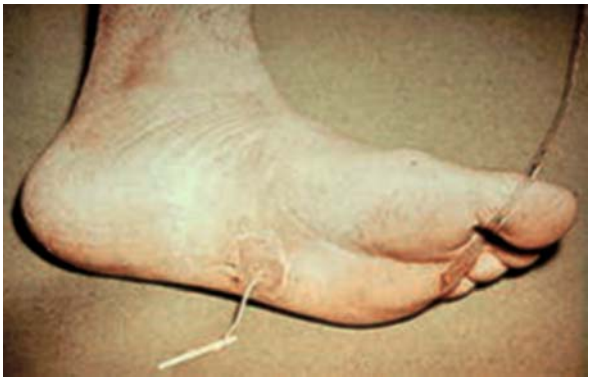
Bilharziasis/Schistomoniasis

Bilharziasis (schistomoniasis) is a worm infection, which is primarily spread in tropical and subtropical regions. It is caused by the various species of *Schistosoma* (e. g. *S. mansoni*, *S. japonicum*, *S. haematobium*). Worldwide, 200–300 million people are infected and 600 million at risk of infection. For its development, the parasite needs particular water snails as intermediate hosts; humans are the definite or final hosts. From the eggs, expelled with the stool or urine into the water, larvae develop, which then penetrate snails. Inside the snails, the larvae further develop and reproduce; finally they are released into the water as cercaria (free swimming larvae). Humans are infected by a contact with this contaminated water. Cercaria can penetrate the intact skin. Via the blood and lymphatic vessels they reach the liver, where they develop into adult parasites. And via the great veins, schistosomas reach other organs. Besides the liver, the most frequently affected organs are the bladder, the intestines, the lungs and the brain. The first symptom in bilharziasis is ► cercarial dermatitis, during the further course of the disease, ► Katayama fever can occur. Without treatment, a chronic infection develops; the symptoms depend on the affected organ. In intestinal bilharziasis, stomach ache and diarrhea occur; an affection of the bladder is characterized by painful micturition and bloody urine. Possible complications are the development of bladder cancer, failure of the affected organ and the occurrence of fistulae in the intestines or the bladder. Diagnosis of schistosomiasis is confirmed by the detection of eggs in

the stool or the urine. The infection is treated with praziquantel, which is administered twice at a time interval of 4 hours.

Guinea Worm Infection/Dracunculiasis

The Guinea worm (or Medina worm), which is primarily found in Africa and Asia, releases its larvae into stagnant waters. These larvae are eaten by small freshwater crabs (*Hyallela azteca*), which thus act as intermediate hosts. If larvae of the Guinea worm are swallowed – either during swimming or with drinking water – they get into the human intestines, where they develop to 1m-long worms within a year. The adult parasites penetrate into the subcutaneous tissue; then they drill through the skin and release their larvae. In the skin, painful ulcers develop, which heal badly. In most cases, the feet and the legs are involved. Due to the pain, patients can hardly walk; thus children cannot go to school, adults are not able to work. Further possible symptoms of dracunculiasis are fever, shivering fits, nausea and exanthemas. Worldwide, about 50 million people are infected with the Guinea worm. The infection can be prevented by the use of nylon filters. Treatment consists of the manual extraction of the worm with supporting antibiotic therapy, niridazole or metronidazole. Administration of an anthelminthic is ineffective. The manual worm extraction with a step by step rolling up of the parasite is a very old method, described in Egypt in 1550 BC (Fig. 1). According to some, the animal seen winding around the caduceus (Asclepius's staff in the insignia of physicians), is not a snake, but a Guinea or Medina worm (http://www.cdc.gov/ncidod/dpd/parasites/dracunculiasis/factsht_dracunculiasis.htm).



Water Quality and Waterborne Infectious Diseases, Figure 1 Extraction of a Guinea worm (according to Granz W, Ziegler K (1976) Tropenkrankheiten. HJ. A. Barth, Leipzig). Internist, 47, 2006; 803

Legionellosis/Legionnaires Disease

Legionellosis, which is caused by *Legionella pneumophila*, first appeared in Philadelphia during the state convention of the American Legion in 1976, hence the name legionnaires disease. The infection, which is transmitted by droplets, is characterized by nausea, high fever and serious pneumonias. Without treatment, the course is lethal in 15–20%. Legionellae reproduce best in warm water (20–45°C), the pathogens die at temperatures above 60°C. Sources of infection are hot water supplies in private houses, hotels, homes, hospitals or sport facilities. Transmission especially takes place via shower heads, Jacuzzi baths and humidifiers. The initial treatment is intravenous administration of macrolides (erythromycin) or chinolones (gyrase inhibitors). When the patient is free of fever, a change to an oral administration of the antibiotics is possible. To prevent legionellosis, ultra filtration or thermic disinfection (heating over 70°C) should be used. To avoid a reproduction of legionellae, the water in reservoirs should be kept at temperatures of more than 60°C.

Cross-References

- ▶ Amebic Dysentery
- ▶ Body Fluid and Electrolyte Balance
- ▶ Cercarial Dermatitis
- ▶ Cholera Vaccination
- ▶ Cryptosporidiosis
- ▶ Drinking Water
- ▶ Food-Safety and Fecal-Orally Transmitted Infectious Diseases
- ▶ Giardiasis
- ▶ Ground Water
- ▶ Katayama Fever
- ▶ Norwalk Virus Infection
- ▶ Poliomyelitis
- ▶ Protozoa
- ▶ Quarantine Diseases
- ▶ Rehydration
- ▶ Solar Disinfection (Sodis)
- ▶ Typhoid Fever Vaccination, Active

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Water-Related Diseases

Synonyms

Water borne diseases

Definition

Water related diseases are diseases caused by microbial pathogens or toxic agents present in water manifested as a sporadic case or as an epidemic.

Water Sources

Synonyms

Water resources

Definition

Water sources are basically different categories of naturally occurring ground water, rainwater and surface water which, with appropriate water treatment, provide safe water for water supplies.

Water Standard

► Water Quality and Pollution

Water Supply

Synonyms

Water system

Definition

The water supply is the total amount of water available for human and other uses. This refers to the share of water abstraction which is supplied to users (excluding losses in storage, conveyance, and distribution). It is a process or activity by which water is provided for some use, e. g., to a home, factory, or business. The basic source of water is rainfall, which collects in rivers and lakes, under the ground, and in artificial reservoirs. A complete water supply system is often known as a waterworks. Sometimes the term is specifically applied to pumping stations, treatment stations, or storage facilities. Storage facilities are provided to reserve extra water for use when demand is high and, when necessary, to help maintain water pressure. Treatment stations are places in which water may be filtered to remove suspended impurities, aerated to remove dissolved gases, and disinfected with chlorine, ozone, ultraviolet light, or some other agent that kills harmful bacteria and microorganisms.

Water System

► Water Supply

Water Treatment

Definition

Water treatment is a process of physical and chemical removal of pollutants, removal of pathogens and biodegradable compounds in water as a barrier to contamination of the ► drinking water system.

Way of Eating

► Diet

Way of Life

► Lifestyle

Weather

Definition

Weather is the condition of the atmosphere at a certain point of time or in a short period of time. The principle parameters of weather are temperature, air pressure, air velocity, and air humidity, and their interactions.

Cross-References

► Climate and Microclimate

Welfare

► Well Being

Welfare Culture

► Sociopolitical Culture

Welfarism

Definition

The term welfarism refers to the traditional microeconomic approach where social welfare is based on the sum of individual utilities, which in turn are determined by the goods and services consumed.

Well Being

Synonyms

Welfare; Wellness

Definition

Well-being can be describe as a state of being well, healthy, contented, etc. Well-being at work can be defined as a state of feeling well and a positive attitude towards work. It also implies that ► workers are able to experience personal growth and positive energy from their work. ► wellness

Well being denotes state of human existance in which basic needs are adequately met and satisfied. It also refers to ► health status, meaning not only absence of illness, but also quality of health.

There are many components to well-being. A large part is standard of living, the amount of money and access to goods and services that a person has; these numbers are fairly easily measured. Others like freedom, happiness, art, environmental health are even more difficult to measure.

Cross-References

► Health
► Quality of Life (QOL)

Wellington Boot

► Condom

Wellness

Synonyms

Well-being

Definition

Wellness means the state of dynamic physical, mental, social and spiritual well-being that enables a people to achieve their full potential and have enjoyable

lives. Simply defined, well-being is the quality or state of being in good health.

Cross-References

- ► Health
- ► Quality of Life (QOL)
- ► Well Being

Western Medicine

Synonyms

Allopathic medicine; Orthodox medicine

Definition

Western medicine refers to medicine practices that developed in western world since the early Renaissance period (around 1450) and that are still practiced by majority health care systems throughout the world. Western medicine is also called biomedicine, allopathic medicine or the Hippocratic tradition. It is opposed to various medical practices that have also developed in the Western world, primarily in terms of scientific basis.

Western Medicine Treatment

- ► Conventional Treatment

West Nile Fever

Synonyms

Infection with the West Nile Fever

Definition

West Nile fever, which appeared first in 1937, is transmitted by certain mosquitoes and is principally found in Uganda, Mozambique, Egypt, Israel, India and Indonesia. Since the end of the last century, infections have also been noticed in America and Europe. Wild living birds are the reservoir of the virus. Dead birds, primarily crows, are assumed to be the first sign of the appearance of West Nile fever. Most cases of the infection are asymptomatic or similar to a flu-like infection with fever, headache, joint pain and aching muscles. Possible complications are myocarditis and encephalitis, which especially appear in immunocompromised persons. These cases may also show a lethal outcome. A specific therapy is not available; the most important preventive measure is the prophylaxis of insect bites.

Cross-References

- ► Infection with the West Nile Fever

WFP

- ► World Food Programme

Whipworm Infection

- ► Trichuriasis

White Plague

- ► Morbus Koch (Koch's Disease)
- ► Tuberculosis
- ► Tuberculosis and Other Mycobacterioses

WHO

Definition

The World Health Organization (WHO) is a specialized agency of the United Nations (UN) that acts as a coordinating authority on international public health. Established on 7 April 1948, and headquartered in Geneva, Switzerland, the agency inherited the mandate and resources of its predecessor, the Health Organization, which had been an agency of the League of Nations.
The vision of the WHO is to improve the health status of all populations in the world to an extent where all human beings can live a socially and economically productive life. The main topics of the WHO are infectious diseases (such as HIV and malaria), smoking, and obesity. The WHO regularly collects data to estimate the worldwide burden of disease and the quality of health care systems.

Cross-References

- ► World Health Organization

WHO Global Influenza Program

► WHO Influenza Surveillance Program

WHO Influenza Surveillance Network

► WHO Influenza Surveillance Program

WHO Influenza Surveillance Program

Synonyms

WHO global influenza program; WHO influenza surveillance network

Definition

In 1946, the WHO established an influenza surveillance network. At present, 110 reference laboratories in 83 countries take part in the program. Additionally, there are 4 international reference centers: the Medical Research Centre in London (MRC, England), the Center for Disease Control in Atlanta (CDC, USA), the Commonwealth Serum Laboratories in Melbourne (CSL, Australia) and the National Institute of Infectious Diseases in Tokyo (NIID, Japan). These centers check the different influenza strains for their variants. The composition of the influenza vaccine is defined based on the most probable variants.

Cross-References

► Outbreak Management and Surveillance of Infectious Diseases

Whooping Cough

Synonyms

Pertussis; Infection with Bordetella pertussis

Definition

Pertussis is caused by *Bordetella pertussis*, a highly contagious bacterium, which is only found in humans and which produces various toxins. The infection is spread by droplets. After an incubation period of 7–14 (–20) days the first of three stages starts, the catarrhal stage. This stage, which last for 1–2 weeks, is characterized by flu-like symptoms and is highly contagious. The following paroxysmal stage presents with paroxysms of coughing, followed by an inspiratory "whooping" sound. During these coughing fits glutinous mucus is brought up and vomiting may also occur. The paroxysmal stage lasts for 4–6 weeks and is followed by the convalescent stage, in which the coughing fits slowly decrease. The most common complications are pneumonia and otits media but in some cases seizures and an encephalopathy can occur. By initiation of early antibiotic therapy with macrolides (erythromycin) for a period of 14 days, the course of the disease can be shortened or weakened. The best preventive measure is active pertussis-vaccination (► immunization, active). Unfortunately, neither natural infection nor active immunization can give lifelong immunity.

Widespread Epidemic

Synonyms

Pandemic

Definition

A widespread epidemic refers to an infection that is geographically widespread; occurring throughout a region or even throughout the world. For example, influenza pandemics are often global.

Widespread Illness

Synonyms

Epidemic

Definition

A widespread illness is defined as an outbreak of a contagious disease that spreads rapidly and widely. It is an occurrence of cases of a disease in excess of usual expectations for a particular population.

Several kinds of widespread illness can be distinguished. A *point-source epidemic* is one in which a group of people all fall ill as a result of a single exposure, typically to an agent in food they have all consumed. An example would be an outbreak of acute food

poisoning due to staphylococcal enterotoxin. A *common-vehicle epidemic* is due to an agent that is spread on an ongoing basis in a "vehicle" such as food, water, or air. Food-borne common-vehicle epidemics usually cause gastrointestinal disease, and are sometimes perpetuated by a carrier who is a foodhandler. *Vector-borne epidemics* are spread by insect vectors and include viruses such as dengue and viral encephalitis, which are transmitted by mosquitoes.

Wilcoxon Matched Pairs Signed Rank Test

Definition

A non-parametric test for comparing the distribution of a continuous variable between two dependent groups. It is analogous to the paired sample t-test, and can be used when the data are ordinal or not normally distributed.

Willingness

► Motivation

Willingness to Pay

Definition

In health economics, the willingness to pay (WTP) is defined as the maximum amount of money an individual is willing to pay to avoid or reduce a specific health problem or to gain a specific health benefit. Willingness to pay is used for cost-benefit analysis. It is measured either directly (► contingent valuation) or indirectly (► revealed preferences). The willingness to accept is the inverse approach of willingness to pay, in which an individual has to define the minimum amount of money that would be acceptable to lose a specific health care service.

Willingness-to-Pay Analyses

Synonyms

Contingent valuation; Hedonic pricing; Stated preference analyses

Definition

How can the value assigned by a patient to a medical benefit be assessed? One way of determining the value of a medical measure in terms of monetary units is the "willingness-to-pay" method, which seeks to determine the medical preferences of patients or of society by ascertaining the level of demand on the basis of hypothetical prices. Such an approach is appropriate mainly for establishing the value of goods whose prices are not determined freely by market conditions or are subject to regulation (e. g. by fixed scales of fees). However, one problem is that an individual's willingness to pay may vary greatly according to his or her state of health. A person who is ill will understandably place an appreciably higher value on a medical intervention than someone who is healthy. Accordingly a representative selection of interviewees is important in any willingness-to-pay analysis.

Willowbrook State School

Definition

Willowbrook State School is a New York State institution for mentally defective children. All subjects, from 1963 to 1966, were deliberately infected with the hepatitis virus; during the course of these studies, Willowbrook closed its doors to new inmates, on the grounds of overcrowding. However, the hepatitis program continued to admit new patients. Thus parents found that they were unable to admit their children to Willowbrook unless they agreed to them participating in the hepatitis studies. It is referred to as one of the most disgraceful scandals against human dignity.

Withdrawal

Synonyms

Withdrawal syndrome

Definition

Withdrawal can be described as a group of physiological and psychological symptoms of variable clustering and degree of severity which occur on cessation or

reduction of use of a drug that has been taken repeatedly, usually for a prolonged period or in high doses. A withdrawal syndrome is one of the indicators of ► (drug) dependence. However, onset, symptoms and course of withdrawal depend on the consumed substance and dose.

Withdrawal State

Definition

A group of symptoms of variable clustering and severity occurring on absolute or relative withdrawal of a psychoactive substance after persistent use of that substance. The onset and course of the withdrawal state are time-limited and are related to the type of psychoactive substance and dose being used immediately before cessation or reduction of use. Possible complications of a withdrawal state are convulsions.

Withdrawal Syndrome

► Withdrawal

Within-Subjects Design

► Paired Groups Design

Women's Health

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Synonyms

Health of the female population; Female health; Health of women

Definition

Historically, women's health implied only pregnancy and ► reproductive health. Today, however, in parts of the world, a woman's reproductive years comprise less than half of her life expectancy. Weisman's definition of 'women's health' considers this fact and refers to three features:

- Health is a product of cultural, social, and psychological factors *and* biology;
- It is important to consider and emphasize a life-span and multiple role perspective;
- The individual and society have to promote health and prevent disease in order to fulfill the concept of health beyond the absence of disease (Weisman 1998).

The focus on women's health is critical as there are diseases which are unique, more prevalent, or more serious in women. In some diseases risk factors and interventions are different for women compared to men. Moreover, changes in diseases over time and across the lifespan differ in the female and male populations.

Basic Characteristics

Female Morbidity and Mortality

Women experience greater morbidity than men although women's life expectancy is higher. Because over the lifetime of a population the proportion of women increases, women are at higher risk of experiencing age-related morbidity and are less likely to have a surviving spousal partner to rely on for assistance (Wang et al. 2004). The female adult ► mortality rate is lower than the male adult mortality rate in almost all countries in the world. Life expectancy at birth for females is at least 80 years in most Western European countries, Japan, the US, and Canada, but below 40 years in some African countries. In older ages women have a clear survival advantage compared to men (UN 2005).

The leading causes of death for women worldwide are HIV/AIDS, malaria, tuberculosis and maternal conditions (WHO 2004). Complications of pregnancy and childbirth are the leading cause of death and disability among women of reproductive age in less developed nations. Maternal mortality ratio, the number of maternal deaths per 100,000 live births, is estimated to be over 1500 in some African countries and Afghanistan and is under 10 in most Western European countries (UN 2005).

In developed countries, women's leading causes of death are cardiovascular disease and cancer. Women's rates of lung cancer mortality have skyrocketed since the 1980s. Breast cancer mortality is second to lung

cancer mortality, followed by colorectal cancer mortality. Breast cancer is the malignancy most often diagnosed in women and is, therefore, one of their leading health concerns. Its early detection through ► mammography should be promoted worldwide. Mammography screening, beginning at the age of 50 years, reduces the burden of breast cancer in the female population as diagnosis before the onset of symptoms results in a better prognosis. However, although the results of screening gradually improve as women get older, their risk of breast cancer increases with each passing decade.

► Sexually transmitted diseases (STDs) are a major burden for the female population. Compared to men, women are less likely to be treated as their disease is more often asymptomatic. Social inequalities between women and men concerning knowledge of STD prevention, influence on sexual relationships and availability of health care services make women more vulnerable to infection and chronic disease. Worldwide, ► HIV infection is increasing among women of childbearing age. HIV infection directly influences women's health and social life, may be decisive in family planning considerations and is a threat for the newborn.

Cardiovascular disease occurs later in life and is more deadly in women compared to men. Short- and long-term survival are lower in women than in men. Diagnosis of cardiovascular disease is difficult in women, as women often only show unspecific symptoms like nausea, anxiety, cold sweat and shortness of breath. Women's cardiovascular disease seems to be undertreated. In the prevention of cardiovascular disease levels of HDL and triglycerides may be more important in women than in men (Woodfield et al. 1997).

Worldwide, the prevalence of ► anemia is about 34% in women and almost 50% in pregnant women. Anemia in pregnancy causes fetal growth retardation and preterm birth and increases the risks in childbirth for the mother and the baby. Anemia may be due to nutritionally related iron deficiency, chronic diseases or menorrhagia prior to pregnancy (Wang et al. 2004).

► Osteoporosis is much more prevalent in women, particularly in postmenopausal women, than in men. In the US about 15% of women over the age of 50 years suffer from osteoporosis which increases the lifetime risk of fractures to about 40%. Prevention (adequate intake of calcium, physical activity) needs to begin during childhood as 95% of bone acquisition is completed by age 17 in girls and peak bone mass is critical for the risk of later osteoporosis. Hip fracture is the most devastating type of fracture leading to death (15%), placement of women into nursing homes (25%) and a decreased quality of life (USDHHS 2004).

Reproductive Health

Worldwide the average age of menarche has declined due to improved nutrition and sanitation. Mean age of menarche, the time of the first menstrual bleeding, is about 13 years. Mean ► menstrual cycle length is 28 ± 7 days, mean duration of menstrual flow is 2–6 days.

► Menopause, the final menstrual period, occurs on average at the age of 51 years. Postmenopausal health risks are heart disease and osteoporosis. The lack of estrogen greatly influences women's quality of life, e. g. in terms of vaginal discomfort and bladder symptoms. ► Hormone replacement therapy is effective in the treatment of menopausal symptoms, but increases women's risk of breast cancer and cardiovascular disease.

► Reproductive health is a state of complete physical, mental and social well-being in all matters relating to the reproductive system. Access to appropriate health care services that enable women to go safely through pregnancy and childbirth is requisite for adherence to women's rights. Pregnancy and childbirth are major life events in which healthy living is essential for the health of the mother and the newborn. Tobacco should be eliminated for the pregnant woman's environment, women should not drink alcohol while pregnant and should pay special attention to their nutrition during this period. Supplementation with folic acid before and during the first weeks of pregnancy significantly reduces the risk of ► neural tube defects in the baby. In addition, daily physical activity during pregnancy is highly recommended. Conditions such as ectopic pregnancy, ► gestational diabetes, hypertensive disorders (e. g. preeclampsia), severe bleeding and chronic ► anemia may be life-threatening to the pregnant woman.

Between under 5% (Sierra Leone) and over 80% (China, Switzerland, Spain and the United Kingdom) of married woman, or woman currently living in a union, aged 15 to 49 years use methods of contraception. Contraceptive prevalence is 67% worldwide, 32% in the least developed countries and 78% in industrialized countries. According to these numbers, fertility rates are much higher in developing countries, but have

declined worldwide due to the development of contraceptive strategies. In developing countries there are still millions of women – on average 19% of the married female population – with unmet contraceptive needs. China with its strict birth control policy and widespread family planning services is an exception. Contraceptives are available to about 90% of married Chinese women (Wang et al. 2004; UN 2005).

The abortion rate is directly related to the prevalence of modern contraceptive methods. More than 25% of the female population live in countries with most restrictive abortion policies, where abortion is not allowed at all or only permitted to save the mother's life. In contrast, 40% of women worldwide live in the 54 countries without restrictions as to reason, and abortions are carried out mostly within a gestational limit of 12 weeks. In other countries a woman's poor socioeconomic position or the risks to her physical or mental health by the pregnancy are acceptable grounds for abortion. Thirteen percent of maternal deaths are due to the complications of unsafe abortions. Legalization of abortion reduces the number of illegal abortions and decreases health risks for the mother. Ninety five percent of abortions conducted under unsafe conditions occur in developing countries, although the abortion rate is highest in Europe (about 50 abortions per 1000 women in reproductive age) (Wang et al. 2004; Center for reproductive rights 2005).

Violence Against Women

Family violence includes physically and emotionally harmful acts: assault or physical intimidation, sexual coercion, threats to harm, control and restraint of daily activities, social life or freedom and denial of access to resources. Violence against women has a significantly negative impact on women's health both directly and indirectly by reinforcement of social inequalities. Violence in areas of conflict affects both women and men, although men are more likely to be the perpetrators and victims in these situations. In addition, women risk violence from members of their own family resulting in injury, depression, or death. Domestic violence, especially ► intimate partner violence, is the most significant cause of homocide in women. Consequences of domestic violence or rape account for about 5% of women's disease burden in developed countries and 19% in developing countries. It is estimated that 25 to 50% of women worldwide experienced physical abuse from men, which is mostly long term (Wang et al. 2004).

The process of successfully ending abuse within intimate relationships is complex. Firstly, women have to recognize the abuse as a problem, be interested in change, and accept and utilize the support of caring others. Public health interventions targeted at women who endure violence have to consider the women's readiness to change and their helpseeking behavior in order to be effective.

Conclusion

Much of women's health risk is associated not only with biological differences between men and women and women's reproductive role but also with gender inequality in social, educational, cultural and economic status. In addition, women have lower access to health care, more often encounter high-risk sexual intercourse and violence. The International Conference on Population and Development (ICPD, Cairo, 1994) and the World Conferences on Women promote good women's health and reproductive health worldwide.

Cross-References

- ► Anemia
- ► Gestational Diabetes
- ► HIV-Infection and AIDS
- ► Hormone Replacement Therapy (HRT)
- ► Intimate Partner Violence
- ► Intrauterine Mortality
- ► Mammography
- ► Menopause
- ► Menstrual Cycle
- ► Mortality Rate
- ► Neural Tube Defects
- ► Osteoporosis
- ► Reproductive Health
- ► Sexually Transmitted Diseases

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Work Ability

► Fitness for Work
► Working Capacity

Work Capability

► Working Capacity

Work Capacity

► Fitness for Work
► Working Capacity

Work Environment

► Working Environment

Worker

Synonyms

Employee

Definition

A worker is any person who performs work, either regularly or temporarily, for an employer. European Economic Community in its Council Directive 89/391 defines a worker as any person employed by an employer, including trainees and apprentices but excluding domestic servants. The following definition of a worker was given in the ILO Convention 155/1981: "Worker covers all employed persons, including public employees."

Worker's Health

► Workplace Health

Worker's Safety and Health

► Occupational Health and Safety

Workforce

► Working Population

Workforce Planning

Definition

Workforce planning is a strategic activity of an organization, aiming to identify and forecast the workforce skills it needs to reach its goals, and to take appropriate measures to fill emerging gaps. It usually starts from an analysis of the organization's environment and its current workforce profile. Future developments are captured by forecasting on the basis of available quantitative data, and/or by developing different scenarios, which also take into account qualitative information. Critical elements then need to be identified and addressed in accordance with the organization's strategic goals.

Workforce in Public Health

Definition

The public health workforce is an integrated national system that involves the collaboration of health partners to provide a continuum of accessible learning opportunities for public health workers.

Work-Induced Diseases

► Work-Related Diseases

Working Capacity

Synonyms

Work capacity; Work ability; Fitness for work; Work capability

Definition

Working capacity in general describes the individual's capacity to do the work tasks he/she is required to do. This includes the ability of the body to maintain physiological equilibrium during work. To meet this requirement certain functional, anatomical, psychological, educational, and social characteristics of the worker are necessary to fulfill the demands of a specific job performance. However, working capacity cannot be assessed by targeting only the actions of a person; it requires consideration of the factors related to the work community, the work environment, and the organization and management of work.

Working Conditions

Synonyms

Workplace conditions; Working environment

Definition

The term working condition refers to a job, task, machinery, tools, layout, factory premises or working climate that covers the workplace environment. It also includes the workers' physical, social and mental workload, psychosocial and organizational contexts of job-tasks under which the job has to be performed or which might influence the work (or job tasks) or work environment.

Cross-References

► Working Environment

Working Environment

Synonyms

Work environment; Workplace environment; Environment at work

Definition

The working environment includes the surroundings, conditions, and influences at work and at the ► workplace that affect an employee. In occupational health, it refers to the physical (physical, biological, chemical, and ergonomic factors at work) and psychosocial (work organization, inter-individual relationships at work, work culture, job security, etc.) work environment. The working environment may be considered as part of a general environment, and there is an obvious inter-relationship between the working environment and the environment. The definition of working environment is essential for occupational health preventive actions that try to change the working environments that are harmful for health and support beneficial ones.

Working Population

Synonyms

Workforce

Definition

Working population may refer to the population employed in a specified occupation or to the total population of a country who are employed and looking for employment. The term on a country level usually covers all people between 15 and 65 years old.

Work Injury

► Occupational Injuries

Work Inspectorate

► Labor Inspectorate

Work-Life Balance

Definition

The extent of conflicting responsibilities and requirements at work and in one's personal life. Attention to the lack of a balance between work and home- or personal-life became particularly relevant to women during the later half of the twentieth century who attempted to strike a balance between ► gender norms about women's role in the household and changing opportunities for women in the workplace. More recently, this balance has gained further relevance for both men and women as changes in technology have offered greater flexibility in the structure of work while also eroding the distinction between work and personal life (e. g. the opportunity to telecommute or work non-standard work hours).

Work Overload

Definition

Work overload happens when job demands exceed an individual's ability to deal with them; i. e. exceed the time and resources available. Work overload represents the weight of hours, the sacrifice of time, and the sense of frustration with the inability to complete tasks in the time given. Long working hours, particularly at the expense of other parts of workers' lives, help to create overload. Added to long hours is the sense that there is too much to do in too little time.

Work overload may be seen as quantitative or qualitative. Quantitative overload is defined as having too much work to do in the time available. Quantitative overload is related to the amount of time available, whereas qualitative overload refers to the skill level of the employee, e. g. to the resources.

Work overload may lead to work-related stress (► job-related stress) – to harmful emotional and physical responses when requirements of a job do not match available individual characteristics and resources. The evidence suggests that a chronic work overload is closely related to burnout syndrome.

Workplace

Synonyms

Worksite

Definition

The workplace is a space where one or more workers perform their job tasks. The workplace also covers all places where workers need to be or to go by reason of their work. Another definition of worksite is that it is a physical area where workers need to be or to go due to their work which is under the control of an employer.

Workplace Conditions

► Job Task
► Working Conditions

Workplace Disability

► Occupational Disability

Workplace Environment

► Working Environment

Workplace Environmental Exposure

Synonyms

► Occupational Exposure

Definition

Workplace exposure is exposure to hazards arising *in* or *from* the workplace, and which could impair the health and well-being of workers. Workplace hazards could be

divided in: accident hazards (transport accidents, falls of persons or objects, stubs, cuts, burns, drowning, etc.), physical hazards (► noise, vibration, ionizing radiation, non-ionizing radiation, etc.), chemical hazards, biological hazards, ergonomic and social factors (mental or physical stress, lifting of weights, violence at workplace, burnout syndrome, etc.). Occupational exposure can be examined on industrial hygiene measurements that are carried out in the workplace.

Workplace Exposure

Synonyms

Occupational exposure; Exposure at work

Definition

Occupational exposure can be defined as the presence of a ► risk factor in the ► working environment external to the ► worker. ► Workplace exposures include physical conditions (e. g., structural insecurity or deficient lighting), physical stressors (e. g., lifting heavy weights or repetitive strain injuries), physical agents (e. g., ► noise, vibration, or ► radiation), chemicals (e. g., dusts or solvents), biological agents (e. g., bacteria or viruses), and psychosocial stressors (e. g., low control over job tasks or poor communication with workmates).

Apart from the nature of ► occupational exposure, it can also be characterized by the intensity, duration, and frequency of exposure. Occupational exposure can occur in different time-frames, such as short-term, long-term, and cumulative exposure. Although many occupational exposures may occur as environmental exposures for the general population, workers are usually exposed to higher levels, and are frequently the focus of research on health effects of these exposures and agents.

As occupational exposure does not only result from the presence of a harmful agent in the environment, it is sometimes defined as "the contact of an occupational chemical, physical, or biological agent with the outer boundary of an organism".

Cross-References

► Occupational Exposure

Workplace Factors

► Workplace Hazards

Workplace Hazards

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Synonyms

Occupational hazards; Workplace factors; Environmental hazards

Definition

Workplace hazards are any activity, situation or substance at the workplace that can cause harm.

Basic Characteristics

History

In the 19th century, the Industrial Revolution brought many safety problems and a higher level of public concern about these problems; the first factory inspections and first job safety laws were established. Social reformers and growing union power achieved, by 1900, minimal legislation to improve workplace health and safety in the most heavily industrialized states. This regulation and system of inspection were, however, inadequate. Those states that had some legislated protections rarely enforced them and focused largely on safety issues; little was done to protect workers from exposure to the growing number of chemicals in the workplace. After 1900, the rising tide of industrial accidents resulted in the passage of state workers' compensation laws so that by 1920 virtually all states had adopted this no-fault insurance program.

The International Labor Organization's Constitution calls for an improvement of working conditions. At the International Labor Conference in 1919, the year the International Labor Organization was founded and asked to "draw up a list of the principal processes to be considered unhealthy". Eventually an encyclopedia was substituted for the list. A comprehensive encyclopedia

was formulated to include analyzes of work; type of worker and working environments; the substances used at work and their related hazards; possible sources of disease and injury; methods of treatment and prevention; and existing protective legislation. The first edition was published in 1930. It covered specific industries, occupation and hazards; medicine and hygiene; and some social policy issues. More than half of the articles were devoted to various individual chemicals. The new, fourth edition, published in 1998, discusses specific industries and their associated hazards in detail.
After World War II, workers in the industrialized countries were able to gain better working conditions by exerting pressure on their national governments.
Occupational health and safety legislation in individual European countries experienced a great deal of flux after the formation of the European Union. The Single European Act establishing the EU was enacted in 1987. Article 118A of the Act addresses employment, working conditions, and occupational health and safety and provides a streamlined legislative process for the development of health and safety directives, and minimum health and safety standards. The EU directives have the force of law and set down general principles for the protection of workers.

Hazards Effects

Workplace hazards are divided into two broad categories: health hazards and safety hazards. Health hazards can cause occupational diseases, and safety hazards may cause injuries.

Health Hazards

A health hazard is something that has the potential to cause an adverse health effect. A potential health hazard exists when a person comes into contact with any agent, situation or condition that can cause harm to the body and result in an illness or a disease. There are five types of health hazard: chemical, physical, biological, ergonomic and stress hazards.
A health hazard may produce serious and immediate (► acute effects) effects or it may cause long-term (► chronic effects) problems which can be developed after a latency period. All or part of the body may be affected. Some health effects are local (► local health effects) while others are systemic (► systemic health effects).

Dealing with workplace hazards involves three key steps: recognition, assessment and control. Regulations require employers to have an ongoing system for the identification (► workplace hazards identification) of existing and potential risks to the health or safety of workers at the place of employment and the measures (► assessment of workplace hazards), including procedures to respond to an emergency, that will be taken to reduce, eliminate or control those risks (► workplace hazards control). The most effective method of identifying health hazards is through the systematic ► inspection of the workplace. The most accessible source of information about the health effects and other characteristics of suspected hazards is the material safety data sheet which by law must be available in the workplace. Evaluating exposure to toxic substances requires the calculation of ► exposure levels for comparison with standards set out by law or other guidelines.

Safety Hazards

Safety hazards may cause injury. They include: slipping/tripping, fire and explosion, moving parts of machinery, tools, and equipment, work at height, ejection of material, pressure systems, vehicles, lifting and other manual handling operations, materials falling from a height, rolling, shifting, or caving-in, unsafe use of explosives, workplace violence, hazards posed by working alone or in isolated workplaces. Injury caused by a safety hazard (such as a cut or fracture) is usually obvious. Safety hazards cause harm when workplace controls are not adequate.
The seriousness of the harm that could result from a hazard is often described as: catastrophic (death and/or permanent injury), critical (serious injury), marginal (minor injury) or negligible (no injury).

Cross-References

► Acute Health Effects
► Assessment of Workplace Hazards
► Chronic Effects
► Exposure Levels
► Inspection of the Workplace
► Local Health Effects
► Systemic Health Effects
► Workplace Hazards Control
► Workplace Hazards Identification

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Workplace Hazards Control

Synonyms

Workplace hazards management

Definition

Controlling health hazards means protecting, limiting or preventing harmful exposure of workers to the hazard (► workplace hazards). Controls can be located at the source of the hazard, along the path between the source and the worker, or around the worker.

If a hazardous agent is found to be present in the workplace in concentrations that could cause health effects, it must be controlled. Control means eliminating the hazard or reducing it to a level that protects workers from adverse health effects. A control must:

- adequately control the hazard to eliminate the danger to the worker;
- protect all workers who are likely to be exposed;
- not create a new hazard in the workplace;
- not create an environmental hazard outside the workplace.

Workplace Hazards Identification

Synonyms

Recognition of workplace hazards

Definition

Recognizing hazards means identifying potential causes of adverse health effects (► workplace hazards) such as agents or workplace conditions that can cause adverse health effects if exposure or overexposure occurs. An understanding of the health effects of hazardous agents or conditions in the workplace is an essential part of determining whether workers are being exposed to health hazards. The first step in determining whether a health hazard exists in the workplace is to determine what chemical, physical or biological agents and stressors are present in the workplace. All hazardous materials present in the workplace must have an up-to-date material safety data sheet.

Workplace Health

Synonyms

Occupational health; Workers' health; Employees health

Definition

Since 1950, the International Labour Organization (ILO) and the World Health Organization (WHO) have had a common definition of occupational health. The definition was adopted by the Joint ILO/WHO Committee on Occupational Health at its First Session (1950): Occupational health is the highest degree of physical, mental and social well-being of workers in all occupations. It represents a dynamic equilibrium between the worker and his occupational environment. The definition was revised at its 12th Session (1995): 'Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job.'

Workplace health means strategies, policies, programs, and practices found in the workplace that provide benefits that improve the total health of the individual and

the population – mental, physical, and psychosocial. It represents a dynamic equilibrium between the worker and his occupational environment.

Workplace Health Promotion

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Synonyms

Worksite health promotion

Definition

Workplace health promotion has been defined as the combined efforts of employers, employees and society, to improve the ► health and well-being of people at work, as was stated in the Luxembourg Declaration on Workplace Health Promotion in the European Union, 1997. Combination of improved work organization and work environment (► working environment), promotion of active participation and encouragement of personal development can reach the aim – healthy people in healthy organizations.

Basic Characteristics

Rationale

The starting point of health promotion in general is the Ottawa Charter from 1986. In the Ottawa Charter (WHO 1987), the World Health Organization emphasizes that health promotion is the process that enable individuals, groups or organizations to increase control over their health and to improve it. This Charter indicated the movement away from individually based health promotion towards the influence of the wider environmental settings in which the individual was placed. It expresses the hope that citizens in each country will take an active role in promoting their own health. Moreover, the prerequisites and prospects for health cannot be ensured by the health sector alone, it demands coordinated action by governments, health and other social and economic sectors, non-governmental and voluntary organizations, local authorities, industry and media. The concept has been further developed in the Bangkok Chapter (WHO 2005), in which the following has been pointed out:

- Strong intergovernmental agreement to increase health;
- Core responsibility of government on health promotion for all;
- Promotion of health as a key focus of communities and civil society; and
- Promotion of health as a requirement for good corporate practice.

Advantages of Health Promotion at the Workplace

This general health-promoting concept can also be applied to the ► workplace setting. Since the 1970s when the emphasis was on preventing illnesses and risk factors at work, or changing a particular lifestyle habit or behavior of individual workers, this approach has moved to a more interdisciplinary model addressing both individual ► risk factors and the broader organizational and environmental issues (Baranski et al. 2002). Workplace health promotion should involve both workers and management in their efforts to change the workplace into a health-promoting setting. Development of healthy work practice and promotion of health at work is one out of ten priority objectives proposed by the WHO Global Strategy on Occupational Health for All (WHO 1995).

The workplace is considered to be an important setting for health promotion activities for the following reasons (Zucconi et al. 2001):

- The adult population is already assembled and organized, and structures already exist for occupational health and health and safety requirements;
- Most adults spend much of their time at workplaces;
- Information and assistance to improve their ► wellness, not accessible through other channels, can be given to large numbers of the population at their workplaces;
- Participation rate is higher than elsewhere;
- Employers and employees have a common interest in promoting health at work;
- Health promotion programs at work can be profitable investments as they improve workers' health and ► fitness for work, thus leading towards greater effectiveness, competitiveness and productivity, and reducing turnover rates, mistakes at work, occupational accidents, absenteeism, etc.

Generally, the workplace setting includes many different types of organization involved in workplace health promotion, such as: large, medium-sized and small enterprises, public administration, health care services and welfare (e. g. hospital health promoting programs, Vienna Recommendations, 1997), schools, and the labor market and administration.

The main obstacle to workplace health promotion is a generalized lack of political awareness at all levels, particularly in middle-sized and small enterprises. The relevant legislation in each country should be implemented and enforced to facilitate enterprises to adopt health-conductive policies and practices. Health promotion must be understood not as a cost but as an investment in the prosperity of a nation and the increased quality of life of its citizens.

Program Structure

Program planning is based on the needs assessment at worksites. Needs assessment is usually based on questionnaires to obtain information on matters such as: self-reported health habits (e. g. smoking, physical activity, nutrition, alcohol consumption), other health risk (e. g. stress, hypertension, hypercholesterolemia, and diabetes), ► occupational hazards (chemicals, noise, stress, etc.), personal priorities for risk reduction and health improvement and willingness to participate in the program activities (Fielding 1998). Any program should be adequately promoted and planned according to the established needs at the workplace. Promotion materials, such as posters, brochures, pamphlets, articles in company publications, videos, films, etc., are a useful tool to call attention to the availability and desirability of participating in the program (Warshaw and Messlte 1998). Activities include clinical check-ups (mammography, flu immunization, etc.); health education on risk factors (smoking, weight control, fitness training, etc.); counseling and behavior modification in relation to weight control, nutrition changes, smoking cessation, fitness, etc.; skills to be developed for stress management, and pre-retirement planning, etc. At the end of the program both the participation rate and employee satisfaction and its outcomes to estimate individual and company achievements should be evaluated, and the need for improvements and possible expansion of the program should be identified, as well.

Integrated Occupational Health and Safety and Workplace Health Promotion

There is emerging evidence that coordinating and integrating ► occupational health and safety and workplace health promotion enhance workers' health (Sorensen and Barbeau 2006). The rational for this integrated approach is the evidence that exposure to occupational hazards and risk-related behavior increases workers' risk of disease, the effect being additive or even synergistic (e. g. smoking and asbestos). Further, workers who are at highest risk of exposure to hazardous working conditions are also those most likely to have risk-related behaviors. Integrating worksite health promotion and occupational health and safety may increase program participation and effectiveness for workers at ► high-risk workplaces, as well as benefiting the broader work organization and environment.

Cross-References

- ► Fitness for Work
- ► Health
- ► High-Risk Workplaces
- ► Occupational Exposure
- ► Occupational Hazards
- ► Occupational Health and Safety
- ► Risk Factor
- ► Wellness
- ► Working Environment
- ► Workplace

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Workplace Health Promotion Activity

Definition

Workplace health promotion involves the combined efforts of employers, employees and society to improve the health and well-being of people at work. This can be achieved through a combination of improving the work organization and the working environment; promoting the active participation of employees in health activities and, encouraging personal development. Workplace health promotion activities are viewed as multi-faceted initiatives to improve health in the workplace based on comprehensive health promotion programs.

Expected benefits for workplace health promotion activities include decreased absenteeism, reduced cardiovascular risk, reduced health care claims, decreased turnover, decreased musculo-skeletal injuries, increased productivity, increased organizational effectiveness and the potential of a return on investment.

Amongst the different kinds of activities involved in workplace health promotion, two should be emphasized – the provision of a healthy workplace and advocacy. Promoting a healthy workplace recognizes that a healthy workforce is essential and integrates policies, systems and practices conducive to health at all levels of the organization. Advocacy is a key health promotion activity for overcoming major barriers to public health and occupational health. The barriers addressed by advocacy are poor living and working conditions, rather than individual or behavioral barriers.

Workplace Health Risk

► Occupational Health Risk

Workplace Health Risk Assessment

Synonyms

Health risk assessment at workplace

Definition

Workplace health risk assessment is a process of identification and evaluation of risks to the workers' health and safety arising from hazards in the workplace which can lead to the elimination or reduction of the risks or the application of control measures where necessary. In the context of occupational health, risk assessment is the process of quantifying the probability of a harmful effect to the health of individuals or populations from certain workplace activities. Occupational health risks also are directly related to physical, chemical and biological factors in the environment and related behaviors. In estimating the risks, three or more steps are involved, requiring the inputs of different disciplines.

The calculation of risk is based on the likelihood or probability of the harm being realized and the severity of the consequences. This can be expressed mathematically as a quantitative assessment or as a qualitative assessment – description of the circumstances by which the harm could arise.

The assessment should be recorded and reviewed periodically and whenever there is a significant change to work practices. The assessment should include practical recommendations to control the risk. The risk assessment provides the basis for planning and organization of work and to undertake actions for prevention.

Modern occupational safety and health legislation usually demands that a risk assessment should be carried out prior to an intervention.

Workplace Health and Safety

Synonyms

Occupational health and safety

Definition

Workplace health and safety is meant to provide work conditions that reduce or eliminate occupational injuries and work-related diseases and enable physical and psychosocial well-being. The protection of workers need not be considered simply as one of the costs of doing business, but as a critical factor necessary to the achievement of economic, environmental and social objectives which are an integral part of sustainable development. This means that the protection of workers should be seen and calculated as an investment with a potentially positive environmental, social and economic effects. The protection of workers cannot simply be seen as a matter of their workplace, but should take into account the inter-relationship between their work, general health, living conditions (water, sanitation, housing), transport, culture and so on. It also implies that action to improve occupational safety and health is a prerequisite for meeting the basic economic and social development perspectives in developing countries, and not simply a luxury to be reserved for the rich countries.

Cross-References

► Occupational Health and Safety

Workplace Health and Safety Service

► Occupational Health and Safety Service

Workplace Health Services

Synonyms

Occupational health services (OHS)

Definition

Occupational health services are ► health services concerned with the physical, mental, and social well-being of an individual in relation to his/her working environment and with the adjustment of individuals to their work. The term applies to more than just workplace safety, and includes health status and job satisfaction. Occupational health services develop and implement preventive measures for individuals and groups at high risk of occupational hazards (► workplace hazards).

Cross-References

► Occupational Health Services

Workplace Injury

► Occupational Injuries

Workplace Inspectorate

► Labor Inspectorate

Workplace-Related Ill-Health

► Work-Related Ill-Health

Workplace Stress

► Job-Related Stress

Work-Related Diseases

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Synonyms

Work-related illnesses; Work-related ill-health; Work-induced diseases; Occupational diseases in wider sense; Non-specific occupational diseases

Definition

The term "work-related diseases" includes a variety of ► multifactorial diseases and disorders in which work and the ► working environment contribute significantly to the cause, but are among numerous causative factors. These diseases are more prevalent among the ► working population than "specific" occupational diseases. They also occur among the general population, but work and ► working conditions need not be a risk factor in every case of each disease. Personal charac-

teristics of the working people and other environmental and sociocultural factors usually play a role as risk factors of these diseases (WHO 1985). Work-related diseases are of great importance to occupational health and public health due to their huge sociomedical and economic impact and the possibilities of their prevention or mitigation.

Basic Characteristics

Work-Relatedness

It is well known that work, as a well-adjusted and profitable human activity, can be an important factor in human health promotion. However, if work is accompanied by excess hazards, it may negatively affect the health of working people in several ways. *First*, specific physical, chemical, or biological exposures from the working environment and during the work performance can cause occupational disease. *Second*, the work may provoke onset of a diseases, or aggravate, accelerate, or deteriorate the course of an already existing disease of non-occupational origin. *Third*, work (performance and working environment) can be one of the numerous causes in a number of ► diseases with multiple etiologies.

The ► work-relatedness of diseases with multiple etiologies was stressed by the World Health Organization (WHO) in the 1970s and 1980s (WHO 1976; WHO 1985; WHO 1989). The WHO Expert Committee (1985) emphasized that "multifactorial work-related diseases are often more common than occupational diseases and therefore deserve adequate attention by health service infrastructure", and that "the new concept of work-relatedness is of substantial importance to health care workers in promoting the health of workers."

The term "work-related disease" defines neither the pathological mechanism nor the diagnostic criteria. For the time being, two pathogenic mechanisms that both operate and interact to varying extents and in various ways are being evaluated: (i) *direct*, physicochemical pathway and (ii) *indirect*, stress-mediated pathway. According to some authors, only work-related stress reactions (physiological, behavioral, emotional, and cognitive) and their long-term consequences (hypertension, affective disorders, alcohol dependence, and musculoskeletal disorders associated with ► absenteeism and loss of productivity) are considered as ► work-related ill-health.

The WHO Expert Committee defines work-related diseases of public significance as follows:

(a) Mental health disorders (e. g., behavioral responses and psychosomatic illness),
(b) Cardio-vascular disorders (e. g., hypertension, ischemic heart disease),
(c) Chronic non-specific respiratory diseases, and
(d) Musculoskeletal disorders (e. g., low back, shoulder, and neck pain).

Recently more attention has also been paid to ► occupational stress-mediated disorders and work-related cancers.

The WHO Expert Committee also listed occupational factors that contribute to the causation of work-related diseases, including physical hazards (e. g., noise, particulate matter), chemical hazards (including carcinogens), ergonomic hazards (e. g., lifting heavy loads, repetitive movements), and psychosocial hazards (e. g., ► work overload, ► work underload, ► shift work, long hours, insecure employment, ► job-related stress).

Epidemiology and Socio-Medical Importance

A high incidence of non-communicable ► diseases with multiple etiologies in the adult human population, including work-related diseases, has enormous social and economic implications. The incidence of work-related diseases is also an important indicator of the quality of the ► working environment. The direct costs of health care for affected individuals, production losses (resulting from absenteeism, disability, and premature death), financial costs (e. g., ► sick-leave, ► disability compensation), and social losses (family problems of diseased or deceased individuals, etc.) are enormous.

According to international data from the WHO and the ILO (WHO 2002; ILO 2004), 2.25 million people die every year from work-related accidents and diseases, among them 315,000 from work-related cancer. About 160 million workers suffer from work-related diseases; and in one third of these cases, illness causes the loss of four or more working days. The ILO has estimated that 4% of GDP is lost every year due to work-related diseases and injuries. Around 4% of total cancers, 10% of skin cancers, 10% of lung cancers, and 2% of leukemias are attributed to ► workplace exposure. Work-related diseases remain a leading cause of productive years lost, also including young workers.

Globally, 37% of all low back pain cases are attributable to occupational risk factors, the attributable fraction being higher among men (41%) than among women (32%). Work-related low back pain was estimated to cause the loss of 818,000 ► disability adjusted life years (DALY) annually.

The American Thoracic Society (ATS 2003) estimated the work-related burden of obstructive airway diseases (both asthma and chronic obstructive pulmonary disease) by ► population attributable risk, and found it to be 15%. The annual costs in the U.S. due to these diseases alone are estimated in a very conservative way to be nearly US$ 7 billion.

According to the survey on working conditions in the European Union (EuroFound 1997), the most common work-related health problems reported by the respondents were low back pain (30%), stress (28%), general fatigue (20%), muscular pain (17%), and headaches (13%).

Issues in Research and Prevention

A consensus on the definition of work-related diseases and particularly for its application in practice is still lacking on an international and national level. Some authors and agencies only consider occupational diseases that are compensated and have a direct causal relationship with workplace exposures as work-related diseases. Others, under the term "work-related disease" consider both classical occupational diseases and "other work-related diseases", like "a disease caused or aggravated by work". There are also opinions that "work-related diseases" can only be considered "multifactorial non-communicable diseases" partially caused by workplace exposure or work practice.

The terminological ambiguities of work-related diseases and their practical implications may be summarized as follows:

(a) There is no internationally recommended or accepted list of work-related diseases, such as the ILO List of Occupational Diseases (ILO 2002).

(b) This makes research and comparison of data on work-related diseases very difficult on a national level as well as on an international level, which may endanger some estimates on work-related disease frequency or their economic consequences.

(c) It is rather difficult to define a case of work-related disease, and to determine the magnitude of ► work-relatedness in each individual case of work-related disease. Variable diagnostic criteria and lack of standard definition of a case of work-related disease might have a significant impact on estimates.

To solve the above-mentioned difficulties, and to investigate and identify underlying pathogenic mechanisms, well-designed epidemiological studies play a leading role.

It is especially important to bear in mind that many work-related diseases can be prevented by addressing workplace exposure and individual lifestyle choices. As work-related diseases can result in adverse or fatal health outcomes, high health care costs, and reduced workplace productivity, their prevention should be the focus of both occupational and public health.

Cross-References

► Absenteeism
► Disability Adjusted Life Years (DALYs)
► Disability Compensation
► Diseases with Multiple Etiology
► Job-Related Stress
► Multifactorial Disease
► Occupational Stress-Mediated Disorders
► Population Attributable Risk (PAR)
► Shift Work
► Sick Leave
► Working Conditions
► Working Environment
► Working Population
► Work Overload
► Workplace Exposure
► Work-Related Ill-Health
► Work-Relatedness
► Work Underload

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Work-Related Ill-Health

Synonyms

Workplace-related ill-health

Definition

Work-related ill health is any health condition caused by, or made worse by a job. This term, in the broadest sense of the word, encompasses all ► occupational injuries, ► occupational diseases, and ► work-related diseases. However, in some instances and in some national practices, work-related ill health has a narrower concept. It means occupational diseases and work-related diseases. Appropriate systematic registration, collection, and analysis of data on work-related ill-health allows insights into the prevalence of work-related ill-health and the costs that it may cause on a company or national level, and permits priorities in prevention to be set.

Cross-References

► Work-Related Diseases

Work-Related Illnesses

► Work-Related Diseases

Work-Relatedness

Definition

Work-relatedness refers to the link between work (occupational risk factors) and specific health outcomes (► occupational diseases, ► occupational injuries, or work-related disorders) in a working population. Identification of the etiology of an occupational or ► work-related disease or injury implies an understanding of the etiology of the disorder, the circumstances of exposure, and the predisposing conditions of the patient. Identification of causation is a critical step in an occupational or work-related case because it may establish the patient's entitlement under workers' compensation if a disease or injury is occupational or work-related and may force correction of the problem, if it still exists, to prevent others from being exposed. The resolution of causation leads naturally to assessment of work-relatedness.

There are several sets of criteria for the determination of work-relatedness for different circumstances. The following set of questions is viewed as appropriate in deciding whether work is causative or a contributing factor to an employee illness: 1. Are the symptoms consistent with the diagnosis? 2. Are the signs consistent with the diagnosis? 3. Is the temporal relationship of exposure and disease clear? 4. Do fellow workers with similar exposure have similar problems? 5. Is workplace monitoring data available and indicative of suspected exposure? 6. Is the condition biologically plausible and confirmed? 7. Is there a lack of non-occupational exposure to the harmful agent?

Assessing work-relatedness is a difficult matter in many cases of chronic disease and in some contested workers' compensation cases. Many disorders that are known to have occupational causes may also occur for other reasons and for unknown causes. A given case may present with a history of multiple exposures over several jobs, each associated with a particular health outcome. This is particularly common in cases of asthma, hearing impairment, and musculoskeletal disorders.

Worksite

► Workplace

Worksite Health Promotion

► Workplace Health Promotion

Work Stress

► Job-Related Stress

Work Underload

Definition

Work underload occurs when work-related demands are too low so that they do not sufficiently challenge the individual, (e. g., monotonous work situations). Two kinds of work underload may be observed – quantitative and qualitative. Quantitative work underload is defined as having too little work to do in the time available, whereas qualitative overload refers to the skill level of the employee (e. g., high skill for very low-level demands). Work underload may be seen as a work-related stressor that can lead to work-related stress (► job-related stress).

World Court

► International Court of Justice

World Food Programme

Synonyms

WFP

Definition

The World Food Programme is a United Nations' agency combating global hunger. Its humanitarian and development projects are financed entirely by voluntary contributions. It works together with non-governmental organizations to deliver food in least developed and low-income countries where victims of natural disasters, refugees, displaced people, and the hungry poor face severe food shortages. Furthermore, its development activities promote the self-reliance of poor people and communities.

World Health Assembly

Definition

The World Health Assembly is the forum through which the ► World Health Organization (WHO) is governed by its 192 member states. It is the world's highest health policy setting body and is composed of health ministers from member states. The main tasks of the World Health Assembly are to approve the WHO program and the budget for the following biennium and to decide major policy questions.

World Health Organization

Synonyms

WHO

Definition

The World Health Organization is a specialized agency of the United Nations focusing on international public health. It arranges and coordinates appropriate relief operations, including measures to combat disease, especially infectious disease, provisions of vaccinations, and appropriation of drugs and medical equipment. Experts of the Organization develop health guidelines and standards and help countries to address public health issues.

Cross-References

► WHO

World Wide Web (WWW)

Definition

The World Wide Web is an easy-to-use hypertext document system developed for the Internet that allows users to access multimedia documents.

Yamatji (Central Western Australia)

► Indigenous Health – Australooceaninan

Yapa (Western Central North Territory)

► Indigenous Health – Australooceaninan

Yates's Correction

Definition

The approximation of the Chi-square statistic in small 2×2 tables can be improved by reducing the absolute value of differences between expected and observed frequencies by 0.5 before squaring. The effect of this correction is to bring the distribution based on discontinuous frequencies nearer to the continuous Chi-squared distribution.

YAWS

Synonyms

Frambesia; Pian

Definition

Yaws is defined as an infectious, nonvenereal tropical disease, primarily of children, characterized by raspberrylike eruptions of the skin and caused by a spirochete, *Treponema pertenue*, that is closely related to the agent of syphilis. It is common in Africa.

Years of Life

► Life Expectancy
► Longevity

Years of Life Lost (YLL)

Definition

YLL is the mortality component of DALY (► Disability-Adjusted Life Years). It represents the number of years of life lost due to premature mortality in the population. YLL corresponds to the number of deaths multiplied by the average life expectancy at the age at which death occurs.

Years Lived with Disability (YLD)

Synonyms

Years lost due to disability (YLD)

Definition

YLD is the disability component of DALY. It represents the number of years of healthy life lost due to disability caused by the non-fatal experience of disease or injury in a population.
To estimate YLD for a particular cause in a particular time period, the number of incident cases in that period is multiplied by the average duration of the condition and a weight factor that reflects the average degree of disability caused by the condition.

Years Lost to Disability (YLD)

Synonyms

YLD; Disability adjusted life years

Definition

Disability-adjusted life year is a measure that expresses years of life lost to premature death and years lived with a disability of specified severity and duration. 1 DALY can be thought of one lost year of healthy life.

Yellow Fever

Definition

Yellow fever can only be transmitted by the bite of the yellow fever mosquito (*Aedes ägypti*), which is primarily found in the tropical regions of Africa, Central and South America. After an incubation period of 3–8 days, the infection starts with general symptoms, like fever, shivering fits, headache and joint pain. Nausea and vomiting can be present as well. The symptoms disappear within a few days. In about 15% of infected persons, a second phase follows, which is characterized by a new rise of body temperature, an icterus, a loss of proteins with the urine (proteinuria) and internal bleeding. These hemorrhages take a lethal course in about 50% of cases. The principal organs concerned are the liver, the brain, the muscles, the joints and the skin. As therapeutic possibilities are restricted to symptomatic measures, prophylaxis of insect bites plays an important role in the prevention of yellow fever. Moreover, an active yellow fever vaccination is available. Immunization is supervised by WHO and is only allowed to be performed in authorized institutions.

Cross-References

► Tropical Diseases and Travel Medicine

Yellow Fever Immunization, Active

► Yellow Fever Vaccination, Active

Yellow Fever Vaccination

Synonyms

Yellow fever immunization

Definition

In yellow fever vaccination, which was introduced in 1937, weakened viruses are administered. Only authorized institutions (like tropical institutes) are allowed to perform this immunization. The ► vaccine can be given to anyone from the age of 6 months. A single shot is sufficient, immunity starts about ten days after vaccination and lasts for ten years. According to the WHO, yellow fever immunization should be carried out routinely in all infants in the yellow fever belts of Africa and South America; travelers to these countries should be vaccinated as well. Contraindications for the yellow fever vaccine are immunodeficiency, acute illness with fever, a known severe allergic reaction to components of the vaccine and early pregnancy (up to the 12th week of gestation).

Yellow Fever Vaccination, Active

Synonyms

Yellow fever immunization, active

Cross-References

► Immunization, Active

Yolngu (Eastern Arnhemland, NT)

► Indigenous Health – Australooceaninan

Young Migrants

► Migrant Children

Zoonotic and Parasitic Infections

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Synonyms

Infectious diseases transmitted by animals; Infectious diseases due to leeches; Infectious diseases due to sponges

Definition

Zoonotic infections are communicable diseases that are naturally transmitted to humans by vertebrates. Transmission can take place directly, by foodstuffs or by animal vectors (ticks, mosquitoes, etc.). Parasites are living organisms that reside on other creatures where they feed and reproduce themselves. Diseases caused by parasites are called parasitoses.

Basic Characteristics

Transmission of Zoonoses

In 1958, zoonoses were defined by WHO as diseases that are naturally transmitted between vertebrates and humans. Parasites that carry infection, like ► head lice, ► pubic lice or ► body lice as well as ► scabies, are transmitted from one human to another. Worldwide, there are about 200 known zoonoses. Possible pathogens are viruses, bacteria, fungi, protozoa, worms and arthropods as well as prions (proteinaceous infectious particles). The latter are responsible for the transmission of bovine spongiform encephalopathy (► BSE). The spread of zoonotic infections is effected by an intensive contact between humans and animals. Besides an infection due to direct contact, transmission can take place by contaminated foodstuffs and drinking water or by other vectors, like mosquitoes, flies or ticks. Persons at high risk of contact infections are those who professionally deal with animals, like farmers, veterinarians or animal keepers, and employees in the meat processing industry. In the private sphere, ► toxoplasmosis, which is transmitted by cats, is a wide-spread infection. In regions where humans and animals live closely together, maybe even in the same room, there is a high risk of transmission of zoonoses that cause ► brucellosis, ► avian influenza and severe acute respiratory syndrome (► SARS); the latter infectious diseases of recent times are characterized by severe courses.

Characteristics of Parasitoses

Parasites are organisms that live in or on others and draw nourishment therefrom. The animal infested by a parasite is called a host. The effects of a parasite on a host can vary from hardly any impairment at all to weakening or damage or even death. Various parasites require different hosts for their cycles of development and some even require an intermediate host before infecting their final or definite host. In cases where sexual reproduction is part of the cycle, it, in general, only takes place in the final host. Micro- and macroparasites are classified according to their size. Viruses, bacteria, fungi and protozoa are microparasites. ► Trichomoniasis, ► leishmaniasis, ► amebiasis and ► cryptosporidiosis are caused by protozoa. Worms, lice, ticks, mites and fleas are macroparasites. While ectoparasites live on the surface of the host's body, endoparasites are found inside. The latter are divided into parasites that live

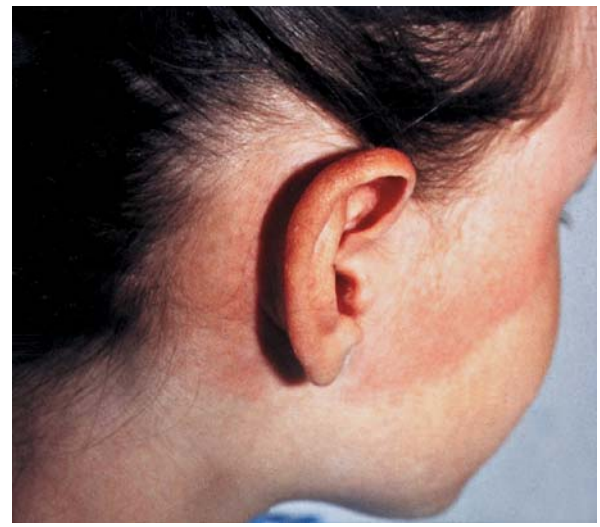
extracellularly, like *Giardia lamblia* (causing ► lambliasis), and those that live intracellulary, like plasmodia (causing ► malaria). While ecto- and endoparasites always stay on or inside their hosts, temporary parasites only come to the hosts for feeding. Temporary parasites are mosquitoes, flies, mites, ticks and predatory bugs. As the vectors are dependent on their biospheres, many of the infectious diseases transmitted by insects are only found in tropical or subtropical regions. Among others, so-called ► tropical diseases are: ► yellow fever, ► West Nile fever, ► Dengue fever, ► onchocerciasis, ► Japanese encephalitis, ► sleeping sickness and ► Chagas disease.

Prevention of Zoonoses and Parasitoses

To avoid zoonoses, compliance to hygienic rules is important when dealing with vertebrates. In animal keeping, cleanliness of sheds, stables and enclosures plays an important role. Contact with animals should not be too intense. This is of special significance for immunocompromised persons. As for pets, a regular deworming should be performed. Particular caution is necessary in dealing with unknown animals, especially free-running cats and dogs in vacation spots. Whenever animals show a strange behavior – unusually tame and trusting wild animals or unusually aggressive pets – they might be infected with ► rabies. Contact with animal spittle, or, especially, a bite, has to be avoided by all means. Dead (wild) animals should not be touched as they might be contagious. These rules should be taught to all children. Transmission of zoonotic and parasitic infections is a particular problem in developing countries (tropical/subtropical) as pathogens reproduce more quickly at warm temperatures and under poor hygienic conditions. However, the risk of fecal-orally transmitted (► fecal-orally transmitted infections) or ► waterborne infectious diseases must also be taken seriously in industrial nations. When dealing with foodstuffs – in both professional and private spheres – compliance to hygienic rules is the most important measure of prophylaxis. As for the zoonoses and parasitoses that are transmitted by vectors, there are different means of prevention. To begin with, insecticides can be used; moreover, the ► prophylaxis of insect bites has to be mentioned. ► Schistosomiasis can be avoided by refraining from bathing in stagnant tropical waters.

Infectious Diseases Transmitted by Ticks

Ticks (*Ixodes ricinus*) are small parasitic arachnids that feed on blood. They are found in moderate climatic zones and prefer a humid environment (soil, grasses, bushes and undergrowth). The period of greatest tick activity is in the muggy weather of spring and autumn. Ticks are responsible for viral ► tick-borne encephalitis (TBE) and for Lyme disease – ► Lyme borreliosis (LB) (Fig. 1), which is caused by the bacterium *Borrelia burgdorferi*. TBE-infected ticks are found in Europe in the bush- and woodland lying on the 7°C isotherm. Endemic regions are Russia, the Baltic countries, Poland, Austria, Czech Republic, Slovakia, Hungary, Slovenia, Croatia and parts of Germany and Sweden. Ticks, which are infected with *Borreliae*, are found in Middle Europe. A simultaneous presence of both pathogens in the same tick is possible. To avoid tick bites, it is recommended to wear covering clothing. As the risk of infection increases with the duration of the adhesion of the tick, the body should regularly be inspected for the arachnid. Ticks should be quickly removed, best by use of pincers. While bacterial Lyme borreliosis can be treated with antibiotics, no specific treatment is available for the viral TBE. As a preventive measure, the population of endemic regions and travelers can receive an active TBE vaccination (► TBE vaccination, active).

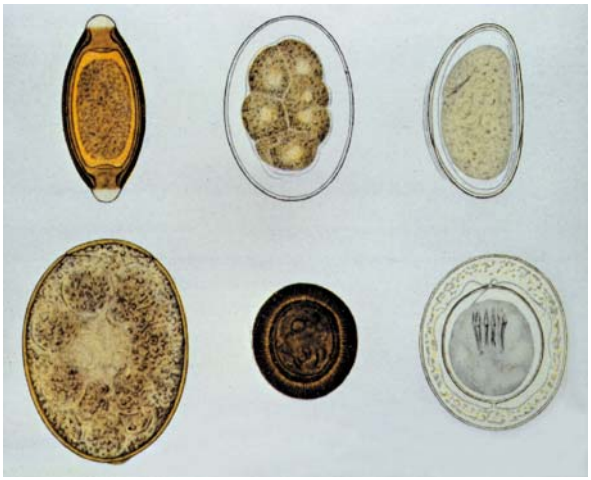


Zoonotic and Parasitic Infections, Figure 1 Erythema migrans in Lyme borreliosis. Lentze, Schaub, Schulte, Spranger (2002)

Worm Infections

Diseases due to worms (vermes) are spread worldwide. Most frequently, infection takes place by the ingestion of contagious worms in various stages of development (eggs, larvae, nymphs); food hygiene plays an important role in prevention. In ► schistosomiasis, ► strongyloidiasis and ► infections with *Ancylostoma duodenale*, larvae can actively penetrate the intact skin. Worms, which are of significance for humans, are divided into flatworms and roundworms (nematodes); tapeworms (cestodes) and flukes (► trematodes) are flatworms. Humans most frequently are the final hosts of cestodes; typically, there is an ► intestinal tapeworm infection. ► Cysticerciasis is an infection due to the infestation of larvae of the pork tapeworm. Humans are wrong intermediate hosts for the dog- and fox tapeworms; an infection with larvae causes ► echinococcosis. *Schistosoma* and other flukes belong to a species of ► trematodes. With more than 20 000 various species, nematodes show a great diversification. The most common worldwide infection with a roundworm is ► ascariasis (Fig. 2). Other infections with nematodes, which are significant for humans, are ► enterobiasis, ► trichuriasis, ► trichinosis, ► ankylostomiasis, ► strongyloidosis, ► dracunculiasis and ► onchocerciasis. Diagnoses of worm infestations are usually done through microscopic detection of eggs or larvae in the stool (Fig. 3); sometimes, worms, or parts of them, are visible in the stool with the naked eye. In ► trichinosis an increase of eosinophils in the white blood cell count (up to 89%) is diagnostic; in infestations by other worm species there is no obligatorily elevation in the number of eosinophils. Worm infestations are treated with ► anthelminthic therapy. Praziquantel is effective against tapeworms and schistosomes, mebendazole against roundworms, hookworm, threadworms and whipworms.

Zoonotic and Parasitic Infections, Figure 2 Case of massive ascariasis; surgically removed worms in a 6-year-old boy with ileus (from Schubert S, Granz W (1988)



Zoonotic and Parasitic Infections, Figure 3 Helminthes eggs: *Trichiuris trichiura*, *Anylostoma duodenale*, *Enterobius vermicularis* (upper row from left to right); *Diphyllobotrium latum*, *Taenia saginata* and *Taenia solium*, *Hymenopepsis nana* (lower row from left to right); native; magnified 650:1 (from Gönnert and Koenig 1968). Lentze MJ, Schaub J, Schulte FJ, Spranger J (2002)

Cross-References

► Acute Life-Threatening Infections
► Amebiasis
► Anthelminthic Therapy
► Ascariasis
► Avian Influenza
► Body Lice
► Brucellosis
► BSE
► Chagas Disease
► Cryptosporidiosis
► Cysticercosis
► Dengue Fever
► Dracunculiasis
► Echinococcosis
► Enterobiasis
► Food-Safety and Fecal-Orally Transmitted Infectious Diseases
► Head Lice

- ▶ Infection with Ancylostoma duodenale
- ▶ Intestinal Tapeworms
- ▶ Japan Encephalitis
- ▶ Lambliasis
- ▶ Leishmaniasis
- ▶ Lyme Borreliosis (LB)
- ▶ Malaria
- ▶ Onchocerciasis
- ▶ Prophylaxis of Insect Bites
- ▶ Pubic Lice
- ▶ SARS
- ▶ Scabies
- ▶ Schistosomiasis
- ▶ Sleeping Sickness
- ▶ Strongyloidiasis
- ▶ Tick-Borne Encephalitis (TBE)
- ▶ Tick-Borne Encephalitis (TBE) Vaccination
- ▶ Toxoplasmosis
- ▶ Trematodes
- ▶ Trichinosis
- ▶ Trichomoniasis
- ▶ Trichuriasis
- ▶ Tropical Diseases
- ▶ Waterborne Infectious Diseases
- ▶ West Nile Fever
- ▶ Yellow Fever

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Wikipedia. Zoonosis. http://en.wikipedia.org/wiki/Zoonosis

z-Score

The z-score is the deviation of an individual value from the mean measured in standard deviations:

$$z = \frac{x_i - \mu}{\sigma},$$

where x_i is an individual observation, μ is the population mean, and σ is a population standard deviation. The numerator value $x_i - \mu$ is called deviation score. The population standard deviation in the above formula usually is not known, and therefore may be estimated using sample data.

The z-score is dimensionless. It points out how far the observed value is located from the mean. For example, if a z-score is –3, then the observed value is located three standard deviations below the mean. The z-score is positive when the observed value is above the mean. z-Scores have a mean of zero and a standard deviation of one. It is informative when the empirical distribution is close to a normal distribution. In such cases, z-scores may be used to compare relative locations of values from distributions with different means or standard deviations. z-Scores may be transformed to scores with any mean and standard deviation, to avoid negative numbers or decimals. For example, if T-scores have a mean of 50 and a standard deviation of 10, then multiply the z-scores by 10 and add 50 to each score (z-scores × 10 + 50).

Entry List

Essays are shown in blue, synopses are shown in blue and bold type.

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