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Louis G. Pol
Richard K. Thomas

The Demography of Health and Healthcare

3rd Edition

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The Demography of Health and Healthcare

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The Demography of Health and Healthcare

Third Edition

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Chapter 1
Health Demography: An Evolving Discipline

1.1 Introduction

Health demography is a subdiscipline within the field of demography that involves the application of the content and methods of demography to the study of health and healthcare. *Demography*, or the study of human populations, focuses on the study of the size, distribution, and composition of populations, as well as related dynamic processes such as fertility, mortality, and migration. *Health* and *healthcare* refer, respectively, to the condition of health as experienced by individuals and populations and to the operation of the healthcare delivery system. Health demography concerns itself with the manner in which demographic attributes influence both the health status and health behavior of populations and how, in turn, health-related phenomena affect demographic attributes. Health demography shares an interest in individual-level health issues with clinical medicine and in population-level health issues with social epidemiology.

The scope of health demography is quite broad, and there is little within the discipline of demography that does not have some relevance for the study of health and healthcare. At the same time virtually every aspect of "health" is amenable to study by means of demographic techniques and perspectives. Whether the issue is the cause or consequence of disease, variations in health status among populations, utilization levels for various health services, the attitudes of health professionals, disparities in medical outcomes, or even the organization of the healthcare delivery system, it can be better understood through the use of demographic perspectives, concepts, methods, and data.

Since health demography is an applied science the emphasis of this book is not on the development of basic knowledge – although that is certainly important – but on the application of demographic concepts and methods to the understanding and solution of concrete problems in the delivery of healthcare. The focus is on the ways in which demographers and others can use demography to inform health policy and address challenges facing the healthcare delivery system.

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1.2 The Origins of Health Demography

The subject matter of health demography is not new. Its roots are found in a number of existing disciplines. In fact, health demography represents a synthesis and reformulation of concepts and substantive data previously developed in a variety of other fields. Much of its character reflects the convergence of traditional demography with aspects of biostatistics and epidemiology. A number of social sciences have provided important concepts and theoretical frameworks that serve as a basis for demographic analysis. These disciplines include sociology, anthropology, geography, and economics.

1.2.1 Demographic Roots

Although some aspects of demography are more obviously linked to the study of health and healthcare than others, there is probably no aspect of the discipline that does not have some relevance. Among the dynamic processes studied by demographers, the analysis of mortality is most directly linked to the health of a population. The study of morbidity is of increasing importance due to the changing nature of illness in contemporary society. Although fertility is not necessarily considered a health-related phenomenon, reproductive patterns have numerous indirect implications for health and health behavior. Even the process of migration is a contributor to the health status and health behavior of the affected populations.

Among the demographic attributes associated with health status and health behavior are basic population characteristics such as size, distribution, and composition. Size and distribution have definite implications for health services demand and utilization, while the compositional attributes of the population (e.g., age, sex, and race) are not only linked to health status but are also excellent predictors of health behavior. Other compositional attributes, such as marital status, socioeconomic status, and religion, are correlated with both health status and health behavior.

Early work in applied demography placed the emphasis on the use of demographic methods in the public policy arena – many of which focused on estimating and projecting population size and composition. More recently a different family of applications has arisen that have been termed *business demography*. Applications to business activities draw from the common body of demographic data and methods; by merging them with business data and perspectives, a unique way of looking at business problems and opportunities emerges. A growing number of applications in health demography reflect a business demography approach.

1.2.2 Epidemiological Roots

Epidemiology literally means the study of epidemics. Its modern usage, however, refers to the study of the origin and progression of illness within a population. The scope of the field has steadily broadened from a focus on the etiology of acute illnesses to the study of the cause, course, and correlates of a wide variety of health conditions. Many epidemiologists are physicians (epidemiology is one of several medical specialties), while other epidemiologists reflect a broader conceptualization of the field. The notion of "social epidemiology" has become widely accepted by a variety of disciplines and emphasizes the distribution of illness within the population and the health behavior of various social groups.

Epidemiology remains the "detective work" of healthcare, and its emphasis on populations rather than individuals makes it a kin of demography. Epidemiological investigation has increasingly shifted from the relationship between environmental disease agents and human health conditions toward the link between demographic characteristics and the prevalence and distribution of various health risks. In fact, much of the epidemiological research since the 1980s has focused on the impact of changing demographic attributes on health status.

1.2.3 Social Science Origins

1.2.3.1 Sociology

During the 1950s, *medical sociology* emerged as a distinct subspecialty within sociology. Although there had always been an epidemiological influence within the field, medical sociology was historically characterized as a sociology *of* medicine rather than a sociology *in* medicine. Medical sociology's early practitioners were primarily on the outside of medicine looking in; their focus was on the application of concepts from sociology to the study of the organization of healthcare. By the 1960s, however, medical sociology had taken on a strong social epidemiology character. Research findings that established a connection between poverty and poor health generated interest in the social and demographic correlates of health status and health behavior.

Medical sociologists have led the effort to document the relationship between health characteristics and age, sex, race, marital status, religion, and other demographic variables. They have also demonstrated the extent of the interaction among various demographic factors and have been influential in the redefining of the concepts of health and illness. Currently, much of the emphasis in medical sociology—and, indeed, in all health-related disciplines—is focused on the persistent health disparities found within the U.S. population. Medical sociologists have been in the forefront of research on the extent to which demographic attributes such as income level and education affect health status and health behavior and a more expansive "sociology of health and healthcare" has emerged.

1.2.3.2 Anthropology

Anthropologists were among the first social scientists to become involved in research on cultural definitions of health and the role of healthcare in society. Anthropologists have traditionally emphasized non-Western cultures in their research, and the study of healthcare has for the most part not been a distinct component of their ethnographic fieldwork. More recently, however, medical anthropologists have turned their attention to the healthcare systems of contemporary societies. In the U.S. in particular, applied medical anthropology has gained momentum, and its practitioners have contributed to our understanding of health and healthcare through the study of: (1) the subcultural differences associated with health status and health behavior; (2) the impact of lifestyles on health status and health behavior; and (3) alternative healthcare systems, more so than others, they emphasize the application of qualitative research methodologies to the study of health and healthcare.

1.2.3.3 Geography

Medical geography is a relatively new field concerned with the spatial distribution of various health-related phenomena and the relationships of various health-related phenomena within space. Thus, medical geography is concerned with the spatial distribution of disease, health conditions, healthcare providers, and health facilities. As such, the discipline links phenomena identified through social epidemiology to geographic referents.

The methods of medical geography can be used to explain the onset and progression of health conditions, analyze physician practice patterns, and determine gaps between the demand for services and the facilities available to provide those services. The increasing power of geographic information systems (GIS) is now being applied in healthcare settings and the development of user-friendly GIS software makes it possible to view health phenomena along a spatial dimension.

1.2.3.4 Economics

Medical economics, a subarea of economics focusing on healthcare, has been well established since the 1960s. Concern over spiraling healthcare costs during the 1980s further contributed to the interest in medical economics among both economists and health professionals. By the 1990s, concern over the financing of healthcare had come to overshadow many other aspects of healthcare delivery.

The interface between economics, healthcare, and demography is evidenced at the system, practitioner, and consumer levels. Medical economists study healthcare expenditures at the national or system level in the light of the demographic makeup of the population, analyze the impact of government programs like Medicare and Medicaid on the provision of care, and calculate the impact of proposed policy changes affecting healthcare delivery. The type of care chosen by consumers – indeed, the decision to seek care at all – is a reflection, partly at least, of their economic status. This, in turn, is a reflection of the demographic attributes of the particular consumer population.

As the emphasis of the field has shifted to a more contemporary approach, medical economics is increasingly being referred to as health economics. Certainly the healthcare reform discussions of the early twenty-first century were informed to a great extent by the work of health economists.

1.3 Overview of the Book

1.3.1 Objectives

This book represents an effort to delineate the nature and scope of the evolving discipline of health demography. As such, it has multiple objectives. The first objective is to further refine the parameters of the field. Given the far-ranging topics that could conceivably fall under that heading, this in itself is a challenging task. In order to make this task manageable, the approach has been to work systematically through the various concepts in demography and relate each to health and healthcare.

Even though the term health demography is increasingly appearing in the demographic literature, only in recent years has the concept become well developed and the content of the field distinct. The connection between demographic trends (e.g., the aging of the U.S. population) and health-related concerns (e.g., the unique health care needs of an aging population) are much more prevalent in academic publications and the media than ever before. The approach taken here requires the integration of materials from epidemiology, the social sciences, and the clinical and administrative domains of healthcare. The ultimate goal is a book that defines the concepts that have saliency for health demography, identifies the relevant theoretical frameworks, and traces the various disciplinary streams that are contributing to its evolution as a distinct field.

The second objective of the book is to demonstrate the relevance of demography for the study of health status, health behavior, and healthcare delivery. To fully appreciate the nature of health conditions in contemporary society, it is essential to understand the demographic context in which these conditions exist. An examination of the distribution of health problems within the U.S. population makes it clear that virtually no health problem is randomly distributed within the population. In almost every case, certain groups are at greater risk than others. All other things being equal, males and African Americans are at greater risk of early mortality than females and whites, the elderly are at greater risk of chronic disease than the young, and the single are at greater risk of mental illness than the married. The salience of this approach for the study of health and healthcare has been underscored by the now-massive volume of research linking health status to individual lifestyles. Since lifestyle variations are rooted to a great extent in demographic traits, health demography provides the framework for an examination of the correlates of health status and health behavior.

The third objective of the book is to illustrate the application of demographic techniques to the study of health and healthcare. The authors' professional orientations are toward applied demography, and the material herein is designed to demonstrate the variety of ways in which demographic analyses are useful in the study of health status, health behavior, and healthcare delivery. There is virtually no concept in demography that does not have application to the study of healthcare. In addition, demographic techniques such as cohort analysis, survival analysis, and estimation and projection methodologies are increasingly becoming tools for health services research, planning, and marketing.

One final point on demographic applications is appropriate in view of the changes occurring in the healthcare field. In the mid-1980s, healthcare administrators came to realize that the delivery of healthcare in a competitive marketplace requires business acumen. Increasing competition and reduced profit margins transformed philanthropic operations into business entities, forever changing the characteristics of healthcare organizations. Not only are business principles being applied in the operation of healthcare organizations, but new functions, long common to other sectors, are becoming increasingly important in healthcare. Activities like research and development, planning, marketing, and program evaluation are being incorporated along with this new management orientation. The one factor that all of these have in common is an underlying foundation in demographic techniques and data.

The questions being asked today in healthcare – Who are my "customers"? What is the market for this service? What products are the most profitable? What is the least costly way to deliver services? – can all be addressed through demographic analysis. The decision-making process, at both the societal and the institutional levels, is increasingly being guided by demographic, not clinical, considerations. What has become the driving force behind national healthcare policy? The aging of the U.S. population. What has become perhaps the major concern for the healthcare entities at the operational level? The demographic profile of potential customers. Today, in fact, virtually no discussion takes place among policy makers or institutional planners that is not prefaced by an exploration of the demographic context of the issues at hand. Indeed, much of the discussion of health policy thus far in the twenty-first century has focused on the impact of demographic trends on the healthcare system (e.g., population aging, increased immigration, unemployment).

This book, perhaps more than anything else, describes what demography can do for healthcare. The major contributions of demography to the study of health and healthcare are in the areas of concepts, techniques and data. An understanding of key demographic *concepts* has become increasingly important for health professionals. Healthcare has already begun incorporating the terminology of business into its vocabulary; it is rapidly expanding its demographic vocabulary as well. Terms like cohorts, population pyramids, survival curves, excess mortality and standardization are increasingly heard in discussions on healthcare planning. The new emphasis on patient characteristics, quality assessment, and market analysis all mandate the incorporation of demographic concepts. The discussion surrounding healthcare reform has further contributed to the need for an adequate grasp of demographic processes.

The healthcare field is also manifesting a growing need for *techniques* developed by demographers. As competition has increased and profit margins have dwindled, healthcare organizations are facing unprecedented challenges to their survival. There is a great need for substantive content from demography and for the incorporation of standard demographic techniques into the health planning process. In the past, it may have sufficed to purchase demographic or healthcare data from vendors and to use them unquestioningly. In today's environment, an appreciation of the underlying analytical techniques used to produce those data has become increasingly necessary. The reporting requirements embedded in the Affordable Care Act reinforce the importance of access to demographic data for health service areas.

Today's challenges must be faced with an in-depth understanding of estimation and projection methodologies. Further, cohort analysis has become essential for studying the aging of populations, since the types of services needed and the type of financial reimbursement may directly or indirectly be a function of the age mix of the organization's patients. Migration estimation methodologies have become increasingly important in the determination of future market needs.

The healthcare field also requires demographic *data*. Since the 1980s there has been an explosion in the demand for information on health and healthcare much of which is demographic in its orientation. Indeed, a whole new industry has emerged that is dedicated to the provision of data to the healthcare industry. Today, few healthcare organizations can survive without an in-depth understanding of the demographic dimensions of their markets, and managed care plans and other corporate forms of healthcare delivery rely heavily on data in their decision-making processes.

Health planners and administrators need to be able to speak knowledgeably concerning the demographic profiles of the users of various services, the respective needs of populations with varying demographic characteristics, and the attributes of various categories of patients. An understanding of such basic information as regional variations in practice patterns or the factors that distinguish a rural service area from an urban one may mean the difference between a program's success and failure. With the resurgent interest in consumer perspectives and patient satisfaction, the link between the demographic characteristics of the patient population and the patient's knowledge and perceptions of a particular provider of healthcare becomes crucial information.

Ultimately, healthcare professionals must develop a demographic *perspective* on the factors that influence health status and health behavior. In today's healthcare environment, there is a pressing need to understand the motivations behind consumer behavior and the manner in which these behaviors are linked to demographic characteristics. After all the projections are made and all the equations solved, it may be that demography's unique perspective is the primary contribution that health demography can offer to the healthcare field.

It should be apparent by now that the authors consider health demography a social science. While it is true that some aspects of the population's health status may be linked clearly to biology (e.g., only women have uterine cancer and mostly African Americans have sickle-cell anemia), the emergence of chronic conditions as the major health problem has clearly introduced a social dimension to any study of epidemiology.

More important, however, is the fact so often forgotten by the medical community that health behavior is social behavior. Whether one is considering the behavior of individual physicians or patients, of hospitals administrators, or of national insurance carriers, social factors play a major role in the actions taken. The patient's decision to visit a particular physician, the psychiatrist's choice of therapy, the hospital board's decision not to allow abortions, and the insurer's decision to increase its premiums for male hairstylists and interior decorators all reflect social, political, and economic considerations to a greater extent than clinical considerations. In today's environment, an understanding of the social dimension of health behavior is crucial. In turn, an appreciation of the social factors in health behavior demands an understanding of the demographic attributes of the population.

1.3.2 The Audience

This third edition of *The Demography of Health and Healthcare* is designed to appeal to academic and professional audiences alike. Within both groups it is expected to have relevance for a wide variety of disciplinary areas. Within academia, the primary audience is expected to be within demography. Demography instructors should benefit from a presentation of this evolving field, while demography students will be exposed to an area that is of growing relevance. Virtually all substantive areas within demography are included, and illustrations of the applications of many of the methods developed by demographers are presented.

Students in other disciplines will also constitute important audiences. Social science and public health students can benefit from the application of demographic concepts and methods to the solution of problems in healthcare delivery. This book should provide a useful framework and some practical examples of applied social science, especially at a time when healthcare providers are increasingly asking demography-related questions. In addition, students in healthcare marketing will increasingly require an appreciation of demographic issues. Healthcare long ago became market driven with demographic analysis an important component of the market research process.

Another academic audience includes students in the various health professions. Not only do clinicians find themselves in increasing need of demographic information, but most clinical training programs now include an administrative or management component. Medical sociology and related courses have long been recognized as essential background for clinicians and non-clinicians alike. A well-rounded education for healthcare professionals will increasingly call for an understanding of health demography, particularly as the emphasis moves away from the treatment aspect of healthcare and toward education and prevention.

Perhaps an even greater need exists among healthcare administration students. As healthcare has become more competitive and healthcare organizations have begun acting more like other businesses, the need for demographic information on the part of administrators has grown. Health demography provides the basis for performing such tasks as planning, business development, marketing, and program evaluation.

The book is also expected to have wide appeal among a broad range of healthcare practitioners. Its illustrations of the application of demographic techniques to concrete problems will allow health professionals to improve their clinical and administrative skills. Clinicians should be better able to understand their client populations, while administrators should be able to improve their management effectiveness through the use of these techniques. The book should serve as a basic reference for planners, researchers, and epidemiologists who are working in healthcare settings. Similarly, healthcare consultants should find this a useful guidebook for the incorporation of demographic data and methods into their toolkits.

Independent practitioners such as physicians, dentists, and optometrists require demographic information for practice planning and development. The healthcare market has become increasingly segmented along demographic dimensions, with medical specialists often focusing on patients along the dimensions of sex (obstetrics, gynecology) and age (pediatrics, geriatrics). This segmentation has increased as healthcare programs have come to specialize in women's health, child health, ethnic health, or rural health, among other areas. Now hospitals are developing "product lines" that are geared specifically toward particular demographic categories (e.g., a geriatric product line) or have their foundation in some demographically based variable (e.g., a cardiology product line).

Health planners at both the system and organizational levels find their analyses increasingly predicated upon demographic data. Discussions regarding services to be offered and the placement of facilities and personnel are more and more demographically oriented. Health planners are being asked to determine the most appropriate sites, healthcare marketers are being asked to target the market for particular services, and healthcare consultants are being asked to develop plans for the expansion of clinics or physician practices. The basic knowledge underlying all of these activities can be primarily found within the scope of what we have defined as health demography.

Despite its intent to survey the field of health demography, there are several things this book is not. Although it introduces basic demographic concepts and methodologies to readers who may not be familiar with them, it is not a demography textbook. The technical aspects are kept to a minimum and equations are notably absent in the main text. On the other hand, working "models" that can be applied to concrete healthcare problems are common.

While the material is adequately documented, an attempt has been made to not encumber the narrative with too many references. Since this is not intended to be a standard textbook, but a guidebook for students and practitioners, more attention has been given to the supplementary resources offered at the end of each chapter than to references within the text. Traditional demographers may even find that some of the "standard" references are absent. This reflects the objective of providing a working document for practitioners, rather than convincing readers that the authors can cite the conventional sources.

Finally, readers are not required to read this book cover to cover in order to achieve maximum benefit, although we hope that most readers will do so. The intent has been to structure the material to allow the experienced demographer or health services researcher to skip over familiar material and directly access the appropriate sections. Practitioners can use it as a reference work and quickly locate the one concept or method that is needed. It is hoped that these approaches can be utilized without interrupting the overall flow of the book.

1.4 Organization of the Book

This book is organized in such a manner as to meet the needs of both those with limited knowledge of demography and/or healthcare and those with extensive knowledge of one or both of these areas. Chapter 2 provides an overview of the U.S. healthcare system and introduces the basic concepts necessary for an intelligent discussion of its components and operation. Readers with extensive healthcare background may want to forgo this section, although important linkages between healthcare and demography are discussed. This chapter provides a framework within which to examine the demographic dimensions of health and healthcare.

Chapter 3 discusses population size, distribution and concentration and the implications of these demographic attributes for health and healthcare. Chapter 4 extends the discussion of the demographic dimensions of human populations by examining the compositional traits of interest to health demographers. on the basic concepts and processes within the field of demography. Chapters 5 through 7 address the dynamic processes of fertility, mortality, and migration and examine how the interaction of these processes contribute to a population's health status and health behavior. A separate chapter on morbidity (Chap. 8) has been added to this edition because of the increasing relevance of morbidity for any treatment of health demography. Those with extensive demographic backgrounds may wish to skip over some parts of these chapters, although all contain worthwhile examples and illustrations from health demography and useful substantive information relevant to these topical areas.

Because of the uniqueness of the healthcare field, Chap. 9 is devoted to data issues. Research in healthcare settings has its peculiar characteristics, and the sources of data are often obscure. While it is possible that more date are generated here than in any other sector of society, the availability of these data is probably more restricted in healthcare than in any other field. Since there is no central coordinating unit to serve as a clearinghouse for healthcare data, the location, form, and accessibility of health-related data are problematic.

Chapters 10 and 11 represent the application of much of the earlier material to health-related issues. They are devoted to the demographic correlates of health status and health behavior for both physical and mental illness, with these chapters perhaps illustrating the essence of health demography. It is here that the issues of who gets sick, why they get sick, and how they respond are addressed. Chapter 12 takes the material reviewed up to this point and discusses the implications of demographic trends for health and vice versa and examines the manner in which policy decisions impact healthcare and the extent to which health-related trends drive policy-making.

The material presented in this book is generally limited to the study of health and healthcare in the United States. Although occasional references are made to situations in other societies for comparison purposes, no attempt is made to generalize the material here to all societies. It should be made clear, however, that the demographic concepts discussed here have relevance for other social systems as well.

Selected Readings

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Health Services Research
Inquiry
Medical Care
Population and Development Review
Population Index
Population Research and Policy Review
Population Studies
Public Health Reports
Social Science and Medicine
Sociology of Health and Illness: A Journal of Medical Sociology

Websites

Centers for Disease Control and Prevention (www.cdc.gov)
National Center for Health Statistics (http://www.cdc.gov/nchs/)
National Institutes of Health (http://www.nih.gov)
U.S. Census Bureau (http://www.census.gov)
University of Michigan (http://psc.isa.umich.edu)

Chapter 2
Health and Healthcare: An Introduction

2.1 Introduction

Health demography focuses on the implications of population characteristics for health and healthcare. However, as central as these concepts are to our discussion, they are surprisingly difficult to define, despite the obsession of American society with both of these concepts. What constitutes health – and its counterparts sickness, and disease – depends on one's frame of reference. Although the term *health* clearly refers to a condition of human individuals and populations, there is no consensus on a definition. Medical sociologists studying the meanings of these terms have had to settle for several definitions, each linked to a different explanatory model. The various definitions and the perspectives they represent will be discussed later in this chapter.

The concept of *healthcare* is also difficult to define and even more difficult to describe in meaningful terms. Is healthcare an industry? A system? An institution? In actuality, it is all of these and more. As with the concept of health, much of what healthcare *is* depends on one's perspective. Although hospital-based medical services involving advanced technology automatically come to mind when the issue is raised, only a fraction of the activities of the healthcare system is directed toward the management of life-threatening conditions. The difficulty of defining healthcare is exacerbated by the system's size, complexity and technological emphasis, as well as by the diversity of functioning units, its various levels of "control," its combination of public, quasi-public, private interests, its mixture of for-profit and not-for-profit entities, and its method of funding. In the final analysis, healthcare is what society defines as healthcare. In the contemporary United States, healthcare has come to include formal institutionalized care along with "alternative" therapies, self-care, and any other activities designed to prevent the onset of disease, treat illness, improve the quality of life, and/or preserve health.

For our purposes, "health" hereafter refers to the health status of the population in terms of both its individual and aggregate dimensions. "Healthcare" refers to society's arrangements for maintaining or improving the health status of the population, again either individually or collectively. Both concepts, it should be noted, are

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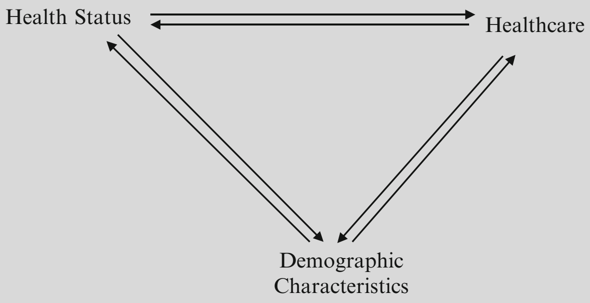
modern in their origin. Health, as an objectified state, was generally not recognized in premodern societies. A rational view of the world (along with a scientific orientation toward disease) was required before society could conceptually distinguish between health and sickness. It was only in the twentieth century that notions of health and healthcare came to be recognized as distinct concepts. The emergence of healthcare as a separate institution required a society that could recognize and support a distinct healthcare function.

Although this book is not intended to be a sociological or political work, the considerations noted above are central to the demography of health and healthcare. The social, economic, and political characteristics of a particular society are both a result of and a determinant of the demographic composition of that society. Similarly, the way society views the sick and disabled reflects these factors quite independently of clinical perceptions. It has often been stated that a society should be judged by how well it treats its sick, and the way society treats its sick is a reflection of demographic considerations as well as social, economic, and political perspectives.

2.2 The Relationship Among Health, Healthcare and Demography

Before examining the nature of health and healthcare in depth, it is worthwhile to discuss the relationship among health, healthcare, and demography. This complex relationship is illustrated by the model depicted in Exhibit 2.1. As can be seen, each of the three components of the model interfaces with the other two in a reciprocal relationship.

Exhibit 2.1 The Interdependence of Health Status, Healthcare and Demographic Characteristics



The relationship between demography, health and healthcare is rooted in the parallel development of these three concepts. The demographic characteristics of the U.S. population serve as both determinants and consequences of the relationship between the population and its system of healthcare. For example, if the population exhibits high health status it can be expected to have low mortality rates and a relatively old age structure since attrition through death will be minimal. At the same time, the demographic characteristics of the population will have an effect on its health status and health service needs. For example, the age composition of the population will be reflected in the types of health problems that are common. Exhibit 2.2 addresses the interface among health, healthcare and demography.

Exhibit 2.2 The Interface of Health, Healthcare and Demography: A Tale of Two Societies

Perhaps the best way to illustrate the interrelationships among health, healthcare, and demography is to present two contrasting examples. This might be done by depicting two quite different societies and the connections between these three factors in each. An appropriate contrast exists between contemporary U.S. society and any number of societies generally referred to as "developing." Examples of the latter might include Bolivia, Chad and Haiti.

The developing society is characterized demographically by relatively high fertility and moderate mortality rates. These dual processes result in an age structure that is relatively young (with a median age of perhaps 17 or 18) and has approximately equal numbers of males and females. Population growth tends to be high, since death rates have fallen well below birth rates. The standard of living is generally low, and educational attainment is limited.

The developing nation will invariably be characterized by poor health status in terms of both morbidity and mortality. The most common problems are acute rather than chronic conditions. The health threats of modern societies (such as heart disease and cancer) are rare, since few in the population live long enough to develop these conditions. Instead, the major health problems are communicable diseases, such as yellow fever and tuberculosis, and infectious diseases affecting the digestive system. The rate of infant mortality is relatively high, with infants accounting for a larger share of deaths than the elderly. Wide variations in mortality by age do not exist, since the major killers do not discriminate in terms of age (or gender or any other factor, for that matter).

(continued)

Exhibit 2.2 (continued)

The healthcare delivery systems in developing societies generally are poorly structured, at least by modern Western standards. This lack of development reflects an absence of the technology, medical manpower, and financing necessary for the establishment of a modern healthcare system. It also reflects the absence of certain cultural values that underlie the transition to a modern healthcare system. Most important, however, the health needs of the population require a healthcare system quite different from that of the United States. The greatest needs are in the areas of public health, disease prevention, and education. Sophisticated surgical techniques are of limited usefulness; few live to an age where this type of intervention would be appropriate. The elimination of contagious disease has to be the focus of the system, and the community – not the individual – must be considered the "patient."

The relationships that exist between these three factors in the United States reflect the differences between the societies in question. Demographically, the United States is characterized by relatively low rates of fertility and mortality. This has resulted in a bullet-shaped population pyramid; the narrow base reflects decades of low fertility, while the wide top reflects the aging of the population as a result of low mortality. The median age is around 35 years, and the proportion of females is well over 50%. Income levels and educational levels are relatively high.

The health problems that exist are those of a modern society. The main factors in morbidity are chronic conditions such as arthritis, diabetes, hypertension, and chronic respiratory diseases. Acute conditions are proportionately rare, with the leading causes of death being heart disease, cancer, and stroke. Deaths from communicable diseases are rare. The overall health status is considered high. Importantly, the majority of deaths are a consequence of the lifestyles practiced by members of society, with dietary habits, smoking and drinking patterns, and risky sexual behavior being major factors. Mortality tends to be highly age specific, since a wider variety of conditions account for death than in developing societies.

The healthcare system in the United States is highly developed and complex. Its main focus, however, is on individual (not community) health. The public health component is limited and the medical management of chronic illness consumes a large portion of the system's resources. Since the threat of death is not as pressing as in developing societies, the system focuses on activities that enhance the quality of life. Thus much of the resources are devoted to mental health services, cosmetic surgery and elective surgery, treatments that contribute to lifestyle preferences more than to longevity. The aging of the population has mandated the development of services geared to the elderly population. Through its operation, the healthcare system contributes to the continued aging of the population and the relative importance of chronic conditions for health status.

A direct relationship exists between a population's health and its healthcare system, and a population's healthcare needs ideally are reflected in the organization of the healthcare delivery system. For example, health problems stemming from the effects of communicable diseases demand a system that emphasizes public health measures, such as improved sanitation and immunization. Health conditions that are a function of problems of living demand a system that emphasizes medical management and lifestyle-oriented services.

At the same time, the operation of the healthcare system affects, to a great extent, the health status of the population. A highly developed healthcare delivery system should (but does not always) result in higher health status. A system that prolongs life, for example, contributes to the transition from a population characterized by acute conditions to one characterized by chronic conditions. Thus, there is a shift in the nature of the problems as the transition occurs, not an overall decrease in the incidence of health problems.

The demographic characteristics of the population interface with the healthcare system to form a complex relationship. The age structure, for example, influences the nature of healthcare delivery. A very young population requires quite different services than does a very old population. At the same time, a system that aggressively attempts to reduce mortality contributes to the development of a society that is both older and numerically female dominated. A system that aggressively promotes birth control as a health measure would have a similar effect on the age and sex structure of the population.

The changes in utilization patterns during the twentieth century can be attributed in part to changes in the demographic attributes of the U.S. population. These changes include increased incomes, higher educational levels, and the development of an industrial structure that to a certain extent subsidizes health services. Better education has increased the population's appreciation of health services, despite the fact that health status tends to increase with increasing education. Higher incomes and employer-sponsored insurance have been enabling factors in the utilization of healthcare.

2.3 The Societal Context of Health and Healthcare

2.3.1 The Institutional Framework

The healthcare system of any society can only be understood within that society's sociocultural context. No two healthcare delivery systems are exactly alike, and the differences are primarily a function of the contexts in which they exist. The social structure of the society, along with its cultural values, defines the healthcare system just as it does in any other social system. The form and function of the healthcare system reflect the forms and functions of the society in which it resides.

Every social system or society has certain functions the performance of which are requisite for survival. These include reproduction, socialization, distribution of resources, maintenance of internal order, provision for defense, provision for the health and welfare of its population, and provision of a means for dealing with the supernatural. Each society establishes institutions for meeting these prerequisites. Thus some form of family evolves to deal with reproduction, some form of educational system to deal with socialization, some form of economic system to deal with the allocation of resources, and so forth. Some form of healthcare/social services system evolves to deal with the health and welfare of the population.

Obviously, not all societies are populous enough or complex enough to support fully developed institutions of each of these types. In cases where this situation exists, a single institution may perform the functions of two or more institutions. For example, the family within a traditional society performs the functions of the educational institution, the economic institution, and others as well. Functions allocated to the healthcare system in modern societies are typically performed by the family or the religious institution in premodern societies.

The form that a particular institution takes varies from society to society. The society's cultural history, its environment, and its relationship with other societies contribute to the shaping of its various institutions. There are numerous forms that can be taken by the family, the political institution, and the economic institution, with the particular form being uniquely tailored to the situation of that society. Similarly, there are a variety of forms characterizing the healthcare institution. One might speak in terms of "traditional" healthcare systems (e.g., shamanism among American Indians), capitalistic systems (e.g., for-profit healthcare in the United States), socialized systems (e.g., the National Health Service in Great Britain), and so forth. No one system is intrinsically better or worse than any other; each has evolved in response to social, cultural, and environmental considerations, and each is uniquely suited to its particular society.

It is only in modern industrial society that healthcare has developed as a distinct institution. For most of human history, society's provision for the healthcare needs of the population has occurred within the framework of the family or religious institution. Traditional societies lack the scientific underpinnings for the development of healthcare systems. An absence of emphasis on rationality and a dependence on the supernatural as an explanatory factor in the existence of health, illness, and death preclude the development of a distinct healthcare system within premodern societies.

Healthcare provides possibly the best example of the emergent dependence on formal solutions in modern societies, since it is an institution whose very development was a result of this transformation. Our great-grandparents would have considered the formal healthcare system the last resort in the face of sickness and disability. Few of them ever entered a hospital and not many more regularly visited physicians. Today, however, the healthcare system is seen as the first resort when health problems arise rather than a necessary evil. In fact, the system's influence is such that Americans now turn to it not only for clear-cut health problems but for a broad range of psychological, social, interpersonal and spiritual problems.

The industrialization and urbanization that swept twentieth century America clearly influenced the direction of development for the healthcare system, as the traditional managers of sickness and death – the family and church – gave way to more complex responses to health problems. The "management" of health became a responsibility partly of the economic, educational, and political systems and, eventually, of a fully developed and powerful healthcare system. Traditional, informal responses to health problems gave way to complex, institutionalized responses. "High-touch" home remedies could not compete in an environment that valued high-tech (and subsequently high status) responses to health problems.

These developments firmly established the healthcare institution as a major force in U.S. society. By the end of the twentieth century, healthcare costs accounted for over 15% of the nation's gross national product, and the industry had become one of the major employers within the U.S. economy. Healthcare came to be accorded high prestige and exerted a major influence over other institutions. The system succeeded to the point that there are few members of society today who are not under some type of "medical management."

2.3.2 The Cultural Framework

The transformation of the U.S. social structure that took place in the twentieth century was accompanied by a cultural revolution resulting in significant value reorientation within American society. The values associated with traditional societies that emphasized kinship, community, authority, and primary relationships became overshadowed by the values of modern industrialized societies. Modern societies place emphasis on economic success, educational achievement, and scientific and technological advancement. Health came to be recognized as a distinct value in American society, with the quest of health coming to dominate much of the activity of the American population.

The extent to which societal values influence the nature of the healthcare system cannot be overemphasized. The emphasis Americans place on economic success led to the establishment of the world's most profit-oriented healthcare system. The emphasis placed on education assured a premium for the long training period required for medical personnel. The value placed on technology clearly influenced the direction of the healthcare system. Most important, perhaps, is the emphasis on activism as a value resulting in an action-oriented healthcare system that demanded direct, aggressive action in the face of health problems.

A society's values are clearly a reflection of that society's demographic makeup. Traditional societies with high death rates and large numbers of children clearly have a different perspective than populations with an older age structure and relatively few births. This influence is probably nowhere more clearly reflected than with the baby boom cohort in contemporary America. This large cohort has developed a set of values that set it apart from any previous generation. One legacy of the baby boom cohort was the introduction of a new value orientation into American society.

To a great extent, these shifts in value orientation reflect the demographic transformation of U.S. society in this century. While it is true that the development of modern scientific medicine required the formulation of germ theory as its foundation, the evolution of contemporary U.S. healthcare corresponded substantially with the demographic changes characterizing the first half of the last century. It is one thing to develop the capacity for inoculating against various disease organisms – this is readily done in less developed countries – but it is quite another to create a mammoth, highly specialized, labor- and capital-intensive industry that not only accounts for over 15% of the gross national product but also exerts a tremendous influence over the everyday lives of society members.

2.4 The Structure of Healthcare Systems

The healthcare system in any society can be separated into two components: the disease theory system and the service delivery system. The disease theory system involves the underlying explanatory framework that provides meaning to the system. This component is unique to each society and reflects that society's worldview. The disease theory system addresses such issues as the nature of health and illness, the meaning of life and death, the appropriateness of intervening in the face of sickness, and the prolongation of life for the terminally ill. In effect, it encompasses the assumptions that underlie the system and provides the basis for the creation of healthcare delivery mechanisms. The disease theory system will not be discussed further here, but it should be noted that this underlying paradigm is both a consequence of and a determinant of the demographic attributes of the population. Most observers, in fact, argue that the U.S. healthcare system experienced a paradigm shift involving the disease theory system during the last years of the twentieth century as a result of demographic trends.

The second component, the healthcare delivery system itself, is our main focus. The delivery system is the mechanism through which society discharges its responsibility for providing for the health and welfare of its members. As such, it involves both structural aspects (such as facilities, organizational arrangements, and role relationships) and functional aspects (such as treatment, research and education).

In the case of the U.S. healthcare system, a discussion of healthcare delivery is considerably more complex than for any other social institution. In fact, the U.S. system is unique in a number of ways. Most notable is the lack of any centralized control mechanism and the fractionated state of the structural components.

Coupled with the fact that the system is incredibly complex, this means that a useful description of the U.S. system is difficult, if not impossible, to find. The description that follows is geared toward the needs of those interested in the demographic aspects of the system and will hopefully provide those with limited knowledge of the system adequate background information.

2.4.1 The Organization of U.S. Healthcare

A useful starting point for examining the organization of U.S. healthcare would be an inventory of its component parts. The U.S. system has an incredible number of functioning units, including hospitals, nursing homes, and clinics providing physician care. This is in addition to the non-physician providers and paramedical personnel such as optometrists, chiropractors and mental health counselors.

The providers of care typically are autonomous parties operating under a variety of guises and means of control. Providers, whether facilities or practitioners, can be organized as private for-profit organizations, private not-for-profit organizations, public organizations, and quasi-public organizations, among others. Similarly, they may be operated by private investors, publicly held, local-government owned and operated, or run by a religious denomination, foundation, or some other not-for-profit entity. The end result, many observers contend, is a "non-system" that is poorly integrated, lacks centralized control and regulation, and is characterized by fragmentation, discontinuity, and duplication. In addition, subsystems exist geared to the needs of demographic subgroups (e.g., *curanderos* for Hispanics and acupuncturists for Asians). The existence of "alternative" sources of care further contributes to the complexity of the system.

Unlike the situation in most other societies, medical care in the United States is typically provided at the local level only. There is no national system for the provision of care, nor are there regional or even state structures for the provision of health services. While the Medicare program is national in scope, it only addresses the financing of care, leaving the actual provision of care to local providers. The only national level providers of care involve the Veterans Administration hospital system and related military facilities. Many states have statewide systems of mental healthcare, but these are generally considered outside the mainstream of U.S. medicine. The local, autonomous provider is the norm in the U.S. system of healthcare delivery.

2.4.2 The Vertical Integration of the Healthcare System

A useful approach to understanding the healthcare system is to conceptualize it in terms of *levels* of care. These levels are generally referred to as primary care, secondary care, and tertiary care. Additionally, some observers identify a fourth category – quaternary care – to be applied to superspecialized services such as organ transplantation. These levels can be viewed as the vertical dimension of the healthcare delivery system. (The multi-level structure of U.S. healthcare is illustrated in Exhibit 2.3.)

Primary care refers to the provision of the most basic health services. Primary care involves treatment of minor, routine problems, along with the provision of general examinations and preventive services. Primary care services generally are provided by physicians with training in family practice, general internal medicine, obstetrics/gynecology, or pediatrics. These practitioners typically are community based (rather than hospital based), rely on direct first contact with patients rather than referrals from other physicians, and provide continuous rather than episodic care. Physician extenders like nurse practitioners and physician assistants are taking on growing responsibility for care, and their role is expected to expand in the face of the healthcare reform legislation of 2010. In the mental health system psychologists and other types of counselors are the major source of primary care. Medical specialists also provide a certain amount of primary care.

Primary care is generally delivered at the physician's office or at some type of clinic. Hospital outpatient departments, minor medical centers, freestanding surgery centers, and other ambulatory care facilities also provide some primary care. For certain segments of the population, the hospital emergency room serves as a source of primary care.

In terms of hospital services, primary care refers to those services than can be provided at a "general" hospital. These typically are routine medical and surgical procedures, diagnostic tests, and obstetrical services. Primary hospital care tends to be unspecialized and requires a relatively low level of technological sophistication. In actuality, there are few remaining hospitals that could truly be considered primary care facilities. Even the smallest hospital today is likely to have equipment and capabilities that may not have been available in major hospitals a few years ago.

Secondary care reflects a higher degree of specialization and technological sophistication than primary care. Physician care is provided by specialists such as specialized surgeons (e.g., urologists and ophthalmologists), specialized internists (e.g., cardiologists and oncologists) and other specialists. Problems requiring more advanced skills and more sophisticated biomedical equipment fall into this category. Although much of the care is still provided in the physician office or clinic setting, these specialists tend to spend a larger share of their time in the hospital setting. Secondary hospitals are capable of providing more complex technological backup, physician specialist support, and ancillary services. These facilities are capable of handling moderately complex surgical and medical cases and serve as referral centers for primary care facilities.

Tertiary care addresses highly complex but relatively uncommon surgical and medical conditions. The practitioners tend to be subspecialists, and the facilities are usually massive and the equipment technologically advanced. Complex procedures such as open-heart surgery, amputations, and reconstructive surgery are performed

Exhibit 2.3 The “Levels” of U.S. Healthcare

	Procedure	Site	Provider
QUARTERNARY CARE	Organ transplant Complex trauma	Multi-institution medical centers	Teams of super-specialist physicians
TERTIARY CARE	Specialized surgery Complex medical cases	Large-scale comprehensive hospitals with extensive technological support	Physician sub-specialists
SECONDARY CARE	Moderately complex surgical and medical cases	Moderate-scale hospitals Some freestanding surgery and diagnostic centers	Physician specialists
PRIMARY CARE	Routine care Standard tests Simple surgery Prevention	General hospitals Clinics Physician offices Urgicenters	Primary care physicians Physician "extenders" (e.g., nurse practitioners, physician assistants, nurses)

↑ Complexity
Severity
Specialization

at these facilities, which provide extensive support services in terms of both personnel and technology. Tertiary care cases are usually handled by a team of medical and/or surgical specialists supported by the hospital’s radiology, pathology, and anesthesiology physician staff. Tertiary care is generally provided at a few centers that serve large geographical areas. Frequently, a single hospital is not sufficient for the provision of tertiary care; a “medical center” may be required. These centers often support functions not directly related to patient care, such as teaching and research.

Some procedures often performed at tertiary facilities may be considered as *quaternary care*. Organ transplantation, especially involving vital organs like heart, lungs and pancreas, is included here. Complicated trauma cases represent another example. These procedures require the most sophisticated equipment and are often performed in association with clinical research initiatives.

This review of the levels of care ignores some other important structural aspects of the system that are not as directly related to patient care. In addition to physicians' offices, clinics, and acute care hospitals, mention should also be made of specialty hospitals and nursing homes. Specialty hospitals include facilities for the treatment of specific categories of conditions such as mental illness, substance abuse, or tuberculosis. They also are established for the treatment of certain categories of patients such as women, children, or geriatric patients. Federally-operated facilities such as those run by the Veterans Administration should also be considered as a special category of facilities. The various specialty facilities are operated under different guises ranging from poorly funded state-operated facilities to upscale, privately owned for-profit facilities. In addition to nursing homes, there is a growing number of newly defined settings for care (e.g., assisted living facilities, extended care facilities) for the care of an aging population.

2.4.3 The Horizontal Dimension of the Healthcare System

The discussion so far has focused on the vertical organization of the healthcare system. The system can also be viewed as having a horizontal dimension in that health episodes can be viewed as linear phenomena that proceed through various stages. If the assumption is made that individuals are naturally in a state of "health," there is little need for formal care. With the onset of symptoms, however, the individual may make a transition to the point of diagnosis and treatment at an outpatient facility (assuming it is not an emergency situation). This may result in assignment to the patient category (sickness), whereby the stages of the vertical axis (primary, secondary, tertiary, and quaternary) come into play. Assuming the patient survives the bout of ill health, he or she may move out of the patient care model back into the community as a "well" person. Alternatively, the patient may require follow-up care or chronic disease management (e.g., by a home care agency), temporary institutionalized care (e.g., in a subacute facility), long-term nursing care (e.g., in a nursing home), or rehabilitative services of some type (e.g., physical or occupational therapy). These postpatient stages extend the model horizontally.

This patient "career" could be thought of as involving three stages: prepatient, patient, and postpatient. Significant aspects of the prepatient and postpatient stages fall outside the vertical dimension of the model. Some of the structural components that are involved in these stages are noted above; others would include public health agencies (for prevention and screening) and hospices (for care of the terminally ill).

2.4.4 Healthcare Personnel

An examination of the structure of the healthcare system requires a discussion of the personnel involved in the provision of care. The US healthcare system is highly labor intensive and involves millions or workers, depending on what occupational definitions are utilized. In fact, the healthcare sector accounts for more employees than any other sector of the economy except education. Increasing from one million employees in 1970, its more than 15 million employees accounted for 9% of the US labor force in 2008 (U.S Department of Labor 2008). The typical hospital has six or more employees per hospital bed, and there are enough physicians in practice to staff several hundred thousand clinics nationwide.

In terms of those who provide patient care, the key player is the physician. There are over 776,000 licensed physicians in active practice in the United States today, (Association of American Medical Colleges 2009). In 2008, 94% of U.S. active physicians were involved in patient care; most of this number (77%) was in office-based practices, with the remainder in hospital-based positions. Small numbers of physicians are involved in research, teaching or administration.

In 2008 39% of physicians were involved in primary care; this includes general and family practice, general internal medicine, obstetrics-gynecology, and pediatrics (American Medical Association 2008). These practitioners are considered primary because they usually serve as “family doctors,” typically represent the initial point of entry into the system, and generally treat routine, less complex conditions. The remainder of the nation’s physician pool is divided among 13 major specialties. Despite greater interest in “family medicine” in the 1980s and 1990s, the trend toward greater specialization continues unabated. See Exhibit 2.4 for a breakdown of medical specialties.

The most prominent of the nonphysician providers of care are nurses of various types. This is the largest occupational group within healthcare. Most nurses are “registered nurses”, indicating that they have received a certain level of training. These are joined by licensed practical nurses, nursing assistants, and nurse’s aides. Nurse practitioners – registered nurses with graduate training – have become increasingly common and often can perform some of the functions usually reserved for physicians. Most nurses and related personnel are employed by hospitals, and some of these positions are found only within hospital settings.

Physician assistants and other physician extenders (including nurse practitioners) were introduced into the healthcare system in the 1980s. The intent has been to “extend” the capabilities of the physician through lesser-trained mid-range medical professionals. For a variety of reasons, this level of care has never been fully accepted by the medical community. It is likely, however, that continued shortages and maldistribution of physicians will eventually boost the demand for physician extenders.

The U.S. healthcare system is noteworthy for its specialized roles. Beyond the basic physician-nurse tandem, a variety of technicians, therapists, and ancillary personnel perform specific tasks. While such personnel are found primarily within the hospital setting, these paraprofessionals are found increasingly in clinics and freestanding facilities of various types as more and more procedures are performed on an outpatient basis. Further, the mental health profession includes a variety of practitioners and paraprofessionals that further complicates the personnel picture. See Exhibit 2.5 on the changing characteristics of American physicians.

Exhibit 2.4 Physician Specialties in U.S. Healthcare

- Primary care physicians
  - Family practice
  - Obstetrics/gynecology
  - Pediatrics
  - General internal medicine
- Specialty care physicians
  - Gynecology subspecialties
  - Pediatric subspecialties
  - Medicine subspecialties
    - Cardiology
    - Dermatology
    - Gastroenterology
    - Nephrology
    - Neurology
    - Oncology
    - Psychiatry
    - Rheumatology
    - Other medicine specialties
  - General surgery
  - Surgical subspecialties
    - Cardiovascular/thoracic
    - Neurosurgery
    - Plastic surgery
    - Ophthalmology
    - Otolaryngology
    - Orthopedics
    - Urology
    - Other surgical specialties
- Hospital-based Physicians
  - Anesthesiology
  - Pathology
  - Radiology
  - Emergency Medicine
  - Radiology subspecialties

Exhibit 2.5 The Changing Demographics of American Physicians

The characteristics of the American physician changed dramatically during the last quarter of the twentieth century. Not only has the number of physicians and their distribution among the various specialties changed, but the demographic composition of this category of professionals has been radically modified. In 1960, there were fewer physicians in the United States per 100,000 population than there were in 1900. However, between 1960 and 2007, the number of physicians per 100,000 population increased from 150 to around 275. This represents a growth rate much greater than that for the population as a whole. This increase in the physician pool was attributable partly to the establishment of new medical schools and the increased size of medical school classes during the 1960s and 1970s. It also was attributable to a relaxing of federal immigration and medical professional eligibility policies that resulted in the influx of tens of thousands of foreign-trained physicians.

(continued)

Exhibit 2.5 (continued)

The change in the demographics of the physician pool has been equally dramatic. Once the almost exclusive province of upper-middle-class white Anglo-Saxon males with close relatives who were physicians, the medical community clearly took on a different profile toward the end of the twentieth century. Between 1980 and 2007, the number of female physicians increased nearly 500% compared to an increase less than 16% for male physicians. Females' proportionate share increased from 8% to nearly 30% during this same time period. By the turn of the century, African-Americans who at one time were almost totally excluded from all except the few African-American medical schools accounted for 6% of the physician pool; Asian-Americans who were even less prominent among medical professionals in 1980 now account for a much greater share of physicians than African Americans.

In terms of medical school enrollment, during the 1980–1981 academic year, whites accounted for 88%, blacks 5%, Hispanics for 4% and Asian-Americans for 3%. By the 2006–2007 academic year, these figures had become 63%, 7%, 8% and 21%, respectively, reflecting a major decline in non-Hispanic whites among medical students, increases in black and Hispanic students and a dramatic increase in Asian-American students. The shift in demographic characteristics has been accompanied by a change in the backgrounds of medical students. Increasingly, those accepted into medical school are drawn from non-science educational backgrounds, are less affluent, and are less likely to have relatives who are physicians.

Today's medical practitioners are younger and more likely to be foreign-born and/or foreign-educated. The grandfatherly family doctor is clearly beyond endangered, since the largest cohorts of physicians today are those under 36 years of age (46%) and 35–44 (37%). Until the 1960s the U.S. physician pool included few non-Americans. Foreign physicians who did enter practice in this country came from the traditional bastions of medical education in England, Scotland and Germany. The 1970s and 1980s witnessed the influx of tens of thousands of foreign physicians, as immigration restrictions were loosened in response to a perceived physician shortage. By 2007 the nearly 200,000 "international medical graduates" – i.e., those born and trained overseas or US-born citizens who went overseas for medical training – accounted for 25% of the physician pool.

What are the implications of this new physician pool, one that is more female, younger, more ethnic and from varying socioeconomic backgrounds? These new doctors have different priorities than the "good old boys" of the past. They are more likely to emphasize primary care and are less interested in huge incomes. They prefer security, stable working conditions and more time off. They are much more likely to be employed as physicians in clinics and other institutional settings rather than setting up independent practices. Finally, they bring unprecedented diversity – demographically and otherwise – to medical practice in the United States.

Source: American Medical Association (2010).

The healthcare system has become increasingly characterized by personnel who are not involved in patient care. Even within the hospital setting, a growing proportion of employees are involved in ancillary activities. Although nurses still are the largest occupational category within hospitals, the greatest growth has occurred in non-care areas such as administration, data processing, medical records management, planning-marketing, and financial management. Some of the components of the healthcare system not involved in patient care are discussed below under the functions of the system.

2.4.5 Control in the System

The complexity of the US system of care makes discussions of control somewhat problematic. The lack of centralized control, or even coordination, means that power in the system is fragmented and diffuse. Decision making is shared by administrators and clinicians, and influenced by "outside" parties such as insurance plan managers. In the case of for-profit hospital chains, decisions affecting a hospital may be made remotely by anonymous executives.

Perhaps the most orderly way to approach this is by dividing the system into public and private sectors. This distinction is not an issue in most industrialized countries, since virtually all healthcare functions in those societies are "public". In the United States the public sector includes those activities that are operated directly (or indirectly through financial sponsorship) by federal, state, or local governments. Various units of government operate facilities and programs for the direct provision of care, finance others through the subsidization of private organizations, and regulate the activities that come under their purview. The federal government actually has few constitutionally mandated healthcare responsibilities, so most of these functions revert to the state level.

Some of these government-related activities are essentially reserved for the public sector. These include provision of care for veterans and the tracking of communicable diseases (the federal government), providing mental health services and training physicians (primarily state governments), and the assurance of a sanitary environment (primarily local governments). Some facilities directly related to the provision of care are operated by the various levels of government with certain types of hospitals and clinics operating under government auspices.

Governments at various levels participate in the financing of health services and related activities. The federal government accounted for about one third of the expenditures for medical care in 2007, primarily through its funding of the Medicare and Medicaid programs (Centers for Medicare and Medicaid Services 2007). States provide matching funds for the Medicaid program, with the administration of the program the responsibility of the participating states. Other state-level activities include the licensure of health professionals, the accreditation of healthcare facilities, and the regulation of the insurance industry. In some states, statewide health planning is also a responsibility of state government. Federal regulatory activities generally involve interstate commerce issues and the monitoring of goods and products through such agencies as the Food and Drug Administration.

Healthcare delivery in the private sector is divided into two major components: the for-profit sector and the not-for-profit sector. The overwhelming majority of ambulatory care and a significant proportion of hospital care is provided in for-profit settings. Physician services account for around 22% of healthcare expenditures and are typically provided on a for-profit basis (Centers for Medicare and Medicaid Services 2007). A growing proportion of the nation's 5,700 hospitals are operated on a for-profit basis, although the majority remain not-for-profit entities. Other parts of the system that are primarily for-profit include the nursing home component, pharmaceutical and medical supplies, and the commercial health insurance industry.

Most hospitals historically have been operated as public entities (under the ownership of state or local governments) or as voluntary not-for-profit hospitals associated with religious organizations. There have always been a few "proprietary" hospitals, usually owned by physicians, which have been operated on a for-profit basis. Although the number of such hospitals declined dramatically during the 1970s and 1980s, their disappearance has been offset by the emergence of the multi-facility, investor-owned chain. The number of the nation's general hospitals owned by for-profit chains increased from 420 in 1977 to around 900 by 2007 (American Hospital Association 2009).

2.4.6 Financing Healthcare

One of the more complex aspects of the U.S. healthcare system, and one that sets it apart from virtually every other system, is the manner in which healthcare is financed. The fragmentation of the system, the variety of entities that can provide services, multiple reimbursement arrangements, and powerful third-party payers create a very complicated financial picture when it comes to patient care. (The financing of research, education, and other components are discussed in their respective sections.)

During the last half of the twentieth century, the financing mechanism was transformed from one in which each patient was essentially responsible for paying for whatever care he or she received to a system involving multiple payers. Although some charitable hospital care was provided early in the twentieth century, most treatment up until the middle of that century was paid for out-of-pocket. By the end of the century the patient was confronted with a bewildering array of payment and reimbursement arrangements.

Government statistics indicate that early in the twenty-first century nearly half (46%) of healthcare costs are being paid by federal and state governments, nearly one-third (30%) by private third-party payers such as commercial insurance companies, and one-seventh (14%) directly by patients (Centers for Medicare and Medicaid Services 2007). The bulk of government funds are allocated for treatment under the federally supported Medicare and Medicaid programs. Physicians services are usually paid for out-of-pocket or through insurance plans (commercial or governmental), and the bulk of hospital services are similarly paid for by insurers (commercial or governmental). This situation is made more complex by indirect payments made by patients to insurance programs or government-sponsored healthcare programs. It is not unusual for a patient to have his medical costs covered through all three mechanisms. Much of the impetus for the healthcare reform legislation of 2010 came from issues faced in the financing of health services in the US.

2.5 Additional Functions of the Healthcare System

While patient care receives the bulk of attention in the US healthcare system, there are a number of other components of the system that, while less visible, involve important functions. These components are each important in their own right and some are critical to the health and safety of the population. Each is also particularly "American" in its characteristics.

2.5.1 Public Health

Public health is perhaps the only component of the US system that focuses on the community rather than the individual. In contrast to the situation in most other industrialized nations, the public health component of the US healthcare system is poorly developed. The establishment of the Public Health Service was predicated upon its not being involved in any way in patient care; that was to be left to the private sector. Thus many functions characterizing the public health components of most industrialized countries are almost nonexistent in the US system.

The public health function is carried out at the national level by the Public Health Service within the Department of Health and Human Services and by such specialized agencies as the Centers for Disease Control. The small portion of federal healthcare expenditures devoted to public health activities is utilized for contagious disease control, monitoring of health problems, and reporting of health and vital statistics data. Each state also has an agency responsible for health services planning and for monitoring health and environmental conditions. The individual states generally have responsibility for the provision of mental health services. At the local level, county government typically has public health responsibility; a limited amount of patient care is provided at the local level to indigent patients through public health clinics.

The data collection function of public health agencies at the federal, state, and local levels provides valuable information not available elsewhere. National vital statistics and morbidity data are compiled by federal agencies. Much of the data used by health planners is routinely gathered by the National Center for Health

Statistics, while the National Center for Health Services Research conducts and supports research related to the financing and provision of care. State agencies maintain records on health facilities, healthcare personnel, and vital statistics. Local health departments are the primary source of information on fertility, morbidity, and mortality. (Chapter 9 on sources of healthcare data provides detailed descriptions of these resources.)

2.5.2 Health Research

Research is a major function performed within the US healthcare system. This is an area in which the federal government plays a significant role through the establishment of healthcare research institutes and the funding of research by other organizations such as universities and research laboratories. In addition, funding for healthcare research is often provided by foundations. State governments fund some of the research conducted at medical schools. Private corporations such as pharmaceutical companies and medical suppliers often conduct internally funded research on products hoped to be commercially viable and subsidize clinical trials at medical schools and research institutes. In fact, the amount of funds spent on research by pharmaceutical companies today far exceeds that spent by government agencies.

In 2007, the federal government invested more than $42 billion in health-related research (Centers for Medicare and Medicaid Services 2007). The National Institutes of Health within the Department of Health and Human Services are the primary sites for federally supported health research. They conduct intramural research and also provide grant support to external research organizations. There are currently 19 institutes, each with a different focus. Institutes whose activities are of particular relevance to health demographers are the National Institute of Child Health and Human Development and the National Institute on Aging.

The Food and Drug Administration (FDA) is the interface between research units and the public distribution of the products generated through research. The FDA has responsibility for regulating the introduction into the US market of all drugs and specified medical devices. While not a research organization per se, the FDA regulates and monitors the product testing it requires of manufacturers.

2.5.3 Education

The education of health professionals is an important function of the U.S. healthcare system. Large amounts of funds are devoted to the training of physicians, nurses, technicians, hospital administrators, and various other health professionals. The 146 medical schools (including osteopathic schools) in the United States are major organizations within U.S. society, graduating nearly 20,000 M.D.'s each year.

Schools of podiatry and optometry, among others, train non-physician practitioners. Approximately 1,500 nursing schools and various related institutes train registered nurses, licensed practical nurses, and nursing assistants.

Health education is frequently funded at the state level, with federal funds often infused in cases of perceived manpower shortages. Most medical schools are state funded, although a few private schools remain in operation. Most major hospitals have educational programs for the training of various levels of professionals, from hospital attendants to residents and fellows in specialty medical training. Because of the demand for health personnel, numerous proprietary healthcare institutes have been established, mostly to train technicians and lower-level personnel.

2.5.4 Planning and Regulation

Although healthcare providers often contend that they are over-planned and over-regulated, neither one of these functions is highly developed in the U.S. healthcare system. Except for brief periods during the 1960s and 1970s, virtually no healthcare planning has taken place at the national level. What remains of this function has been left to state and local levels. State and local health planning agencies primarily serve as boards of review for health facilities development and major equipment purchases and/or as data compilation agencies. Essentially the only health "planning" activity carried out at the federal level today involves the Healthy People initiative of the US Public Health Service.

The brief periods in which health planning has flourished have represented a boon for health demographers. The legislation mandating the establishment of health planning agencies empowered them to compile and disseminate data on a wide variety of health issues. Most importantly, these agencies were able to obtain information on hospitals and other providers of care that would not have otherwise been available. The de-emphasis on health planning that occurred during the 1980s left health planners with fewer local data resources than were previously available to them.

The regulation of healthcare is typically not a function of the federal government. The exceptions that exist are those that would relate to any other industry – for example, interstate trade activities or postal service violations. Regulation is left primarily to the individual states, who have responsibility for monitoring both facilities and personnel. The states frequently accredit and monitor educational programs as well. There are some national organizations that provide accreditation and exert varying degrees of oversight. Some, such as the Joint Commission on Accreditation of Healthcare Organization, have the force of law, with withdrawal of hospital accreditation being an effective "death penalty." Others are more voluntary with regard to their members' participation, with limited regulatory powers. Physicians and some other health professionals are allowed a great deal of self-regulation, although this is usually based on state statutory support. Exhibit 2.6 presents some key concepts for health demography.

Exhibit 2.6 Key Concepts for Health Demography from Medical Sociology, Epidemiology, and Healthcare Administration

Acute condition: A health condition characterized by episodic occurrence, relatively direct causation, relatively rapid onset, rapid progression and short duration, and a disposition involving either recovery or death.

Age adjustment: A procedure whereby incidence and prevalence rates are adjusted to consider the age structure of the population being studied. This is one of the more common techniques used to "standardize" rates.

Average daily census: The average number of inpatients (excluding newborns) receiving care in a hospital each day during a particular reporting period (DHHS).

Average length of stay (ALOS): The average number of inpatient days recorded by hospitalized patients during a particular time period. ALOS is calculated by dividing the total number of patient days recorded during the time period by the number of patients discharged from the hospital.

Case finding: The various procedures utilized to determine the numerator to be utilized in calculating incidence and prevalence rates. Case-finding involves both determining what constitutes a "case" and procedures for calculating the number of cases within the population at risk.

Chronic condition: A health condition characterized by a relatively complex etiology, slow onset and progression, extended (even lifelong) duration, and no clear-cut disposition. Chronic conditions typically cannot be cured, only managed.

Cohort: Refers in its broadest usage to any segment of the population that has some characteristic in common. In epidemiology, cohorts refer most often to segments of the population that have been exposed to a certain health risk. In demography, cohorts refer most often to age groups within a particular population. In either case, cohorts can be traced over time to determine changes in the composition of the group and the disposition of its members.

Disease: Technically, a scientific construct referring to a medical syndrome involving clinically identifiable and measurable signs and symptoms reflecting underlying biological pathology. The term *disease* is actually utilized in a much broader sense than this clinical conceptualization, often referring to any condition treatable by the healthcare system.

Endemic: Situation in which a pathological condition is common to a large portion of a population, to the extent that its presence might be considered "normal." The prevalence of endemic conditions does not fluctuate much over time.

(continued)

Exhibit 2.6 (continued)

Epidemic: Refers to a health condition not normally present within a population but whose appearance represents an "outbreak" of the particular condition. Generally refers to a condition that is contagious or communicable (which contributes to its abnormally high, but usually short-lived occurrence).

Epidemiology: Literally, the study of epidemics, but has come to mean the study of the etiology, distribution, and course of disease within a population.

Etiology: The cause of a health condition. The etiology may be relatively simple and direct as in the case of most acute conditions, or it may be complex and indirect as in the case of most chronic conditions.

Health status: Indicator of the overall state of health of an individual or, more often in health demography, a population. There is no one measure of health status, with existing health status indicators utilizing either outcome measures (e.g., morbidity and mortality) or utilization measures (e.g., physician office visits or hospital admissions).

Incidence: The rate at which the onset of new cases of a particular health condition occurs. Incidence is calculated based on the number of new cases diagnosed during a particular time period (usually 1 year), divided by the population at risk.

Illness: The existence of a clinically identifiable medical syndrome in an individual or a population. Social scientists often distinguish between illness and sickness, with the former referring to the presence of some biological pathology and the latter referring to the presence of some condition recognized by society as a state of ill health.

Morbidity: The level of sickness and disability existing within a population. There is no overall indicator of morbidity, so it is usually looked at in terms of the incidence or prevalence of specific conditions.

Mortality: Refers to the rate at which deaths occur within a population. Mortality rates are calculated by dividing the number of deaths occurring within a particular time period (usually 1 year) by the total population alive during that time period.

Occupancy rate: The proportion of a hospital's beds (or those of some other healthcare facility) that are occupied on the average during a particular time period. The occupancy rate is calculated by dividing the average daily census for a particular time period by the number of hospital beds available during that time period.

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Exhibit 2.6 (continued)

Population at risk: The portion of a population that has been exposed to a particular health threat or is susceptible to a particular health threat. The population at risk is used as the denominator in calculating incidence and prevalence rates when the condition in question does not affect the total population.

Prevalence: The total number of cases of a particular health condition within a population at a particular point in time. Prevalence is calculated by dividing the number of known cases at a particular point in time by the population at risk at that point in time.

Relative risk: The probability of the occurrence of a particular health condition within a population relative to the risk for some other population. Relative risk is calculated by determining how much more likely a condition is to occur among one population (e.g., smokers) compared to another (e.g., nonsmokers). The relative risk is often contrasted to the absolute risk of the occurrence of a condition.

Sickness: The presence of ill-health in individuals or populations based on whatever definition the particular population uses for ill health. Social scientists distinguish between sickness and illness, with the former referring to the social construct of "sickness" and the latter referring to the presence of measurable biological pathology.

Sign: A manifestation of a health condition or disease syndrome that can be identified through clinical tests or through the observation of a healthcare professional.

Symptom: A manifestation of a health condition that is experienced by the affected individual. Symptoms are often "internal" (e.g., pain) in the sense that they can only be identified by the individual.

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Chapter 3
Population Size, Distribution and Concentration

3.1 Introduction

The size of the population within a geographic area – typically measured in terms of the number of people – is the simplest and most straightforward of demographic attributes. And, for many purposes, it is the most important. Not only is the size of a population important in its own right, but many of the calculations utilized in determining healthcare needs and health services demand depend on this information. After size, the pattern of distribution and concentration of persons within a geographic area probably is next in importance for anyone examining the interface of demographics and healthcare.

Demographers generally begin telling the "demographic story" about a population by presenting information on its size in very basic terms. Statistics that describe the size and location of various populations are, in fact, common in the popular press. Significant population increases (or decreases) often make the headlines and, when reports from the Census Bureau are released, information on population gains and losses are eagerly awaited since a primary (and legally mandated) function of the census count is to determine Congressional representation. The significance of population size for the various states is demonstrated by the fact that, after the 2000 census, four states (Arizona, Florida, Georgia and Texas) gained two additional Congressional seats, four states (California, Colorado, Nevada and North Carolina) gained one Congressional seat, eight states (Connecticut, Illinois, Indiana, Michigan, Mississippi, Ohio, Oklahoma and Wisconsin) lost one seat, and two states (New York and Pennsylvania) lost two seats.

Data on the size and location of the population also provide the basis for descriptive statistics such as rates and ratios. Population counts, whether for total population or for sub-segments, serve as the denominators for rates like the incidence of heart disease per 10,000 population and the number of hospital beds per 1,000 population. The calculation of rates facilitates comparisons between areas of different sizes. The observation that deaths in California substantially outnumber those in Montana is not an indicator that health conditions are necessarily

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worse in California. A comparison of death rates – deaths per 1,000 population, for example – would provide the basis for a meaningful comparison. In healthcare as in other fields, rate calculation is one of the first steps in determining the need for services, facilities, and personnel.

3.2 Defining and Measuring Size, Distribution and Concentration

3.2.1 Population Size

The first demographic "fact" usually employed in describing a population is its size. Size is typically measured in terms of the number of individuals who reside in the defined geography at a specified time. The size of a population is an important consideration with regard to virtually every issue to be addressed. The fact that the United States has a population of over 300 million individuals has important national and international implications, as does the fact that Denmark has a population of less than six millions residents (that is, smaller than 17 U.S. states). The size of a population determines the level of need for various services, contributes to the level of diversity within the population, and represents a key metric for demographers.

While size is typically measured in terms of the number of individuals within a population in contemporary modern societies, the individual is not the only unit that might be considered. The size of a population might be determined based on the number of households or families for example. In societies that emphasize communal life and deemphasize the individual, they may see the world as made up of families rather than individuals. Other societies may see the household (which may or may not correspond with the number of families) as the unit for measurement. While measuring size in terms of individual group members is technically the most accurate method, the perspectives of other cultures with regard to their "demographic map" should not be ignored.

The most complete count of a population is performed by means of a census. A census involves an attempt to count (and describe) each individual "officially" residing in the country (or other geographic area) at a particular point in time. In the U.S., a census is conducted every 10 years and, as this book goes to press, the results from the 2010 census are being released. (For more detail on the decennial census, see Chapter 9 on data sources).

In order to assure a complete count of residents at the time of the census, the street address is used as the key locator. Using data provided by the U.S. Postal Service, the Census Bureau identifies every postal address in the country and uses this information as the basis for collecting data. For the majority of the population with a single permanent address this approach is effective and most census forms today are returned by mail. However, there are exceptions that require additional effort on the part of the Census Bureau, such as migrant workers and homeless individuals. For those addresses for which no census form is returned, in-person interviews may be required.

In the process of gathering data on the number of persons in households and other living units, information on the unit's specific location (e.g., a street address) is collected, and the individual's information is typically associated with that address. The exception would be for individuals who live in group quarters such as a nursing home, college dormitory or prison, in which case the institution would be identified (although ultimately related to a physical address). Aggregating individual living unit data from the census to a specific geographic area (e.g., census tract, county) generates size data for that area. In addition, every population count must be specific with respect to date. As noted above, post-censal population estimates and projections which are discussed later in this chapter and in Chap. 9 provide information for time periods when actual data are not available. These estimates and projections are invaluable for health planning purposes.

Health demographers and other users of census data are typically not interested in data on specific individuals and households (and, indeed, this information is not made available). Information on individuals is aggregated up to various levels of geography, with the smallest reported unit being the block and the largest the United States as a whole. There are various levels of aggregation that occur between the smallest and largest units and the level of aggregation most suitable for a particular analysis depends on the circumstances.

Several issues must be addressed in the counting of the population. The first concerns who is to be counted. Censuses are designed to count every individual resident within a defined area regardless of their legal status. There has not always been total agreement, however, as to who is a resident of the U.S. and, thus, eligible to be counted. In the early days of the census, there was debate over whether to count children, women, slaves and American Indians at various times. More recently issues have arisen with regard to the counting of migrant workers and homeless people. Today, with the increase in undocumented immigrants, new questions have emerged with regard to the counting of this population. The Census Bureau has established rules that determine who is eligible for enumeration. So, for example, U.S. military personnel and diplomats stationed abroad are counted as U.S. residents while foreign tourists visiting in the U.S. on census day are not.

The assigned location of individuals in terms of geography is also of concern with people generally counted at their usual place of residence. Since the place of residence is defined as the location where the individual usually sleeps and eats, the usual place of residence is easy to establish for the vast majority of the population. Definitional complications may arise, however, for subpopulations such as college students, migrant workers, persons with two or more residences and the homeless. While college students are typically assigned to the location of their educational institution, the determination of usual residence for the remaining groups involves the application of specific rules, enumerator judgment, and special counting attempts (e.g., visiting rescue missions to count the homeless).

A further distinction between an individual's usual place of residence (night-time) and his workplace location (daytime) is important. The downtown areas and industrial parks of many U.S. cities teem with people during working hours only to become virtual ghost towns in the evening. The opposite is often true for residential areas. In many situations, information on the location of the daytime population may be more useful than information on place of residence. Locational decisions relating to medical emergency facilities, vehicles, and staffing, for example, require a sensitivity to differentials in daytime and nighttime populations. The ability to provide at least minimal services to all parts of the community requires either a count or an estimate of these distinct populations. While information on daytime populations is not likely to be readily available, estimates of the daytime population for a geographic area can be estimated using such information as commuting patterns (e.g., from the census) and commercial concentrations (e.g., from the economic census).

3.2.2 Population Distribution

While the size of a population is an important consideration, the manner in which that population is distributed within the geographic area is equally important. It is one thing to know that the United States has a population of over 300 million residents, it is another to realize that these residents are unequally distributed throughout the country's various regions, states and communities.

The first measure of population distribution relates to the numbers of people residing within various geographic areas. Thus, the nation's 309 million residents are distributed among the various states. The numbers of residents reported for each state is useful information but for many purposes it may be more useful to think in terms of the proportion of the population accounted for by the respective states. It is one thing to understand that California contained more than 33 million residents. This takes on more meaning when it is realized that these residents account for approximately 12% of the country's population. The numerical and percentage distributions for the various states are presented in Exhibit 3.1.

Examining the total population can be complicated enough when distribution is considered but, typically, someone analyzing population distribution (particularly for health-related purposes) is going to be interested in the distribution of subpopulations based on demographic attributes (e.g., various racial or ethnic groups, poverty populations, the elderly, etc.). The distributions of these subgroups are likely to differ in some cases significantly from the distribution of the general population. Thus, a health planner seeking to determine the distribution of Medicaid-eligible residents across the U.S. will find a geographic distribution much different from that of the population as a whole.

Measures of population distribution assume both accurate population counts and relatively stable geographic boundaries. The proportion of the population associated with a subarea can only be successfully calculated if the population figures for the subarea and the total population are reasonably accurate. Similarly, the proportion allocated to a particular geography can only be consistently determined if the boundaries remain constant. Thus, year-to-year state population estimates are not

Exhibit 3.1 U.S. Population Distribution by State: April 1, 2010

Alabama	4,779,736	Montana	989,415
Alaska	710,231	Nebraska	1,826,341
Arizona	6,392,017	Nevada	2,700,551
Arkansas	2,915,918	New Hampshire	1,316,470
California	37,253,951	New Jersey	8,791,884
Colorado	5,029,196	New Mexico	2,059,179
Connecticut	3,405,565	New York	19,378,102
Delaware	897,934	North Carolina	9,535,483
District of Columbia	601,723	North Dakota	672,591
Florida	18,801,310	Ohio	11,536,504
Georgia	9,687,653	Oklahoma	3,751,351
Hawaii	1,360,301	Oregon	3,831,074
Idaho	1,567,582	Pennsylvania	12,702,379
Illinois	12,830,632	Rhode Island	1,052,267
Indiana	6,483,802	South Carolina	4,625,364
Iowa	3,046,355	South Dakota	814,180
Kansas	2,853,118	Tennessee	6,346,105
Kentucky	4,339,367	Texas	25,145,561
Louisiana	4,533,372	Utah	2,763,885
Maine	1,328,361	Vermont	625,741
Maryland	5,773,552	Virginia	8,001,024
Massachusetts	6,547,629	Washington	6,724,540
Michigan	9,883,640	West Virginia	1,852,994
Minnesota	5,303,925	Wisconsin	5,686,986
Mississippi	2,962,297	Wyoming	563,626
Missouri	5,908,927		

Source: U.S. Census Bureau

likely to be problematic since there are virtually never any changes in state boundaries. On the other hand, it is not unusual for the U.S. Postal Service to modify ZIP Code boundaries in response to service demands. This means the number and proportion of residents allocated to a particular ZIP Code could change over time. Similarly, MSA boundaries expand through the addition of counties, making it misleading to assess decade-to-decade change unless the boundaries are standardized.

A variety of different geographic units are used by demographers in their examination of population distribution. These units may be as small as a census block or as large as a nation. They may be in easily recognized hierarchies that divide the nation into states and the states into counties or county equivalents. Other sets may include less familiar units such as census block groups or county subdivisions. Some sets of geographic units can be easily converted to others, while it may be difficult to relate some units to others (e.g., census tracts to ZIP Codes). In any case, an understanding of the geographic distribution of the population begins with an understanding of the various spatial units utilized as a framework for population distribution. Exhibit 3.2 summarizes the various types of geographic units that might be of use to demographers.

An understanding of the distribution of the population is critical for the analysis of health service needs and the allocation of healthcare resources. The distribution of the population is a major determinant of the distribution of the need for health services. Ideally, health resources should be distributed proportionately to the distribution of the population. In actuality, there is often a mismatch between the location of the population and the location of health resources such as hospitals, physicians and various clinical services. This results in a maldistribution of health services vis-à-vis the population, with some localities having too many resources by accepted standards and some localities having too few.

At the same time, the distribution of health resources has implications for the utilization of services and, ultimately, for the morbidity and mortality status of the populations in various geographic areas. It goes without saying that an area with numerous health services is going to generate a higher volume of healthcare utilization than an area of sparse health services. But it may not be so obvious that an excess of health services does not necessarily mean services will go unutilized. It often means that a higher level of utilization will be recorded because of the excess of services. It is something of an anomaly in healthcare that competing services do not simply carve up existing demand but may serve to drive up the demand beyond what it would normally be.

In order to measure the appropriateness of health resources for a particular population a variety of ratios have been developed. For example, analysts may speak in terms of the number of physicians per 1,000 population or the number of residents per physician within a given geography. The same type of ratios might be used for hospital beds or nursing home beds (e.g., the number of available beds per 1,000 population or 1,000 seniors, respectively). In addition, there are standards for the number of residents it takes to support a cardiac intensive care unit or a cancer treatment facility. Such figures can be used to compare the adequacy of health facilities between various geographies and, in some cases, for purposes of health planning. In the latter situation, some states may, for example, mandate that a certain population must exist before it will approve the construction of a new hospital or that a certain number of deliveries are generated by a population before it will approve a new obstetrical unit.

Exhibit 3.2 Units of Geography for Health Demography

The geographic units used for demographic analysis can be divided into three major categories: political or administrative units, operational units and statistical units, along with a residual category of units that do not fit into either of these categories.

(continued)

Exhibit 3.2 (continued)

Political Units

Political or administrative divisions are the most commonly used geographical units in marketing. Many healthcare organizations' service areas coincide with political boundaries such as cities, counties, or states. Furthermore, it is convenient for private sector organizations to use standard political or administrative units to establish their boundaries. Political units also are useful in spatial analysis, as many statistics are compiled on the basis of political boundaries. The following political and administrative units are frequently used in marketing.

Nation

The nation (in this case, the United States) is defined by national boundaries. Although a few national chains or consumer health products companies may be interested in data at the national level, most healthcare organizations focus on lower levels of geography. However, national averages (e.g., mortality rates) are often important as a standard to which other levels of geography might be compared.

States

The major subnational political unit is the state, with data typically available for 50 states, the District of Columbia, and several U.S. territories. Because the individual states have responsibility for a broad range of administrative functions, many useful types of data are compiled at the state level. In fact, state agencies are a major source of health-related data. However, each state complies data independent of other jurisdictions, resulting in uneven data reporting from state to state.

Counties

The county (or, in some areas, townships or parishes) represents the primary unit of local government. The nation is divided into more than 3,100 county units (including some cities politically designated as counties). The county is a critical unit for data collection since many healthcare organizations view their home county as their primary service area. States typically report most of their statistics at the county level, and the county health department is likely to be a major source of health data. Even healthcare organizations with regional markets are likely to consider the county as the building block for data collection.

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Exhibit 3.2 (continued)

Cities

Cites are officially incorporated urban areas delineated by boundaries that may or may not coincide with other political boundaries. Although cities typically are contained within a particular county, many city boundaries extend across county lines. Because cities are incorporated in keeping with the laws of the particular state, little standardization with regard to boundary delineation exists. For this reason cities do not make very useful units for market analyses. In many cases, however, city governments are involved in data collection activities that may be useful to marketers.

Congressional Districts

Congressional districts are established locally and approved by the federal government. These districts are typically delineated by means of political compromise and do not correspond well with any other geographical units. Although the Census Bureau reports out its data for congressional districts, limited additional information is collected at the congressional district level. In addition, the boundaries tend to change over time, making these units not particularly suited as a basis for demographic analysis.

State Legislative Districts

State legislative districts have similar characteristics to congressional districts. They are drawn up by the states based primarily on political compromise. Although the Census Bureau reports its data for state legislative districts, virtually no other data are collected for such districts. Furthermore, their boundaries are subject to periodic change. For these reasons they are not very useful as units for purposes of health planning.

Health Planning Districts

Health planning districts do not neatly fit into the categories described here since they have different forms, operate under different authority, and have varying functions from community to community. At one time there were federal regulations that governed health planning districts and standardized their structure and function. Today, however, the few health planning agencies that exist operate depending on the parameters set by the state or community

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Exhibit 3.2 (continued)

for which they have responsibility. Ideally, a health planning district should cover the service area for local healthcare providers, but realistically they often have to conform to political boundaries.

Operational Units

Operational units are areas drawn up for purposes of managing the operations of some entity. They may or may not have formal regulatory designation and, because they are responsive to the needs of a particular entity, are more susceptible to change than some other types of units.

Zip Codes

Unlike the geographical units previously discussed, ZIP Codes do not constitute formal government entities. Their boundaries are set by the U.S. Postal Service and are subject to change as population shifts occur or the needs of the Postal Service dictate. This lack of stability often means that ZIP Codes have limited value for historical analyses or tracking phenomena over a long period. Furthermore, ZIP Codes seldom coincide with census tracts or other political or statistical boundaries, making the synthesis of data for various geographies extremely difficult. ZIP Codes tend to be much larger than census tracts, sometimes including tens of thousands of residents.

Utility Districts

Utility districts are designated for purposes of distributing power, water and gas and for disposing of garbage and other by-products of human activity. These districts tend to reflect the spheres of influence of various utility companies and may or may not correspond with other boundaries.

School Districts

School districts are established for the operation of school systems and are reflective of the educational needs of the local population. Although theoretically reflecting the distribution of school-aged children within the

(continued)

Exhibit 3.2 (continued)

population, other factors may play a role in determining the configuration of school districts within a community. In older communities, school districts may be well established but for most parts of the U.S. continuous population shifts mean that the boundaries for school districts must be frequently adjusted.

Statistical Units

Statistical areas are established to allow various agencies of government to collect and report data in a useful and consistent manner. The guidelines for establishing most statistical units are promulgated by the federal government. The most important statistical units of use to health demographers are discussed below.

Regions

Regions are established for statistical purposes by the federal government by combining states into logical groupings. Four regions have been established by grouping states based on geographical proximity and economic and social homogeneity. Health statistics are sometimes reported at the regional level by federal health agencies. (The term *regional* is also used informally to refer to a group of counties or states delineated for some other purpose than data compilation).

Divisions

For statistical purposes the federal government divides the nation's four regions into nine divisions. Each division includes several states, providing a finer breakdown of the nation's geography. Divisions are seldom used as a basis for health planning.

Metropolitan Statistical Areas

Metropolitan statistical areas (MSA) are delineated by the federal government as a means of standardizing the boundaries of cities and urbanized areas. Because each state has different criteria for the incorporation of cities, the MSA concept provides a mechanism for creating comparable statistical areas. An MSA includes a central city, central county, and any contiguous counties that could logically be included within the urbanized area. An increasing amount of data is available on MSAs, and this unit is often used to define a market area.

(continued)

Exhibit 3.2 (continued)

Urbanized Areas

An urbanized area as defined by the Census Bureau includes the entire densely settled area in and around each large city, regardless of whether the area is within the corporate limits. Although limited amounts of data are available for urbanized areas, knowledge about urbanized areas is important in developing a full understanding of the population distribution within a metropolitan area.

Census Tracts

Census tracts are small statistical subdivisions of a county established by the Census Bureau for data collection purposes. In theory census tracts contain relatively homogeneous populations ranging in size from 1,500 to 8,000. For many purposes the census tract is the ideal unit for compiling data. It is large enough to be a meaningful geographical unit and small enough to contribute to a fine-grained view of larger areas. The Census Bureau collects extensive data at the census tract level, although this information is only available every 10 years from the decennial census. In general, limited health data are available at the census tract level, although some government agencies do collect and report data for this unit of geography.

Census Block Groups

Census tracts are subdivided into census block groups that include approximately 1,000 residents. A tract is composed of a number of block groups, each containing several blocks. The block group provides an even finer picture of a community than the tract, although fewer data elements are likely to be compiled at the block group level. Little health data are available at the census block group level.

Census Blocks

Census block groups are subdivided into census blocks, the smallest unit of census geography. The term *block* comes from the fact that the typical block is bounded on four sides by streets, although some other visible feature (e.g., railroad track, stream) or nonvisible feature (e.g., city limits) may serve as a boundary. Census blocks tend to be the most homogeneous of any unit of census geography, with the average block housing approximately 30 persons.

(continued)

Exhibit 3.2 (continued)

Only a limited amount of demographic data, and virtually no health data, is available for census blocks.

ZIP Code Tabulation Areas

ZIP Code tabulation areas (ZCTA) have been developed by the Census Bureau for tabulating summary statistics from the decennial census. This new entity was developed to overcome the difficulties in precisely defining the land area covered by each ZIP Code used by the U.S. Postal Service (see below). ZCTAs are generalized area representations of U.S. Postal Service ZIP Code service areas. They are created by aggregating the census blocks whose addresses use a given ZIP Code into a ZCTA with that ZIP Code assigned as its ZCTA code. ZCTAs represent the majority of U.S. Postal Service five-digit ZIP Codes found in a given area. The Census Bureau's intent was to create ZIP Code–like areas that would retain more stability from census to census.

3.2.3 Population Concentration

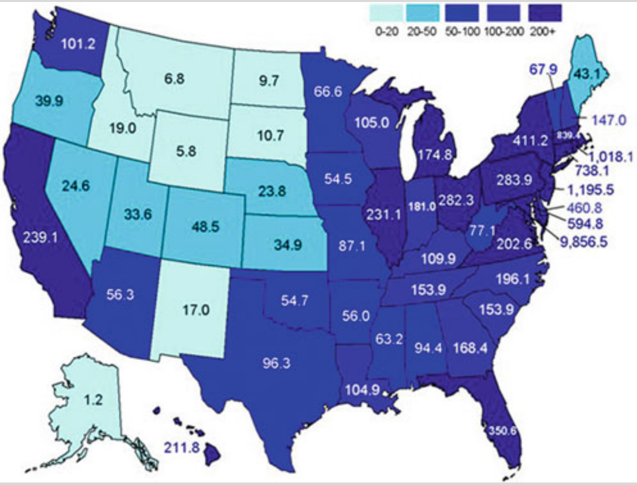
The concentration of the population represents a form of distribution and relates primarily to how concentrated or dispersed the population is. Concentration is usually measured in terms of density, and provides information on a population's concentration within a particular geographic area. Usually measured in the U.S. in terms of persons per square mile. Density can be computed for any area – as long as one knows the size of the land area and the population within that area. Note that land area is emphasized since bodies of water are typically excluded when calculating density. Similarly, any areas where inhabitation is restricted (e.g., national parks) may also be excluded from the denominator in density calculations.

The population density of cities, states, entire continents, and even the world can be computed. In the U.S. density is typically stated in terms of persons per square mile. In other countries, density may be measured in terms of square kilometers, hectares, acres or some other measure. Monaco, with an area of less than one square mile, has the world's highest population density or almost 43,000 people per square mile. Mongolia is the world's least densely populated country with only

4.3 people per square mile. Australia is a close second with 6.4 people per square mile. The United States, with its extensive territory, has a current population density of over 87 per square mile. About 90% of the earth's people live on 10% of the land. Additionally, about 90% of the people live north of the equator. However, the world's population distribution is not stable and there are continuous shifts in concentration throughout much of the world. In the US, and in much of the world for that matter, population concentrations have been increasing over time. The estimated population density for the U.S. in 2010 was around 87 persons per square mile (i.e., 309 million residents divided by 38 million square miles). The most highly concentrated state population is found in New Jersey, with nearly 1,200 persons per square mile in 2010; the least highly concentrated state population was found in Alaska, with barely one person per square mile. The borough of Manhattan in New York City is considered the highest concentration of population within the U.S., with approximately 20,000 persons per square mile.

Another way of looking a concentration is in terms of an area's mean center of population. This is the point at which the population is equally distributed in all directions to the point that the area would balance like a plate set on top of a stick. At the time of the first census in 1790 the mean center of population was in Maryland; today it is in Missouri. During the twentieth century the mean center of population shifted 324 miles to the west and 101 miles to the south. Exhibit 3.3 presents data on population density by state.

Exhibit 3.3 Population Density by State, United States: 2010



Source: U.S. Census Bureau

Like distribution, measures of concentration assume reasonably accurate population counts and fixed geographic boundaries. For most units of geography (e.g., states, counties, census tracts) the boundaries and, hence, the land area typically do not change. For other units such as ZIP Codes and school districts the boundaries (and thus the land area) are subject to change.

An understanding of the concentration of the population is critical for the analysis of health service needs and the allocation of health resources. Certain types of services require a critical mass of population (i.e., a certain number of people concentrated within a certain geographic area), and such services cannot be efficiently delivered at lower population densities. Exhibit 3.4 describes methods for delineating a healthcare market.

Exhibit 3.4 Identifying a Healthcare Market Area

Increased competition among healthcare providers has made the accurate delineation of market areas crucial for the effective operation of patient care organizations. Market boundary information is used in conjunction with population data, intelligence on competitors and patient records to better understand the distribution of patients, justify adding new services and/or facilities, and determine shifts in the location of competitors. The challenges of delineating a service area differ for existing healthcare organizations or sites and for new organizations or sites.

A number of methods can be used to delineate market area boundaries, and it is good practice to compare boundaries based on more than one technique. One method involves establishing the maximum distance or driving time that people are willing to travel for a given service, using the locations of the service as the center of a circle or other shape determined by distance or time. This method applies to a new initiative or to an existing one that doesn't have adequate information on its customers. Computer software is available for performing this type of delineation and there are vendors who will provide this information.

A second method, and one that relates to an existing initiative, involves plotting on a map the residences of a sample of recent patients or other customers who have used a specified service or location. The distribution of residences can be assumed to replicate the market area. Note that the market area for some services might be more restricted (e.g., general hospital services) and for others more expansive (e.g., specialized hospital services). Therefore, for any large healthcare organization multiple market areas may be involved. It should also be noted that some customers may not come from residences at all but from some other site (e.g., work, school, a nursing home, etc.).

For most new services establishing prospective market area boundaries is more of a challenge and may require more than one technique. Initially,

(continued)

Exhibit 3.4 (continued)

the residential and/or workplace distribution of patients using similar services should be plotted. If another organization is offering the same or a similar service, then its market area boundaries could be used as a model. Distance and driving time must be evaluated as well. A more subjective approach may be required if the service is new to the area. Data on the market area for the same service offered in a different market may be available through professional networks. These data could help establish time-distance parameters. Surveys of potential consumers of the specified service (e.g., physicians and patients) also may provide valuable time-distance sensitivity information.

Delineating a healthcare market area involves the use of carefully chosen geographic units, although market areas are sometimes approximated in order to adhere to existing geographic boundaries. This brings us to a couple of technical considerations related to delineating market area boundaries. First, the true market area may not coincide with standard geographic boundaries. For example, the apparent market area for a specified service may cut across ZIP Codes, census tracts or other geographic units. This not only makes for irregularly shaped market areas but also leaves partial units within the boundaries, necessitating the allocating of partial data to the fractured geographic units. Health planners may gerrymander the market area for the sake of access to data that would not be available for a partial geographic unit.

The second concern is over the fluid nature of market areas. Because of the mobility of the U.S. population and its constantly changing residential patterns, situations may exist where the market area in question is undergoing change (even as the boundaries are being drawn). Market area boundaries must be constantly updated in order to take these changes into consideration, especially in an industry as volatile as healthcare.

3.3 Community Type

Demographers classify populations in terms of the types of communities they occupy. While the type of community is addressed somewhat by the geographic units discussed above, there are other less formal community types that demographers may employ in their analyses. These are important not only because they describe the nature of population distribution, but they also reflect differences in lifestyles and various demographic characteristics. Further, there are a number of health-related issues associated with different community types, from the incidence of disease to the use of health services.

Demographers classify the least populous areas as rural areas. Technically, from the Census Bureau perspective these are areas containing less than 2,500 residents.

The Bureau further divides rural areas into rural farm areas and rural non-farm areas.

Generally speaking, communities of 2,500 or more residents (with at least a certain population density) and less than 50,000 residents are considered "small towns" or just "towns" in popular parlance. It is usual to have small towns scattered around rural areas; however, increasingly, the suburbs and exurbs of metropolitan areas contain small towns.

Typically, communities of 50,000 or more are considered to be "cities", with social, cultural and economic characteristics that separate them from towns. Cities are further classified as small cities, medium cities and large cities, with essentially no upper limit on the population size. The thresholds for different sizes of cities vary based on who is establishing the classification.

Cities of any significant size are classified by the Census Bureau as metropolitan statistical areas, micropolitan statistical areas, or combined statistical areas. The first two invariably contain a central city of 50,000 or more for a metropolitan area and 10,000 or more for a micropolitan area. With rare exceptions, these urban areas contain a central county which houses the central city as well as adjacent counties that comprise the metro- or micro-area. These adjacent counties are typically referred to as suburban counties and the urban communities within there borders as suburbs. Further, the central county often includes suburbs that are distinct from the central city.

The central city is also often subdivided into an urban core (that typically includes a central business district) and surrounding suburban areas (which may or may not be within the city limits). Older cities may have two or more successive rings of suburban development, often encouraged by the establishment of highway "loops".

Finally, communities and counties that exist beyond the suburban counties of a metro- or micro-area are referred to as exurbs. These may include rural areas, small towns and/or cities that are somewhat beyond the Census Bureau-recognized limits for consideration as part of the metro- or micro-area.

Combined statistical areas (CSAs) are metropolitan or micropolitan statistical areas that retain their metro- or micro- identity while being included in a larger metropolitan area. In certain parts of the country, most notably the East Coast and West Coast, there are unbroken stretches of urban development in which metropolitan areas actually merge with each other. These are referred to as consolidated metropolitan statistical areas and may contain tens of million of residents.

Understanding these various gradations of both official and unofficial community types would benefit from a concrete example. Officially part of the Washington-Arlington-Alexandria, D.C., Virgina, Maryland and West Virginia Metropolitan Statistical Area, the Washington, D.C., area illustrates the various community types. The District of Columbia, while not techically a county, essentially has the status of the central county of the MSA. Washington is the central city in that "county" which contains other, smaller cities (e.g., Georgetown). This central county is surrounded by counties in four states, five in Maryland, ten in Virgina, and one in West Virginia. These "suburban" counties include cities of various sizes (e.g., Arlington, Virginia, and Silver Springs, Maryland), towns of various sizes (some incorporated, others unicorporated) and rural areas (including some rural farm areas). There are an additional eight counties in Maryland and Virginia that are considered exurban (i.e., not part of the metropolitan area but nevertheless interconnected). Finally, the Washington metropolitan statistical area is combined with the Baltimore Metropolitan Statistical Area to form the Washington-Baltimore Consolidated Statistical Area. (See Exhibit 3.5 for a map showing certain aspects of the Washington MSA, Exhibit 3.6 for a practical example of the use of geographic units for health planning and Exhibit 3.7 on geographic information systems).

Exhibit 3.5 Washington, DC, Metropolitan Area

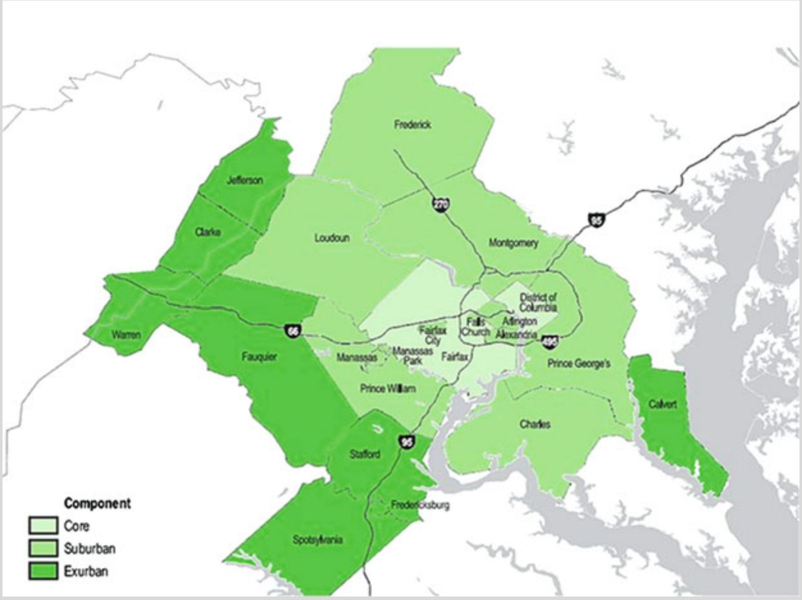


Exhibit 3.6 Where Are the Patients?

By the end of the 1980s, the healthcare industry had become highly competitive. This new healthcare environment demanded that healthcare providers know the characteristics and distribution of patients and potential patients. This development prompted hospitals and other providers to turn to their data processing centers and research departments in order to get a handle on the geographic distribution of their patients (and perhaps those of their competitors). All administrative record systems maintain street

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Exhibit 3.6 (continued)

address and ZIP Code identifiers for patients for billing purposes if for no other reason. The obvious first step for these organizations was to determine where their patients were coming from based on ZIP Code or some other unit of geography.

By accessing ZIP Code-level data, health professionals are able to acquire insights into the distribution those who use health services. The wide use of ZIP Codes by healthcare administrators and planners reflects the fact that ZIPs are widely available and easy to understand. Further, a number of data vendors focus on ZIP Codes and make estimates and projections available at the ZIP Code level between censuses. Further, if a certain segment of the population is to be targeted for a promotional campaign by a healthcare organization, it is likely that the mailing lists requested will be made available at the ZIP Code level.

On the minus side, ZIP Codes tend to be relatively large in terms of both population and geographic area, making them unwieldy in some cases. They may not correspond to the boundaries of an identified market area. The fact that ZIP Code boundaries are subject to change also limits their usefulness given the importance of measuring change in the characteristics of targeted populations.

While a tabular presentation may be useful, it is much more descriptive to present these data in the form of a map. Clusters of patients can be identified and areas of weak or strong market penetration calculated. Today, computerized mapping packages are available that can quickly generate maps that graphically depict the distribution of whatever phenomenon is being examined.

Regional hospitals and other healthcare providers that serve multicounty or multistate markets may find the ZIP Code or even the county level of geography to be inadequate. However, most healthcare providers, particularly those in urban areas, are more local in their orientation. Smaller urban hospitals as well as clinics often cater to a certain segment of the community that demonstrates narrow geographic distribution. The practices of primary care physicians, for example, are likely to serve a limited geographic area.

While ZIP Code-level data give an indication of the socioeconomic status of the patient, a lower level of geography is often required by healthcare providers. The next lowest level after the ZIP Code is the census tract, with a ZIP Code typically encompassing a number of census tracts. Unfortunately, since ZIP Codes and census tracts have been developed independently, there is little correspondence between the boundaries of the two types of units. Census tract-level data allows a much more granular analysis and plotting one’s customers on a map by census tract presents much more detail than possible using ZIP Codes. Further, if the healthcare organization is federally funded (e.g., a federally qualified health center) or is seeking federal grant funding, the federal agency involved will require that data be provided at the census tract level.

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Exhibit 3.6 (continued)

There may be rare occasions where a health planner requires data at a lower level than the census tract (e.g., census block or census block group). At the block group level, a substantial amount of census data is available for use by the analyst. However, the breadth of data available at the block level is, understandably, limited to a few basic variables.

Ultimately, the choice of geographic level to be used for an analysis depends on: (1) the objectives of the analysis; (2) the degree of granularity required; (3) the implications of crossing political boundaries; and (4) the type of data required. The last criterion is worth expanding upon, since data of different types and levels of granularity vary with geographic level. At the national level, for example, health-related data can be obtained in great detail for virtually any desired variable. These data are readily available and can be disaggregated for any relevant demographic category (e.g., Hispanics, frail elderly, baby boomers). Similarly, at the state level a wide range of data is available and, in some cases, exceeds in scope what data may be available at the national level due to state-specific programs that are in place. At the county level, a considerable amount of data is available, with counties being the initial source of vital statistics. Of course, data collected through the decennial census are available for all of these levels, although they quickly become dated. (See the discussion on the American Community Survey in this regard).

While the Census Bureau does allocate census data to the ZIP Code level, the best source of data at this level is the commercial data vendors who specialize in generating estimates and projections at the ZIP Code level. At the census tract level and below, virtually the only source of data is the census. As noted above, there is extensive data available at the tract level, somewhat less data available at the block group level, and only limited data available at the block level. The American Community Survey does report data out at the census tract and block group levels based on the sample surveyed, but there are virtually no additional sources of data for geographic units below the census tract.

Exhibit 3.7 Geographic Information Systems

Demographic data and, to a lesser but significant degree, health data are usually linked to geography. When demographic data are presented they typically refer to a county, census tract or some other unit of geography. Similarly, health statistics such as birth rates, death rates and disease incidence rates are generally presented for a geographic area. In fact, both demographers and epidemiologists have long used maps to display population characteristics and the distribution of disease and death. Given the spatial link

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Exhibit 3.7 (continued)

to the data used by health demographers, it makes sense to use maps to display this information. It could be argued that, if a picture is worth a thousand words, a map is worth 10,000 words. Not only do maps provide a visual depiction of the distribution of demographic data but they serve as the foundation for performing spatial analyses to explore the nature of the relationship of the chosen variable and geography.

The technology available for mapping has advanced from manual cartography to the age of geographic information systems (GIS). A GIS is a computer-based system that allows an analyst to combine the geographic information inherent in a map with data linked to geography. The result is a spatial depiction of the distribution of the phenomenon under study. The resulting maps can indicate the distribution of health conditions relative to various geographic areas. More important, it is possible to “layer” variables on a map to indicate the relationship between various factors under study. Thus, a health demographer could view a map with layers for the distribution of cancer within a population, the proportion of the population that smoked, and the degree of air population in various parts of the community. In one visual the connection between cancer, tobacco use and air pollution could be illustrated.

The use of GIS is enhanced by the ability to assign a geocode to disease cases, environmental hazard sites, health facilities or any other factor with a geographic link. This involves assigning a latitude and longitude (typically based on a street address) to the data point under study. This allows the exact placement of that data point on a map where it can be viewed in relation to other data points. Further, the geocode assigned to a data point (e.g., a doctor’s office) will also indicate other geographic identifiers such as ZIP Code, census tract or county). Even in the absence of a street address, a geographic positioning system (GPS) can be utilized to assign a geocode.

The ultimate benefit of GIS technology involves the ability to perform spatial analysis. Various methodologies for spatial analysis are available that allow the analyst to examine multiple phenomena within a geodemographic context. As in the case of cancer epidemiology above, it becomes possible to examine phenomena from a variety of different dimensions – demographic, behavioral, environmental, topographical and so forth. Patterns that might not otherwise be noticeable emerge and metrics can be generated to indicate the spatial relationship between seemingly disparate variables. Simple applications of spatial analysis include the efficient routing of delivery trucks within a distribution area and the identification of catchment areas for various types of health services. GIS is expected to become an increasingly important tool in the health demographer’s arsenal as both more sophisticated and user-friendly GIS capabilities are developed.

3.4 Population Change and Its Measurement

Demographers pay considerable attention to population change and, indeed, the anticipated demand for health services is a reflection of shifts and in the location and composition of the population. A population's characteristics at any point in time represent a static "snapshot" of that population, and it is the changes that occur in a population that represent the dynamic aspects. Population change can be manifested in a change in the size of a population, in the distribution and concentration of the population and in the population's composition. (Compositional change will be addressed in Chap. 4).

The three components of population change are fertility (births), mortality (deaths) and migration. Individuals are added to the population through the fertility process and subtracted through mortality. Individuals are added to a population through in-migration and subtracted through out-migration. Thus, the population at Time 2 is a result of adding births and in-migrants and subtracting deaths and out-migrants from the population at Time 1. Population change resulting from the addition of births and the subtraction of deaths is referred to as "natural increase" (or decrease as the case may be). In a closed society, these are the only factors that influence population change. Since there are virtually no closed societies, the role of migration must be factored into the equation.

Changes in population size and distribution almost invariably result in changes in population composition. Even the most static traditional society will undergo change as a result of demographic processes, albeit at an almost imperceptible rate. Differential birth rates or deaths rates for subgroups in society will result in compositional change. This is occurring in the United States today, for example, as the white population exhibits lower birth rates than various minority populations, leading to a restructuring of the racial and ethnic composition of the U.S. population. Similarly, in-migrants may have different characteristics from the population in the receiving community and, in fact, migrants tend to affect the population composition of both the communities from which they originate and those to which they migrate.

While the measurement of population change is a critical activity of demographers, there are often situations in which adequate information is not available for this purpose. There are occasions in which information on population size and characteristics is desired for a past time period for which data are not available or for a future time period for which data obviously do not exist. In these situations, demographers rely on population estimates and projections. Using well-established techniques, data on population size and in some instances population characteristics are produced for past, present and future time periods.

Population estimates and projections can be either simple or complex. The simplest approach to estimating or projecting change is to use known data points to extrapolate or interpolate data. Obviously, the more data points one has access to, the more accurate the estimate or projection. If one knows, for example the population of a community for 1990 and 2000, respectively, the population estimate for 1995 can be made by interpolating from these two figures. Assumptions must be made, of course, concerning the rate of change for that decade, with the most straightforward approach assuming that the rate of change was constant over the 10-year period. Similarly, if one wanted to project the population for 2010 for this same community, it would be possible to extrapolate from the existing data points into the future. The analyst could determine the numerical change between 1990 and 2000 and assume that same absolute change for 2010. Alternatively, the analyst could determine the percentage change, apply that figure and assume the same proportional change for 2010. In most cases, these two approaches yield different answers and the demographer must have an understanding of the community in question to determine the best method to use. As noted earlier, all of these methods make assumptions about the rate of change between any two time periods under study.

Estimates and projections can also be produced by combining data from the most recent counts available (or most recent estimates) with data on births, deaths, and migration and/or symptomatic data (e.g., housing starts and utility hookups). These more reality-based methods are preferred if adequate data are available.

Population estimates and projections are viewed as proxies for actual data such as census data. They are, however, susceptible to statistical error and the amount of error is not likely to be known. Further, their efficacy depends on the accuracy of the assumptions made.

3.5 Trends in Population Size, Distribution and Contribution

Since the first U.S. census was conducted in 1790 (and before) the population of the United States has experienced steady growth. The continuous increase in the size of the population has been a major force in the political and economic development of the country. From a nation of roughly 4 million persons in 1790, the population of the United States had increased to over 308 million in 2010. The inordinate growth of the 1950s reflects the high post-war fertility rates that spawned the baby boomers, while the spike in growth during the 1990s probably reflects an increase in the volume of immigration. The growth trend for the United States from 1950 to 2010 is presented in Exhibit 3.8.

Population density in the United States is currently around 87 persons per square mile. While density has been increasing steadily over time, these figures are relatively low compared to most other countries. The 2010 US figure of 87 compares to the most recent estimate of 360 for China, 583 for Germany, 940 for India, 873 for Japan, and 919 for Belgium. Population density at the national level is of limited interest to demographers because of the small amount of decade-to-decade change. However, when subnational geopolitical units such as regions, states, counties and cities are considered, the amount of change in the concentration of persons across geographic areas becomes important for a variety of considerations including healthcare.

Exhibit 3.8 US Population Growth and Density: 1950–2010

Year	Population	Population per square mile	Increase over previous decade	Percent change
1950	151,325,798	42.6	19,161.229	14.5
1960	179,323,175	50.6	27,997,377	18.5
1970	203,302,031	57.4	23,978,856	13.4
1980	226,545,805	64.0	23,243,774	11.4
1990	248,718,301	70.3	22,176,102	9.8
2000	281,421,906	79.5	32,703,605	13.1
2010	308,745,583	87.4	27,323,632	9.7

Source: U.S. Census Bureau

Exhibit 3.9 Population for the 10 States with the Highest and Lowest Growth Rates: 1990–2000 and 2000–2010

1990–2000			2000–2010		
Rank	State	Percentage change	Rank	State	Percentage change
1	Nevada	27.3	1	Nevada	35.3
2	Alaska	15.5	2	Arizona	24.7
3	Arizona	15.1	3	Utah	23.9
4	Colorado	13.7	4	Idaho	21.2
5	Utah	13.3	5	Texas	20.9
6	Washington	11.6	6	North Carolina	18.6
7	New Mexico	11.2	7	Georgia	18.5
7	Georgia	11.2	8	Florida	17.9
9	Oregon	10.5	9	Colorado	17.0
10	Texas	10.2	10	South Carolina	15.4
51	District of Columbia	–8.7	51	Michigan	0.0
50	Rhode Island	–1.4	50	Vermont	0.0
49	Connecticut	–0.4	49	New York	0.2
48	North Dakota	0.4	48	Ohio	0.2
47	New York	0.8	47	West Virginia	0.3
46	Massachusetts	0.9	46	Massachusetts	0.3
45	Maine	1.1	45	Maine	0.4
44	Pennsylvania	1.6	44	Pennsylvania	0.4
43	West Virginia	1.9	43	Rhode Island	0.4
42	Iowa	2.3	42	Iowa	0.4

Source: U.S. Census Bureau

An examination of growth rates for the various states and the District of Columbia provides insight into not only population growth and change but into population redistribution. Exhibit 3.9 presents data on the states with the highest and lowest growth rates for the 1990–2000 and 2000–2010 periods.

3.6 Sources of Data on Population Size, Distribution and Concentration

The decennial census has historically been the primary source of data on population size, distribution and concentration. The census involves a complete count of individuals residing in a specific place at a specific time. The U.S. Census Bureau (within the Department of Commerce) has conducted population censuses since 1790. The census of population and housing is conducted every 10 years (in years that end in zero) and data from the 2010 census was being analyzed as this volume was going to press. The census is limited it is usefulness since it is only conducted infrequently and it often takes 2–3 years for data to be released once the census is completed. Despite this, census data is valuable in that it provides information on the population down to the census block level.

Today, the U.S. decennial census is supplemented by the American Community Survey (ACS) which essentially replaces the census long form. The American Community Survey uses a series of monthly samples to produce annually update data formerly collected via the decennial census long form. Now fully implemented, the ACS mails survey forms to 250,000 households each month (or 3 million forms annually). Data are collected primarily by mail, with telephone and personal follow-ups as required. The ACS includes people living in both housing units and group quarters. As the size of the response pool has increased over time, the ACS has begun providing data down to the census tract and block group levels form more parts of the country. The American Community Survey is considered an improvement over the census long form because it provides small-area information annually instead of once a decade. However, since it is based on a sample, the various deficiencies associated with sample surveys are present.

State and local governments are also sources of demographic data. State governments are charged with tracking their populations, with each state having a state data center for demographic projections. University data centers may also be involved in the processing of demographic data and in producing population estimates and projections. Local governments may also generate demographic data for use in various planning functions.

3.7 Implications for Healthcare Delivery

The size of a population is generally considered the primary factor with regard to the health services that the population requires and/or can support. Given the fact that most members of any population will use health services at some point, knowing the size of a population provides intelligence on the volume of health services required (although not necessarily the type of health services). For most services there are standards related to the number of residents it takes to support a particular practitioner, facility or service. For example, health professionals may consider a population of 10,000 necessary before the local hospital can feasibly offer cardiac catherization services. Or, national standards typically call for one primary care physician for every 3,000 residents, on the assumption that this is the ratio of physicians to population necessary for meeting the population's primary care needs. Exhibit 3.10 indicates the number of physicians required for a hypothetical population of 25,000.

Exhibit 3.10 Estimated Number of Physicians Required (Selected Specialties)

Specialty	Number required
Family medicine	7.5
General internal medicine	7.0
OB/GYN	2.5
Pediatrics	3.5
General surgery	2.5
Psychiatry	2.0
Cardiology	1.5
Orthopedics	1.5
Ophthalmology	1.5
Other specialties	8.5

Similarly, the size of the population determines the types of health services that are required, realizing of course that the demographic attributes of any given population will also influence health service needs. For a hypothetical population of 25,000, it could be argued that, based on national standards, the services listed in Exhibit 3.11 represent a partial listing of the services that would be required for this population.

Exhibit 3.11 Selected Medical Services Required

Service	Estimated annual physician visits
Well-child exam	2,861
Follow-up exam	3,056
Pregnancy management	1,949
Gynecologic exam	1,747
Post-surgical exam	1,371
Routine exam	1,291

In a community of any size the population is not likely to be equally distributed throughout the geography in question. There will typically be concentrations of residents in certain areas, creating communities with a high density of residents and other areas characterized by a low density of residents. Thus, the demand for health services will not be uniform across the geographic unit but will be greater for some areas and less for others. Ideally, the quantity of health personnel, facilities and services should be proportionate to the size of the population being served. However, because healthcare providers are relatively free to establish their practices, facilities and services wherever they want, health professionals tend to favor some communities over others. Unfortunately, it is not necessarily the communities with the largest populations that attract greater quantities of healthcare resources. Increasingly, the ability to pay for healthcare on the part of the population is a major consideration when it comes to the location of health resources. This situation results in an imbalance (or maldistribution) of health services in many communities, to the extent that larger populations may have fewer healthcare resources than smaller but more affluent populations. Given the absence of centralized control within our healthcare system, the maldistribution of health services is a chronic and, for many communities, a growing problem. See Exhibit 3.12 for a discussion of the maldistribution of health services.

Exhibit 3.12 The Maldistribution of Health Services

The United States suffers from a chronic and growing maldistribution of health services. Healthcare personnel, facilities and services, while generally more plentiful in areas of high population concentration, are disproportionately found in certain communities and conspicuously absent in others. Two factors account for this maldistribution of services: changing population distribution and locational decisions on the part of health professionals. The mobility characterizing the U.S. population creates a very dynamic situation in terms of population growth and change. At any given time various communities are undergoing rapid growth with large new developments arising seemingly overnight. At the same time, many communities are undergoing population decline. While typically not as rapid as the growth observed, populations in inner-city communities may decrease as housing units are demolished, older populations die off or residents are drawn to more attractive suburban communities.

The on-going redistribution of the population creates two distinct dynamics related to the distribution of health resources. Areas undergoing rapid population growth may be underserved (e.g., not enough physicians or hospitals) as healthcare resources fail to keep up with population shifts. At the same time, those areas experiencing slow growth or even population loss may have a relative excess of services. Healthcare facilities represent major investments in a community and are not opened and closed in the same manner one would open or close a small retail business. Further, hospitals are major employers in many smaller communities, and the closure of the local hospital would have a major impact on the local economy. This means that hospitals in rural communities are often operated long after there is a need for this level of service. Physicians, on the other hand, are much more mobile

(continued)

Exhibit 3.12 (continued)

and have greater ability to adjust to changing population distributions. Thus, large numbers of rural communities have few or no physicians (even though they may have a hospital). The mobility of physicians and the inability of rural communities to attract health services mean that hundreds of U.S. counties are classified as primary care shortage areas.

Within most metropolitan areas healthcare resources tend to be concentrated around a small number of "medical centers" and in the more affluent portions of the community. To the extent that physicians make rational decisions with regard to choice of practice location, they base these decisions in part on the demographic characteristics of the various communities they have to choose from. As a result upscale suburbs have a disproportionate share of healthcare resources while inner-city communities exhibit a paucity of such resources. Today, in fact, as upscale suburbs are developed it is typical for physicians to establish practices in anticipation of future needs for health services rather than following residents to the new community. Of course, hospitals are soon to follow, often leaving older sections of the city without health facilities. As U.S. society has become more suburbanized, the disparities in the availability of health services have grown to the point that it has become a maxim that healthcare resources are concentrated where there is the least need while areas with the most need have the least resources.

The maldistribution of health resources does not lend itself to easy remedy. Federal efforts to address physician shortages and maldistribution have had limited success. Without clear and enforceable healthcare policies that present viable and acceptable alternatives to the current unplanned distribution patterns, small communities will continue to engage in heroic efforts to keep their hospitals open. States and municipalities will continue to offer incentives for physicians to practice in rural areas and staff these hospitals. Without a mechanism for assuring adequate health services should a hospital be closed, rural communities have little choice in their actions. Even with these efforts a large number of rural hospitals (and some urban ones) have closed over the past two decades.

Additional Resources

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Chapter 4
Population Composition

4.1 Introduction

Population composition refers to the combined demographic characteristics of persons within a geographic area. These characteristics create a profile of the population and are the attributes that give a population its particular character. The population composition of New York City sets it apart from Memphis, Tennessee, and Omaha, Nebraska, more so than its size. The composition of an area's population is useful in projecting the incidence of disease and death as well as health status and health services demand. Two communities of equal size do not have the same healthcare needs if one has a younger, more affluent and racially homogeneous population than the other. Similarly, patterns of health-related behavior such as tobacco use and dietary patterns are likely to be reflections of population composition. (See Chaps. 10 and 11 for discussions of the demographic correlates of health status and health behavior).

Compositional variables are primarily descriptive in nature. Their usefulness is derived from their ability to profile a population in terms of its relevant attributes. An area's age distribution, racial makeup, income level, and dominant religion are the types of characteristics that give a population its "personality." When these variables are related to health status and health behavior, however, they go beyond description and become powerful predictors of the health of a population and its patterns of health services utilization.

The use of composition-based models to predict and understand health phenomena is an increasingly important component of demographic and health services research. It may be interesting to note that a population of a county or city is 15% elderly (percent of the population that is age 65 and over), 40% African American, mostly at a working-class income level, has an average educational level of the tenth grade, and an average family size of 3.5. This information becomes more than interesting and valuable when it is linked to health status and health behavior. These facts can

L.G. Pol and R.K. Thomas, *The Demography of Health and Healthcare*,
The Springer Series on Demographic Methods and Population Analysis 13,
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be converted to information on the level of sickness and disability in the population, the type of health problems that can be anticipated, the number of hospital admissions, the number of surgeries to be performed, the demand for obstetricians, and even the death rate, among other factors.

4.2 Compositional Variables

Compositional variables can be divided into two categories: biosocial characteristics and sociocultural characteristics. *Biosocial characteristics* are those that have an underlying biological or physical component. As such, they tend to be "ascribed" characteristics present at birth and not amenable to change. Biosocial factors include age, sex, race and ethnicity, and with the exception of ethnicity all are rooted squarely in biology. Ethnicity has its basis in a common cultural heritage, but endogenous marriage within ethnic groups often results in the development of a gene pool that fosters common physical characteristics.

Biosocial characteristics have significant social connotations in that society ascribes certain social attributes to biosocial variables. For example, while being male or female is a biological condition, society attaches certain attributes to men (i.e., masculine traits) and to women (i.e., feminine traits). In fact, demographers use the term "sex" to refer to biological differences and "gender" to refer to socially ascribed attributes. Similarly, we speak in terms of age-appropriate behavior to indicate that age is not just a matter of years lived but that there are certain social attributes associated with different ages.

Sociocultural factors reflect the position of society members within the social structure. Sociocultural factors, in US society at least, are primarily "achieved" rather than ascribed. These are not traits one is born with in a biological sense but those that are acquired (voluntarily or involuntarily) through one's place in the social system. These factors are "cultural" in that those affected take on characteristics assigned by society. Sociocultural factors include marital status, income, education, occupation, and religion among others. Each variable is discussed in turn in the sections that follow.

4.2.1 Biosocial Characteristics

4.2.1.1 Age

For many purposes, the age distribution of a population represents its most significant compositional variable. After population size, the age distribution is the most important factor in determining a society's character and for calculating many of the rates used by demographers. From a healthcare perspective, the age distribution is a major consideration in determining the number and types of health problems that exist and the pattern of health services utilization.

Age is measured in chronological terms beginning at a person's date of birth. For data collection purposes, individuals may be asked to disclose their age as of their last birthday or simply to provide their date of birth. In the latter case, exact age is derived by subtracting the birth date from the current or reference date. Age data in the United States are generally thought to be of high quality, though some age "heaping" is seen in self-reported data for milestone years such as 21, 62, 65, 100, and years that end in zero, suggesting that some respondents are not truthful in reporting their age. Age data are generally aggregated for a specific geographic unit (e.g., census block, ZIP Code, a market area), and further aggregations are made simply by summing the totals for smaller units.

Although age data may be sometimes presented in single years (e.g., 1, 2, 3, etc.), ages for a population are typically grouped into intervals to simplify data presentation. Five-year and ten-year intervals are generally used by demographers, with exceptions sometimes made for the youngest intervals (under 1, 1–4), and the oldest intervals (age 85 and above). However, there is no substantive reason for utilizing these intervals and others that are more relevant to the issue at hand may be more appropriate. It may even be appropriate to create more "functional" intervals, such as 0–14, 15–24, 25–44, 45–64 and 65 and older. In addition, age-based cohorts may be carved out in order to focus on specific sub-populations such as teenagers (i.e., 13–19), childbearing age women (i.e., 15–44), and the oldest-old (i.e., 85 and older).

Means and medians are often used as summary indicators of the overall age distribution. The median age is most commonly used since it provides the best indicator of the mid-point of the age distribution, although it is still important to examine the entire age distribution when a deeper understanding is required. The current median age of the US population is around 37 years. This contrasts with a population like that of Uganda with a median age of 15 years. Obviously, the difference in median age between the US and Uganda has all manner of implications for the respective societies and particular implications for health and healthcare. For example, younger populations have proportionally more women in their childbearing years, and therefore produce more births. It is not unusual to separately calculate the median age for males and females as well as for other demographically meaningful subgroups.

The mean age (or arithmetic average) of the population is sometimes used as an indicator of age distribution, although the mean is much more sensitive to extreme values than the median and, thus, considered less meaningful. Measures of statistical dispersion (e.g., standard deviation) may also be used to describe a population's age distribution. Exhibit 4.1 contains detailed age data for the U.S. population in 2010. The data show that the distribution is a mature one with similar proportions at all age groups except the very oldest.

4.2.1.2 Sex

The *sex* or *gender* of an individual is perhaps the most straightforward attribute to determine, given that there are only two possible categories, male and female. The sex distribution is typically presented in terms of raw numbers (e.g., 5,200 females and

Exhibit 4.1 Age Distribution of U.S. Population: 2010

Age category	Population	Percent distribution
Under 5 years	20,201	6.5
5 to 9 years	20,349	6.6
10 to 14 years	20,667	6.7
15 to 19 years	22,040	7.1
20 to 24 years	21,586	7.0
25 to 29 years	21,102	6.8
30 to 34 years	19,962	6.5
35 to 39 years	20,180	6.5
40 to 44 years	20,891	6.8
45 to 49 years	22,790	7.4
50 to 54 years	22,298	7.2
55 to 59 years	19,665	6.4
60 to 64 years	16,818	5.4
65 to 69 years	12,435	4.0
70 to 74 years	9,278	3.0
75 to 79 years	7,318	2.4
80 to 84 years	5,743	1.9
85 years and over	5,493	1.8
Total	308,745	
Median age	37.2	

Note: Population in millions
Source: U.S. Census Bureau.

4,800 males), percentages (e.g., 52% female and 48% male), or converted into a "sex ratio". The sex ratio indicates the number of males per 100 females. Based on the raw numbers above, a sex ratio of 92.3 would be generated, meaning that for this population there are only around 92 males for every 100 females. In most developed countries the sex ratio is less than 100, indicating fewer males than females. As the population ages, the sex ratio decreases due to the higher attrition rate of males. At the age range 85 and over there are two women for every man, a nice arrangement if one happens to be a man in this age group. The sex distribution has important consequences in all societies and particular significance for health status and health behavior.

4.2.1.3 Race and Ethnicity

Race and ethnicity are at the same time biologically determined and socially constructed. Racial identity is based on physical characteristics such as skin color. Ethnic identification, on the other hand, is based on a common cultural heritage. Both "race" and "ethnicity" are social constructs with race, in particular, having no scientific basis. Thus, the number of racial groups and the basis for racial categorization

Exhibit 4.2 Racial and Ethnic Composition of the United States: 2010

Race/ethnicity category	Number	Percent distribution
Total population	308,745	
White alone	223,553	72.4
Black or African American alone	38,929	12.6
American Indian, Alaska native alone	2,932	0.9
Asian alone	14,674	4.8
Native Hawaiian and other Pacific Islander alone	540	0.2
Two or more races	9,009	2.9
Hispanic origin	50,448	16.3

Note: Population in thousands
Source: U.S. Census Bureau

varies from society to society. In the US recognized racial groups include whites, African-Americans, Asian-Americans and American Indians (including Alaska natives). The decennial census is the major source of data on the racial composition of the US population and in recent censuses it has been possible to claim two or more races.

Ethnic identification may be determined by members of a subgroup or ascribed by the larger society. Members of many ethnic groups view themselves as distinct from the larger society; others many not see themselves as different at all. Thus, while the Census Bureau may categorize all residents of Hispanic background as “Hispanic”, few Mexicans, Cubans or Puerto Ricans would apply that label to themselves.

The only ethnic group officially recognized by the Census Bureau is Hispanics, although there are other ethnic groups within US society that could be identified. Jews and Arabs could both be considered ethnic groups in US society as could subgroups identified based on their national heritage (e.g., Southeast Asians, east Indians, Ukrainians). Of course, to be considered as an ethnic group, the subpopulation must retain significant aspects of its traditional culture. When the population’s racial/ethnic composition is examined, Hispanics are classified as ethnic group members as well as in terms of their race. Exhibit 4.2 presents a breakdown of the racial and ethnic distribution for the US population. Note that the total exceeds 100% since Hispanic origin persons are double counted—i.e., as members of an ethnic group also assigned to various racial groups. The data show that more than one-third, 35.6%, of the U.S. population is made up of persons classified as a racial or ethnic minority. This figure has been rising and will continue to grow given the differences in age structure and fertility behaviors across all groups.

Race and ethnicity have particular significance for health status and health behavior, and one of the major issues in contemporary American healthcare is the extent to which disparities in both health status and health behavior are associated with different racial and ethnic groups.

4.2.2 Sociocultural Characteristics

4.2.2.1 Marital Status/Living Arrangements/Family Structure

Marital status, living arrangements, and family structure are all ways of looking at household characteristics. In the past, marital status was thought by demographers to be the best indicator of household relationships. However, as the traditional family gave way to new and different types of households, other measures of household characteristics became more salient.

Individuals are typically grouped into four marital status categories: single, married, widowed, and divorced. The Census Bureau also recognizes a "married but separated" category, although this does not constitute a formal marital status in all states. In addition to the current marital status of individuals, information may be collected on previous marriages and selected characteristics of any marriage (e.g., age at marriage, race/ethnicity of bride and groom, etc.). Historically, most Americans married when they entered adulthood and virtually everyone married eventually. However, beginning in the 1960s the rate of marriage began to drop and this decline has continued to the point that barely one-half of American adults are married today. Marital status carries a surprising number of implications for health status and health behavior.

Exhibit 4.3 shows recent trend data on the marital status of the U.S. population. As can be seen, the proportion of persons 18 and over who are married is declining while the percentages for never married and divorced are increasing. Implications of the continued restructuring of the U.S. family range from the level of insurance coverage to the presence/absence of support individuals to assist in the management of health problems.

In addition to marital status it is important to determine the living arrangements and family status of members of a population. A *household* is made up of one or more persons living in a housing unit. A *housing unit* is defined as one or more rooms that comprise separate living quarters with access from the outside or through a

Exhibit 4.3 Marital Status of the United States Population: 1990–2008

	1990		2000		2008	
Total population age 18 and over	181.8[a]	(100)[b]	201.8	(100)	224.5	(100)
Never married	40.4	(22.2)	48.2	(23.9)	58.3	(25.9)
Married	112.6	(61.9)	120.1	(59.5)	128.7	(57.3)
Widowed	13.8	(7.6)	13.7	(6.8)	14.9	(6.4)
Divorced	15.1	(8.3)	19.8	(9.8)	23.3	(10.4)

Source: U.S. Census Bureau (2011), table 56

[a] Numbers in millions

[b] Percent distribution

common hall and a kitchen or cooking equipment for exclusive use. Thus, individual apartments and duplex units are considered separate housing units, while dormitories and military barracks are not; the latter are referred to as *group quarters*.

Determining whether or not persons in a housing unit or elsewhere constitute a family is also important. A *family* is defined as two or more persons related by blood, marriage, or adoption who live together. Two persons living in the same housing unit are considered to be a household regardless of the relationship; if they are related to each other they are classified as both a household and a family. Because of this distinction, households are assigned to family and nonfamily categories. Family households are distinguished based on the relationship (through marriage, birth or adoption) of their members.

The distinctions between different types of household structures are important for a number of reasons. Family households, for example, have legal standing, while nonfamily households typically do not, although recent changes in state laws in this regard should be noted. Further, family households are likely to differ from nonfamily households in a number of ways unrelated to the size or nature of the relationship. In healthcare, the health service needs of nonfamily households are likely to differ from those of families. Ultimately, whether members of a housing unit are "related" by marriage, blood, friendship, convenience or some other basis has important health care implications.

One additional residential category to be considered is group quarters. Group quarters are defined by the Census Bureau as living arrangements for groups not living in conventional housing units or groups living in housing units containing ten or more unrelated people or nine or more people unrelated to the person in charge. Group quarters are owned or managed by an entity or organization providing housing and/or services for the residents. These services may include custodial or medical

Exhibit 4.4 Household Composition of the United States: 1990–2008

	1990		2000		2008	
Number of households	93,347[a]		104,705		116,783	
Persons per household	2.63		2.62		2.56	
Family households	66,090	(70.8)[b]	72,025	(68.8)	77,873	(66.7)
Married couple	52,317	(56.0)	55,311	(52.8)	58,370	(50.0)
Male households	2,884	(3.1)	4,028	(3.8)	5,100	(4.4)
Female households	10,890	(11.7)	12,687	(12.1)	14,404	(12.3)
Nonfamily households	27,257	(29.2)	32,680	(31.2)	38,910	(33.3)
Male households	11,606	(12.4)	14,641	(14.0)	17,872	(15.3)
Female households	15,651	(16.8)	18,039	(17.2)	21,038	(18.1)
One person	22,999	(24.6)	26,724	(25.5)	32,167	(27.5)

Source: U.S. Census Bureau (2011), table 56

[a] Numbers in thousands

[b] Percent distribution

care as well as other types of assistance, with residency commonly restricted to those receiving these services. People living in group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, assisted living facilities, group homes, military barracks, correctional facilities, and workers' dormitories. Although most hospitals are not considered group quarters because of the limited length of stay, long-term care hospitals and various types of residential treatment facilities might be included in this category. As the US population continues to age, the number and percentage of Americans living in group facilities are expected to increase.

Exhibit 4.4 provides data on household composition of the U.S. from 1990 to 2008. The proportion of households considered family households (two or more persons who are related) has declined while non-family households have increased proportionately. Moreover, there has been a rise in the proportion of single-person households.

4.2.2.2 Income

Income refers to the amount of money taken in by individuals and households during a specified time period (usually a year). Income statistics generally refer to income in the previous year and income is either reported in absolute dollars (i.e., $23,550) or grouped into intervals (e.g., $20,000–24,999, $25,000–29,999). In most cases, income data are collected for the household whether it is a family household or a group of unrelated individuals (i.e., family income vs. household income). In addition to the amount of income, data may be collected on the source of income (e.g., wages and salaries, interest, royalties).

While income data presented in intervals provide a useful perspective on the distribution of income for a population, more straightforward indicators are typically used. Thus, for all households it is common to report the median household income with the mean household income sometimes also being reported. Similarly, demographers may present the median (or mean) family income in which case only family households are counted. Median household and median family incomes represent the mid-point of household income and are calculated by determining the point at which half of the households or families are above and half are below the mid-point.

The mean income represents the arithmetic average for all households or families. This indicator is used less frequently than the median since it is more sensitive to extremes in reported income. For example, for a small population, one household with a million dollars in income could badly skew the mean toward the high end.

One other indicator of income level that is frequently used is per capita income. This indicator is calculated differently in that total income for a population is established and then divided by the number of individuals in that population. Per capita income is not considered as useful as household-based indicators because the per capita income can be influenced by a number of factors that might make such an average misleading. (Exhibit 4.5 presents a sample income distribution with associated measures of concentration).

One other indicator of a population's income is its *poverty* level, or the extent to which individuals, families or populations are economically deprived. Poverty can be measured in absolute or relative terms, depending on the intent. In the U.S. the federal government establishes the criteria for what is considered to be the poverty threshold. The threshold is based on the amount of money required to cover basic living expenses (e.g., housing, food, clothing). The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The federal government distinguishes between urban and rural households in calculating the threshold. The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps) in its calculations. In 2010, the poverty threshold for an urban family of four was around $23,000 and an estimated 13% of Americans currently live at or below the poverty level.

Relative poverty is measured in terms of the household or population's relationship to the median household income. Thus, if the nation's median household income is $50,000, a household with an income of $25,000 would be considered to be 50% below the median. It is impossible to discuss demographics and health without considering the impact of poverty on the health status of the population.

Exhibit 4.5 Money Income of Households in the United States by Age of Householder and Level of Education: 2007

	Median income ($)
Age of householder	
15–24	31,790
25–34	51,016
35–44	62,124
45–54	65,476
55–64	57,386
65 and over	28,305
Total	50,233
Education attainment (highest degree)	
Less than 9th grade	20,805
9th–12th grade (no diploma)	24,492
High school graduate	40,456
Some college, no degree	50,419
Associate's degree	60,132
Bachelor's degree or more	84,508
Bachelor's degree	77,605
Master's degree	90,660
Professional degree	100,000
Doctoral degree	100,000

Source: U.S. Census Bureau (2011), table 56

Exhibit 4.5 displays data on median household income cross-classified by the age and education status of the householder. As anticipated, median household income rises with the age of the householder, peaking at the age range 45–54 years of age. Those with less than a ninth grade education have median incomes one-fifth the size of those with professional and doctoral degrees.

4.2.2.3 Education

Education refers to amount of schooling a population has attained. The educational status of a population is typically stated in terms of the number of school years completed and/or the types of degrees earned. Thus, members of a population may be asked to report the number of years of schooling they have completed (e.g., completion of high school equals 12 years, and college graduate equals 16 years). Similarly, respondents are asked to report the highest diploma or degree they have earned (e.g., high school diploma, master's degree). Educational attainment is frequently expressed in mean or median years completed, although an analysis of the distribution of years of education completed by a population is often important to determine the range of educational experiences. Exhibit 4.6 presents the current educational breakdown for the United States population.

Exhibit 4.6 Educational Attainment in the United States 2007

Less than high school	14.3%
High school graduate only	31.6%
Some college, no degree	16.7%
Associate's degree	8.6%
Bachelor's degree or more	18.9%
Advanced degree	9.9%

Source: U.S. Census Bureau (2011), table 56

4.2.2.4 Health Insurance Coverage

The *health insurance coverage* characterizing a community's population is an increasingly important population composition measure used by health demographers due to the disparities that exist in insurance by demographic group and the implications that insurance coverage has for morbidity and mortality. In analyzing the community's ability to pay for healthcare, the proportion of residents covered under various forms of insurance is an important consideration. Commercial (or private) insurance has typically included both group and individual coverage. Other major payor categories include those covered under the federally-sponsored Medicare and Medicaid programs. Medicare coverage is primarily for the elderly, but it does include a growing proportion of disabled enrollees. Coverage under the joint federal-state Medicaid program is primarily for citizens with very low incomes. A residual category has been established for those who do not have insurance coverage.

Exhibit 4.7 Health Insurance Coverage in the United States by Age: 2007

Age category	Private coverage (%)	Medicaid (%)	Not covered by health insurance (%)
Under 18	64.2	28.1	11.0
Under 6	59.3	33.5	10.5
6–11	65.4	27.7	10.3
12–17	67.8	23.1	12.0
18–24	60.1	12.5	28.1
25–34	65.9	8.1	25.7
35–44	73.7	7.2	18.3
45–54	75.9	7.1	15.4
55–64	75.4	7.4	12.0
65 and over	57.6	8.9	1.9
Total	67.5	13.2	15.3

Source: U.S. Census Bureau (2011), table 56

This "self-pay" category involves a wide range of population segments that typically have little in common except for a lack of insurance coverage.

There are clearly demographic correlates to health insurance coverage, and the type of insurance (or lack thereof) is often a reflection of the demographic characteristics of a subpopulation. Aside from the obvious health implications of having health insurance versus not having health insurance, there are also implications for having different types of insurance. Thus, seniors covered under Medicare have virtually all of their health problems covered, while poor people covered under Medicaid may have relatively limited coverage for many types of problems.

Exhibit 4.7 presents data on health insurance coverage cross-classified by the age of the individual. Overall, over 15% of the U.S. population was without health insurance in 2007. However, the proportion without coverage varies widely with age. Those at the oldest and youngest ends of the age continuum have the lowest percentages of persons without coverage. Non-coverage peaks at the ages 18–24 and 25–34 with more than one quarter of the population not having health insurance. The effect on these figures of the recent passage of health reform measures is unknown at this time.

4.2.2.5 Work Status/Occupation/Industry

Work status, *occupation*, and *industry* data all relate to one's position in the labor force. Work status includes information on labor force participation and employment status. For individuals who are employed, additional information on the number of hours worked may be collected. Part-time and full-time classifications may be used based upon the number of hours per week and weeks per year worked. While the term underemployment is frequently used today, there is no commonly agreed upon definition.

Occupation refers to the kind of work a person normally does (that is, the "job"). Examples of specific occupations include registered nurse, gasoline engine assembler, and teacher's aide. Each occupation is assigned a code from the dictionary of occupational titles (DOC), and individual workers are assigned to an occupation by the Census Bureau. The large number of occupations is aggregated into 9 or 10 major groupings, such as professional and technical, sales, and management. Of particular interest to this discussion is the large number of individuals in the U.S. economy employed in healthcare. At around 10% of the workforce, health workers are a major occupational segment and one that remains among the fastest growing year after year. As will be seen in Chap. 10, one's occupation has significant correlations with access to insurance, health status, and risk of occupational death. Exhibit 4.8 presents data on current employment in the healthcare field.

Industry refers to the business or industry where the occupation resides. For the examples above, the registered nurse would be assigned to health and social services, the gasoline engine assembler to manufacturing, and the teacher's aide to educational services. Industries are classified based on the North American Industrial Code (NAIC) system. The distribution of workers by industry provides a profile of the economy, and changes in the size of the respective industries reflect changes in the economy. As with occupation, this information provides clues to the level of insurance coverage and the extent and type of occupational injuries that can be anticipated. (Exhibit 4.9) presents data on US industrial employment.

Exhibit 4.8 Employment in Healthcare in the United States Wage and Salary Workers 2008

Management/business/finance	614,600
Professional and related occupations	6,283,900
Counselors	171,300
Social workers	206,700
Dietitians and nutritionists	35,500
Pharmacists	67,500
Physicians and surgeons	512,500
Registered nurses	2,192,400
Clinical laboratory technologists/technicians	278,900
Emergency medical technicians/paramedics	142,100
Licensed practical/licensed vocational nurses	619,100
Office and administrative support	2,540,300
Billing/posting/machine operators	194,800
Receptionists/information clerks	386,300
Secretaries/administrative assistants	770,700

Source: Bureau of Labor Statistics (2010)

4.2.2.6 Religion

Despite the importance of religion in American society, religion is one of the least reported compositional variables. Questions regarding religious affiliation or level of

Exhibit 4.9 U.S. Industrial Employment 2009

Agriculture/forestry/fishing	1.8%
Construction	6.8%
Manufacturing	10.5%
Wholesale trade	2.9%
Retail trade	11.6%
Transportation/warehousing/utilities	5.0%
Information	2.3%
Finance/insurance/real estate	6.9%
Professional/scientific/management	10.6%
Educational services/healthcare/social assistance	22.7%
Arts/entertainment/recreation	9.2%
Other services	5.0%
Public administration	4.8%

Source: American Community Survey (2009)

religiosity are not included in censuses and government-sponsored surveys. However, sample surveys, church registries, and even healthcare institutional data (e.g., hospital admission forms) can provide partial information on religious affiliation. The types of questions usually asked concern religious affiliation (e.g., Roman Catholic), attendance (e.g., number of times attending per month), and religiosity (e.g., depth of religious commitment). Because healthcare-related questions are seldom asked at the same time religious inquiries are made, the relationship between the two factors is not well understood. However, as demonstrated in a later chapter, there is some evidence linking religious participation and religiosity to both health status and health behavior.

4.3 Sources of Data for Compositional Variables

There are three main sources of data on compositional variables: government agencies, professional associations, and commercial data vendors. Governments at all levels are involved in the generation, compilation, manipulation and/or dissemination of demographic data. The federal government, through the decennial census and related activities, is the world's largest processor of demographic data as well as a major generator of health-related databases. The Census Bureau is the primarily source of most demographic data in the U.S. The National Center for Health Statistics, the Centers for Disease Control and Prevention, the National Institutes for Health, and other health-related agencies generate much of the nation's health-related data. The Bureau of Health Resources (Department of Health and Human Services) maintains a master file of much of the health data compiled by the federal government entitled the *Area Resource File* (ARF). Other federal sources outside of health-related agencies, such as the Bureau of Labor Statistics (e.g., health occupations) and the Department of Education (e.g., educational achievement) contribute to the data available on the composition of the U.S. population.

State and local governments are also major sources of both demographic and health-related data. State governments generate a certain amount of demographic data and each state has a population center for generating and disseminating demographic data. Data centers at public universities may also be involved in the generation and processing of demographic data. City or county governments may produce local population projections and other demographic data.

Various associations within the healthcare industry represent another source of health-related data. Chief among these are the American Medical Association (and related medical specialty organizations) and the American Hospital Association. There are also other organizations of personnel (e.g., American Dental Association) and facilities (e.g., National Association for Home Care) that maintain databases on their members and on activities related to healthcare occupations.

Commercial data vendors have emerged to fill perceived gaps in the availability of various categories of demographic and health data. These include commercial data vendors that establish and maintain their own proprietary databases, as well as those that reprocess and/or repackage existing data. Because of the demand for health-related data, several commercial data vendors have added health data to their inventories, and a few health-specific data vendors have emerged. These vendors not only repackage existing data into more palatable form, but some also are developing their own proprietary databases. Some vendors conduct major nationwide surveys of healthcare consumers.

Although not considered a major source of data on compositional variables, many private organizations repackage data collected elsewhere (e.g., from the Census Bureau or the National Center for Health Statistics) and present it within a specialized context. The Population Reference Bureau, a private not-for-profit organization, distributes population statistics in various forms, for example. Some, like the American Association of Retired Persons (AARP), not only compile and disseminate secondary data but are actively involved in primary data collection, as well as the sponsorship of numerous studies that include some form of data collection. (The sources of data for health demography are discussed in more detail in Chap. 9).

4.4 Displaying and Analyzing Compositional Variables

Data on compositional variables will be typically generated as raw data, and it is up to the analyst to convert these data into meaningful information. This section discusses some of the ways in which demographic data might be displayed and classified, and the types of analysis used to compare different geographies in terms of their compositional attributes. Since different geographies will record populations of differing sizes, it is difficult to compare one geography or population to another using raw data. Therefore, it is necessary to convert raw data into a form that allows for meaningful comparison. For example, knowing that 10,000 deaths occurred in Florida and 2,000 deaths occurred in North Dakota in 2005 does not really allow us to compare the health status of the respective states. But, if we convert these into death rates and generate a crude death rate of 8.5 per 1,000 population for Florida and a rate of 9.5 per 1,000 for North Dakota, we have a basis for comparison.

Compositional traits are often expressed in proportion terms (e.g., 25% of the population in Orange County, Florida, has a college education or above) along with summary measures such as means and medians. The use of any of these summary measures can result in useful insights, though sometimes the statistics presented are misleading. When using percentage distribution information, it is generally better to include data for several categories (perhaps the entire distribution), even though the focus may be on only one level of aggregation. This will give the user/reader a more complete picture of the conditions being addressed.

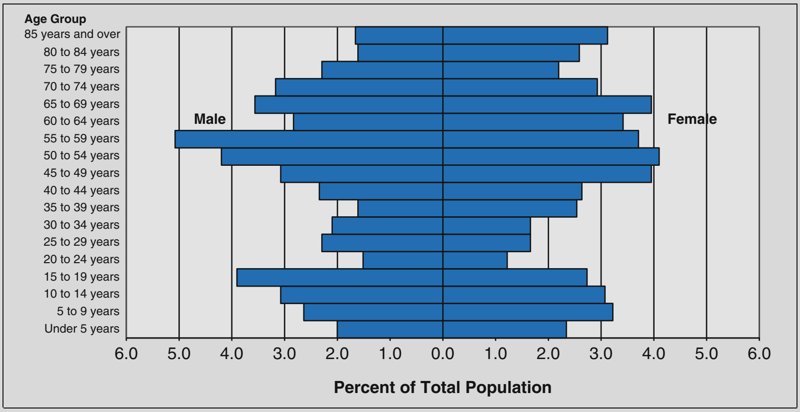
Since the mean refers to the arithmetic average and the median to the midpoint of a distribution, these two measures of central tendency are likely to be used for different purposes. It is generally better to rely on the latter, though the use of both of these statistics, along with an examination of the entire distribution, is the best approach. A given mean or median may be the result of an infinite number of combinations of distributional data. Therefore, utilizing the mean or median without analyzing the distribution from which those figures are derived may result in an incomplete understanding of the data.

4.4.1 Population Pyramids

Population distributions are sometimes presented visually in the form of *population pyramids*. The age/sex distribution of a population is presented in a series of stacked bars, though other combinations of characteristics can be used. Each bar represents the percentage of the total population at that age, though absolute numbers may be used as well. The left side displays the percentage of males in each age cohort and the right side the percentage of females in each age cohort. Pyramids that are “bottom heavy” have younger age structures, while old age structures demonstrate more constant age-to-age percentages and appear bullet shaped.

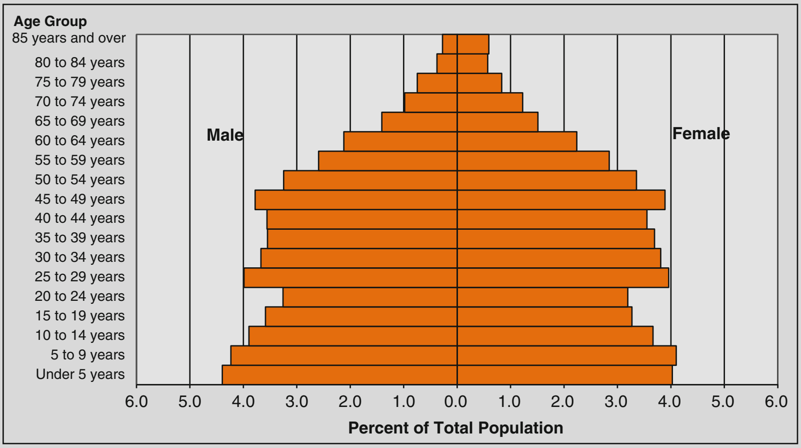
Exhibits 4.10 and 4.11 present the population pyramids for Garfield and Sarpy Counties in Nebraska for 2000. Garfield County is a rural county located in the north central part of Nebraska. Sarpy County is part of the Omaha metropolitan statistical area and is the fastest growing county in the state. As can be seen, the age structure of Sarpy County is much younger that that of Garfield County and its pyramid has a much lower “center of gravity.” Garfield County, on the other hand, has a top-heavy distribution. About 25% of the population of Garfield County is age 65 and older while the corresponding proportion for Sarpy County is approximately 6%. The median age differences are large, with median ages of approximately 40 years for Garfield County and 29 years for Sarpy County.

Exhibit 4.10 Population by Sex and Five-Year Age Group: Garfield County: 2010



Source: U.S. Census Bureau, 2010 Census of Population
Prepared by: Center for Public Affairs Research, UNO

Exhibit 4.11 Population by Sex and Five-Year Age Group: Sarpy County: 2010



Source: U. S. Census Bureau, 2010 Census of Population
Prepared by: Center for Public Affairs Research, UNO

The age distribution and the sex ratio are significant factors when it comes to both health status and health services utilization. Arguably, the age-sex distribution of a population is the best predictor of the types of health problems characterizing that population, attitudes toward healthcare and the level of mortality, making the population pyramid a barometer of sorts for a variety of health-related variables. Exhibit 4.12 describes some of the health-related implications illustrated by population pyramids.

Exhibit 4.12 Population Pyramids and Healthcare Demand

As can be seen in Exhibits 4.10 and 4.11, the age/sex structures of Sarpy County and Garfield County are very different. The Garfield County population pyramid is indicative of an older population, and one that is likely to decline in size in the future if net migration is unable to counteract the effect of excess mortality. In fact, in recent years Garfield has experienced more annual deaths than births, and without a significant number of migrants already would have declined in size. Sarpy County, on the other hand, is a relatively young population with the potential for significant growth.

While describing the respective populations is visually interesting, a consideration of what these shapes mean for the demand for health care makes these figures even more valuable. Tabular data, while precise, sometimes are overlooked or undervalued because it is more difficult to "see" a pattern in them. Graphs or charts are sometimes seen as more instructive. When both populations' age structures are examined in relation to health care demand, it is relatively easy to predict increased demand for nursing homes, home health care, gerontological services, and cardiologists in the Garfield County. On the other hand, the Sarpy County market area may be viewed as needing more obstetrical services, sports medicine facilities, and minor emergency clinics per capita.

Viewing successive population pyramids allows for an assessment of change as well as the components of change. If, for example, the Garfield County pyramid were to remain relatively constant over time, the number of net migrants would have to be substantial given the higher rates of mortality at the older ages. Moreover, the large number of migrants would in all likelihood be different in terms of health care demand, insurance type and coverage and service preferences than the native population.

However, if a more precise evaluation of health services demand is to be undertaken, more detailed tabular data must be utilized. And because of the unique natures of these communities, other compositional factors such as income levels and educational status must be accounted for in estimating aggregate need for both Garfield County and Sarpy County.

4.4.2 Dependency Ratios

Age data can be used to calculate *dependency ratios*, or the quotient of an area's dependent population divided by its "supporting" population. Dependent and supporting populations are defined in terms of economic dependence and support. The supporting population in the United States is usually considered those individuals between the ages of 18 (or 20) and 64, while dependent populations are under age 18 (or 20) and over age 64. Dependency and support are general notions regarding economic activity, and the population aged 18 (or 20) to 64 is considered to be economically active (income earning).

The *youth dependency ratio* for the United States in 2008 can be calculated as follows:

$$\frac{\text{number of persons under age 18}}{\text{number of persons } 18-64} = \frac{73{,}942{,}000}{191{,}248{,}000} = 0.39$$

This ratio of 0.39 converts to 2.56 persons of approximate working age for every person under age 18. Since 1950 this ratio has declined from 0.58 (1.72 persons of approximate working age for each person under age 18) reflecting the decline in the proportion of children within the U.S. population.

The *age dependency ratio* for 2008 can be calculated as follows:

$$\frac{\text{number of persons aged 65 and over}}{\text{number of persons } 18-64} = \frac{38{,}870{,}000}{191{,}248{,}000} = 0.20$$

This ratio of 0.20 converts to 5.00 persons of approximate working age for each person age 65 and over. Since 1950 this ratio has increased from 0.14 (7.14 persons of approximately working age for each person 65 and older). The age dependency ratio is used to illustrate the ability of a population to support its "non-productive" seniors as well as the growing impact of persons aged 65 and over on the U.S. Social Security system.

The *total dependency ratio* takes the sum of both dependent populations (under age 18 and over age 65) and divides by the number of persons aged 18–64. In 2008, the total dependency ratio was 0.59, or 1.69 persons of approximate working age for every person under age 18 or over age 64. Interestingly, the total dependency ratio has not changed much in 50 years; the tremendous growth in the elderly population has been offset by a significant decline in the youth population.

These ratios exhibit a great deal of variability across geographic areas, and this variation has important implications for the demand for health services and the ability of the population to support the necessary care. In 2010, for example, the youth dependency ratios for Garfield and Sarpy Counties, Nebraska, were 0.48 and 0.46, respectively. In contrast, the age dependency ratios were 0.52 and 0.12, respectively. In other words, Garfield County had approximately two workers for every person age 65 and over, while Sarpy County had 8!

4.4.3 Cohort Analysis

Another way of examining compositional data is through *cohort analysis*. A cohort is a group of persons with a common characteristic or characteristics. Age is the most frequent basis for cohort identification used by demographers. Age cohorts are identified by grouping together persons of similar age. It is assumed, although not always correctly, that persons within a cohort share experiences and behavior because of their common characteristic. Cohort analysis typically involves following a cohort over time to measure the effects of exposure to various events, conditions, etc., such as American soldiers exposed to Agent Orange during the Vietnam War or patients undergoing a particular medical procedure.

Cohort analysis is sometimes used as a basis for ascribing experiences and behavior patterns to a cohort when individual data are not available. Cohort analysis can range from measuring the change in number and proportion of persons in various age groupings over time to ascertaining how cohort experiences affect different types of behavior (Swanson and Siegel 2004). Cohort-to-cohort comparisons allow an assessment of change in cohort behavior over time.

Cohort analysis can be particularly useful in a healthcare setting. Since health problems are frequently age specific, cohort analysis can determine future patterns of morbidity and mortality. Age cohorts also exhibit varying types of health-related behavior or levels of exposure to a particular type of carcinogen that is unique to the population in question. The cohort in question could be tracked over time to provide insights, for example, into disease prevalence.

Studying the transition or aging of a cohort from one period to the next may involve the use of mortality data and survival analysis, both of which are discussed in Chap. 6. For example, the cohort aged 65–69 in 2010 is made up of those persons aged 60–64 in 2005 minus those who died during the interval (not accounting for immigration). Tracking change in cohort size tells the analyst a great deal about health service demands that are likely to characterize this cohort in the future.

In the military example introduced earlier, the goal of following up on the cohort of military personnel exposed to Agent Orange in Vietnam is to determine if they have higher incidence and prevalence rates for selected health conditions thought to be related to their exposure. This cohort can be compared to other military cohorts who were not exposed, and statistical tests can be used to determine if any identified morbidity or mortality rate differences are likely to have occurred by chance. Veterans of the Gulf, Iraq or Afghanistan Wars may be studied in the same way, but the analysis is more complicated because the Gulf War syndrome may well be the product of several different types of exposures (e.g., inoculations and burning oil).

4.4.4 Standardization

Population sizes vary between different areas and, without some way of standardizing the phenomena being evaluated, comparisons between two or more populations can be misleading. Rates can be used to control for differences in size, allowing for the

Exhibit 4.13 Age/Sex Composition and Incidence of Breast Cancer for Two Fictitious Communities

	Community A				Community B			
Age group	Males	Females	Cases[a]	Rate[b]	Males	Females	Cases[a]	Rate[b]
60–64	13,000	13,000	100	7.69	10,000	12,000	100	8.33
65–69	12,000	12,000	75	6.25	10,000	12,000	100	8.33
70–74	10,000	10,000	75	7.50	12,000	14,000	100	7.14
75–79	8,000	8,000	125	15.42	10,000	12,000	100	8.33
80 and over	7,000	7,000	125	17.86	8,000	10,000	100	10.00
Total	50,000	50,000	500	10.0	40,000	60,000	500	8.33

[a] Cases of breast cancer

[b] Rate per 1,000 female population

comparison of data for two or more regions, states, metropolitan areas, or market areas with respect to mortality, morbidity, level of health resources, or health-related behaviors. However, even a simple comparison of rates can lead to incorrect conclusions.

For example, if two communities of 10,000 people were being compared and analysts found that one had twice the breast cancer incidence rate as the other, it would be logical to assume that morbidity levels are higher for one population than the other. While variations in morbidity levels may be able to provide some explanation for the observed differential, demographic explanations must be considered as well. The simplest demographic analysis would determine if there were marked sex differences between the two communities. In other words, a heavily female community would clearly be expected to have more cases of breast cancer, *ceteris paribus*. Or suppose that one community has a much older age structure than the other. Since breast cancer is more common among older women, the older community would be expected to report more cases of breast cancer.

Up until this point, it has been argued that the age/sex structure differences in the two communities must be studied before cancer incidence is evaluated. Are there any other demographic variables that might help explain why there is a breast cancer rate difference between the two communities? The researcher may want to consider racial-ethnic compositional differences and/or any other demographic factors known to be associated with breast cancer (e.g., childbearing history). The ultimate goal is to hold constant or control for as many of these factors as possible in order to eliminate competing explanations.

Exhibit 4.13 illustrates the advantages of accounting for age and sex differences. Both communities are equal in size and have the same incidence of breast cancer. However, as seen in the table, Community A has 50,000 females while Community B has 60,000 females. Because breast cancer is very rare in males, it makes better sense simply to calculate a female-specific rate. The new rate per 1,000 females for communities A and B are 10.0 and 8.33, respectively.

However, suppose that Community A had the same sex structure as that for B. How many breast cancer cases would there be? The rate, 10 per 1,000, would have to be multiplied by the size of the female population in Community B, or 60,000. The result of 600 cases is 20% greater than the 500 cases observed. The same adjustment can be made in the other direction; that is, the number of expected breast cancer cases in Community A (assuming it has the same rate as that of Community B) can be calculated. Multiplying 8.33 per 1,000 by 50,000 yields 416 cases, a 17% reduction from the 500 cases observed.

The difference in age structure may also be addressed. First, a standard population (either Community A or B) is chosen. The analyst might be concerned with the rate that Community A might have if it had Community B's age structure. In this example, only the female population is utilized. The calculations are straightforward:

Age	Rate per 1,000	Female population		Cases
0–67	7.69	12,000	=	92
65–69	6.25	12,000	=	75
70–74	7.50	14,000	=	105
75–79	15.62	12,000	=	187
80 and over	17.86	10,000	=	179
Total		60,000		638

The results show that if Community A had the same age structure as Community B, there would have been 638 breast cancer cases, an increase of about 6.3%. The new "adjusted" rate is 638/60,000, or 10.63 per 1,000.

From an applied standpoint, the analyst may have hypothesized that health conditions were the same in each community, given that each had the same "rate" of breast cancer. However, after adjusting for age and sex, one could conclude that health conditions in Community A are more favorable than in Community B. Of course, other factors would have to be considered before the analysis was complete.

4.5 Trends in Population Composition and Their Implications for Healthcare

The U.S. population experienced a number of dramatic demographic trends during the last half of the twentieth century. These demographic trends are important in that they contributed to the changing composition of the country's population; this, in turn, influenced the morbidity profile of that population. These shifts also have implications for the future morbidity profile of the U.S. Indeed, the demographic transformation of the American population in the twentieth century might be considered a major, if not the major, determinant of the needs to be addressed by the healthcare system. The impact of these trends did not end simply with a change in age structure or racial composition, but came to be reflected in changes in the attitudes held by healthcare consumers.

During the second half of the twentieth century, the changing demographic profile led to a shift away from acute conditions and toward chronic conditions as the predominant form of health problem. Improved living conditions, better nutrition and higher standards of living, accompanied by advances in medical science, reduced or eliminated the burden of disease attributable to acute conditions. This void was filled, however, by the emergence of chronic conditions as the leading health problems and leading causes of death. The older population that resulted from these developments was now plagued by hypertension, arthritis, and diabetes, as well as numerous conditions that reflected the lifestyles characterizing the American population in the second half of that century.

This section cannot begin to address all of the demographic trends that have contributed to the changing healthcare environment. It focuses on the key demographic trends and notes their likely implications for health demographics.

4.5.1 The Changing Age Structure

The first, and perhaps most important, demographic trend in the U.S. is the population's changing age distribution. The aging of America has obviously been one of the most publicized demographic trends in history. The implications of this trend for health services demand have been well documented, with age arguably the single most important predictor of the demand for health services.

The U.S. population has been aging steadily, with a median age in 2010 of around 37 years. The proportion of the population now 65 or older stands at over 13%. Population growth within the older age cohorts (age 55 and above), and particularly among the oldest-old (age 75 and over), is currently faster than that for the younger cohorts. The total US population increased by 24% between 1990 and 2010, while the population 75 and over rose by over 30%. The movement of the baby boomers into the "middle ages" made the 45–65 age cohort the largest age group in the first decade of the twenty-first century. This is a cohort that grew up in affluence and comfort and its members are used to having things, including their health, in working order. As they contend with the onset of chronic disease and the natural deterioration that comes with aging, increasing pressure will be put on the healthcare system. Some younger cohorts (i.e., those 25–34) actually experienced a net loss of population during the last two decades. A continued "shortage" of younger working age individuals (i.e., those 25–40) will persist well into the twenty-first century.

The nature of the future senior population will be determined to a great extent by the characteristics of the baby boomers. Boomers have begun to reinvent retirement, with retirement no longer seen as a type of "default" condition, but as a context for new and different lifestyles. Boomers, in fact, have already influenced the healthcare delivery system in significant ways, and now they are driving the demand for a wide range of new services such as laser eye surgery, skin rejuvenation, and menopause management.

An automatic accompaniment to the aging of America has been the feminization of its population. Generally speaking, the older the population the greater the "excess" of females. Except for the very youngest ages, females outnumber males in every age cohort. Among seniors, females outnumber males two to one, and, at the oldest ages, there may be four times as many women as men. This results in an older age structure for women, and in 2010, the median age for women was 38.5 years compared to 35.8 years for men. Further, 24.3% of the female population was 55 or over, compared to 21.9% of the male population. In 2010, the excess of females over males in the population amounted to over five million in the United States. At age 85 and over there are 2.07 women for every man.

As a result of this trend, the female healthcare market is considerably larger than the male market. Further, women are more aggressive users of health services than are men. Perhaps even more important, women bear much of the burden for healthcare decision making, not only for themselves but for their families. They are also more likely to influence the health behavior of their peers.

4.5.2 Growing Racial and Ethnic Diversity

Another demographic trend that characterized American society during the last half of the twentieth century was increasing racial and ethnic diversity. America has once again become a nation of immigrants, with the numbers of newcomers from foreign lands during the period 1990 through 2010 equaling historic highs. In addition, long-established ethnic and racial minorities are growing at faster rates than are native-born whites. The cumulative effect of the trends of the past several years has been a diminishing of the relative size of the white population (especially the non-Hispanic white population) and the growing significance of the African-American, Asian, and Hispanic components of the U.S. population. Current figures reveal an America that is becoming less "white", while African-American, Asian-American, and American Indian/Alaskan Native populations are becoming proportionately larger. More importantly, the census documented the rapid growth of the Hispanic population and, by 2001, Hispanics had surpassed African Americans as a percentage of the U.S. population. Since most of the population growth during the next two decades will be a function of immigration, the proportion of non-Hispanic whites within the population will continue to decline. (A telling statistic is the fact that, in 2010, racial and ethnic minorities accounted for 50% of the children under 5, but account for only 38% of the total population).

Given the fact that the U.S. healthcare system has historically been geared to the needs of the mainstream white population, the trend toward greater racial and ethnic diversity cannot help but have major implications for the nature of the system. Any effort to engage the population in desired health behavior must take into consideration the changing racial and ethnic characteristics of the population and the demands that these changes will make on the system. This is made all the more important by the documented level of disparities among racial and ethnic groups in the U.S. Many factors contribute to the high rate of disparities among these groups in terms of health status, health behavior, and type of treatment by health professionals.

4.5.3 Changing Household and Family Structure

Another demographic development characterizing U.S. society is its changing household and family structure. This trend is no surprise to demographers, although it has seldom been linked to health issues. For decades, the family has been undergoing change. First it was high divorce rates, then it was less people marrying (and those who did marry marrying at a later age); then it was less people having children (and those that did have children having fewer of them and at a later age).

In 2008, the Census Bureau reported that 57.3% of the U.S. population age 18 and over was married, a very low figure by historical standards. Some 26.0% had never married, 10.4% were divorced, and 6.4% were widowed (US Census Bureau, 2008, Table 56). These figures for the non-married all represent record highs. Given that health status and health behavior differ considerably among the various marital statuses, the current and future array of statuses should be a concern for the health demographer.

These changes in marital status have had major implications for the U.S. household structure. It has meant that what is popularly considered the "typical" American family (with two parents and x number of children) has become a rarity. According to the 2009 American Community Survey, only 21% of the households in 2009 fell into this category. Today, married couple (without children) households have become the most common household form, but this type of household accounts for less than 29% of the total. "Non-traditional" households have become the norm, and an unprecedented proportion of households are one-person households.

As with marital status, the changing household structure has important implications for both health status and health behavior. To a great extent, health services have been historically geared to the needs of "traditional" households involving two parents and one or more children. This has been encouraged by the extensive provision of employer-sponsored insurance that focused on the wage-earning head of household. The demands placed on the healthcare system by two-parent families, single-parent families, and elderly people living alone are significantly different from each other and require different responses on the part of the healthcare system. The continued diversification of U.S. household types for the foreseeable future is likely to require commensurate modifications in the healthcare delivery system.

The role of the family in health communication has long been recognized. Most people indicate that they obtain most of their information related to healthcare from informal networks of family and friends. As these channels for health communication have become less available, new sources for communicating health information must be established.

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Chapter 5
Fertility

5.1 Introduction

Fertility refers to the reproductive experience of a population. The reproductive experience involves all factors related to sexual behavior, pregnancy, and birth outcomes. The number of births as well as the characteristics of those births, along with factors describing the mothers and fathers of babies form the basis for fertility analysis.

Fertility is a social process requiring the biological interaction of two persons in a specific economic, social and/or political context. Fertility behavior is viewed broadly here and includes pre-pregnancy behavior, prenatal care, health-related activities during pregnancy (e.g., cigarette smoking), pregnancy outcome (e.g., birth, miscarriage, induced abortion), and post-natal care. From a healthcare perspective, fertility can be viewed as a process whereby behavior (e.g., contraceptive use and coital frequency) leads to an outcome (e.g., pregnancy). This perspective considers the relationship of culture, technology and economic conditions with fertility behavior.

Fertility plays an important role in shaping the demographic makeup of a population. The level of fertility, along with an area's mortality and migration characteristics, determines the size and composition of any population or healthcare service area, and knowledge of the size and makeup of a healthcare market is crucial for health planning.

Fertility patterns and related behavior have numerous implications for health and healthcare. The obvious linkage involves the healthcare needs of mothers and children prior to, during, and after birth. Unique service and facility needs related to childbearing are evident. Other requirements emerge when all stages of the reproductive process are considered. For example, health service providers are major sources of contraception-related services. Disorders related to the male and female reproductive systems represent significant opportunities for healthcare providers, and infertility treatment is a growing component of the healthcare system. Together, these activities can be viewed as direct effects of fertility-related behavior on the healthcare system.

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The Springer Series on Demographic Methods and Population Analysis 13,
DOI 10.1007/978-90-481-8903-8_5,

The demographic characteristics of women who bear children such as age, race, marital status, income and education have been shown to be good predictors of fertility levels and birth outcomes. Women and children from lower-income groups, for example, have historically not received the same quality of pre-natal and post-natal care that their middle- and upper-income counterparts received. More postnatal complications and less healthy children and mothers are the result.

Variations in fertility levels among geographic areas provide valuable information about service needs. Differences in the number of births and birth rates among regions or local service areas result in variation in the demand for obstetrical and related services. In turn, changing demand affects staffing needs, staff training requirements, facility planning and construction, and overall business planning for existing and new service providers.

An important fertility-related concern for healthcare planners and providers, particularly at the local level, is the wide annual variation in the number of births. Various nonmedical factors determine the ages at which women bear children and, indeed, whether they have any children at all. This elasticity in fertility makes the projection of future births difficult, especially for subnational areas. Over a five-decade span, the United States has experienced a peak of 4.3 million annual births (in the early 1960s), a valley of 3.1 million births (in the mid-1970s), a rise to about 4.0 million births (during the early 1990s), a small decline to 3.9 million (in the late 1990s), and another peak to 4.3 million in the early twenty-first century. These short-term fluctuations place heavy demands on a system that can not easily modify its capacity for providing obstetrical services.

The drop in births of about one million per year from the peak of the baby boom (1957–1961) to the mid-1970s meant, at the very least, the elimination of nearly two million consumers (mothers and babies) of prenatal, obstetrical, and pediatric services per annum. While the total number of births in the U.S. today is approximately the same as it was at the peak of the baby boom, the average number of children women bear over a lifetime is now about 60% of that of the early 1960s; in 2010 the average woman was likely to bear about two children over her lifetime. This decline in births per woman has implications for both total births and the mix of services required for mothers who are now having fewer children.

Longer-term fluctuations in the number of births translate into changes in the size of age cohorts over time. Fewer births over time result in the shrinking of the overall healthcare consumer market at the younger ages (e.g., 15–24). Projections beyond 2010 indicate reductions in the size of other age groups (e.g., 35–50), and this downturn is largely driven by a decline in the number of births at an earlier time. The continued trend toward smaller households and families as well as the reduction in the proportion of persons living in families means that there will likely be other changes in healthcare demand, practices, and concerns in the future. Exhibit 5.1 describes the interaction between fertility and the other two demographic processes to be discussed in subsequent chapters.

Exhibit 5.1 Demographic Processes: Interactions Among Fertility, Mortality and Migration

Populations grow or decline, age or become younger and otherwise experience demographic change due to the interaction of the demographic processes of fertility, mortality and migration. Throughout most of human history, high fertility has combined with high mortality to keep population size and growth low. For example, between 10,000 BC and 5,000 BC the population of the world grew from an estimated 1 million to 5 million (Vaughn's 2011). At various points in time, mortality has spiked due largely to the spread of disease, climate change, and/or war. High fertility could not offset the resulting deaths and the overall population declined. In the eighteenth, nineteenth and twentieth centuries, high fertility combined with declining mortality to drive rapid population growth, and the size of the world and regional populations became much larger. In all of these eras migration played an important role in the size and the growth of regional and local populations, most often as a response to changes in living and political conditions. Currently, low fertility is matched with low mortality to produce population loss in a number of nations in the developed world (Goldstein et al. 2003), while in the developing world fertility exceeds mortality by a relatively large margin.

Migration continues to be a significant component of growth at the national and subnational levels in a number of nations. Even at a time when the total number of humans alive on the planet was small, patterns of movement, for example, out of Africa to Asia and Europe, served to drive the growth of the population on the receiving end of migration streams. Later on, masses of people moved from Europe (voluntarily) and Africa (involuntarily), for example, to populate the Americas. From 1650 to 1820 the population of North America grew from about 0.5 million persons to 9.6 million (Vaughn's 2011). The impact of those migrants on the population at the receiving end was remarkable.

The combination of fertility, mortality and migration shapes not only the size of the population but its composition. Populations with high fertility and relatively low mortality such as those found in Mexico have a relatively young age structure. A young age structure and high fertility lead to significant population growth in both the short and long terms. High fertility, low mortality populations tend to be young, and young populations produce large numbers of births in part because so many women are in their childbearing years. The social, economic and political issues that are linked to high and sustained population growth are complicated.

Although demographers have identified fertility, mortality and migration as key processes of population study, the important demographic outcomes of the interaction among those processes are the size, distribution and composition

(continued)

Exhibit 5.1 (continued)

of populations whether they be for the world, nations, states within nations, or local areas.

References

Goldstein, J., Lutz, W., & Testa, M. R. (2003). The emergence of sub-replacement family size ideals in Europe. *Population Research and Policy Review*, *22*, 479–496.

Vaughn's Summaries. (2011). World population growth history chart. *Vaughn's Summaries*. Downloaded from URL: http://www.vaughns-1-pagers.com/history/world-population-growth.htm#population-growth-chart.

5.2 Concepts and Measures

Fertility involves social interaction that results in a live birth. *Fertility* is most often measured in terms of the number of births that occur within a population. The conditions of the newborns (e.g., birth weight and Apgar scores) can be determined along with compositional traits (e.g., marital status and age) of the mothers. This information is typically gathered from birth certificates.

Other concepts used by demographers that are of value to healthcare professionals include *fecundity* (the physiological ability to reproduce); *age at menarche* (the onset of menstruation); *menopause* (the end of menstruation); and *parity* (the number of births women have previously experienced). Changes in physiological factors in response to the physical and social environments (e.g., the historical reduction in age at menarche in the United States), are likely to affect fertility levels and the demand for services.

Additional important concepts useful to the health demographer include *pregnancy wantedness* (whether the pregnancy was wanted before, at that time, later, or not at all with respect to when pregnancy occurred), and *marital timing* (whether the pregnancy occurred before or after being married). The marital status of the mother is also an important issue from a healthcare perspective. Wantedness and marital timing have been shown to be related to a host of health-related concerns, including behavior before, during, and after pregnancy. For example, women who have unwanted pregnancies are less likely to change behavior that is potentially deleterious to their unborn babies than women who want to be pregnant. Women who conceive and bear their first child before marriage average more births than those who conceive and bear their first child after marriage.

For statistical purposes, births are usually assigned to the mother's *place of residence*, although births reported by *place of occurrence* can provide valuable information to health services providers when planning obstetrical services. This is particularly the case in situations (e.g., rural areas) where there are few obstetrical resources and pregnant women have to travel outside the community for delivery, or in communities (e.g., regional medical centers) that are likely to experience a significant influx of delivering mothers from outside the service area.

The level of fertility is often expressed in rates. The calculation of rates facilitates the comparison of fertility levels across areas that differ in size and/or other characteristics. Comparing the number of births for two cities with populations of 100,000 and 1,000,000, respectively, makes little sense given that the base population producing births is 10 times larger in the latter city. Rates therefore are used to make such comparisons more meaningful. Before any rates are utilized, however, the analyst should fully understand the advantages and potential limitations of those measures. Exhibit 5.2 provides a general treatment of fertility rate calculations.

Exhibit 5.2 Calculating Fertility Rates

Fertility rates are relatively easy to calculate, and in most instances the required data are readily available. Birth data (numerators) are available from vital statistics registries, and population figures (denominators) can be drawn from Census Bureau counts or estimates generated by other sources. These basic rates can be adjusted to reflect other factors such as age and marital status as desired.

$$\text{Crude birth rate (CBR)} = \frac{\text{Number of births in year X}}{\text{Population at midpoint (July 1) in year X}} \times 1000$$

$$\begin{array}{c}\text{General fertility}\\ \text{rate (GFR)}\end{array} = \frac{\text{Number of births in year X}}{\begin{array}{c}\text{Number of women age 15 to 44 (or 49)}\\ \text{at midpoint (July 1) in year X}\end{array}} \times 1000$$

$$\begin{array}{c}\text{Age - specific fertility}\\ \text{rate (ASDFR)}\end{array} = \frac{\begin{array}{c}\text{Number of births in year X}\\ \text{to women age y to y + n}\end{array}}{\begin{array}{c}\text{Number of women age y to y + n}\\ \text{at midpoint (July 1) in year X}\end{array}} \times 1000$$

$$\text{Total fertility rate (TFR)} = \frac{\text{Sum of ASFRs} \times 5}{1000}$$

$$\text{Gross Reproduction Rate (GRR)} = \sum_{i=1}^{n} \frac{B_x}{P_x}$$

$$\text{Net reproduction rate (NRR)} = \sum_{i=1}^{n} \frac{B_x}{P_x} - \frac{L_x}{1_0}$$

where Bx/Px is the female age-specific birth rate for age x to $x+n$; $Lx/1_0$ is the life table survival rate appropriate for that age interval, and $\sum_{i=1}^{n}$ indicates that all the products for each ASFR combination are summed. Given that there are eight categories of ASFRs in Exhibit 5.3, n would be equal to 8.

Exhibit 5.3 Age-Specific Birth Rates: 2008

Age group	Rate per 1,000 women
10–14	0.6
15–19	41.5
20–24	103.0
25–29	115.1
30–34	99.3
35–39	46.9
40–44	9.8
45.49	0.7

Source: Martin et al. (2011), table 4; U.S. Bureau of the Census (1996), table 92

The *crude birth rate* (CBR) is the basic measure of fertility. It is calculated by dividing the total number of births for a given year (or the average over 3 years) by the midyear total population for that year (the midyear in the range if a 3-year average of births is taken). This quotient is then expressed as the number of births per 1,000 population. The crude birth rate for the U.S. was 23.7 births per 1,000 persons in 1960 and fell to 14.0 by 2008 (Martin et al. 2011, table 1).

While the CBR is adequate for making very general comparisons and has the advantage of requiring only two pieces of information, it has two major shortcomings. First, the denominator includes people who are not *at-risk* of having a birth. Males, very young females, and females beyond menopause are not at-risk of giving birth, yet they appear in the denominator of the rate. Second, the CBR masks differences between the age composition of populations. Fertility rates are greatly affected by age composition, particularly for women, and the CBR cannot account for this. Two populations of the same size could easily have dissimilar CBRs simply because females in the childbearing ages accounted for 20% of one population but 35% of the other. As a result of these shortcomings, more refined measures of fertility have been developed.

The *general fertility rate* (GFR), sometimes referred to simply as the *fertility rate*, represents a refinement of the CBR. It adjusts the denominator of the rate by focusing on the *population at risk*. It is expressed in terms of births per 1,000 females aged 15–44 (or 15–49). In 1960, the GFR was 118 births per 1,000 women aged 15–44, and by the mid-1990s it had declined to less than 60. The GFR reached a "modern" high of 69 in 2007 but has been declining since then (U.S. Census Bureau 2010, table 80; Ventura et al. 1999, table 1).

While the GFR expresses fertility in terms of births per 1,000 women in the at-risk age group, it provides no information on fertility for specific age intervals (e.g., women aged 15–19). Additional information can be provided by calculating *age-specific birth rates*. Age-specific birth rates are essential in that changes in fertility levels specific to certain ages provide the analyst with much needed information regarding trends in service demand. For example, in 2008 12.4% of births to women under age 15 were low birth weight (i.e., less than 2,500 grams) compared to 7.4% of women 25–29 (Martin et al. 2011, table 25). Populations with higher concentrations of births to mothers at younger ages will require a greater level of specialized health services needed by low birth weight children.

Demographers typically calculate age-specific fertility rates using 5-year age intervals. Five-year intervals are used for convenience and, in cases like adolescent fertility measurement, narrower age intervals may be used. The age-specific fertility rate (ASFR) for women 20–24 years of age, for example, is derived by dividing the number of births to women who are 20–24 years of age by the number of women in the interval (mid-year population). The rate is usually calculated for 1 year (or an average is taken for three consecutive years), and fertility is expressed in terms of births per 1,000 women in the given age range. Exhibit 5.3 presents age-specific fertility rates for the United States in 2008. As can be seen, there are wide differences in the rates. The rates for women under age 20 and age 40 and over are much smaller than those for women aged 20–39.

It is important to recognize that historically ASFRs have shown considerable short-term variation. For example, in 1960 (during the peak of the baby boom) the ASFR for 20- to 24-year-olds was 258 (258 births per 1,000 women in this age cohort). By 2008 this rate had declined to 103. Overall, ASFRs declined markedly after the 1950s. Since 1980, however, a somewhat different trend has become apparent, including an increase in ASFRs at the age intervals 30–34 and 35–39. These increases show that fertility at the older ages has risen in recent years.

The *total fertility rate* (TFR) is sometimes utilized as a summary measure for age-specific fertility rates. The TFR reflects hypothetical completed fertility for a population. Technically, the only way to accurately determine how many children a cohort of young women (e.g., those currently under age 15) will have over their lifetimes is to wait 30 or more years until they have completed their childbearing. Therefore, hypothetical measures that allow an analyst to project the completed fertility of a specified cohort without the long wait have been developed. The calculation of the TFR assumes that a group of 15-year-old females will experience the same age-specific fertility rates throughout their lifetimes; e.g., at ages 15–19 the cohort will experience a birth rate of 56.8 births per 1,000 women per year. Since the interval 15–19 covers 5 years, the rate is multiplied by five. Adding up all the ASFRs (multiplied by 5) produces a hypothetical total number of births per 1,000 women. The TFR calculation yields figures of 1.8 births per woman for 1987 and 2.08 for 2008 (Kent 2011).

While this hypothetical rate may be somewhat at variance with actual fertility experience, the TFR represents a good estimation of completed cohort fertility as long as ASFRs remain fairly stable. Recent data suggest that ASFRs, in fact, are becoming more stable. As a result, TFRs are themselves becoming more stable and are better predictors of future fertility. While the TFR for the interval from 1960 to 1964 was 3.4, it has stayed between 2.0 and 2.08 since 1988.

The TFR has been further modified and refined by demographers. One modification, the *gross reproduction rate* (GRR), adjusts the TFR to include only female births. This adjustment makes intuitive sense since it is only females who can bear children. *Replacement-level fertility*, the number of births required for females to exactly replace themselves, is about one birth per woman over a lifetime, or a GRR of approximately one. While the first reaction with regard to arriving at the GRR might be to multiple TFR by 0.5, to do so would result in an overestimate of the GRR. Instead, the TFR must be multiplied by the inverse of the sex ratio at birth, which is about 105 male births for every 100 female births. In other words, the TFR should be multiplied by 0.488 in order to arrive at the GRR. More detailed calculations can be performed depending upon the need for precision in the GRR.

While the GRR meets the demand for a measure of replacement, it fails to account for the mortality experience of both children and mothers. Therefore an additional refinement, the *net reproduction rate* (NRR), has been created in order to adjust the measure of replacement by accounting for the deaths to women and female children that are known to occur. Adjusting for mortality results in NRRs that are smaller than GRRs. However, replacement fertility remains at 1; that is, the NRR must be 1 to constitute replacement-level fertility. The factors used to adjust the GRR are derived from observed mortality data and the life tables based on these data.

5.3 Trends in Fertility

A number of important fertility-related trends can be identified for the United States population. Exhibits 5.4 and 5.5 present the annual number of births in the U.S. from 1945 through 2008. As can be seen, the number of births increased from 2.9 million in 1945 to 4.3 million annually for 1957 through 1961. The period from 1946 to 1964 is generally recognized as the era of the post-World War II baby boom; until 1989, 1964 was the last year in which there were at least 4.0 million births in the United States. The interval 1965 to 1972 is seen as the transition to the *baby bust* that lasted from 1972 to 1978. Although some regard post-1978 fertility as evidence of a baby boomlet, it might be more accurately described as an *echo baby boom*. In other words, there was an increase in births due to the rapid rise in the number of potential and then actual mothers as the early baby boomers reached their childbearing years. After 1987 there was an increase in the number of births that could not be explained by the echo effect. The number gradually increased through the end of the twentieth century and continued to rise in the early part of the twenty-first century. By 2007, the figure for annual births had reached 4.3 million, a number not realized since the 1957–1961 period. Since the latter figure is generated by a population with a much larger base, there has been an actual decline in fertility rates.

At the state and local levels, fertility patterns may vary significantly from those at the national level. For example, the number of births in Florida and California increased from approximately 115,000 and 363,000 in 1970 to 231,000 and 552,000, respectively, in 2008 (Martin et al. 2011, table 10). Thus, the annual number of births in these areas increased by 100% and 52%, respectively. Births in Ohio and New York, on the other hand, declined from 200,000 and 318,000 to 141,000 and

Exhibit 5.4 Annual Births, United States: 1945–2008

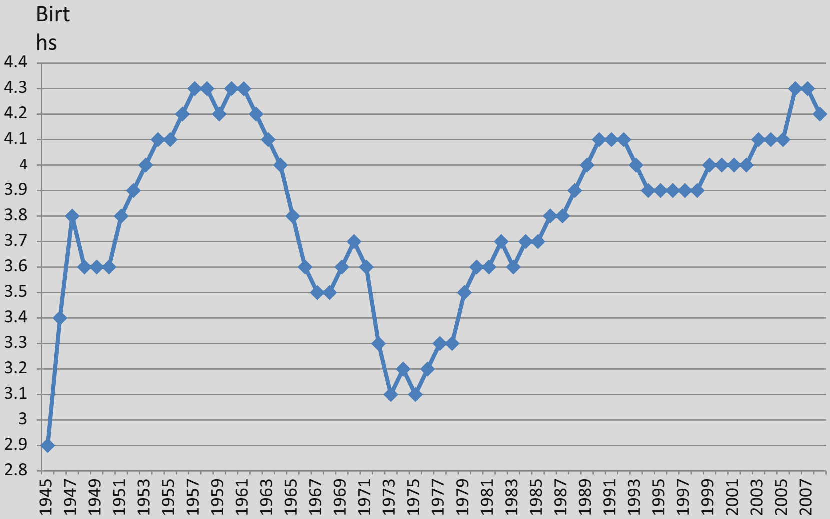
Year	Births (in millions)	Year	Births (in millions)
1945	2.9	1977	3.3
1946	3.4	1978	3.3
1947	3.8	1979	3.5
1948	3.6	1980	3.6
1949	3.6	1981	3.6
1950	3.6	1982	3.7
1951	3.8	1983	3.6
1952	3.9	1984	3.7
1953	4.0	1985	3.7
1954	4.1	1986	3.8
1955	4.1	1987	3.8
1956	4.2	1988	3.9
1957	4.3	1989	4.0
1958	4.3	1990	4.1
1959	4.2	1991	4.1
1960	4.3	1992	4.1
1961	4.3	1993	4.0
1962	4.2	1994	3.9
1963	4.1	1995	3.9
1964	4.0	1996	3.9
1965	3.8	1997	3.9
1966	3.6	1998	3.9
1967	3.5	1999	4.0
1968	3.5	2000	4.0
1969	3.6	2001	4.0
1970	3.7	2002	4.0
1971	3.6	2003	4.1
1972	3.3	2004	4.1
1973	3.1	2005	4.1
1974	3.2	2006	4.3
1975	3.1	2007	4.3
1976	3.2	2008	4.2

Sources: U.S. Bureau of the Census (1975); U.S. Bureau of the Census (2010); Ventura et al. (1999)

250,000, respectively, during the same interval. These figures represent decreases of 29% and 21%, respectively. Such subnational differences must be taken into consideration in the development of fertility related services.

In order to understand the source of the rise in the TFR, a closer examination of age specific fertility rates is required. Exhibit 5.6 presents age-specific fertility rates for 3 years: 1960, 1980 and 2008. The variation in age specific birth rates is marked. During the post-war baby boom all rates were high, with peak figures at ages 20–24

Exhibit 5.5 Annual Births: U.S., 1945–2008 Births (in millions)



Sources: U.S. Bureau of the Census (1975); U.S. Bureau of the Census (2010); Ventura et al. (1999)

Exhibit 5.6 Age-Specific Birth Rates in the United States: 1960–2008

	1960	1980	2008
Age category	Rate	Rate	Rate
10–14	0.8	1.1	0.6
15–19	89.1	53.0	41.5
20–24	258.1	115.1	103.0
25–29	197.4	112.9	115.1
30–34	112.7	61.9	99.3
35–39	56.2	19.8	46.9
40–44	15.5	3.9	9.8
45–49	0.9	0.2	0.7

Source: Martin et al. (2011), table 4; U.S. Bureau of the Census (1996), table 92
Note: Rates represent number of births per 1,000 women in age category

and 25–29. Twenty years later, during the baby bust, almost all rates had fallen, and by a large margin. However, the figures for 2008 show a shift in pattern. Rates for ages 20 and above all show an increase from those seen in 1980 and for the ages 30 and above the upward movement is substantial. The TFR rose between 1980 and 2008 in part as a result of the fact that older women exhibited an increase in fertility rates.

As noted earlier, a TFR of 2.1 is considered to be replacement level fertility. Very low TFRs, less than 2.1, over a longer period of time in nations such as Spain result in an aging population and eventual population decline if there is not an immigration counter-balancing flow in place. The TFR for the U.S. has been below 2.1 since the mid-1970s, and without significant immigration the U.S. population would achieve zero population growth and subsequent population decline once population momentum was lost. China has experienced decades of below replacement fertility and no immigration. The population is aging rapidly and will begin to decline in size in the next 20 years.

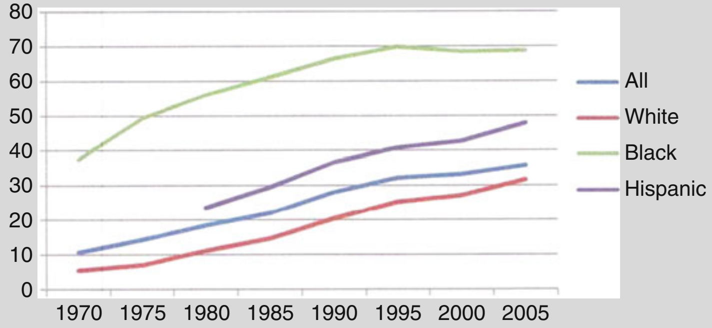
The most recent trends in the TFR in the U.S. show a small increase from 1.9 in 1990 to 2.08 today. Some popular media interpretations have hailed the increase in the TFR as clear evidence of a change in fertility-related preferences. However, further investigation leads to a different conclusion. Fertility rates for the African-American and Hispanic populations are somewhat higher than that for whites, and as the U.S. population becomes more heavily populated by the two minority groups the TFR will rise without any real change in fertility. In 2008, the TFR for whites was 2.07, followed by African Americans, 2.3, and Hispanics, 2.9 (Martin et al. 2011, tables 4 and 8).

There are several trends in factors related to birth outcomes that are important to consider. These factors help explain the hows and whys of fertility variations and trends. With regard to the likelihood of conception, several trends are worthy of note. Not only has contraceptive use increased since the 1970s, but the pattern of use has changed over time. Nearly 62% of women of childbearing age use some type of nonsurgical contraceptive (e.g., oral contraception, intrauterine device [IUD] or diaphragm). Nearly 17% have been sterilized (U.S. Bureau of the Census 2010, table 97). Reliance on the pill, IUD, and diaphragm has declined since the 1970s, while sterilization as a means of contraception has become increasingly common. There remains a large number of women who do not use contraceptives, leaving them exposed to wanted and unwanted pregnancies.

A change in the average age at first intercourse can have important implications for the health of a population. For example, premarital intercourse on the part of teenagers has increased markedly since the 1970s. Earlier age of first intercourse results in a rise in the risk of pregnancy and increases exposure to sexually transmitted diseases. Despite the increasing younger age of first intercourse, the birth rate for women 15–19 has steadily declined largely due to increases in the proportion using contraceptives.

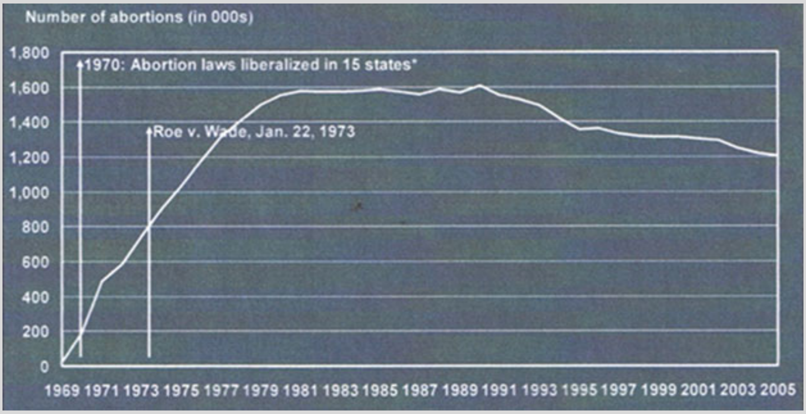
Another major trend in fertility variation relates to children born out of wedlock. In 2008, nearly 41% of all births in the United States were to unmarried mothers. Approximately 72% of all African American births were to women who were unmarried, but only 28% of white births were so classified (Martin et al. 2011, table 15). While the proportion of African-American births occurring out of wedlock appears to have leveled off (albeit at a very high rate), the proportion of white and Hispanic births to unmarried mothers continues to increase. When the age of the mother is accounted for the race and ethnic differential narrows. At ages 15–19, 82% and 98% of all white and African-American births, respectively, are to mothers who are unmarried. At ages 30–34, 11% of white births and 19% of African American births are to unmarried mothers. Exhibit 5.7 presents recent data on the percentage of all births to mothers who are unmarried by race and ethnicity.

Exhibit 5.7 Trends in Out-of-Wedlock Births United States: 1970–2005



Source: National Center for Health Statistics

Exhibit 5.8 The Annual Number of Legal Abortions Increased Through the 1970s, Leveled Off in the 1980s and Fell in the 1990s



Source: National Center for Health Statistics

One of the more controversial trends related to fertility in the United States is the growth in the number of annual abortions since that procedure was declared legal in the 1970s. As presented in Exhibit 5.8, the number of legal abortions climbed steadily after the liberalization of abortion laws from 200,000 in 1970 to a high of around 1.6 million in 1980. Since 1980 the number has steadily decreased, representing a decline of about 400,000 annually from the early 1980s. Services related to the performance of induced abortions involve a variety of healthcare components, including medical, counseling and contraceptive services.

5.4 Factors Affecting Fertility

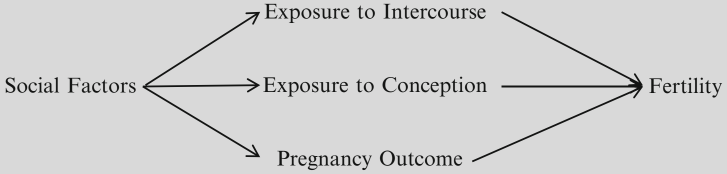
A number of social factors affect fertility levels and these factors must be examined with regard to healthcare concerns. For example, the distribution of births by birth weight is an important determinant of service needs, given that low birth-weight babies require additional care, and in some cases specialized long-term care. Currently, about 7% of all annual births are low birth weight or less than 2,500 grams and 12% are born preterm, 36 or fewer weeks of gestation (Martin et al. 2011, table 23). The age of the mother (a social factor) is linked to the likelihood of having a low birth-weight child. Over 13% of all births to the very youngest mothers are low birth weight, while only 6% of mothers aged 25–29 fall into this category.

Although the analysis of fertility rates provides useful information for health planners, additional information concerning births is required for many purposes. Information on factors influencing the birth process, as well as the demographic characteristics of both mothers and babies, makes it possible to determine the level and type of healthcare needs for a population.

A model for understanding these factors was developed during the 1950s by Davis and Blake (1956) and is still useful today. The model as presented in Exhibit 5.9 illustrates the factors influencing fertility outcomes. These factors do not act independently of each other, although each category represents a separate stage in the fertility process. That is, intercourse must occur first, followed by conception, and last, by successful gestation. The intercourse variable is operationalized in terms of age at first intercourse, frequency of intercourse, time spent in and out of marriage, and age at first marriage.

The second set of factors, "exposure to conception," reflects the level of contraceptive use, sterilization, and infertility. The last group of factors focuses on pregnancy outcomes measured in terms of frequency of miscarriages, stillbirths, and induced abortions. Together with social factors such as age, socioeconomic status, race-ethnicity, and marital status of mothers, these intercourse, conception, and outcome factors produce varied levels of fertility for demographically defined subpopulations. Note that the focus of the Davis-Blake model, as well as that for most fertility analyses, is on the study of women. Few data are available on men in this regard, and the interest in fertility analysis from a male perspective is a relatively recent phenomenon (e.g. Kaufman 1997).

Exhibit 5.9 Factors Affecting Fertility



Source: Davis and Blake (1956).

In regard to race and ethnicity, several differences in fertility patterns are apparent. In 2009, the white general fertility rate was 58 births per 1,000 women aged 15–44, compared to 69 for African Americans and 93 for Hispanic mothers (Martin et al. 2011, table 9). In addition, within the Hispanic population, variation is seen when subcategories are considered. The range is from 53 for Cuban-Americans to 91 for Mexican-Americans (Martin et al. 2011, table 7).

Fertility differences by the educational attainment of the mother are even greater than those for race and ethnicity. Women in the 35–44 age range with less than a high school education will have the most children over their lifetimes, followed by high school graduates and college graduates, with those with an advanced degree recording half the number of births over their lifetimes as those without a high school diploma. College-educated women in particular have exhibited a dramatic shift to a later age of childbearing over the past 35 years.

Fertility levels vary widely by labor force status and income level as well. Women in the labor force have a GRR of 52.8 versus 90.0 for those not in the labor force. In regard to income, those at the lowest income, less than $10,000, have a GRR of 87.2 compared to that of 59.3 for women in the highest income range, $75,000 and more (U.S. Bureau of the Census 2010, table 92).

These same characteristics can be used in the analysis of differentials in fertility-related behaviors. While 67.0% of women age 40–44 received a pelvic exam in 2002, only 27.0% of women 15–19 received the exam. Comparisons by race show that 63.2%, 58.1% and 48.5% of white, black and Hispanic women, respectively, received pelvic exams (U.S. Bureau of the Census 2010, table 96).

The greatest value in this information lies in its usefulness for understanding the impact of multiple factors (e.g., age and race) on fertility and fertility-related health services while accounting for compositional changes over time. For example, given racial/ethnic differences in fertility and the younger age structures of the African-American and Hispanic populations, the proportion of all births that are African American or Hispanic are projected to increase sharply in the next decade. Given that the rates for early prenatal care are lower and the incidence of low birth weight is higher in these populations, the subsequent demand for related health services can be expected to rise markedly.

The above discussion does not present an exhaustive list of the factors having potential impact on fertility and the factors worthy of concern vary by service or market area. For example, other racial and ethnic group data would be of interest in the Southwest or on the West Coast. Compositional change (e.g., changing age or racial-ethnic composition) over time is equally important given the population redistribution patterns underway in the United States. Substantial increases in the number of births are possible over relatively short periods of time (3–5 years) in rapidly growing areas. The importance of the above information lies in its salience for the level of need for birth-related services. Once again, two service or market areas with the exact same population size may have very different demands given variations in age, income, race/ethnicity structure, contraceptive use, and marital status of mothers. By understanding current conditions and anticipating change a range of factors related to fertility, service providers can gain a significant competitive edge over those institutions that know little about the reproductive future.

5.5 Sources of Fertility Data

While a more thorough treatment of demographic data sources appears in Chap. 9, several specific comments regarding fertility-related data are appropriate at this juncture. Fertility data are drawn from a variety of sources, although official vital statistics registries represent the most reliable source of information on fertility. Relatively high-quality birth registration systems exist in each state, and the standard birth certificate includes a variety of data on the characteristics of the child, mother, and father. Data from these state systems are compiled at the national level by the National Center for Health Statistics. Exhibit 5.10 provides a list of items on the standard birth certificate.

In addition to the birth registration system, sample surveys are a source of data on fertility-related behavior. Surveys provide information on such issues as contraceptive use, infertility, and breast-feeding practices. Surveys like the National Survey of Family Growth conducted by the National Center for Health Statistics make it possible to track trends in fertility-related behavior.

The U.S. Census Bureau collects data on a limited number of fertility issues through both the American Community Survey (ACS) and the Current Population Survey (CPS). In the ACS, women are asked whether or not they had given birth within the previous year. The CPS has a more extensive list of fertility inquiries, including questions with regard to actual and expected fertility are asked and cross-tabulated by other demographic factors.

Exhibit 5.10 Items Included on the Standard Certificate of Live Birth

Child	Mother	Father	Pregnancy
Name	Name	Name	Pregnancy history
Sex	Age	Age	Date of last normal menses
Date of birth	State of birth	State of birth	Month prenatal care began
Hospital/facility name	Place of residence	Race/ethnicity	Prenatal visits
County of birth	Race/ethnicity	Education	Pregnancy complications
Birth weight	Marital status	Relation to child	Concurrent illnesses
Apgar score	Education		Congenital anomalies
			Method of delivery
			Medical risk factors
			Obstetric procedures

Source: National Center for Health Statistics

5.6 Contemporary Issues

Because of the dynamic nature of the fertility process in the United States, there are a number of issues related to the reproduction process that bear discussion. Perhaps no other aspect of the demographic tapestry has experienced as much change in the past 50 years, with significant trends in fertility rates overall, changing patterns of marriage and family formation, changes in sexual behavior and contraception use, and a variety of other areas. Examples of these issues are presented in the sections that follow.

5.6.1 Fluctuations in Births

While there are a number of contemporary healthcare issues that are closely tied to the fertility process, some are particularly relevant for health services planning, marketing, and business development. The first concerns the changing demand for services resulting from fluctuations in the number of births in a given market area. The annual number of births in the U.S. appears to be stabilizing at about 4.0–4.3 million per year. At the same time, large area-to-area differentials in annual births persist. Some locales have a demographic environment conducive to producing a large number of new "customers" (e.g., a young age structure, little significant out-migration, and, perhaps, a number of in-migrants who are younger), while others have demographic conditions that likely will result in low birth production.

Changes in population size reflect the specific combination of births, deaths, and migrants characterizing an area. For example, many cities in Florida are experiencing relatively high population growth rates due to in-migration yet record relatively few births each year. In fact, the number of deaths each year is larger than the number of births in a number of these cities. Thus the demand for fertility-related services is low. Other cities, particularly those in the Northeast and Midwest regions of the U.S., exhibit negative growth (population loss), even though a substantial number of births are recorded each year.

5.6.2 Variations in Fertility Rates

Variations in fertility rates over time can be attributed to a number of factors. These include social, economic, and political factors, not to mention more practical matters such as access to contraceptives. In the United States and other postindustrial countries, increases in educational levels and standards of living have contributed to declining fertility since the beginning of the twentieth century. This trend also was influenced by a major shift in the economic structure during this time period. Agrarian economies place a premium on large families; in industrial economies, large families become a liability. In addition, growing numbers of women have entered the labor force, particularly since World War II, further discouraging and/or preventing the establishment of large families.

Within this general trend, fluctuations can be identified that reflect social, economic and political conditions. Birth rates have historically declined during periods of economic uncertainty (e.g., the Great Depression) and increased during periods of prosperity (e.g., the post-WWII boom). Similarly, birth rates are typically lower during wartime than peacetime. Although government policy in the United States typically has not been utilized as a mechanism for controlling fertility, it has been argued that the federal tax structure historically has favored families with children. In some other societies (e.g., Prussian Germany and the People's Republic of China), fertility levels have been directly controlled by the ruling government.

Another consideration in the United States is the impact of social psychological factors on fertility. This is another way of writing that reproduction is "trendier" at some points in history than others. The predisposition of couples to have children is influenced by societal expectations, current fashion, and competing values. Children in the United States were viewed as having a different function at the beginning of the twentieth century than they have now. In any society, the perceived function of children influences the value placed on progeny, which in turn influences the propensity to reproduce. In some societies, such a high value is placed on children (or on the connotations of reproduction for masculinity and femininity) that other factors such as changing socioeconomic status may be overridden.

As noted earlier, levels of fertility have implications for the demand for certain health related services, with the need for obstetricians and pediatricians a direct reflection of the fertility rate. This situation is complicated by the fact that in the U.S. today fertility rates are higher among the lower socioeconomic groups and among racial and ethnic minorities – segments of society that may not have access to mainstream American medicine and require dedicated services (e.g., Medicaid providers or multilingual practitioners) to meet their needs.

One other consideration is the impact of the health status of the population on fertility levels. It is a biological fact that the ability to reproduce for people (particularly women) who are in very poor health or under considerable stress is reduced. Even people in these circumstances who are able to conceive may face challenges in bringing the pregnancy to term or producing a healthy child. Because of this, careful consideration should be given the health status of the population under study when examining fertility patterns.

5.6.3 Provision of Services

Another issue that emerged in the 1990s and continues today concerns the fluctuation in the number of providers of obstetric services. Over time there has been a marked increase in the number of obstetricians who have given up that specialty. At the same time, demand for their services remains high. The reasons for dropping out of the pool of service providers (e.g., a substantial increase in malpractice insurance premiums) are important, but from a more general perspective other problems may be created if physician shortages occur. For example, patients may be required to travel longer distances for care, resulting in increased health risks for both mother and baby. Or other mothers may forego prenatal care if local services are not accessible.

Aside from the question of an adequate supply of service providers overall is the concern that in some areas – due to less desirable living conditions or more litigious populations – the decline in providers could be relatively large. One solution to this shortage involves increasing responsibilities assigned to nurses and nurse practitioners, and to some extent that has occurred. While a decline in obstetrics specialists creates opportunities for new doctors and other medical personnel, they face the same obstacles as the providers who abandoned their practices. Many hospitals and clinics have faced difficulties in attracting the requisite staff, especially for obstetrical services, for a number of years.

Providers of obstetrical services must also accommodate the changing tastes and preferences of consumers seeking birth-related services. From an increase in husband participation to having births under water, the market for various birthing techniques has broadened considerably over the last 30 years. In fact, the establishment of birthing centers sounded the death knoll for many traditional labor and delivery practices. The increased demand for these techniques is directly related to a variety of demographic factors.

Moreover, there is increasing competition for healthcare consumers, particularly for those who are healthy. The introduction of standard business practices by healthcare providers has put some competitors at a distinct advantage over others, and some of the advantage is not always direct. For example, some hospitals and clinics have developed ways of attracting quality staff by establishing successful marketing strategies. Maternity units targeted toward families who wish to have a "total" birthing experience can be found all over the U.S. A package price for prenatal, birth, and postnatal services is being offered by some healthcare organizations along with marketing efforts to attract young mothers and their families to additional services (e.g., smoking-cessation clinics and exercise programs). Since obstetrical costs constitute the major category of expense for most health plans, all of those involved in the provision of care must understand these processes. For organizations that want to remain ahead of the competition, an understanding of demographic information will be essential. Exhibit 5.11 focuses on planning issues related to opening a new OB unit.

Exhibit 5.11 A Case Study in Fertility Services: Planning an OB Unit

The establishment of an obstetrical facility may seem straightforward enough. One need only estimate the likely number of births in the area, arrange for appropriate medical staff and physical facilities, and offer the service. This process, however, masks a great deal of the complexity that surrounds the provision of services for obstetrical needs. In fact, there is virtually no aspect of demography that can be ignored in planning for an OB unit.

(continued)

Exhibit 5.11 (continued)

From the first step on, the process requires considerable research and the application of a number of demographic concepts. The first challenge involves the delineation of the service area for an OB unit. How far is it reasonable to expect pregnant women to travel to deliver a baby (or for prenatal and postnatal services if the obstetrician's office is located near the facility)? The administrators may already have some idea of the facility's service area for general care, but are OB patients different? They are, in fact, and a hospital is likely to attract OB patients from a broader area than patients for many other diagnoses. The delineation of the OB service area will, therefore, depend on the availability of competing services, the location of obstetricians' offices, and access to transportation.

Having delineated the appropriate service area, it is then necessary to calculate the demand for obstetrical services.[1] How many deliveries can be expected annually from the population being served? This, of course, can be calculated in a number of ways. The simplest – and probably most misleading – of these would be to determine the crude birth rate for the target population. This would be misleading in that the denominator is the entire population and, of course, large segments of the population (e.g., men, very young and very old women) are not "eligible" for obstetric services. Nor does the crude birth rate take such factors as age, race, and marital status into consideration. Further, if the only data is available is for the entire county, applying the countrywide crude birth rate to the target population at the ZIP Code level may mean that an average is being used that is skewed due to higher African-American birth rates, while in actuality you have a predominantly white service area population.

It would be more appropriate to utilize an indicator (e.g., general fertility rate) that takes the age and sex distribution of the area into consideration. It would be best if the actual fertility experience of the target population were known. If it is not, one could apply some standard rate that accounts for age, sex, race, and even income distribution. Any ethnic concentrations within the service area should also be noted, as many such groups (e.g., Hispanics) are likely to display different fertility patterns than the general population.

Incidentally, detailed current population estimates that include age, sex, and racial/ethnic composition may not be readily available. The smaller and more irregularly shaped the service area, the more likely this is to be a problem. The profiling of the service area population may be done by purchasing data from private vendors (usually at the ZIP Code level) or seeking assistance from local planning agencies that often make such estimates. It may be

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[1] Obstetrical care is probably the only health service for which the "need" and the "demand" are almost synonymous. Once the process (pregnancy) is set into play, it is irreversible. Many heart patients may back out of bypass surgery, but pregnant women – after a point at least – cannot opt out of the process.

(continued)

Exhibit 5.11 (continued)

necessary to call on the services of an area demographer if possible, since every service area is likely to have its own peculiar characteristics.

Once the current population has been profiled, it should be possible to apply the appropriate rate and estimate the yield of births from the service area. However, it will be a year or two before the facility is operational, and perhaps 5 years before its financial viability can be determined. Thus, an indication of projected births becomes more crucial than the number of current births. How does one determine the number of potential births for the future? Here the various projection techniques of the demographer come into play. One might first want to examine overall population trends; that is, is the service area population increasing, decreasing, or stable? Is the service area growing, i.e., are housing units being added? A projected decline in the population base does not bode well for a new facility. More importantly, however, how is the composition of the population changing? A growing population will not be beneficial if it is rapidly aging.

Projections can be made using straight-line techniques, cohort analysis, or more reality-based approaches that take factors such as housing stock into consideration. In the short run, the rate of natural increase (difference between births and deaths) or decrease is not likely to be significant, but the migration rate certainly is. The identification of in-migrants and out-migrants becomes essential. What type of people, for example, are moving into the community – retirees, young marrieds, middle-aged empty nesters? Can the identified trends be expected to continue into the future? In addition, will known fertility rates be maintained indefinitely? The analyst must project the population in terms of the variables discussed above – age, sex, race, and ethnicity. In addition, some projection of socioeconomic status must be made, assuming that the patient's ability to pay for services is a consideration.

Obviously a number of assumptions have to be made to develop a profile of the service area population 5 or 10 years into the future, and many of the demographer's tools are necessary for this task. Once a future population has been established, the potential number of births can be projected. The planning does not end here, however, since a number of other factors need to be taken into consideration. The economic status of the target population needs to be evaluated (unless OB services are considered a "loss leader"). Further, the availability of medical manpower needs to be considered, since a new facility with no physician support or an inadequate number of neonatal nurses will not be viable. The risk level of the population must also be considered. Is this a population of high rates of premature and low birth-weight babies or a population that utilizes significant levels of prenatal care? If so, special facilities and services may be necessary.

(continued)

Exhibit 5.11 (continued)

Two other related factors must also be considered. First, what are the psychographic characteristics of the service area population? Is this a "Gen X" population interested in innovative birthing arrangements, rather than the traditional delivery format this facility is offering? Or is it a more traditional population with no interest in the progressive alternative birthing facility being planned? These questions lead directly into the issue of competition. The perception of the organization offering the OB facility will influence utilization levels, so image becomes a key factor. An understanding of how consumers see this facility relative to its competitors is essential.

The subject of competition raises one final point. The projected birth figure for the service area population is only meaningful if there is no competition. In most areas, there will be more than one facility competing for obstetrical cases. The new facility cannot expect to obtain all potential births, but only its market share. The current distribution of births among existing facilities must be determined in order to estimate the share that the new facility will capture, assuming all other factors remain constant. Of course, market share can shift as a result of a variety of factors. Information on deliveries can often be obtained from state health agencies or purchased from data vendors who calculate market shares. Some realistic estimate of the capturable market share must subsequently be made in order to determine the true potential utilization for the planned facility.

As can be seen, virtually all aspects of demography are utilized in the planning of this type of facility, and the process can even be more complicated than outlined above. This helps explain the booming business in the sale of demographic data and the growing number of individuals with demographic training being utilized by healthcare organizations.

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Chapter 6
Mortality

Mortality refers to the level of death characterizing a population. Mortality research investigates the who, how, why, and when issues related to dying, issues directly connected to the effectiveness of the healthcare system. Demographers have contributed greatly to the understanding of mortality and healthcare issues both in terms of the development of mortality measures and the identification of mortality patterns within the population. Comparisons of deaths, death rates and life expectancy across geographic units (e.g., nations) provide insight into variations in health conditions and health services.

6.1 Concepts and Measures

6.1.1 Concepts

Death is defined as the complete cessation of life after a live birth has taken place. Deaths that occur prior to a live birth – fetal deaths – are allocated to a separate category of mortality study. Though the words "cessation of life" may seem to comprise a simple, straightforward definition, medical advances are making the interpretation of death more complex. As the ability to artificially prolong life has improved markedly, the distinction between life and death has blurred. The definition of death is constantly being rewritten in the light of medical and technological advances, although that issue is beyond the scope of this book. It is important to note that the complexities related to deaths and death decisions will not be resolved in the short term (Swanson and Siegel 2004).

Mortality refers to the level of death within a population as measured by the number of deaths and death rates characterizing that population for a particular year. The mortality level can be thought of as a proxy for the level of morbidity characterizing a particular population. It not only reflects the type of health conditions affecting

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a population but provides insights into the efficacy of the healthcare system serving that population.

Infant mortality refers to the level of death characterizing babies under 1 year of age within a given year. The infant mortality rate (IMR) is used to compare the health and well-being of populations across and within countries. The rate of infant mortality is an effective measure of not only health conditions but social, economic and environmental conditions within a population, thereby providing significant insights beyond just the occurrence of infant deaths.

The IMR can be divided into *neonatal* and *postneonatal* components, with the former referring to deaths during the first 28 days of life and the latter reflecting deaths occurring from 29 days to 1 year. Deaths occurring prior to delivery are considered *fetal* deaths. Deaths during the first month of life are most often a result of congenital abnormalities, low birth weight and birth complications, respiratory distress syndrome, and maternal complications of pregnancy. Deaths during the remainder of the first year are primarily due to environmental factors.

The *causes of death* affecting a population are a major factor in determining the level of mortality. Populations in different times and places are subject to different causes of death which explain differentials in mortality rates and life expectancy.

6.1.2 Measures

The most basic way to measure mortality is simply to count the number of deaths. Such counts are usually based on a 1-year period and may be reported for the nation as a whole, states, metropolitan areas or smaller geographic areas. Compiling death counts over a period of years has helped identify trends with regard to increases or decreases in mortality. Deaths are also cross-classified by the medical, social, and economic characteristics of the deceased (e.g., cause of death and age at death).

Using a simple count of deaths in the analysis of mortality has several shortcomings. As in the case of fertility analysis, the comparison of deaths among geographic areas or over time generally is not very useful, given the various sizes of the populations reporting these deaths. It is usually of little value to compare the number of deaths in Community X (population 10,000) with the number of deaths in Community Y (population 100,000). Because of the need to compare the mortality for different populations and over time, demographers have developed a number of rates for this purpose. Exhibit 6.1 presents common measures of mortality.

The simplest measure used is the *crude birth rate* (CDR). Like the crude birth rate discussed in Chap. 5, this rates expresses mortality as the number of deaths per 1,000 population during a particular year (e.g., 6.5 deaths per 1,000 people). Since the number of deaths, particularly for small populations, may fluctuate widely from year to year, researchers may calculate a 3-year average for the number of deaths. This average is used to calculate the rate, with the population for the middle year used as the denominator.

Just as everyone in a population is not at risk of pregnancy, not everyone in a population is at equal risk of death. Lumping all deaths into one crude death rate limits the measure's usefulness. Therefore, age-specific death rates (ASDRs) are often generated. By determining the death rate for each cohort, it becomes possible to determine which portions of the age distribution account for the mortality observed. ASDRs are usually calculated for 5-year age intervals, though 3- or even 1-year intervals may be used for more detailed analyses. Exhibit 6.2 illustrates age-specific death rates for males and females over the lifespan.

As can be seen from Exhibit 6.2, the likelihood of dying is different for each age cohort and for males and females in each cohort. In the US today, the risk of death is particularly high during the first year of life but drops dramatically for children and teenagers. The likelihood of death increases slowly for each age cohort with death rates beginning to accelerate when the population reaches "middle age". Not surprisingly, the greatest risk of death is exhibited by the oldest age cohorts.

The infant mortality rate (IMR) represents a special case of age-specific death rates. The IMR is expressed as a 1-year rate and is examined separately because of the greatly increased probability of dying during the first year of life compared with subsequent ages. Persons under age 1, for example, are 20 times more likely to die in a given year than someone in the 1–4 year-old cohort. Other rates can be calculated to further specify the timing of deaths during the first year.

Exhibit 6.1 The Calculation of Mortality Rates

The calculation of mortality rates is relatively straightforward and the requisite data are usually readily available. Death data are available from vital statistics registries, and population figures (rate denominators) can be drawn from Census Bureau data, state demographic centers or commercial data vendors.

$$\text{Crude death rate (CDR)} = \frac{\text{Number of deaths in year } X}{\text{Midyear population in year } X} \times 1000$$

To avoid anomalies in the data related to a single year (e.g., results of an epidemic or natural disaster), it is common to utilize a 3-year average with the population for the midpoint of the middle year used for the denominator.

$$\begin{array}{c}\text{Age} - \text{specific}\\ \text{death rate (ASDR)}\end{array} = \frac{\text{Deaths to persons age } X \text{ to age } X+5 \text{ in year } Y}{\text{Number of persons age } X \text{ to age } X+5 \text{ in year } Y} \times 1000$$

with X to $X+5$ signifying the 5-year interval. Three-year averages for deaths may be used as numerators if there is substantial year-to-year variation in the number of deaths.

$$\begin{array}{c}\text{Infant mortality}\\ \text{rate (IMR)}\end{array} = \frac{\begin{array}{c}\text{Number of deaths to persons}\\ \text{under 1 year of age in year } X\end{array}}{\text{Live births in year } X} \times 1000$$

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Exhibit 6.1 (continued)

Since infant deaths are a relatively rare occurrence, 3-year averages for infant deaths may be used, especially since there is likely to be significant year-to-year variation. The same method may be applied to neonatal and post-neonatal death calculations.

$$\begin{array}{c}\text{Neonatal mortality}\\ \text{rate (IMR)}\end{array} = \frac{\begin{array}{c}\text{Number of deaths to persons}\\ \text{1 to 28 days of age in year } X\end{array}}{\text{Live births in year } X} \times 1000$$

$$\begin{array}{c}\text{Post} - \text{neonatal}\\ \text{mortality rate (IMR)}\end{array} = \frac{\begin{array}{c}\text{Number of deaths to persons 29 days}\\ \text{to 1 year of age in year } X\end{array}}{\text{Live births in year } X} \times 1000$$

$$\begin{array}{c}\text{Cause} - \text{specific}\\ \text{death rate (CSDR)}\end{array} = \frac{\begin{array}{c}\text{Number of deaths from a specific}\\ \text{cause in year } X\end{array}}{\text{Midyear population in year } X} \times 1000$$

$$\begin{array}{c}\text{Maternal mortality}\\ \text{rate (MMR)}\end{array} = \frac{\text{Number of women dying during childbirth in year } X}{\text{Live births in year } X} \times 1000$$

Exhibit 6.2 Age-Specific Mortality Rates by Sex, United States: 2000

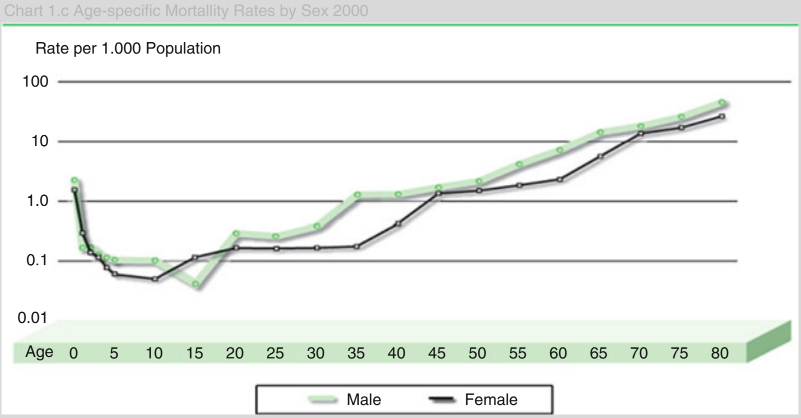
Chart 1.c Age-specific Mortallity Rates by Sex 2000

Neonatal deaths refer to infant deaths during the first 28 days of life. Four conditions – congenital abnormalities (birth defects), low birth weight, respiratory distress, and maternal complications – account for over half of all infant deaths. Post-neonatal deaths are those that occur during from day 29 to 1 year of age. Sudden infant death (SIDS) is a major factor in post-neonatal deaths, accounting for some 30% of deaths during this period.

The fetal death ratio is calculated by dividing the number of late fetal deaths (i.e., usually after 28 weeks of gestation) by the number of live births. The perinatal mortality rate combines late fetal and early infant mortality into one rate. This figure is used to assess the quality of antenatal and perinatal medical care. It is calculated by adding the later fetal deaths (usually after 28 weeks of gestation) to early infant deaths (usually during the first 7 days after birth but sometimes the first 28 days – i.e., neonatal period – after birth) for a given year and then dividing by the denominator (i.e., live births for that year).

While the age at death provides useful information, a more complete picture of mortality patterns can be generated by examining cause-specific deaths. The method for calculating cause-specific death rates (CSDR) is similar to that for age-specific death rates with the numerator being the number of deaths from a particular cause.

For many measures of mortality the rates may be misleading if the population under study is not a "standard" population. When comparing two communities in terms of their mortality profiles, the various rates discussed above are useful if the population composition is similar. However, in many cases, distinctly different populations may affect the rates and result in misleading comparisons. For example, the crude death rate for Florida in 2009 was 9.2 per 1,000 population, a figure much higher than the CDR of 7.2 per 1,000 for Nevada in that same year. This would suggest that Nevada is a healthier state than Florida, even though one might not believe this to be the case. Indeed, when the death rate is standardized to take into account differences in age structure, the age adjusted death rate for Florida is 6.7 and for Nevada is 7.9 (Kochanek et al. 2011). In addition to age standardization, it is possible to adjust mortality rates by other demographic characteristics such as sex and race. Exhibit 6.3 describes the process of rate standardization used by demographers.

Exhibit 6.3 Standardization of Mortality Data

Standardization is a method for adjusting mortality rates or other measures of vital processes for compositional factors that have an effect on those rates. For example, the number of deaths occurring in any year is a function of three components: health status, population size and demographic attributes (e.g., age). Since mortality rates are frequently used as indicators of health conditions, it is important to hold population size and age structure (and perhaps other attributes) constant when mortality rates are being constructed.

The calculation of rates addresses concerns over differences in population size and allows the analyst to compare the health status of two populations that are different demographically. The crude death rate (CDR), for example, may be used for this purpose. However, the CDR may be misleading since it is influenced by differences in the age structures of the populations in question. That is, areas with relatively young populations (and hence less risk of dying) are likely to report low death rates, while areas with relatively old populations (and greater risk of dying) are likely to report high death rates independent of

(continued)

Exhibit 6.3 (continued)

the size of the respective populations. Thus, while age-specific death rates (ASDRs) are higher for all age cohorts in Mexico than in the United States, the CDR is lower in Mexico due to its very young age structure. For this reason, the unadjusted CDR is not a good measure for comparative purposes.

It is possible to adjust or standardize rates in order to control for age structure and, often, other factors (e.g., race). One method for accomplishing this is to select a "standard" age structure (e.g., the age structure for the United States), apply the ASDRs from two different populations to the standard age distribution, and then compare the number of deaths and crude death rates that result from the exercise. This process generates the number of deaths for the respective populations *as if* their age structures were the same. The revised number of deaths (the numerator) can then be divided by the population size and an age-adjusted death rate (AADR) generated.

Demographers distinguish between "direct" and "indirect" standardization to refer to the use of two different ways in which to account for differences in age structure. Direct standardization is used to calculate a weighted average of the age-specific mortality rates of the population under study where the weights represent the age-specific sizes of the standard population. Indirect Standardization is used to produce age-specific mortality rates from the standard population to derive expected deaths in the population under study. In this method, the crude death rate of the population is multiplied by an adjustment factor that is designed to take account of the peculiarities of the age composition or age-sex composition of the population under study.

The same principles of standardization can be used when adjusting rates for other factors, such as education, race, and ethnicity. A similar process can be utilized to adjust fertility rates by holding certain factors constant. For example, the death rates for a predominantly white population and a predominantly African-American population might be recalculated using a standardized method that assumes that the populations have comparable racial characteristics.

6.1.3 Life Tables

Although inappropriately named, life tables provide healthcare planners, demographers, insurance companies and other risk managers with a great deal of useful information about mortality patterns. Life tables are a mechanism for combining death data and rates into a summary measure of mortality. Age-specific mortality rates are transformed and combined in such a way as to generate a measure of life expectancy. *Life expectancy*, in general terms, is the average number of years a hypothetical group or cohort of persons born today or alive at a particular point in time could be expected to live if current age-specific death rates (ASDRs) remain constant throughout their lifetimes. In other words, as the hypothetical cohort ages it is subject to probabilities of dying specific to that age interval, which in turn are based upon current ASDRs. Life expectancy projections are made by adjusting ASDRs to match the assumed levels for some time in the future. Exhibit 6.4 presents an abridged life table for the United States.

Life tables provide a host of information about mortality conditions, and it is possible to trace trends in mortality by assembling life table data for more than one time period. Comparative life table analysis can yield information on life expectancy differentials by sex and race for any age. For example, though life expectancy at birth is more than 5 years greater for females than it is for males, the difference narrows to 4 years at age 40, 3 years at age 60, and 2 years at age 80. When one looks jointly at race and sex, larger differentials emerge. Black females outlive black males by nearly 9 years. White females outlive black males by 14 years.

Not only do these data have serious social, economic, and political implications, but the racial differentials indicate that two very different populations exist vis-à-vis the healthcare system. Healthcare providers and policy makers alike must take differential life expectancies into consideration in performing their respective tasks. Thus, using the black male versus white female example, out of 100,000 white females born over 85,000 will be alive at age 65 (l65–70). For black males, only 57,000 will be alive, or only about two thirds of the white female population. Certainly this differential has serious implications for planning for the elderly healthcare market. Based on the above data and other observations, it can be said that the African-American male population is considerably younger than the remaining three sex/race groupings, African-American female, white male, and white female. Coupled with additional psychographic and behavioral information, specific strategies regarding service development and promotion could be formulated for this very different market segment.

A final use for life tables involves the calculation of survival ratios. These ratios are a means of determining the proportion of persons surviving from one age interval to the next. Once calculated, they can be used to determine what proportion of persons alive now can be expected to be alive at some point in the future given the assumption that death rates remain relatively constant.

The survival ratio for persons 75 years of age living to 80 is .716. That is, about 72% of the persons who were alive at age 75 will also be alive at age 80. Cause-specific life tables allow the measurement of the effect of the hypothetical removal of certain causes of death on overall life expectancy. It is not unusual to find life table calculations assuming that heart disease or cancer is eliminated as a cause of death. Clinical researchers and healthcare administrators alike have a vested interest in the survival ratios of patients on whom various procedures are performed.

While most life tables are constructed at the national or state levels, methods have been developed to generate substate life expectancies. Furthermore, simple life tables can be expanded to include more than one probability of exit. Life table analysis can be expanded to include joint probabilities of dying and having a certain condition, such as a disability. For example, life expectancy for those who were 70 in 1997 is 84 years for those without a disability and 82 years for those with a disability (Crimmins et al 2009). Research along these same lines has resulted in the creation of a composite indicator, the *healthy life-year* (HeaLY). For this indicator, life expectancy and morbidity data are combined to produce figures for life-years lost due to a variety of conditions (Hyder et al. 1998).

Exhibit 6.4 Abridged Life Table for the United States: 2003

	Probability of dying between ages x to $x+n$	Number surviving to age x	Number dying between ages x to $x+n$	Person-years lived between ages x to $x+n$	Total number of person-years lived above age x	Expectancy of life at age x
Age	$_nq_x$	l_x	$_nd_x$	$_nL_x$	T_x	e_x
0–1	0.006879	100,000	688	99,398	7,784,998	77.8
1–5	0.001174	99,312	117	396,970	7,685,600	77.4
5–10	0.000727	99,196	72	495,784	7,288,630	73.5
10–15	0.000898	99,124	89	495,452	6,792,846	68.5
15–20	0.003251	99,035	322	494,460	6,297,395	63.6
20–25	0.004869	98,713	481	492,387	5,802,935	58.8
25–30	0.004865	98,232	478	489,966	5,310,547	54.1
30–35	0.005551	97,754	543	487,457	4,820,581	49.3
35–40	0.007433	97,211	723	484,370	4,333,124	44.6
40–45	0.011588	96,489	1,118	479,837	3,848,755	39.9
45–50	0.017540	95,371	1,673	472,927	3,368,918	35.3
50–55	0.025802	93,698	2,418	462,770	2,895,990	30.9
55–60	0.036299	91,280	3,313	448,575	2,433,221	26.7
60–65	0.055819	87,967	4,910	428,282	1,984,646	22.6
65–70	0.082066	83,057	6,816	399,173	1,556,364	18.7
70–75	0.125036	76,241	9,533	358,595	1,157,191	15.2
75–80	0.188740	66,708	12,590	303,365	798,596	12.0
80–85	0.288884	54,117	15,634	232,350	495,231	9.2
85–90	0.420212	38,484	16,171	151,473	262,881	6.8
90–95	0.575974	22,312	12,851	77,357	111,408	5.0
95–100	0.733375	9,461	6,938	27,543	34,051	3.6
100 and over	1.000000	2,523	2,523	6,508	6,508	2.6

Source: National Center for Health Statistics (2006)

$_nq_x$ = the proportion of persons alive at the beginning of the interval who died during the interval
l_x = the number surviving from one age interval to the next after deaths are subtracted
$_nd_x$ = the number of deaths that occur to that age interval during the specified time period
$_nL_x$ = the number of person-years lived during that interval
T_x = the reverse sum of $_nL_x$ values
E_x = the life expectancy at the specified age

6.2 Trends in US Mortality

Like fertility, mortality is a dynamic process, influenced by a number of demographic factors and subject to significant fluctuations. The total number of annual deaths in the United States, as indicated in Exhibit 6.5, increased steadily during the twentieth century. However, by 2005 this trend had moderated and the number of annual deaths stabilized at around 2.42 million per year, or around one million more deaths annually compared with1935. More significant than the number of deaths, however, is the mortality rate since it is adjusted for population size. The crude death rate in 1900 was 17.2 per 1,000. This figure declined dramatically during the first one-half of the twentieth century, with a rate of 10.8 recorded in 1940. The death rate continued to decline during the century, dropping to around 8 per 1,000. The most recent NCHS data indicate a 2009 crude death rate of 7.9 per 1,000 (Kochanek et al 2011).

At the beginning of the twentieth century life expectancy was about 49 years, with women outliving men by about 3 years. Over time, life expectancy increased dramatically to over 59 years in 1930, 68 years in 1970 and over 75 years in 1990. In 2006, life expectancy in the U.S. was over 77 years and projected to rise to 79.5 by the year 2020 (U.S. Bureau of the Census 2010, table 102). During the same period of time the male/female differential in life expectancy widened, reaching 7 years by 1970. The 7 year margin continued until 1990, followed by a gradual narrowing of the difference. Today, women outlive men by 5.0 years. An interesting twist has arisen with regard to life expectancy in some geographic areas of the United States. Recent research has indicated that the trend toward greater longevity has been reversed for the populations in a number of U.S. counties, with 4% of U.S. men and 16% of U.S. women experiencing *declining* life expectancy (Ezzati et al. 2008). This unexpected development has been attributed to the adoption of more dangerous lifestyles.

Exhibit 6.5 Total Number of Deaths in the United States: 1935–2007

Year	Deaths[a]
2007	2,424
2006	2,426
2005	2,448
2000	2,403
1995	2,312
1990	2,146
1985	2,084
1980	1,990
1975	1,893
1970	1,921
1965	1,828
1960	1,712
1955	1,529
1950	1,452
1945	1,402
1940	1,417
1935	1,393

Sources: U.S. Bureau of the Census (1975), 1–4; U.S. Census Bureau (2010), table 106

[a] Deaths in thousands

In addition to realizing a substantial increase in life expectancy over the twentieth century and into the twenty-first century, the relative health condition at each age has improved. For example, recent research has allowed demographic researchers to extend life expectancy information to include healthy life years expected. For health planners as well as anyone else who wishes to better understand current demand for health services, particularly for the population age 50 and above, factoring in the health condition of the population that reaches age 50, 60 or 100 must take place in order to understand the market and how it might be changing. Exhibit 6.6 presents trends in life expectancy by sex for the US.

One of the significant developments during the twentieth century in the U.S. was the dramatic reduction in infant mortality rates. As can be seen in Exhibit 6.7, early in that century infant mortality was a leading cause of death and contributed to a relatively short life expectancy. Between 1920 and 1940 the IMR was cut essentially in half and by 1970 it was halved again. Overall, a rate of 85 infant deaths per 1,000 live births in 1920 was cut to 7 per 1,000 by 2000. A similar but even more dramatic trend was recorded for maternal deaths, a leading cause of death for females at the beginning of the twentieth century. The maternal death rate of around 80 per 10,000 births was reduced to only 1 per 10,000 by the end of the twentieth century. The improvements in infant and maternal mortality rates can be attributed to a number of factors in addition to better medical care, including improved public health conditions and changes in demographic characteristics such as education and income. Moreover, the sharp reduction in the maternal mortality rate was directly responsible for the rapid increase in female life expectancy that took place in the middle part of the twentieth century.

Exhibit 6.6 Life Expectancy at Birth by Sex in the United States: 1900–2006

Year	Males	Females
2006	75.1	80.2
2000	74.1	79.3
1995	72.5	78.9
1990	71.8	78.8
1985	71.1	78.2
1980	70.0	77.5
1975	68.8	76.6
1970	67.1	74.8
1960	66.6	73.1
1950	65.6	71.1
1940	60.8	65.2
1930	58.1	61.6
1920	53.6	54.6
1910	48.4	51.8
1900	46.3	48.3

Sources: U.S. Bureau of the Census (1975); U.S. Census Bureau (2010), table 102

Exhibit 6.7 Infant and Maternal Mortality Rates in the United States: 1920–2005

Year	Infant mortality[a]	Maternal mortality[b]
2005	6.9	1.0
2000	6.9	1.0
1990	9.2	0.8
1980	12.6	0.9
1970	20.0	2.2
1960	26.0	3.7
1950	29.2	8.3
1940	47.0	37.3
1930	64.6	67.3
1920	85.8	79.9

Source: U.S. Bureau of the Census (1975), 136–147; U.S. Census Bureau (2010), table 111

[a] Deaths per 1,000 live births

[b] Deaths per 10,000 live births

The disappointing progress the U.S. has made in reducing infant mortality is to a great extent a function of disparities in access to healthcare that exist between various groups in that society. The relatively large infant mortality disparity between African Americans and whites, for example, illustrates a link between a demographic characteristic and mortality levels. Today, African-American infant mortality rates remain over twice as high as those for white Americans. The racial difference in infant mortality can be attributed to dissimilarities in the cause of death. African-American infants experience a higher rate of infant mortality as a result of their greater likelihood of dying from complications associated with low birth weight and pregnancy, pneumonia, and respiratory distress syndrome.

Significant changes have occurred with regard to the major causes of death affecting US society (Herron 2010). Current death patterns will drive present and future medical research in terms of treatment modalities and prevention programs. As long as heart disease and cancer dominate as causes of death in the U.S. and the world, billions of dollars will be invested in reducing their impact. In turn, medical developments and the advancement of new models that can lead to the reduction of illness will alter the structure of sickness and death, influencing the research foci of the future. The demand for medical care, drugs and supplies, physical facilities, and healthcare personnel will be shaped by these efforts and the resulting change in sickness and death patterns. To the extent that certain diseases are eliminated, the demand for care related to those diseases (with the possible exception of immunizations) will be eliminated. In regard to the introduction of "new" forms of sickness and death, they too will shape the demand for health services. The rise in obesity, in particular the prevalence of morbid obesity, is driving up the rates of diabetes and heart disease.

At the macro level, efforts to link environmental factors to death have heightened the population's awareness regarding the presence of carcinogens and other environmental health threats. The market here is both directly related to healthcare (e.g., ongoing research uncovering the connection between pollution and death) and indirectly related (e.g., the development of a medical waste industry). For decades to come, medical researchers will be linking the British Petroleum well leak in the Gulf of Mexico to increases in death rates in coastal cities and other areas in the U.S. where oil washed ashore.

Exhibit 6.8 compares death rates from various causes over time. Heart-related causes and cancer now account for about 48% of all mortality. The dominant causes of death early in the twentieth century have waned in importance due to improvements in both disease prevention, including immunization, and treatment.

Exhibit 6.8 Leading Causes of Death in the US: 1990 and 2007

	1900	2007
Heart disease	345.2	204.3
Pneumonia/Influenza	202.2	17.5
Tuberculosis	194.4	<10
Digestive system	142.7	<10
Cancer	186.6	64.0

Ethical and moral issues emerge when the expenditure of funds in the public and private sectors on death prevention is considered. To a great extent, market forces influence which health conditions are researched and, therefore, which segments of the population must wait longer for disease cures. Recent concerns over the spread of the AIDS virus illustrate the wide variety of ethical issues that can emerge in the treatment of disease. One issue concerns the priority level placed on AIDS research and education, a topic hotly debated by various private entities and government agencies. A second issue focuses on how to protect the unaffected public while still guaranteeing individual rights to those who are afflicted. A third ethical problem pits the rights of healthcare providers (e.g., doctors, dentists, nurses) versus the rights of AIDS patients to obtain non-AIDS related healthcare services.

The remaining connecting issues concern the relationship among mortality, population size, age structure (to a large extent demographic factors), and the need for healthcare. The number of deaths and death rates have clear linkages to population size and age structure, which in turn dictate both the level and type of healthcare needs. For example, reduced infant and childhood mortality has been a major determinant in increased life expectancy. Increased life expectancy, coupled with an older age structure, means that not only is there a large proportion of the population at the older ages (with unique healthcare needs), but many of these persons are relatively healthy – so much so, in fact, that they are likened to populations 15 or 20 years younger in earlier generations. Given an increase in preventive measures such as immunization for specific strains of influenza, they are likely to maintain their good health for an even longer period of time. Exhibit 6.9 provides some demographic clues on how to avoid death.

Exhibit 6.9 How to Avoid Death: Demographic Clues to Longevity

During the twentieth century, Americans became increasingly obsessed with improving their health and prolonging their lives. That obsession has continued into the twenty-first century. Optimism over our ability to eliminate disease and increase life expectancy pervades U.S. society. The healthcare industry has expanded to address these issues to the point where it now consumes 17% of the nation's gross national product. While society has become increasingly dependent on the healthcare system as a means of prolonging life, researchers have become firmly convinced that there are other factors unrelated to healthcare utilization that offer clues to longevity. Most of these clues, it turns out, are linked to demographic variables.

The accumulated research on life expectancy for the past three decades has indicated the following rules for prolonging life. There are some other contributing factors (such as proper diet, exercise, and moderation in lifestyle), but in this context we are emphasizing the demographic factors. (It should be remembered that we are talking about statistical averages, so no one should take the information below personally.)

Rule 1: Arrange to be born female. Females appear to be biologically stronger and more durable than males. The death rate for females is lower for virtually every cause of death and for every age group. The U.S. male population exhibits an annual death rate considerably higher than that for females. With the elimination of maternal mortality as a major cause of death, females became a relatively low-risk group with regard to mortality.

Rule 2: Arrange to be born white. An advantage in longevity, at least in contemporary U.S. society, is associated with being white rather than non-white. (Although there are some racial subgroups with low mortality rates, these are the exceptions.) Although white members of U.S. society may not be able to claim inherent biologically superiority, the advantages accruing to them by virtue of their standard of living and lifestyles provides a longevity edge. The death rate for the African-American population is one and one-half times that for whites. Whites have a several year advantage over African-Americans in life expectancy. (Of course, if you could arrange to be born a white female, you could expect to live longer than just about anybody.)

Rule 3: Arrange to be born into an affluent household. An appropriate contemporary axiom might be that the rich get richer and the poor get sicker. The relative disadvantage of the poor in U.S. society is reflected in

(continued)

Exhibit 6.9 (continued)

differential mortality rates and life expectancy. The death rate for the lowest socioeconomic status groups is one and one-half that of the most affluent groups. The affluent can consequently expect to live several years longer on the average than the nonaffluent. The privileges of class tend to override the effect of the healthcare delivery system; simply providing the poor more healthcare has done little to improve their overall health status. (Many of the nonwhite, incidentally, violate this rule as well, leading to the assertion that socioeconomic status is a more powerful determinant of health status than is race.)

Rule 4: Get married (and stay married). The contemporary American trend toward later marriages or no marriages at all may bode ill for mortality statistics. Not only are the married healthier overall than the unmarried (whether single, divorced, or widowed), but this advantage shows up in mortality and longevity statistics. When those in various marital statuses are adjusted for age, the death rate for the married is considerably lower and the life expectancy considerably higher than for the unmarried. (Of course, this means that one must strive to keep one's spouse health and happy as well. Becoming divorced or widowed carries a death threat.)

Rule 5: Get as much education as possible. From all indications, the more educated we are, the healthier we are. (This only applies to physical health; it seems that the better educated may have more – albeit less serious – mental disorders. Luckily, these are not usually fatal.) This is reflected in mortality statistics, for as the educational level rises, the death rate declines. Similarly, life expectancy increases as education increases. This is partly explained by the higher health consciousness of the better educated, resulting in healthier lifestyles and more appropriate use of the healthcare delivery system. It is also influenced by the fact that income improves with education, as do working conditions (a college campus *is* a lot safer than a construction site).

Rule 6: Obtain a white collar, professional job. While it is obvious that some professions are more dangerous than others, there are factors that are not quite so evident. Occupational injury and disease rates vary widely by industry and type of work, and these differentials become translated into mortality and longevity differences. While white-collar professionals are not without their health risks (they are, after all, leading candidates for heart attacks), they tend to benefit from higher socioeconomic status and healthier lifestyles overall. Some white-collar, professional occupations are to be avoided, however, calling for potentially lifesaving research prior to selection of a profession.

6.3 Factors Affecting Mortality

While mortality is most often considered an outcome, it is important to understand well the antecedents that effect deaths, death rates, and life expectancy. As already noted, there was a 30-year increase in life expectancy during the 20th century, driven by reductions, in particular, in infant mortality and deaths to others in the youngest age cohorts. Life expectancy at birth is still increasing, albeit slowly, which again translates into a fall in age-specific mortality rates. Life expectancy, and the number of healthy years, at the oldest ages have increased as well.

A continued fall in death rates is not pre-ordained. Natural disasters, war, epidemics and pandemics can quickly bring a rise in mortality, although usually for a nation or a region and not the entire planet. The U.S. is not immune to the possibility that death rates could plateau or perhaps even rise, especially in the longer term. The shift in population composition to one that has a much higher percentage of persons who are African American and/or Hispanic is accompanied by a downward pressure on life expectancy given that that these two racial and ethnic minority groups have a lower life expectancy than the majority (now) white population. In regions, states, metropolitan areas and smaller geographic units where there has been a rapid transition from a white dominated to a racial/ethnic minority dominated population, overall life expectancy has likely fallen below the average upward trajectory seen for the entire nation.

Other trends are likely to lead to higher rates of mortality (and morbidity, see Chapter 7) in the long term. The rise in childhood obesity, for example, in the longer term will lead to a higher prevalence of adult obesity, more cases of diabetes and hypertension, and thus a fall in life expectancy if there is a lack of behavioral and medical developments that counteract the trend. In addition, the number of healthy life years is reduced substantially in the obese population. Less healthy lifestyles in general lead to higher rates of sickness, compromised immune systems and ultimately increased mortality and morbidity at even younger ages. While improvements in treatments for the major killers heart disease and cancer can mitigate some the negative impact noted above, it is not at all clear that these advances can outpace the trends noted above.

Overall, the factors affecting mortality can be divided into the elements under individual and population control and those not under control. The biology underlying death cannot be overtaken and we all must die. Whether human lifespan is 120 or 150, death will occur. At the same time, many dimensions of behavior that have been shown to be linked to early death are discretionary. Most of the population does not have to be obese and no one needs to smoke. Exercise and a generally healthy diet are available to nearly the entire population. Public policy also has a role in individuals' decisions. Laws that mandate the use of seatbelts, make cars safer, and bring stiff penalties to those who are found to drink alcohol and drive all have the effect of reducing mortality. While newer policies that are designed to reduce obesity, deter texting while driving an automobile, and encourage exercise are controversial now they too in the long term could decrease the number of deaths and death rates.

6.4 Sources of Mortality Data

The primary source of mortality data in the United States is the government death registry maintained by the National Center for Health Statistics. This registry is compiled from death certificates filed at the local level (i.e., county health department) which are batched for each state and forwarded to NCHS for processing and analysis. The data collected on the standard death certificate include primary cause of death, contributing causes, and individual demographic and socioeconomic characteristics such as sex, race, ethnicity, last occupation, place of residence, and place of death. Using these data, demographers can begin to study the relationship between the cause of death and a variety of demographic variables.

There are several potential problems related to data compiled from death certificates. While identifying the cause of death may seem relatively easy to a layperson, in practice it is often difficult to determine the precise cause of death, potentially resulting in the incorrect assignment of cause. Some deaths are complicated in that more than one condition is present (e.g., cancer and pneumonia) with several bodily systems affected (e.g., heart and lungs). Further, it is often difficult to distinguish between and among the primary and contributing causes, especially since the proximate cause of death may not represent the ultimate explanation. For example, few people dies as a direct result of diabetes or AIDS since some derivative condition (e.g., pneumonia) or associated system failure (e.g., kidney failure) is likely to be the proximate cause of death. This situation is further complicated by the fact that the cause of death in many jurisdictions may not be assigned by a physician but a medically untrained coroner.

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Chapter 7
Migration

7.1 Introduction

Migration, or geographic mobility, is the third component of population change (along with fertility and mortality). Migration is the most dynamic and complex of the three population processes, as well as the most difficult to measure. While death occurs once to each individual and the average number of births per woman in the United States is about two, migration is a much more frequent event for most Americans. Recent estimates indicate that the typical American moves 20 times between birth and death, although there is now clear evidence that the level of residential mobility is actually declining (U.S. Census Bureau 2000; Kulkarni and Pol 1994). About 17% of the population changes residence each year (down from 20% in the 1940s). Over a 5-year period more than 45% of the population moves.

7.2 Concepts and Measures

Migration refers to a physical move involving an intended permanent change in residence. Permanent change in residence implies that the person or household in question intends to stay in the new residence for some period of time. A residence is defined as the place where a person usually sleeps and eats. Having any residence at all implies some type of permanency in what is recognized as appropriate housing (e.g., apartments, duplexes), though certain categories of individuals do not have recognized residences (e.g., the homeless). Daily or seasonal movement to and from jobs or for climatic reasons does not qualify as migration, though such short-term changes in location have implications for the provision of healthcare. Communities such as Daytona Beach, Florida, and Sturgis, South Dakota, encounter short-term population increases due to tourism; knowledge of the size and composition of the temporary population is crucial in planning for healthcare needs.

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Demographers divide migration into two major categories – international and internal. Persons involved in migration either move between countries or they move within the boundaries of a single country. *International migration* refers to the intended permanent movement between one country and another, although there is often a question as to the intended permanence of the move. Persons migrating to a country are referred to as *immigrants*, while individuals moving out of a country are labeled *emigrants*. Every country has laws and policies that govern international migration, especially immigration. In the United States, international migration is regulated by immigration laws that establish the conditions for immigration into the country. These laws also specify country-specific limits on the number of persons who may legally move to the United States in any given year. Immigration law in the U.S. has limited effect on emigration from this country; most US citizens and all non-citizens are free to leave as long as some country will allow entry.

Internal migration refers to change of residence within a particular country. Internal migration is generally less regulated (and measured) than is international migration. Within the United States, internal migration is basically unimpeded, though laws designed to limit the growth of certain communities have a relatively long history. Demographers refer to internal migrants coming into an area as *in-migrants*, while those leaving an area are termed *out-migrants*.

Internal migration can be categorized as either short-distance or long-distance, and a hierarchy of definitions has been created to reflect the distance of the move. Anyone who permanently changes residences (regardless of distance) is classified as a *mover*, but in order for a mover to be technically a *migrant* in the U.S., the mover has to change his or her county of residence. The county was chosen for the mover/migrant distinction because it was felt that, in general, movement across such a boundary involves substantial change in social and economic milieu. Thus, a migrant is a mover, but a mover is not necessarily a migrant. Other useful distinctions also reflect the distance and nature of the movement. *Intrastate* migration refers to movement within a state while *interstate* migration refers to movement between two states.

The difficulty in measurement is largely the product of conceptual ambiguity and the lack of clear measuring techniques. Measurement is problematic because, in the U.S., there is no migration registry. Migration data are most often derived by comparing addresses at two points in time based on a survey or some type of systematic record keeping. This approach, however, does not consider the number or nature of the moves that may have occurred between the two dates specified.

The migration concept is difficult to apply to certain categories of people in transit (e.g., migrant workers, “snowbirds”), for whom the move is not expected to be permanent. Moreover, the growing complexity of living arrangements reflected in nontraditional households and blended families makes the measurement of migration even more difficult.

In recent decades, migration has become the most important component of the population change equation in the U.S. At the subnational level, the impact of migration is felt more immediately than the effect of fertility or morbidity on a community. As birth rates and death rates have fallen, migration has come to play an even more important role in population change. The effects of migration can be significant in the short run for population size and composition at both the point of origin and the point of destination. Persistent long-term migration flows affect subsequent population change in the areas receiving migrants through the births and deaths of "new" residents. Areas losing residents through out-migration do not realize the births and deaths of their former residents and to not benefit from the "lost" births with respect to population growth.

Migration streams, or the flow of relatively large numbers of persons from one area to another, are a common phenomenon. These streams involve large numbers of migrants moving from one location to another for the same reason. For example, the flow of African-Americans from the South to the Northeast and Midwest during the 1930s and 1940s constituted a migration stream. More recently, African-Americans migration streams from the Midwest and Northeast to the South have been identified. Thus, some African Americans were born in the South, resided in the North for some period of time, and returned to the South at a later point in time.

Several migration streams are viewed as important from a demographic perspective. Rural to urban migration, which began in some areas of the nation as early as 1850, has altered the course of industrial development. The east-to-west and city-to-suburb movement of the population has forever changed the social, economic and political structure of the United States. In more recent years the migration of persons from the Snowbelt to the Sunbelt has markedly affected both the place of origin and the place of destination.

Migration can also be classified as voluntary or involuntary. *Voluntary migration* occurs at the migrant's volition and usually involves moves for economic needs, retirement, family reasons or simply for a change of scene. *Involuntary migration* is typically a result of political or religious persecution, wars or civil unrest, or famines and other natural disasters. Further discussion in this chapter will focus primarily on voluntary migration.

One other distinction should be made between legal and illegal immigration. *Legal immigratio*n refers to those entering a country with the formal permission of that country. This typically involves the acquisition of a "green card" in the U.S. that allows for the permanent or fixed-period residence of the immigrant in this country. All immigrants, of course, must possess a current, legitimate passport before entry. Other countries have similar legal requirements. *Illegal immigrants* are those who enter a country without proper legal authorization. Many of these are temporary movers seeking short-term employment or visits with family members. Others enter the country illegally with the intent of staying permanently. While reasonably accurate records are maintained by federal immigration authorities (Immigration and Customs Enforcement) on legal immigration, limited data are available on illegal immigrants.

Demographers have developed a number of migration measures, and many of the same concerns discussed in the chapters on fertility and mortality are relevant to this discussion. With migration, additional measurement difficulties arise related to the concepts employed and the data sources available. Accurate records are maintained in the U.S. for international migration (i.e., for immigrants and emigrants). However, these accurate records pertain primarily to legal immigrants; the data on the growing number of illegal immigrants is understandably less accurate and based on estimates. In some instances, and largely for political reasons, numbers are simply made up. In addition, no formal records are maintained on internal migration in the U.S., leaving a significant gap in our understanding of the year-to-year mobility of the U.S. population.

The most common measure of migration is simply a count of the number of individuals moving from one geographic area to another. Thus, the number of people moving into a county during a given year and the number of people moving out of that county constitute crude indicators of migration. Two summary measures of migration have been developed to refine these raw numbers. *Net migration* is a measure of the absolute difference between in-migration and out-migration for an area over a given time period. For example, if county X in state Y gained 10,000 in-migrants and lost 5,000 out-migrants between 2005 and 2010, the figure for net migration would be 5,000. (Had the figures been reversed, net migration would have equaled -5,000). *Gross migration* is used to measure the total amount of migration by adding in-migrants to out-migrants. Thus, gross migration for county X for this time period would be 15,000. Gross migration is used to assess the overall level of population turnover while net migration is a better indicator of the outcome of the migration process.

While the comparison of the absolute numbers of movers, nonmovers, and migrants is important, rates need to be calculated when there are size differences between the areas being compared. Thus, rates for in-migration, out-migration, net migration and gross migration can be generated. The numerator for these rates is the total for each migration category (e.g., in-migrants); the denominator depends on what is considered as the population at risk for migration. The identification of the population at risk, that is, persons with at least some probability of moving over a given timeframe, is complication because each rate has a different risk group.

Consider, for example, the out-migration rate for a specific city in a 1-year period. The numerator of the rate is the number of out-migrants, while the denominator is the population at the beginning or in the middle of the 1-year period. However, identifying the population at risk for the in-migration rate is problematic since virtually the entire population of the United States is considered to be at some risk of moving into the city. For this reason, the denominator for the in-migration rate is typically the same one used for calculating the out-migration rate. This means that the rate generated is technically the percentage of population increase due to in-migration. (See Exhibit 7.1 for migration rate calculations).

The rate of migration has a substantial impact on the population size and characteristics of the affected communities. This in turn affects the nature of healthcare need. An examination of migration data for Florida illustrates this point. The population of Florida grew substantially (17.6%) between 2000 and 2010, although that growth rate was considerably below those found in previous decades. Net migration – not natural increase, the difference between births and deaths – has historically accounted for over 85% of the state's growth. The growth due to net migration was not uniform across all age cohorts, however, with the largest absolute increases for young adults (25–34), mature adults (50–64), and the oldest old

(85 and over). Each of these age cohorts experienced increases in excess of 200,000 for the 2000–2010 period.

These data have important implications for health services. Certainly the growth in Florida's population (estimated at over 5,000 per week between 2000 and 2010) means that overall demand for health services is increasing rapidly. More importantly, substantial changes in the level and types of services are expected as a result of the state's rapidly changing population composition. For example, there is rapid growth among the young working-age population, a population that does not require high levels of health services overall and seldom uses inpatient services. On the other hand, this is a population characterized by higher rates of substance abuse, certain mental disorders, accidents, homicide, and suicide. These problems are significant enough to require adequate specialized services.

At the same time, there is tremendous growth in two populations that are high utilizers of health services: the very young and the oldest old. The very young require significant amounts of healthcare, beginning with the birth process itself and continuing through early childhood. In a state known for its large number of senior citizens, it is likely that pediatric services do not keep up with the demand. At the other end of the age spectrum, the senior population utilizes a disproportionate share of health services, especially hospital services. In states like Florida, it is difficult for the healthcare infrastructure to keep pace with the demand for services. Chronic shortages of geriatricians, obstetricians and pediatricians are likely to occur under these circumstances.

Exhibit 7.1 The Calculation of Migration Rates

Migration rates are relatively easy to calculate if the required data are available. Data (numerators) on international migration are available from Immigration and Customs Enforcement and internal data are available from IRS records and sample surveys. Population figures (denominators) can be drawn from Census Bureau counts or from estimates generated by other sources. These basic rates can be adjusted to reflect other factors such as age and marital status as desired.

$$\text{In - migration rate} = \frac{\text{Persons moving into area in } Y_1}{\text{Midpoint population estimate in area for } Y_1} \times 1{,}000$$

$$\text{Out - migration rate} = \frac{\text{Persons moving out of area in Y}_1}{\text{Midpoint population estimate in area for Y}_1} \times 1{,}000$$

$$\text{Net - migration rate} =$$

$$\frac{\text{Persons moving into area in } Y_1 - \text{Persons moving out of the area in } Y_1}{\text{Midpoint population estimate in area for } Y_1} \times 1{,}000$$

(continued)

Exhibit 7.1 (continued)

Gross migration rate =

$$\frac{\text{Persons moving into area in } Y_1 + \text{Persons moving out of the area in } Y_1}{\text{Midpoint population estimate in area for } Y_1} \times 1{,}000$$

$$\text{Migration efficiency} = \frac{\text{Net migrants (in - migrants} - \text{out - migrants)}}{\text{Gross migrants (in - migrants} + \text{out - migrants)}}$$

For a hypothetical population of 10,000 that experienced during *Y1* 2,000 in-migrants and 1,000 out-migrants the following rates would be generated:

In-migration rate: 200 per 1,000 population
Out-migration rate: 100 per 1,000 population
Net migration rate: 100 (a net gain) per 1,000 population
Gross migration rate: 300 (moves in or out) per 1,000 population
Migration efficiency: .333

7.3 Migration Trends for the US

7.3.1 International Migration

The volume and nature of immigration to the United States have varied greatly over the history of the country. Exhibit 7.2 provides the decade-by-decade record of immigrant flows, along with the percentage of total decade population growth accounted for by immigrants. A comparison of the data by decade shows a low of 528,000 immigrants for the period 1931–1940 and a high of 9.1 million immigrants during the 1990s. The contribution of immigration to population growth was greatest during the first two decades of the twentieth century. This contribution declined markedly in the 1930s, and it was only in the 1980s that immigration's contribution to growth began to increase. Clearly, the recent trend has been upward, with immigrants accounting for over 40% of population growth in the first decade of the twenty-first century. This trend has led to an increase in the number of legal immigrants living in the U.S., from 24 million in 1995 to 37 million in 2007, more than tripling the figure for 1970. This figure does not take into consideration illegal immigrants which are estimated in the millions. It should also be noted that without post-World War II international migration, the population of the United States, and sub-areas, would be declining in number and much older in age structure would be realized.

The country of origin is an important consideration in the analysis of immigration trends. Exhibit 7.3 presents historical data, with four continent groupings as points of origin. Up until 1920, the vast majority of immigrants were from Europe. Since 1920 most of the share lost by Europe has been gained by Asia, and in the decade of the 2000s nearly one-third of all immigrants originated in Asia. All together, 85% of all immigrants came from Asia or other countries in North and South America in the

1990s. In 2010, the major sources of legal immigrants by country were Mexico (139,120), China (70,863), India (69,162), the Philippines (58,173), and the Dominican Republic (53,870). These same countries (except for the Dominican Republic) account for the largest numbers of foreign-born currently living in the U.S. As a result of this shift in county-of-origin, the immigrant population is quite different in culture and language from the majority European-origin population found in the United States at an earlier time. See Exhibit 7.6 on the “new” immigrants.

Information regarding the characteristics of immigrants is important for an understanding of their impact on health-related issues. Females now account for over half of the immigrant population to the U.S. The predominance of females represents a recent shift in sex ratio, since up until the 1980s the majority of immigrants were males. Over half of all immigrants are under age 30 and few are 65 and over. The median age for recent immigrants is only 29 years, compared to 40 years for native-born Americans. Immigrants overall are less educated than the native born. However, the young age structure of today’s immigrants accounts for virtually all of the national increase in public school enrollment over the last two decades. In 2000, there were 8.6 million school-age children from immigrant families in the United States and this number continues to increase. The leading occupations for immigrants in 2007 were farm workers, building maintenance, and construction workers (U.S. Census Bureau 2008). The poverty rate for immigrants is 50% higher than that of natives, with immigrants and their U.S.-born children (under age 21) accounting for 22% of all persons living in poverty.

Exhibit 7.2 Immigrants and the Proportion of Population Growth Due to Immigration by Decade for the United States: 1831–2007

Decade	Immigrants (in thousands)	Population growth for decade (in thousands)	Percent of population growth due to immigration
1831–1840	599	4,203	14.3
1841–1850	1,713	6,122	28.0
1851–1860	2,598	8,251	31.5
1861–1870	2,315	8,375	27.6
1871–1880	2,812	10,337	27.2
1881–1890	5,247	12,792	41.0
1891–1900	3,688	13,047	28.3
1901–1910	8,795	15,978	55.0
1911–1920	5,736	13,738	41.8
1921–1930	4,107	17,064	24.1
1931–1940	528	8,894	5.9
1941–1950	1,035	19,028	5.4
1951–1960	2,515	27,767	9.1
1961–1970	3,322	23,979	13.9
1971–1980	4,493	23,244	19.3
1981–1990	7,258	22,164	32.7
1991–2000	9,080	32,712	27.8
2001–2007	7,220	17,200	42.0

Source: U.S. Census Bureau (2010), tables 2, 7, and 50. Source data came from the U.S. Immigration and Naturalization Service, *Statistical Yearbook*

Exhibit 7.3 Immigrants to the United States by Continent of Origin: 1831–2007

Decade	Total immigrants[a]	Europe	Asia	Other America	Africa
1831–1840	599	496 (83)	– (0)	33 (6)	– (0)
1841–1850	1,713	1,598 (93)	– (0)	62 (4)	– (0)
1851–1860	2,598	2,453 (94)	41 (2)	75 (3)	– (0)
1861–1870	2,315	2,064 (89)	65 (3)	167 (7)	– (0)
1871–1880	2,812	2,262 (80)	124 (4)	404 (14)	– (0)
1881–1890	5,247	4,722 (90)	68 (1)	426 (8)	– (0)
1891–1900	3,688	3,559 (97)	71 (2)	39 (1)	1 (0)
1901–1910	8,795	8,136 (93)	244 (3)	362 (4)	7 (0)
1911–1920	5,736	4,377 (76)	193 (3)	1,144 (20)	8 (0)
1921–1930	4,107	2,478 (60)	97 (2)	1,517 (37)	6 (0)
1931–1940	528	348 (66)	15 (3)	160 (30)	2 (0)
1941–1950	1,035	622 (60)	59 (3)	355 (34)	7 (0)
1951–1960	2,516	1,492 (53)	157 (6)	841 (33)	17 (1)
1961–1970	3,322	1,239 (37)	445 (13)	1,579 (48)	39 (1)
1971–1980	4,493	801 (18)	1,634 (36)	1,929 (43)	92 (2)
1981–1990	7,256	706 (10)	2,814 (34)	3,581 (49)	192 (3)
1991–2000	9,080	1,309 (14)	2,890 (32)	4,449 (49)	382 (4)
2001–2007	7,200	1,043 (14)	2,473 (34)	3,117 (43)	526 (7)

Sources: U.S. Bureau of the Census (1922), (1932), (1953); U.S. Census Bureau (2010). Source data came from the U.S. Immigration and Naturalization Service, *Statistical Yearbook*

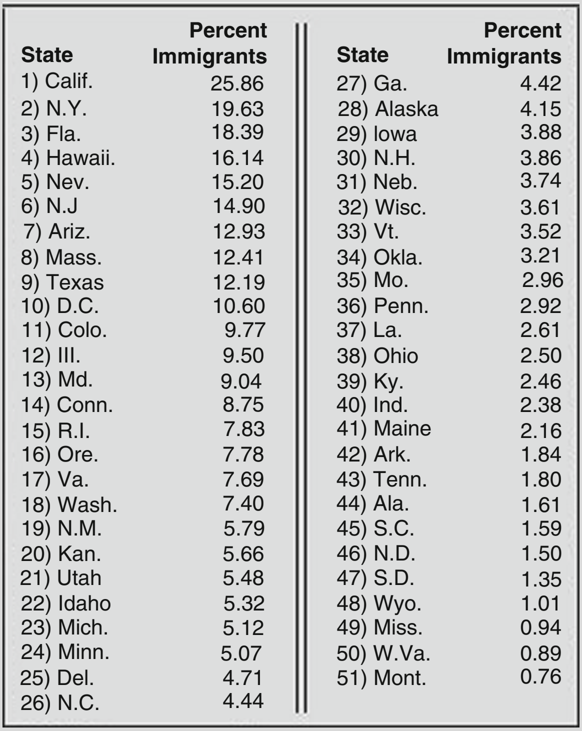
– Less than 1,000

[a] Numbers in thousand, percentages in parentheses

The relatively young age structure of the immigrant population means that the health service demands of these persons are theoretically lower than those normally expected from a population of comparable size. Nevertheless, to the extent that immigrants have been exposed to health conditions and diseases not found in the United States, their need for care is often different. In addition, their younger age structure implies an inordinate demand for obstetrical services in the short run and pediatric services in the long run. Further, cultural preferences may result in greater or lesser demand for care or for increased demand for non-traditional healthcare services (e.g., acupuncture, herbal remedies). At the same time the lower rate of health insurance coverage among immigrants complicates their relationship with the healthcare system (U.S. Census Bureau 2008).

When immigration trends are analyzed at the subnational level, it is found that immigrant destination is skewed toward relatively few states. Contemporary immigrants settle predominantly in seven states: California, New York, Florida, Texas, Pennsylvania, New Jersey and Illinois. The combined immigrant population of these seven states accounted for 70% of the total foreign-born population as of 2007. Exhibit 7.4 presents data on the percentage distribution of immigrants by state. The top ten metropolitan areas (MSAs) accounted for over 44% of all immigrants. Exhibit 7.5 illustrates graphically the distribution of recent immigrants to the US.

Exhibit 7.4 Percent Immigrants by State 2007

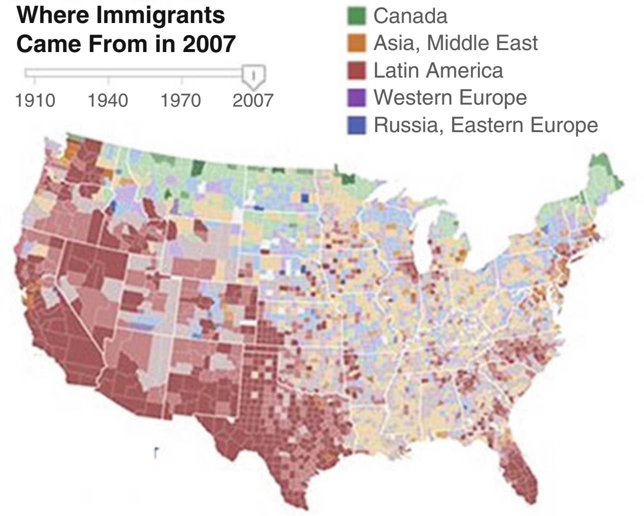


State	Percent Immigrants	State	Percent Immigrants
1) Calif.	25.86	27) Ga.	4.42
2) N.Y.	19.63	28) Alaska	4.15
3) Fla.	18.39	29) Iowa	3.88
4) Hawaii.	16.14	30) N.H.	3.86
5) Nev.	15.20	31) Neb.	3.74
6) N.J	14.90	32) Wisc.	3.61
7) Ariz.	12.93	33) Vt.	3.52
8) Mass.	12.41	34) Okla.	3.21
9) Texas	12.19	35) Mo.	2.96
10) D.C.	10.60	36) Penn.	2.92
11) Colo.	9.77	37) La.	2.61
12) Ill.	9.50	38) Ohio	2.50
13) Md.	9.04	39) Ky.	2.46
14) Conn.	8.75	40) Ind.	2.38
15) R.I.	7.83	41) Maine	2.16
16) Ore.	7.78	42) Ark.	1.84
17) Va.	7.69	43) Tenn.	1.80
18) Wash.	7.40	44) Ala.	1.61
19) N.M.	5.79	45) S.C.	1.59
20) Kan.	5.66	46) N.D.	1.50
21) Utah	5.48	47) S.D.	1.35
22) Idaho	5.32	48) Wyo.	1.01
23) Mich.	5.12	49) Miss.	0.94
24) Minn.	5.07	50) W.Va.	0.89
25) Del.	4.71	51) Mont.	0.76
26) N.C.	4.44		

Source: Center for Economic Development and Business Research, Wichita State University (2010)

Without question, the flow of immigrants to selected states and MSAs significantly alters the demand for health services. Furthermore, these figures do not take into account refugees or illegal immigrants. In view of the language and cultural differences characterizing the immigrant population, the provision of healthcare may be significantly affected at the point of destination. Indeed, the use of health services by the immigrant population is surrounded by controversy. Exhibit 7.6 examines some of the issues surrounding the "new" immigrants and healthcare.

Exhibit 7.5 Location of Recent Immigrants to the United States by Place of Origin: 2007



Source: *New York Times* (2009)

Exhibit 7.6 The "New" Immigrants and Health Care Delivery

During the 1970s and 1980s the United States experienced a resurgence of immigration. The annual influx of legal immigrants reached a level not experienced since the 1930s. These numbers of legal immigrants were thought to be matched during the 1980s by immigrants entering the United States illegally. For the first time in decades, immigration became a major issue for scholarly research and public policy debate.

This debate has not been inspired so much by the renewed volume of immigration (although that certainly is an issue for some parts of the country) as by the nature of the immigrants. These "new" immigrants have for the most part originated in Asia, the Caribbean and Latin America, and, increasingly, Africa and the Middle East. Unlike the well-educated, often professional immigrants to which we have grown accustomed, these new waves include large numbers of refugees from societal disruption from around the world. They often arrive with only the clothes on their backs. Those coming from Asian and African cultures may bring very "foreign" ways with them. Similarly, the estimated ten million illegal aliens in the United States from Mexico, Central America, and the Caribbean often come from lower socioeconomic backgrounds.

(continued)

Exhibit 7.6 (continued)

This wave of new immigrants has numerous implications for health status and healthcare delivery. Legally admitted immigrants in need of medical care – especially refugees – may face significant barriers to receiving care. These immigrants often come from countries where healthcare is poorly developed and/or disrupted by political conflict. These groups also present special problems in that the cultural distance between them and the U.S. system is great, and they are often impoverished when they arrive. Some groups (e.g., those from southeast Asia and Africa) may be affected by health problems that the system may not be prepared to treat. The high birth rates, by U.S. standards, characterizing many immigrant groups mean that certain communities may face increased demands on their obstetrical services.

Immigration from areas of a high incidence of diseases now rare in the U.S. is thought to have fueled the resurgence of tuberculosis, chagas, and hepatitis in areas of low incidence. According to Centers for Disease Control and Prevention (CDC), tuberculosis cases among foreign-born individuals remain disproportionately high, at six times the rate of U.S.-born persons (Centers for Disease Control and Prevention 2011).

The burden imposed by illegal immigrants – to the extent that it can be documented – may be even more substantial. Data on health care costs for illegal immigrants are sketchy because hospitals and community health centers don’t ask about patients’ legal status. In California, a 2004 study by the Federation for American Immigration Reform put the state’s annual cost at $1.4 billion. Similar studies in Colorado and Minnesota in 2005 came up with much smaller estimates: $31 million and $17 million, respectively.

Further, undocumented immigrants contribute to the number of people in the U.S. without health insurance. The Pew Hispanic Center estimates that 59% of the nation’s illegal immigrants were uninsured in 2009, compared with 25% of legal immigrants and 14% of U.S. citizens. Today, illegal immigrants represent about 17% of the nation’s 46 million uninsured people – and about 30% of the increase since 1980 (Livingston 2009).

These problems are exacerbated due to the concentration of illegal immigrants in certain parts of the country. These areas include parts of Florida, Texas, and California, along with New York City. Since much of the healthcare provided is uncompensated, a severe strain is placed on the healthcare system. Although the federal government has provided some financial assistance to health care systems serving certain groups, this assistance does not begin to cover the costs of this care.

Even as some hospitals are overwhelmed by the volume of medically indigent immigrants, fear and distrust keep many immigrants away from the healthcare system. Immigrants are likely to enter the system after considerable delay, and preventive measures such as prenatal care may be rare.

(continued)

Exhibit 7.6 (continued)

Problems arising from communication challenges and cultural differences are multiplied for illegal immigrants who fear that any contact with an “official” can result in deportation. Members of some groups still utilize traditional healthcare techniques and, where possible, traditional healers.

The issue of the health of immigrants and the associated cost to the public has been largely discussed. The non-emergency use of emergency rooms ostensibly indicates an inability to pay, yet some studies allege disproportionately lower access to unpaid healthcare by immigrants. For this and other reasons, there have been various disputes about how much immigration is costing the United States public health system. On the other hand, researchers have found what is known as the “healthy immigrant effect”, in which immigrants in general tend to be healthier than individuals born in the U.S. (at least when they arrive in the country).

Providers of healthcare have attempted to adapt to this new category of patient, even to the point of catering to those among them that can pay. Individual hospitals have modified their policies and practices in keeping with the concerns of ethnic patients, and at least one marketing firm has emerged to provide guidance to healthcare organizations desiring to target ethnic patients. Some institutions are finding, contrary to the above, that immigrants often pay out-of-pocket for services, making them relatively desirable customers. Some hospitals, in fact, have attempted to capitalize on their ethnic connections by encouraging the flow of more affluent foreigners into the United States for purposes of using the particular hospital’s services.

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7.3.2 Internal Migration

In the United States, internal (or domestic) migration is a dynamic process that is a significant contributor to population change. As previously noted, about 17% of the population changes residence each year (down from 20% in the 1940s), and over a 5-year period more than 45% of the population moves. This translates into about

135 million persons moving during the first 5 years of the twenty-first century alone. Of the 135 million, 26 million or 60% were classified as movers (within county) and 38% were classified as migrants (crossed a county boundary) (U.S. Census Bureau 2011). Focusing on the nearly 16 million migrants, about 9 million moved within the state of previous residence and 7 million moved across a state boundary.

The history of the United States is, to a great extent, a chronicle of migration. While space doesn't allow the details of historical internal migration to be presented, some key trends should be noted. The general flow of population in the U.S. since the colonization of the New World by Europeans has been from east to west. The county's population center at the time of the first census in 1790 was on the east coast; today, the population center is in Missouri. As the country became fully settled, the general trend toward east-to-west movement continued but a more complicated picture emerged. During the first half of the twentieth century a large number of people left the South, destined primarily for the Midwest and the Northeast but also contributing to the influx of new residents into the West region. This flow primarily involved African Americans who had been displaced from farm work with the mechanization of agriculture. Since the 1950s, however, the outflow from the South has been reversed and today the South has more population than any of the other three regions.

Between 1995 and 2000 the highest levels of both in- and outmigration of all four census regions occurred in the South. Just over 5 million people moved from the Northeast, the Midwest, and the West to the South between 1995 and 2000. During the same period, 3.2 million individuals left the South for one of the other regions. The resulting net in-migration rate was 20.2, meaning that the South gained 20.2 people through migration for every 1,000 individuals living there in 1995. The Northeast, the Midwest, and the West displayed different migration patterns from the South. Between 1995 and 2000, net outmigration in the Northeast reached 25.5 for each 1,000 residents in 1995. In the Midwest, the net outmigration rate during the same period was much lower, at 9.1. Although the second-highest level of in-migration was in the West, at 2.7 million people, this figure was balanced by an almost equivalent number of out-migrants, creating a net in-migration rate for the West of just 0.2 (U.S. Census Bureau 2003).

Exhibit 7.7 presents data on the flow of migrants (both internal and international) in and out regions within the U.S., along with the net figure resulting from both in-migration and out-migration. There was substantial movement of persons during this period, resulting in a net inflow for the South region and a net outflow for the Northeast. However, the net flows only tell part of the story. While the West had a net loss of 31,000 persons to the South, 380,000 persons moved from the South to the Northeast. Though the net flows have important implications for healthcare, gross migration is a better measure of population turnover than net migration. The net gain or loss of 25,000 persons for a region over a 5-year period may seem like a small number, but if those who left the area were demographically very different from those who entered it, the impact could be substantial.

The other major trend since World War II has been the shift in residence based on type of community. At the time of the first census in 1790, 95% of the population lived in what today are classified as "rural" areas. With the advent of industrializa-

Exhibit 7.7 Regional Migration Patterns United States 2010–2011[a]

	Northeast	Midwest	South	West
In-migration	247	537	1,056	616
Out-migration	524	493	831	608
Net migration	–277	43	225	9
Movers from abroad	189	172	379	319
Net migration (including abroad)	–88	215	604	328

Source: U.S. Census Bureau (2011)

[a]Figures stated in thousands

tion in the U.S., a mass movement from rural areas to urban areas occurred, to the point that today only 5% of U.S. citizens live in rural communities. The rural-to-urban migration trend peaked in the 1970s and a new flow emerged – from urban areas to suburban areas. Since that period the major flow has been out of the nation's central cities and into surrounding suburbs. Today, more Americans live in communities classified as suburbs than in any other type of community.

Additional insight into internal migration can be gained by examining the respective characteristics of movers and nonmovers. Movers are considerably younger than nonmovers, recording a median age 9 years less. The youth of movers is reflected in the concentration of persons under 35 and age 65 and over. Therefore, areas receiving migrants gain a younger population, in general, while areas losing migrants "age" more rapidly because of the loss of younger persons. Continued gain or loss can have a significant impact on both the size and age structure of populations sending and receiving migrants. One notable exception to the youth selectivity of migration is the migration in the movement of older persons to certain retirement areas of the United States. Even so, the overall proportion of persons above the age of 55 who move is low. Sustained population gain or loss can have a significant impact on both the size and age structure of the populations sending and receiving migrants.

Overall, domestic movers are slightly more likely to be male and considerably more likely to be never married and better educated. The incomes of movers, however, tend to be somewhat lower on the average and the poverty rate somewhat higher.

7.4 Sources of Migration Data

Data on migration within the United States are derived from censuses, surveys, and administrative records. On Census Bureau forms respondents are typically asked if they lived in the same house 1 year ago or 5 years ago. On the National

Health Interview Survey conducted by the National Center for Health Statistics, respondents are asked how long they have lived at their current location and how many times they have moved in the last 3 years. The other source of migration data, administrative registries such as Social Security and the Internal Revenue Service, use a two-points-in-time comparison of addresses to generate data on the volume and nature of residential moves. The IRS data come closest to complete coverage of the population but none of these data sources captures the complexity of contemporary migration patterns.

7.5 Implications of Migration for Health and Healthcare

Migration in its various forms has a number of implications for health status, health behavior and health services utilization for both the sending and receiving communities. The volume and type of health services consumed depend primarily on the size and composition of the population. As the population increases or decreases, the demand for health services will follow. Many destination communities have difficulty meeting healthcare demand because the local infrastructure and the medical personnel pool cannot be expanded rapidly enough. On the other hand, areas losing population cannot easily scale back the infrastructure in order to adjust services to the needs of the residual population.

Each type of migration can have important implications for healthcare providers. Rural-to-urban, city-to-suburb, and region-to-region flows are seen as major contributors to the changing healthcare needs in areas that are either net exporters or net importers of people. For example, a migration stream from the Midwest to central Florida may result in both a large increase in population and a change in demographic characteristics. This may affect preferences for health services and the ability to pay for care. At the same time, the size and composition of the population at the point of origin is affected.

As population composition changes, not only will overall demand be affected, but the type of services needed will change. Changes in age distribution are perhaps the best predictor of changes in utilization, since both volume and type of services are linked directly to age composition. Changes in the educational level or income level are also likely to have a substantial impact on health services. Education plays an important role in the use of a number of services, and income and the ability to pay for health services are important factors in healthcare utilization. Occupational characteristics may determine the type of insurance available, and even religious affiliation may influence preferences for the type of care obtained or the hospital chosen.

These same factors play a part in the demand for physician services. A retirement community undergoing a major influx of elderly migrants may face heavy demand for cardiologists, oncologists, urologists, gynecologists, and ophthalmologists. A suburban community undergoing rapid growth will find an increasing need for obstetricians, pediatricians, dermatologists, allergists, and ear, nose, and throat specialists.

Since there are wide variations in healthcare environments and practice patterns across the United States, migrants from one region to another are likely to be characterized by differing patterns of health behavior. A migrant from the West Coast to the rural South would probably be surprised at the lack of emphasis on preventive care and health education, the absence of health maintenance organizations, and the limited role of alternative therapies. Conversely, migrants from rural areas to urban communities are likely to be overwhelmed by the complexity of the healthcare system and the seeming obsession with health displayed in the receiving community. International migrants are likely to originate in societies with quite different orientations toward healthcare. Those entering the United States as refugees may have developed attitudes of distrust toward government agencies and be apprehensive with regard to public health programs.

Examples of changes in morbidity and mortality due to migration flows are almost endless. A community experiencing a wholesale exodus of its working-age residents and their children will find itself left with the health problems of an older population that may be less educated, poorer, and less likely to practice good health habits. The mortality rate will increase as those less at risk of death leave the community. Problems of infectious and parasitic conditions, digestive disorders, and accidents associated with the young, however, are likely to decrease. Along these same lines, an urban fringe area undergoing rapid suburbanization through the influx of young families may find itself with an "excess" of acute conditions such as pediatric problems, obstetrical problems, neurotic conditions, and even acne. The mortality rate is likely to decline due to the influx of relatively low-risk in-migrants. The communities of origin will find their remaining residents proportionately more likely to die from heart disease, cancer and stroke.

Two other considerations are important with regard to health status, and both relate to the characteristics of the migrants themselves. Research has indicated that migrants are often characterized by higher levels of both physical and mental disorders than non-migrants. This is not to suggest that less healthy individuals choose to migrate – the opposite is probably true, in fact – but that migration itself takes a toll on health. The most clear-cut evidence relates to mental illness symptoms, in that the migration process is stressful to the point of inducing psychiatric symptoms. It has been found that even very affluent executives and their families often suffer traumatic effects due to mobility even when it means substantial career advancement. Dislocation, with its loss of family, friends and schoolmates, involves a substantial risk.

The other health status factor related to the migrants themselves has to do with the particular disorders that migrants carry with them. This has not been an issue with regard to migration within the United States since the end of the great rural-to-urban migrations in the middle of the twentieth century. Now, however, the influx of international migrants has led to a concern over the health consequences of these population movements. These "new" immigrants include Southeast Asians, Latin Americans, and Africans, among others. In some cases the concern is over the introduction of diseases indigenous to their homelands and not found in the United States (e.g., rare tropical diseases). Of greater consequence, however, has been the reintroduction of certain health problems long ago eradicated in this country.

One migration stream that has particular implications for healthcare involves the international flow of physicians. The U.S. is a net importer of doctors and other health personnel. This reflects both push and pull factors, as physicians trained in other countries may perceive they have limited opportunities or resources in their home country and are pushed out or the shortage of health personnel in the U.S. pulls health professionals from overseas to this country. Exhibit 7.8 discusses the role of foreign doctors in the U.S.

Exhibit 7.8 Foreign Doctors in U.S. Health Care

The past three decades have witnessed a steady increase in the participation of foreign-trained doctors in the U.S. healthcare system. Referred to as foreign (or international) medical graduates (FMGs or IMGs), these doctors account for 27% of the physicians practicing medicine in the United States today. The average American knows little about this aspect of medical care. However, if one requires the services of an anesthesiologist, a psychiatrist, or certain other specialists, there is a good chance that the care will be provided by someone who went to medical school in a foreign country.

In medical circles the continued influx of FMGs and the implications of their presence in American healthcare remain somewhat controversial issues. Organized medicine has always voiced concern over the quality of training that foreign physicians receive, contending that it does not meet American medical school standards. In the 1980s, with physicians facing increased competition for patients and revenue, the threat of additional competition from foreign-trained doctors led to attempts to limit immigration, introduce more difficult qualifying examinations, and preclude foreigners from specialty training and licensure.

Since World War II, FMGs have become an increasingly significant component of the U.S. physician pool. At present, more than 228,000 FMGs are in practice in this country and nearly 30% of physicians enrolled in residency training programs at various hospitals and other health care facilities received their medical degrees in another country. An undetermined number of FMGs (possibly in the tens of thousands) are in this country attempting to obtain residency positions or licenses to practice. Most of these are "alien FMGs," who are typically citizens of foreign countries who have received their basic training (i.e., the M.D. degree) in their homelands and subsequently immigrated to the United States for specialty training and, for most, the establishment of practices. Some are "U.S. FMGs," American citizens who have received medical school training overseas and subsequently returned to the this country for residency training. Some of these have been educated at long-established medical schools in Europe; most, however, have attended newly created medical schools in the Caribbean or Mexico. The numbers of U.S. FMGs, however, remain small compared to alien FMGs.

(continued)

Exhibit 7.8 (continued)

The medical education process should be briefly described in order to place this discussion in context. In the United States and in most other countries, individuals enter medical school with an undergraduate degree. The medical school curriculum includes approximately 2 years of basic science training, followed by 2 years of clerkship. These third and fourth years are spent essentially as apprentices, with students rotating through various clinical departments in addition to attending classes. At the end of this program, ranging from three and one-half to 5 years, medical students are awarded an M.D. degree. In the United States, at least 2 years of postgraduate or residency training are required for licensure. While in residency training, physicians provide much of the charity care that is offered and staff hospital emergency rooms. In effect, in today's medicine the actual training in patient care takes place during the residency program.

Although there was some influx of FMGs into the United States throughout the early twentieth century, the size of the current pool is primarily the result of national policies formulated during the 1960s. At that time, it was widely held that a severe physician shortage existed. Measures were taken to facilitate the immigration of FMGs to fill the gap until an adequate supply of American-trained physicians could be established. These policies resulted in an influx of large numbers of FMGs, with several thousand entering practice annually from the early 1970s to the present. By the mid-1970s, however, concerns over a shortage were replaced by fears of a physician surplus. The number of domestically trained physicians had increased dramatically, and large numbers of alien physicians had been added to the manpower pool. In response to these developments, immigration policies were made more restrictive, and more difficult qualifying examinations were introduced for FMGs. Both formal and informal measures were introduced to discourage entry of FMGs into training and practice, and legislation was proposed to limit the entry of U.S. FMGs into the market.

During the 1970s and 1980s, the circumstances under which immigration occurred changed significantly. Previously, immigrant physicians entered under temporary visas, and most returned to their homelands. As early as the 1970s, however, the majority of FMGs were seeking permanent immigration status with the intention of practicing medicine in this country. The earlier immigrants typically entered by means of a formal exchange program, while the later ones were more likely to obtain entry though a nonmedical status, such as tourist, student, family reunification, or even refugee. Even those who entered on a temporary exchange basis often subsequently petitioned for a change of status once here.

(continued)

Exhibit 7.8 (continued)

The changing basis for admission was accompanied by a change in the national origin of the FMGs. This, perhaps, contributed to the controversy as much as issues of quality and competition. In the years immediately following World War II, the typical physician-immigrant was from Europe. However, by the late 1960s, the influx was dominated by Asian immigrants, particularly those from India and the Philippines. While both of these groups continue to be important, they have been joined by large numbers of physicians from Southeast Asia and Iran. By the 1980s, increasing numbers of immigrants were arriving from Latin America. Many of these newer immigrants entered as refugees, often without complete documentation of their medical background. During the late 1970s, this flow was augmented by thousands of U.S. FMGs.

There are numerous sub-issues involved here that relate to testing, training requirements, licensure requirements, and even the issue of discrimination, which is currently being explored by the legal system. What is important to focus on for this brief discussion is the significance of physician-immigrants for the U.S. health care system. Opponents of FMGs argue that foreign-trained physicians are less qualified to provide care than American-trained physicians. They are increasingly arguing that they are contributing to physician oversupply and causing unnecessary competition. These opponents are primarily representatives of organized medicine – presenting the view of medical schools, specialty associations, and practicing physicians – that have a vested interest in limiting physician supply.

On the other hand, FMGs and their supporters contend that foreign-trained physicians have historically made important contributions to U.S. medical teaching, research, and practice. There is evidence that FMGs enter specialty areas that are considered undesirable by domestic medical school graduates. Further, they are found to practice in areas (such as inner cities and rural communities) in which American-trained physicians are reluctant to practice. Many residency programs contend that FMGs are essential for the provision of care to their indigent patients, particularly in inner-city hospitals that are not attractive to U.S. medical school graduates.

Regardless of the merits of the above arguments, one fact is clear. FMGs will continue to be a major factor in U.S. medical care for the foreseeable future. Each year thousands of FMGs enter practice, despite the increased restrictions. In actuality, the presence of foreign physicians in the U.S. has become so commonplace that they receive less and less notice.

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Additional Resources

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Chapter 8
Morbidity

8.1 Introduction

Morbidity, in its simplest term, refers to the level of sickness and disability characterizing a population. Demographers traditionally have focused on the impact of mortality (the end result of morbidity) on populations, and only in recent years has the emphasis shifted more in the direction of morbidity as morbidity has come to play a greater role in shaping demographic characteristics.

In many ways, the study of morbidity is at the core of health demography. The demographic characteristics of a population yield a morbidity profile that can be translated into healthcare needs and supply. Ultimately, to understand the health status of a population, one must analyze the clinically identifiable conditions affecting that population, as well as the conditions that society members themselves identify. The current concern over disparities in health status – disparities most often described in demographic terms – has attracted increased attention to what demography can bring to this discussion.

The interest in morbidity on the part of demographers, epidemiologists, health planners and medical scientists steadily increased over the last 40 years. The significance of morbidity to the U.S. and other developed countries has grown for a number of reasons. These include in addition to the declining significance of mortality, the expansion of public health activity and the shift from an emphasis on acute conditions to chronic conditions, among other developments. These developments are discussed at various junctures later in the chapter. The body of research on this topic has expanded dramatically. The literature available on morbidity has grown and findings from research in this field are driving much of the current thought in healthcare.

L.G. Pol and R.K. Thomas, *The Demography of Health and Healthcare*,
The Springer Series on Demographic Methods and Population Analysis 13,
DOI 10.1007/978-90-481-8903-8_8,

8.2 The Interaction of Demography and Morbidity

The morbidity characteristics of a population interact directly and indirectly with other demographic variables in numerous ways. The morbidity of a population is typically defined in terms of the distribution of illness among various demographic groups. This distribution of morbid conditions dynamically affects other demographic processes, the mortality characteristics of the population and its future demographic composition. Sickness (and subsequent death rates) have a significant impact on population size and composition. For example, reduced infant and childhood mortality has been a major determinant of increased life expectancy.

At the same time, other demographic processes and compositional variables affect morbidity. Increased life expectancy, coupled with an older age structure, means that not only is there a large proportion of the population at the older ages (with unique health care needs), but many of these persons are relatively healthy – so much so, in fact, that they are likened to populations 15 or 20 years younger in earlier generations. However, the relationship between increased life expectancy and healthy life is not so clear. For example, Cai and Lubitz (2007) found increases in nondisabled and active life and decreases in length of life with a disability between 1992 and 2003 using the data for the Medicare Beneficiary Survey. Researchers label this as compression of disability. At the same time, Crimmins et al. (2009) using data from the Longitudinal Studies of Aging I and II found that between 1984 and 2000 disability-free life expectancy increased only by the same amount as overall life expectancy. When mortality declines because people survive longer with a disease, there will be an expansion of what can be labeled disease mortality. If older persons are prevented in some way of contracting a disease in the first place, then a true increase in healthy life expectancy occurs (Crimmins and Beltrán-Sánchez 2010). Given an increase in preventive measures such as immunization for influenza, they are likely to maintain their good health for an even longer period of time. (Exhibit 8.1 describes the role of the epidemiologic transition on morbidity characteristics).

Ultimately, the morbidity status of a population will manifest itself in the compositional variables related to that population. For example, a population with a high proportion of acute conditions is likely to exhibit a higher death rate and shorter life expectancy than a population with a high proportion of chronic conditions. That is, the former is likely to have less persistent illness but higher death rates, while the latter is likely to have more widespread illness but lower death rates and longer life expectancy. The fact that acute and chronic conditions affect populations differently means that people with certain demographic characteristics will be disproportionately effected thereby affecting population composition. A case in point would involve young male African Americans who suffer disproportionately from a variety of health conditions. As a result, this cohort is underrepresented within the U.S. population.

Exhibit 8.1 The Epidemiological Transition

During the twentieth century, the United States and most other developed countries experienced an "epidemiologic transition". The epidemiologic transition involved a shift from a predominance of acute conditions to a predominance of chronic conditions within their populations. This phenomenon was primarily a consequence of the demographic transition affecting these countries earlier in the century and advances in society's ability to manage health problems. In the former case, the aging of the population resulted in a dramatic change in the types of health conditions affecting its members. In the latter, the introduction of public health measures and, to a lesser degree, advances in clinical medicine eliminated certain health conditions and inadvertently brought other conditions to the fore.

While acute conditions result from pathogens in the environment or accidents, chronic diseases are characterized by a much more complex etiology. While acute conditions appeared to affect a cross-section of the population sometimes seemingly at random, chronic diseases appeared to be much more selective in their impact. In the twentieth century, emergent chronic diseases reflected the combined affect of heredity, environment, lifestyles and even access to healthcare. From a demographic perspective, this meant that, for the first time, demographically related disparities in health status might become common within a population.

Prior to the epidemiologic transition, the most common health conditions were respiratory conditions, gastrointestinal conditions, infectious and parasitic conditions, and injuries. Even today, in traditional societies and populations with a younger age structure cholera, yellow fever, skin diseases, nutritional deficiencies and similar acute conditions remain common. Post-epidemiologic transition populations in developed countries and those with older populations are more likely to be affected by heart disease, cancer, diabetes, arthritis, chronic respiratory diseases and similar chronic conditions. As a practical matter, most members of traditional societies did not live long enough to contract chronic conditions and, when they did contract them, chronic conditions could not be managed and early death ensued.

It was not until the epidemiologic transition was well underway that the focus in medical science began to shift from acute conditions to chronic conditions. This shift has been a difficult transition for the healthcare system due to the complexity of chronic disease etiology, its unpredictable progression, and its management challenges. More attention began to be paid to disease etiology (and, subsequently, disease prevention), disease progression and management and, importantly, the demographic disparities associated with chronic disease. For demographers and others concerned about the population's morbidity profile, the shift from a predominance of acute conditions to a predominance of chronic conditions has been momentous.

8.3 Relevant Concepts

The term "morbidity" is used in a number of ways, but to demographers it refers to the level of sickness and disability characterizing a population. Demographers are, of course, almost exclusively interested in morbidity as associated with populations and seldom with morbidity of individuals. The term has its root in "morbid" from the Latin "morbus" for disease and "morbidus" for diseased. These terms may be used, however, in various ways inside and outside of the scientific community. Thus, one hears reference to a "morbid curiosity" or the "morbid details", and other terms that may not reflect the scientific meaning of the word. Morbidity may be used to refer to a person or a group, with the former referring to the health status of an individual and the latter to the health status of a population.

While most scholars would concur with the definition above, it does raise the question of what constitutes being ill or diseased. Does this mean that a condition has been "officially" diagnosed by a medical practitioner? Does the condition have to alter health status or affect one's quality of life before it is counted? Is a physical disability really a disability if it doesn't interfere with one's activities? Ultimately, the application of the definition depends on the assumptions made by those evaluating the health of the population. These issues will be addressed in the sections that follow.

These questions highlight the fact that morbidity is essentially a social construct and may be viewed in different ways in different societies or even by different groups (including demographic subgroups) within a society. Different cultures have different perceptions of what constitutes ill health, what physical states are symptomatic of morbidity, and what the significance of a particular morbid condition is.

There are a number of terms used to describe ill health. Not only are different terms employed, but the same term may be used in different ways under different circumstances. "Illness" and "sickness", for example, are terms used by demographers and the general public to describe ill health. Although often used interchangeably, social scientists make a distinction between the two related concepts as will be seen below.

Illness refers to the individual, private, and usually biological aspect of the state of ill health. This perspective emphasizes the existence of clearly identifiable clinical symptoms, reflecting underlying biological pathology. Illness relates to the set of symptoms known primarily to the affected individual, and in this sense is private as opposed to public. It is argued that illness (but not sickness) is a state shared by human beings with all other animals; that is, it is a state of biological dysfunction affecting the individual organism. Under this definition, it could be contended that the actual level of illness is similar from society to society, reflecting the primarily biological nature of illness. The term is also used to describe the condition that causes the ill health (e.g., yellow fever is an illness that creates ill health in the individual).

Sickness refers to the public or social component of ill health. Illness is transformed into sickness when the condition becomes publicly known through announcement by the affected party, observation by significant others, or professional diagnosis. Thus, while illness is primarily a biological state, sickness is a social state. Sickness is social not only because it is recognized beyond the bounds of the individual per se, but also because it has implications for social role performance and interpersonal interaction.

Some simple examples may help clarify the distinction between illness and sickness. An individual who feels bad (e.g., headache and nausea) is clearly ill. However, if the individual never discloses his or her symptoms to others (or they go unobserved by others) and continues to perform social roles adequately, he or she would not be considered sick. Conversely, if an individual is unable to perform social roles due to some generalized condition, although clinically identifiable symptoms cannot be found, this individual would be considered sick. Because of the constraints of biology, variation in the level of illness is limited; since sickness is a social construct, the amount of sickness is highly elastic.

Unlike illness, the level of sickness varies widely from society to society and within the same society at different points in time. The amount of sickness reflects the perceptions of society at that point in time, and a list of common sicknesses would vary from society to society. This means that the level of sickness is much more "elastic" than the level of illness. Examples of the elasticity of sickness can be found in wartime when military physicians at induction centers adopt a quite different standard of what constitutes disability than in peacetime.

One final model that should be noted primarily applies to contagious diseases and mental illness. This is the legal model, and it is applied in situations where the legal "health" or competence of the individual is in question. A legal rather than scientific definition comes into play in cases where competence must be determined for involuntary hospital admission, guardianship, or custody decisions, and in cases where the individual's ability to manage his or her affairs is in question. Although a physician is generally required to certify the individual's competence, it is ultimately the courts that decide based on criteria established by the legal system. The situations in which the legal definition might be applied to physical illnesses would be in the case of certain "reportable" diseases and conditions requiring quarantine.

Another term used to describe morbidity is *disability*. In many ways, disability is even more difficult to operationalize than other morbidity concepts. While it would appear simple enough to enumerate the blind, deaf, or otherwise impaired, the situation is actually quite complex. A wide variety of other conditions that are not so clear-cut cloud the picture. Does lower back pain that interferes with work constitute a disability? When does an arthritic condition become disabling? How is mental retardation classified, and at what point? Even those disabilities that appear obvious defy easy categorization due to the subjective dimension of disability. There are many hearing impaired individuals and amputees, for example, that would take exception to being classified as disabled. The contemporary approach to identifying the level of disability within a population involves the application of objective measures (discussed in a later section).

Health conditions are typically classified as either acute or chronic. An acute condition is a health condition characterized by rapid onset, usually short duration, and a clear-cut disposition (e.g., cure, death), typical of developing countries and younger populations. A more technical definition is utilized by the National Center for Health Statistics and reads: An acute condition is a type of illness or injury that ordinarily lasts less than 3 months, was first noticed less than 3 months before the data of data collection, and was serious enough to have had an impact on behavior (National Center for Health Statistics 1985). Pregnancy is considered to be an acute condition despite lasting longer than 3 months. Common acute conditions include respiratory problems, communicable diseases, parasitic diseases, gastrointestinal problems and accidents.

Acute conditions are the dominant type of health problem in traditional societies (e.g., hunting-and-gathering, agricultural societies) and developing countries where virtually everyone is at the same risk of acute conditions. Limited public health facilities, impoverishment and a young age structure all contribute to a predominance of acute conditions. Further, the short average life expectancy in such societies mitigates against the appearance of many chronic conditions – that is, people do not live long enough to develop conditions that reflect years of cumulative wear or old age.

A chronic condition is a health condition characterized by slow onset, lengthy progression, and a usually indefinite disposition, typical of modern, industrial societies, and older populations. The National Center for Health Statistics considers a health condition to be chronic if it lasts more than 3 months. Common chronic conditions include arthritis, cardiovascular disease such as heart attacks and stroke, cancer such as breast and colon cancer, diabetes, epilepsy and seizures, obesity, and oral health problems.

Conditions that are not cured once acquired (such as heart disease, diabetes, and birth defects are considered chronic. Additionally, other conditions must have been present 3 months or longer to be considered chronic. An exception is made for children less than 1 year of age who have had a condition “since birth,” as these conditions are always considered chronic.

Chronic conditions are common in more industrialized societies and in those with an older age structure. The acute conditions common to younger populations are supplanted by chronic conditions that reflect lifestyles, health behaviors and the accumulative effect of a life of stress and wear and tear. In populations were chronic conditions predominate a significant portion of the population is likely to be affected since, unlike acute conditions, chronic conditions do not go away. See Exhibit 8.2 for a comparison of acute and chronic conditions.

Exhibit 8.2 Characteristics of Acute and Chronic Conditions

	Acute condition	Chronic condition
Etiology	Simple/biological	Complex/multiple
Rate of onset	Rapid	Slow/insidious
Distinctiveness of onset	Clear-cut	Difficult to diagnose
Duration of illness	Short-lived	Perpetual
Treatment	Counter pathogens	Manage symptoms
Course of disease	Recovery or death	Slow progression
Goal of care	Cure	Management
Duration of care	Short-term	Lifelong
Contribution to mortality	Direct	Indirect

Source: Thomas (2005)

8.4 Morbidity Classification

For a condition to be classified as morbid and thus end up in morbidity statistics, it has to meet some established standard. Thus, unless one's A1C score based on the blood test for diabetes, for example, reaches a certain level there is no diagnosis of diabetes. Note that, although demographers are concerned with the status of populations, the recording and classification of morbidity is assigned to individuals and these cases are summed to create the population's morbidity profile. Thus, we can speak of individual (clinical) morbidity and epidemiologic (group) morbidity.

Morbidity may be used to refer to a person or a group, with the former referring to the health status of an individual and the latter to the health status of a population. Demographers are, as noted earlier, almost exclusively interested in morbidity as associated with populations and seldom with morbidity of individuals. The exception to this might be the situation in which the identified health status of individuals must be summed to generate the morbidity status of the population in question. This does raise the question as to whether population morbidity is the sum of individual morbidity or something qualitatively different.

In order to understand a population's morbidity profile, one must be familiar with the classification systems that are utilized in clinicians. The most widely recognized and utilized disease classification system is the *International Classification of Diseases*. The ICD system, whose major disease categories are shown in Exhibit 8.3, is the official classificatory scheme developed by the World Health Organization within the United Nations. The version currently utilized in the United States is the ICD-9-CM version, with CM standing for "clinical modification (American Medical Association 2011). The U.S. version reflects modifications necessary in keeping with current medical practice in American hospitals. (An update version of the ICD system – version 10 – has been developed and is slowly being introduced).

The ICD system is designed for the classification of morbidity and mortality information and for the indexing of diseases and procedures that occur within the hospital setting. A different system is used for conditions seen in physicians' offices. The present classification system includes two components: diagnoses and procedures. Two different sets of codes are assigned to the respective components; the codes are detailed enough that very fine distinctions can be made among various diagnoses and procedures. For our purposes, diagnoses will be the primary focus since they are the manifestation of morbidity within a population (and not the treatment of those diagnoses).

The disease classification component utilizes 17 disease and injury categories, along with two "supplementary" classifications. Within each of these major categories, specific conditions are listed in detail. A three-digit number is assigned to the various major subdivisions within each of the 17 categories. These three-digit numbers are extended another digit to indicate the subcategory within the larger category (in order to add clinical detail or isolate terms for clinical accuracy). A fifth digit is sometimes added to specify further any factors associated with that particular diagnosis. For example, Hodgkin's disease, a form of malignant neoplasm or cancer, is coded as 201. A particular type of Hodgkin's disease, Hodgkin's sarcoma, is coded 201.2.

Exhibit 8.3 Major Categories of Diseases and Injuries International Classification of Diseases Version 9

1. Infectious and parasitic diseases
2. Neoplasms
3. Endocrine, nutritional, and metabolic diseases and immunity disorders
4. Diseases of the blood and blood-forming organs
5. Mental diseases
6. Diseases of the nervous system and sense organs
7. Diseases of the circulatory system
8. Diseases of the respiratory system
9. Diseases of the digestive system
10. Diseases of the genitourinary system
11. Complications of pregnancy, childbirth, and the puerperium
12. Diseases of the skin and subcutaneous tissue
13. Diseases of the musculoskeletal system and connective tissues
14. Congenital anomalies
15. Certain conditions originating in the perinatal period
16. Symptoms, signs and ill-defined conditions
17. Injury and poisoning

V. Classification of factors influencing health status and contact with health service
E. Classification of external causes of injury and poisoning

Exhibit 8.4 Sample of Disease Classification Using ICD-9-CM

Condition	Coding
Ischemic heart disease	410–414
Other forms (i.e., not coded elsewhere)	414
Coronary atherosclerosis	414.0
Aneurysm of heart	414.1
Aneurysm of heart wall	414.10
Aneurysm of coronary vessels	414.11
Other aneurysm	414.12
Other specified forms of chronic ischemic heart disease	414.8
Chronic ischemic heart disease, not elsewhere specified	414.9

If the Hodgkin's sarcoma affects the lymph nodes of the neck, it is coded 201.21. (See Exhibit 8.3).

Introduced by the federal government during the 1980s, *diagnostic related groups* (DRGs) represented an attempt to standardize the classification of hospital patients. DRGs represent a mixture of diagnoses and procedures. The primary diagnosis is modified by such factors as other coexisting diagnoses, presence of complications, patient's age, and usual length of hospital stay in order to create the 579 diagnostic categories currently in use. DRGs can be grouped into 25 major diagnostic categories (MDCs) in order to simplify the system. These MDCs are based primarily on the different body systems.

The classification of morbidity related to mental problems is conceptualized somewhat differently from physical illness, and this is reflected in the classification system for mental disorders. Mental illness involves disorders of mood, behavior, or thought processes (American Psychiatric Association 2000). This sets this category of health problems apart from physical disorders; differences in etiology, symptomatology, progression, diagnostic procedures, and treatment modalities are clearly distinguished. The fact that mental disorders are generally not amenable to clinical diagnostic procedures has important implications for the classification system that has evolved.

The definitive reference on the classification of mental disorder is the *Diagnostic and Statistical Manual: III*, commonly referred to as DSM-III. Its 17 major categories of mental illness and over 300 identified mental conditions are exhaustive (American Psychiatric Association 2000). The DSM classification system is derived in part from the ICD system discussed earlier. It is essentially structured in the same manner, with a five-digit code being utilized. The fourth digit indicates the variety of the particular disorder under discussion, and the fifth digit refers to any special considerations related to the case. The nature of the fifth-digit modifier varies depending on the disorder under consideration. (Exhibit 8.5 provides the major classifications within the DSM-IV system).

Exhibit 8.5 Diagnostic Categories Utilized in the Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition)

Disorders usually first evident in infancy, childhood, or adolescence
Organic mental disorders
Substance use disorders
Schizophrenic disorders
Paranoid disorders
Psychotic disorders not elsewhere classified
Affective disorders
Anxiety disorders
Somatoform disorders
Dissociative disorders
Psychosexual disorders
Factitious disorders
Disorders of impulse control not elsewhere classified
Adjustment disorder
Psychological factors affecting physical condition
Personality disorders
Miscellaneous codes related to treatment

Exhibit 8.6 The Discovery of a New Disease: The Case of Menopause

A variety of factors may contribute to the discovery of a "new" disease. This may involve the identification of a here-to-fore unknown condition (e.g., Legionnaire's disease), the discovery of a syndrome involving a set of symptoms not previously connected before (e.g., AIDS), or the redefinition of an existing condition as a health problem (e.g., alcoholism).

The last case is relevant to menopause, a condition that was added to the *International Classification of Diseases* in the 1980s. Although menopause is considered to be a normal biological process, it became increasingly "medicalized" during the last half of the twentieth century. During this period, the condition was transformed from symptoms that were essentially "all in the head" of affected women to a clinical condition involving estrogen deficiency or ovarian dysfunction although there are remarkable differences in the biophysical, social and emotional dimensions of the condition from culture to culture. The condition was reduced to a set of biochemical processes presumed to characterize all female bodies, regardless of social or cultural context.

The notion of menopause as a pathological condition originated with a specific body of research but, once the condition was isolated, the "disease" took on a life of its own, unaffected by subsequent research. Early research, for example, was based on women who had experienced surgically induced menopause or who suffered from extreme conditions that involved unusual physical side effects. The findings drawn from an abnormal population were extrapolated to the general population, and the notion of menopause as a disease became firmly entrenched.

Recent research utilizing more normal populations has found no evidence of pathology or medical problems. Not only do most women not experience abnormal symptoms but, among those few who do, there are typically other health conditions accompanying the onset of menopause. Thus, it could be argued that other health conditions contribute to problem menopause and not the other way around.

To a great extent, the identification of menopause as a pathological condition was a result of a "campaign" by a handful of endocrinologists who were proponents of menopause as a hormonal disorder during the 1930s and 1940s. Other physicians were willing to accept this notion because it fit well with their medical model concept of disease. As is often the case, the identification of menopause as a disease was facilitated by the availability of inexpensive synthetic estrogen. Not only could a pathological state be identified, but a medical treatment had become available for its management. Thus, despite the fact that 15% or less of American women experienced a problem menopause, in 1975 it was found that 51% of women had taken estrogen replacement drugs at some point.

Despite the risks now known to be associated with estrogen replacement therapy, the medical community continues to debate the existence of menopause

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Exhibit 8.6 (continued)

as a disease. The fact that there are proponents on both sides of the issues reminds us that the formal identification of a disease is often a function of the perspectives of both the health professionals involved and the general public. It could be argued, in fact, that ultimately there are very few diseases in an absolute sense, with the identification of disease being as much a social phenomenon as a clinical one.

Source: Thomas (2005)

8.5 Morbidity Measures

A primary task of a health demographer, epidemiologist or public health official is to determine the morbidity status of the population in question. They each are interested in the type and number of health conditions affecting the population and how these conditions are distributed throughout the population. For all practical purposes the latter is more relevant to health demographers, particularly the extent to which morbidity is distributed in relation to demographic groups within that population (Exhibit 8.6).

Morbidity levels can be measured both subjectively and objectively. Given the subjective nature of many health conditions, a qualitative assessment of the health status of an individual or population may be made (including asking the individual to assess their own status through self-reports). A more objective assessment may involve the use of a more quantitative assessment tool (e.g., a health risk assessment) or an actual clinical examination.

Several measures have been developed for use in morbidity analysis. Various community surveys have utilized global indicators as a means of measuring health status based on self-reports. The major government study to take this approach is the National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics. Respondents are asked to rate their health as “excellent”, “very good”, “good”, “poor” or “fair” (National Center for Health Statistics 2010. The responses from the 2009 survey are presented in Exhibit 8.7.

A number of more objective measures have been developed for determining the morbidity of a given population. Some of the indicators that are used include rates for specific conditions, symptom checklists, and various measures of disability. Two of the most useful measures are incidence and prevalence rates. An *incidence rate* refers to the number of new cases of a disease or condition over a certain time period expressed as a number per 1,000, 10,000, or 100,000 population at risk. It is often expressed as a rate (for example, the incidence of measles per 1,000 children 5–15 years of age during a specified year). Incidence is a measure of morbidity or other events that occur within a specified period of time.

Exhibit 8.7 Self-Assessment of Health Status 2009

Characteristic	Percent in poor or fair health
All (age-adjusted)	9.4
Age distribution	
Under 18	1.8
18–24	3.6
25–44	7.2
45–54	13.1
55–64	19.1
65–74	19.9
75 and over	28.9
Sex	
Male	9.1
Female	9.7
Race/ethnicity	
White	8.7
Black/African American	14.2
American Indian	16.3
Asian American	8.4
Hispanic	13.3
Poverty status	
Poor	21.8
Near poor	16.3
Nonpoor	5.6
Geographic region	
Northeast	8.4
Midwest	8.6
South	10.9
West	8.8

Source: National Center for Health Statistics (2010)

Prevalence refers to the number of cases of a disease, infected persons, or persons with some other attribute present during a particular interval of time. It is often expressed as a rate (for example, the prevalence of diabetes per 1,000 persons during a year). A *prevalence rate* divides the total number of persons with the disease or condition in question by the population at risk with respect to a specific point in time. “At risk” is a term that refers to the population that is eligible or can experience that condition. For example, in general births occur to women age 15–49, so the population of females age 15–49 is considered at risk of having a birth.

The prevalence rate includes, for example, the total number of persons with AIDS divided by the population at risk. In this instance the population at risk is the total population, since this is a prevalence rate and the entire population is theoretically at risk. In 2006, the HIV/AIDS prevalence rate was 447 cases per 100,000 population (Centers for Disease Control and Prevention 2008), while the HIV/AIDS incidence rate in that year was 12 cases per 100,000 population (National

Center for Health Statistics 2010). The prevalence rate always exceeds the incidence rate, since the former includes all cases (i.e., existing cases and newly diagnosed cases). The only time the two rates are nearly comparable is when the condition is acute and of very short duration. For example, the incidence rate would almost equal the prevalence rate at the height of a 24-h virus epidemic since victims recover almost as quickly as they are affected.

Incidence and prevalence rates are both used in the study of the distribution of disease. If the analyst knows, for example, that the incidence rate for a certain medical procedure is 17 per 1,000 population aged 65 years and over and has reason to believe that the incidence rate for that procedure will remain nearly constant for the next 5 years (data must support this assumption), then the demand for that procedure 5 years in the future can be determined by multiplying the incidence rate by the projected population of persons age 65 and above. The prevalence rate can be used in much the same way when the condition is a chronic one.

The incidence rate is also a valuable measure in epidemiological investigations. If a new or mysterious condition afflicts a population, epidemiologists can trace the spread of the condition through the population by backtracking using incidence data. The cause or population of origin of a new disease can often only be determined by identifying the characteristics of the victims and the conditions under which the disease was contracted. The exact date of occurrence becomes crucial if the epidemiological detective is to link the onset to a particular set of circumstances. Quite often the key is the sociocultural characteristics of the victims. AIDS is a case in point wherein the means of transmission is identified based on the non-biological characteristics of the victims.

A more useful set of figures can be generated by creating a set of projections based upon different assumptions (likely scenarios), given that incidence and prevalence rates may change over time and that population projections may vary. For example, it is common in health planning to project the characteristics of a defined population (e.g., county, ZIP Code) into the future (e.g., 5 years, 10 years out) and apply known incidence or prevalence rates to that population. Thus, if the planner knows that the population will be older at the future date, the process will yield a higher level of the chronic conditions that characterize an aging population. Conversely, if the population is expected to be younger (e.g., more young families moving into the community), a higher incidence of the acute conditions associated with childhood can be anticipated.

An additional rate utilized by demographers and useful to health planners is the case rate. A *case rate* is merely an expression of the reported incidence of a disease per 1,000, 10,000, or 100,000 persons and is not as finely tuned as a rate that is adjusted for the population at risk. It is possible to refine the above rates to include more narrowly defined populations at risk. For example, one might want to compare the case rate for HIV/AIDS among different categories of Hispanics (i.e., Mexicans, Puerto Ricans, Cubans).

The morbidity profiles of the individuals within a population can be combined to create a cumulative profile for the population. This allows for the development of an overall morbidity rate for that population. The process is complicated somewhat by the existence of co-morbid conditions – that is, an individual characterized by two or more – often related – morbid conditions.

Another group of health status measures might be generally referred to as disability measures. Even more so than other aspects of morbidity, disability is difficult to operationalize. While it would appear simple to enumerate the blind, deaf, or otherwise handicapped, the situation is actually quite complex. A wide variety of other conditions that are not so clear-cut cloud the picture. Does lower back pain that interferes with work constitute a disability? When does an arthritic condition become disabling? How is mental retardation classified, and at what point? Even those disabilities that appear obvious defy easy categorization due to the subjective dimension of disability. There are many hearing impaired individuals, for example, that would take exception to being classified as disabled.

This definitional problem is partly resolved by the utilization of more objective and easily measured indicators as proxies for disability. One category of indicators focuses on "activities of daily living" (ADL). ADLs constitute a series of indicators related to the ability of individuals to care for themselves, solely or with assistance. Thus, the respondent is asked to what extent he can feed himself, dress himself, and go to the bathroom unassisted. Other indicators may address mobility, as in the ability to climb stairs, walk a certain distance without discomfort, and so forth. ADLs offer a fairly effective means of getting at the overall disability status of individuals by combining their responses into a score that indicates the individual's relative level of disability.

Another category of disability measurement might be referred to as "restriction" indicators, since they reflect the extent to which affected individuals are restricted in terms of work or school activities. Measures in this category include: work-loss days, school-loss days, bed-restricted days, and limitation of activity indicators (Exhibit 8.8). The number of days missed from work or school, the number of days individuals are restricted to bed, and the extent to which individuals cannot carry out routine daily activities can all be calculated and used as proxy measures of morbidity. While such measures are being used increasingly, it should be remembered that much of this information is available only from sample surveys. It is possible that many "cases" go undiscovered and uncounted. Nevertheless, significant variations have been identified in terms of the demographic correlates of disability as measured in this manner.

Exhibit 8.8 Accidents: Not So Accidental?

In the United States, accidents are a common occurrence and, led by motor vehicles fatalities, "unintentional injuries" are one of the ten leading causes of death. Accidental injuries are a major cause of lost workdays and schooldays and contribute significantly to the cost of healthcare in the U.S. Because accidents are not closely associated with old age – unlike heart disease and stroke, for example – they account for a disproportionate share of productive years of life lost due to premature death.

It would be natural to assume that accidents, by their very nature, are unpredictable and random in occurrence. It is reasonable to assume that

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Exhibit 8.8 (continued)

motor vehicle accidents, firearms accidents, and sports injuries would be no respecter of age, sex, race or class. While most other health conditions might be expected to display patterns of distribution that reflect the demographic and sociocultural traits of the population, one would expect accidents to be randomly distributed throughout the population.

While the distribution of accidents may be more random than most other conditions, the distribution is far from random. Accidents are more common among males than females, those in certain age groups, members of certain racial and ethnic groups, and even within certain socioeconomic categories. Children, adolescents, young adults *and* the elderly suffer more accidents than other age groups, while nonwhites experience a higher rate of accidents than whites. Lower income groups appear more susceptible to accidents than the more affluent. In fact, injuries do not even occur randomly to professional athletes, but can be linked to certain sociocultural characteristics.

One category that would appear to be a good candidate for random distribution is accidental falls. Falls are the most common cause of accident-related deaths. Some 17,000 people die from falls in the U.S. each year. The leading cause of death for children is accidents and, for this age group, that usually involves a fall. In fact, the very young and the very old are the most affected by fall-related injuries. In addition, the distribution of falls within the population is associated with social class and other demographic and sociocultural factors. Further, the occurrence of falls varies by the month of the year, the day of the week and the time of day, reflecting an extremely non-random pattern.

It might be worthwhile to examine falls among children, since the rate is high and falls account for 42% of emergency room visits by children. Among children, males account for 53% of the fall-related injuries and females 47%. In terms of age, the highest rate of falls is for those 65 and over, with a rate of 400 per 100,000 individuals each year. The second highest age cohort, those less than 10 years of age, reported a rate of 175. The reported rate of fall-related injuries for the low-income population is 250 per 100,000, compared to 80 per 100,000 for the high-income population.

The greatest number of fall injuries for children are reported for May and June and the fewest number for November and December. A full 45% of falls occur on Saturday or Sunday. The highest fall rates are from 6 p.m. to midnight.

If a pattern can be discerned for the distribution of falls within the population, even clearer distinctions can be expected for conditions that are directly related to lifestyle and social characteristics. The fact that a decreasing number of conditions can be linked to biological factors means that the importance of demographic and sociocultural factors in the distribution of disease, disability and mortality within the population will be only continue to grow.

Source: Thomas (2005)

There are health status measures related to ascertaining medical outcomes. Medical outcomes measurement is a growing area of interest for both researchers and decision makers, with outcomes seen as an indicator of service delivery efficiency and medical success. The short-form health survey (SF-36) is one device used to measure outcomes (Ware 1997). It includes one multi-item scale that assesses eight health concepts: (1) limitations in physical activities, (2) limitations in social activities, (3) limitations in usual role activities related to physical health problems, (4) pain, (5) general mental health, (6) limitations in usual role activities related to emotional problems, (7) vitality and (8) general health perceptions. The SF-36 is suitable for self-administration, computerized administration, or administration by a trained interviewer in person or over the telephone.

One other approach to measuring morbidity within a population involves the use of health risk appraisals (HRAs). HRA involve questionnaires that are administered to members of the general population or to defined populations such as employees or insurance plan members. They typically consist of a serious of questions that the respondent answers relative to existing health conditions, health-related attitudes and health practices. While generally designed for assessing the health status of individuals, the combined results of health risk assessments might provide an overall of the health status of the population being examined. While HRAs are increasingly used to identify and monitor the health status of the population under study, there are a number of limitations to their use. By definition, they represent a superficial assessment of health conditions, they rely primarily on self-reports with all the issues that introduces, and they are usually voluntary (meaning that the participants self select). Finally, the results of health risk assessments are not likely to be publicly available thereby limiting their usefulness in specifying the morbidity characteristics of a population (Exhibit 8.9).

Exhibit 8.9 The Health Status Index

One of the greatest challenges in healthcare over the years has been the development of an acceptable health status index. Beginning with the social indicators movement of the 1960s, there has been periodic interest expressed in the development of an index that could be used to represent the health status of a population or a community in either absolute or relative terms.

A health status index is a single figure that represents the health status of a population or a community. It involves an attempt to quantify health status in objective and measurable terms. A health status index is constructed by combining a number of individual health status indicators into a single index. This index can then be utilized to compare the level of need from community to community or for a single community over time. It can be used as a basis for setting priorities and evaluating the worthiness of proposed programs. It can also serve as a basis for allocating resources and as a tool for evaluating the effectiveness of existing programs.

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Exhibit 8.9 (continued)

A number of conceptual problems surround the development of health status indices. These problems begin with the question of what indicators to include. To this are added the issues of quantification and measurement. Further, the question of how to weight the various component indicators is also raised. There are no simple means for resolving these issues. Every analyst must address them in the best manner possible and carefully document the process that is used in developing the index.

A variety of indicators can be utilized in the creation of a health status index. Many of the indicators that might be included – e.g., death rates – are fairly obvious. Others, such as certain demographic indicators, might not be. Some like the death rate would be considered direct indicators of health status. Others might be referred to as “proxy” measures of health status, in that they are not direct indictors of health conditions but can be assumed to indirectly indicate the level of health status within a population.

The major categories of health status indicators utilized include morbidity indicators, outcome indicators, utilization indicators, resource availability indicators, and functional status indicators. Morbidity measures are obvious indicators of health status, since they reflect the prevalence and/or incidence of various conditions, as well as the level of disability within a population. Thus, the extent to which a population is affected by various acute and chronic conditions constitutes an important component in any health status index.

Measures of functional state represent a form of morbidity measurement. These include a range of measures such as days of work lost, days of school lost, bed-restricted days, activity-restricted days, and so forth. The use of these measures reflects the notion that individuals who are limited in their functional abilities reflect poor health status (regardless of the source of the limitation).

Health status indices can be calculated for any level of geography for which data are available. However, the smaller the unit of geography the finer the distinction that can be made. Many health planning agencies conduct analyses down to the census tract level, while others utilize the zip code or county as the unit of analysis.

Once the indicators have been chosen, values must be assigned to each indicator for each unit of geography being analyzed. A number of different methodologies can be utilized for this process, and the important factor is to come as close to both scientific rigor and face validity as possible. Assuming that all indicators are to be equally weighted, one approach might be to score each indicator on a scale of 1–5 for each geographic unit. Negative characteristics would be scored closer to 1 and positive characteristics closer to 5. The scores for each indicator could be summed and then divided by the number of indicators to provide an average score for each geographic unit somewhere between 1 and 5. It should be noted that the absolute number generated through the process means little; its value is derived from the

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Exhibit 8.9 (continued)

ability to compare it with other figures. This index number could be used, for example, to compare one community to another or track the health status of a particular community over time.

The current methodologies for constructing health status indices are certainly not without their critics. There are numerous conceptual, methodological, and practical issues that must be addressed in the development of a health status index. Nevertheless, the need to better understand the health characteristics of our communities mandates continued efforts toward the development of defensible health status indices.

Exhibit 8.10 BMI as a Measure of Morbidity

The steady increase in the collection of health care data via disease reports, administrative data, and surveys has made it possible to create a variety of morbidity and comorbidity indices. These indices are subsequently used in a host of analyses designed to provide insights into the changes in the levels of sickness and illness. In addition, the indices are linked to mortality data in order to better understand shifts in death rates (Chaudhry et al. 2005). Related indices such as the Health Utilities Index, HUI, are frequently used in clinical studies as summaries of the health status/quality of life of a study subject (Horsman et al. 2003).

One index receiving significant attention in recent years is a simple one, the body mass index (BMI). The BMI is easy to calculate:

$$\text{BMI} = \frac{\text{mass (Kg or pounds)}}{(\text{height (m or inches)})^2}$$

The BMI is not a direct measure of morbidity, with the exception of disease such as bulimia nervosa, merely an indicator of risk to morbid conditions such as high blood pressure and diabetes. BMI scores are classified into seven categories ranging from severely underweight, index score less than 16.5 (that is, a person who is 5′5″ and weighs less than 118 pounds) to Obese Class 111 (a 5′5″ person weighing 290 pounds or more). BMI scores can be calculated by age, thus allowing for the objective identification of young persons who are overweight, and possibly morbidly overweight.

It should be noted that the BMI has several shortcomings. The BMI sometimes overestimates adiposity in those who have more lean body mass and underestimates adiposity in those who have less lean body mass. Therefore, its predictive power is limited. For example, those with intermediate BMI

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Exhibit 8.10 (continued)

scores are sometimes found to have high risk of death from diseases such as coronary artery disease than those with higher BMI scores (Romero-Corral et al. 2008).

However, the BMI is relatively easy to calculate and comparing scores over time provides a good summary of the growing problem of obesity, and morbid obesity, in the U.S > and other developed countries. By examining shifts over time in the distribution of BMI index scores among children in the U.S., health researchers have been able to document the growing epidemic of childhood obesity and morbid obesity.[1]

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[1] In 1999, the National Health and Nutrition Examination Survey (NHANES) implemented dual energy x-ray aborptiometry (DXA) to a relatively large (19,040) nationally representative sample of persons 8 years of age and older. Results from the DXA scans enable research to draw conclusions about the distribution of, for example, percentage body fat cross-classified by factors such as age, sex, race and ethnicity (Borrud et al. 2010).

8.6 Generating Morbidity Data

There is no systematic method available for the direct collection of morbidity data (Exhibit 8.10). In order to determine the morbidity profile for a population, it is necessary to identify and count the number of cases of various conditions within that population. The two major means of carrying this out are through accessing data on “known cases” – that is, cases that show up in various registries, hospital databases, etc. – and through community surveys. Data on reported cases can be obtained from disease registries, administrative records and surveys of healthcare providers. Community surveys based on a sample of the population might be conducted of residents within a community.

The use of available records would seemingly be a good source of data on morbidity but there are a number of problems in this regard. First, there is no official repository of data on health conditions that come to the attention of the healthcare system. While hospitals collect detailed data on their patients and some even submit these data to repositories shared with other hospitals, unless most or all hospitals participate an incomplete picture is presented. Second, most health services are delivered outside the hospital setting and there is no mechanism for reporting the cases seen by hundreds of thousands of doctors plus uncountable numbers of other practitioners. In any case, stringent rules govern the handling of personal health data and information on some types of conditions (e.g., psychiatric disorders) would not be made public under any possible scenario. Finally, and most important, “known cases” are just that – health conditions that become “public” by virtue of being treated by the healthcare *and* subsequently reported.

The use of community surveys comes closer to identifying the true level of morbidity within a population as opposed to the apparent level of morbidity indicated by known cases. Community surveys typically involve the administration of a questionnaire (often including a symptom checklist) and, in some cases, an actual physical examination. The more sophisticated to these involve on-site administration while more rudimentary data collection efforts may involve telephone, mail or Internet data collection. Collecting morbidity data via health risk assessments is less effective, however, in that participation in often voluntary resulting in a less than representative sample. Further, HRA data are often proprietary and even if available are of questionable value due to self-reporting.

Data registries generate data useful for health demography is represented by registration systems. A registration system involves the systematic registration, recording, and reporting of a broad range of events, institutions, and individuals (Swanson and Siegel 2004). The implied characteristics of a registry include the regular and timely recording of the phenomenon in question. Most of the registration systems relevant to this discussion are sponsored by some branch of government, although other types of registration systems will be discussed below as well. The best-known registration activities in the United States are those related to "vital events" (i.e., births and deaths) and reportable diseases.

A variation on registries that is finding increasing use in health demography is "administrative records". Administrative records systems are not necessarily intended to be registries of all enrollees or members of an organization or group but a record of transactions involving these individuals. Thus, the list of all Medicare enrollees would constitute a registry, but the data generated by virtue of Medicare enrollees' encounters with the health care system would be under the heading of administrative records (since not all Medicare enrollees would use services during a given time period). Data sets made available by the federal government on Medicare and Medicaid activity involve administrative records that are useful for a number of purposes.

Administrative records serve a useful function in that they provide access to sources of data not otherwise available. However, unlike other forms of data generation such as censuses and surveys, the raw data are not strictly under the control of those who establish the data file. Administrative records may be submitted by a variety of parties, creating inherent problems in data quality and standardization. A great deal of effort is currently be expended to improve the quality of administrative records for use in health care. For example, Medicare data, including the number of enrollees, are now available for all counties in the U.S.

The Centers for Disease Control and Prevention (CDC) have been involved in disease-surveillance activities since the establishment of the Communicable Disease Center in 1946. Surveillance activities now include programs in human reproduction, environmental health, chronic disease, risk reduction, occupational safety and health, and infectious diseases. The purpose of the surveillance system is to provide weekly provisional information on the occurrence of diseases defined as "notifiable" by the Council of State and Territorial Epidemiologists (CSTE). To this end, the CDC maintains a number of registries on various disease categories.

The National Notifiable Diseases Surveillance System (NNDSS) is the mechanism by which notifiable disease data, such as those for gonorrhea, hepatitis, Lyme disease, and pertussis (whooping cough) are gathered. It should be recalled that these particular diseases have been singled out primarily because of their communicable nature. A *notifiable disease* is one for which regular, frequent, and timely information on individual cases is considered necessary for the prevention and control of that disease. Public health officials are particularly interested in these conditions since they have the potential to spread to epidemic proportions. Note that they are virtually all acute conditions, at a time when the major health problems are chronic conditions. For this reason, reportable morbid conditions have become increasingly less useful as indicators of health status. (See Exhibit 8.11 for a listing of major notifiable diseases and their occurrence).

By definition, the list of reportable diseases is restricted essentially to communicable diseases, thereby omitting chronic conditions for all practical purposes. In the past three decades, however, chronic conditions (along with behavioral and lifestyle-caused diseases) have come to be the main factors in both morbidity and mortality within modern, industrialized countries. Cardiovascular disease, cancer, diabetes, depression and arthritis are now among the leading factors in mortality.

A note of caution must be introduced regarding these data, particularly since the reporting of notifiable diseases is essentially voluntary. As the CDC notes, diseases that cause severe clinical illness and are associated with serious consequences are subject to adequate reporting. Less virulent diseases, on the other hand, are less likely to be reported. Data quality is significantly affected by the availability of diagnostic facilities and the priorities of officials who are responsible for reporting. Furthermore, while state laws and regulations mandate disease reporting, notification of the CDC is voluntary. As a result, underreporting is a problem with regard to some diseases, and further inquiry is recommended if these data are to be used. On the positive side, disease surveillance data as currently collected make possible analyses at the individual, group, (e.g., age cohort), and geographic levels (Doyle et al. 2002).

Exhibit 8.11 Selected Notifiable Diseases for the United States 1980–2007

Disease	1980	1990	2000	2007
AIDS	N.A.	41,595	40,758	37,503
Animal rabies	6,241	4,826	6,934	5,862
Malaria	2,062	1,292	1,560	1,408
Syphilis	69,000	134,000	32,000	41,000
Gonorrhea	1,004,000	690,000	359,000	356,000
Tuberculosis	27,700	25,700	16,400	13,300
Rubella	3,904	1,125	176	12
Mumps	8,600	5,300	300	800
Pertusis	1,700	4,600	7,900	10,500

Source: U.S. Census Bureau (2010)

Examples of the use of administrative records for measuring the level of morbidity would include diagnoses reported for Medicare beneficiaries when they use their coverage and reports of hospitals to state oversight boards or data repositories. If hospitals provide raw data it is possible to determine at a very high level of granularity the types of conditions for which people are being hospitalized. An increasing number of reporting units also include outpatient activities associated with the hospital. Admittedly, these records only include known cases and even among those the more serious cases that require hospitalization. Thus, at best, these types of administrative records only provide a partial view of the morbidity status of the population.

Federal health agencies conduct periodic surveys of hospital inpatients and ambulatory patients utilizing clinics and other outpatient services. In addition, databases have been established for the systematic compilation of information on inpatient and, to a lesser extent, outpatient utilization. These data collection efforts allow for the identification of cases for a wide variety of conditions and the monitoring of the level of these conditions over time. While this information is invaluable, coverage is far from complete at this point. It also should be remembered that these compilations include only reported cases. If individuals afflicted by various disorders are not diagnosed and treated, they will not show up in these studies. The one systematic effort to collect data on morbidity based on known cases in carried out by the National Center for Health Statistics through its survey activities. The *National Health Interview Survey* (NHIS) is an ongoing national survey of the noninstitutionalized civilian population in the United States. Each year, a multistage probability sample of 49,000 households is interviewed. The data gathered are quite detailed and include demographic information on age, race, sex, marital status, occupation, and income. Information is compiled on physician visits, hospital stays, restricted-activity days, long-term activity limitation, health status, and chronic conditions.

The *National Hospital Discharge Survey* (NHDS) is a continuous nationwide survey of inpatient utilization of short stay hospitals. A multistage probability sampling frame is used to select hospitals to be included and over 200,000 discharge records are reviewed each year. Information is collected on the demographic, clinical, and financial characteristics of patients discharged from short-stay hospitals.

The *National Ambulatory Medical Care Survey* (NAMCS) is a nationwide survey designed to provide information about the provision and utilization of ambulatory health services in physician offices. Data on the age, race, ethnicity, and sex of the patient are gathered, along with the reason for the visit, expected source(s) of payment, principle diagnosis, diagnostic services provided, and disposition of visit.

The second means of collecting data on morbidity is through the use of community surveys. The intent here is to not only capture those cases that actually are diagnosed and presumably treated by the healthcare system, but to identify instances of morbidity that or not counted because the case has not been diagnosed or the individual with recognizable symptoms has chosen some other response than the formal healthcare system (e.g., faith healer, self-medication). It becomes necessary, then, to perform community surveys to determine a true level of morbidity (as opposed to the apparent level of morbidity demonstrated by known cases). Community surveys involve both the administration of questionnaires and the performance of physical examinations. Obviously, these are labor intensive activities and require that a sample be identified for collecting the data.

NCHS also collects data through community surveys. The *National Health and Nutrition Examination Survey* (NHANES) is designed to collect information about the health and diet characteristics of the U.S. population, combining home interviews with health tests performed in a mobile examination center. The survey collects information on physical health status, dental health and nutrition. Data are used to determine cholesterol levels, trends in obesity and other health characteristics of the population.

Of increasing importance is the Behavioral Risk Factor Surveillance System (BRFSS) conducted by the CDC. BRFSS is a state-based system of health surveys that collects information on health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury. For many states, the BRFSS is the only available source of timely, accurate data on health-related behaviors. More than 350,000 adults are interviewed each year, making the BRFSS the largest telephone health survey in the world. States use BRFSS data to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs. Many states also use BRFSS data to support health-related legislative efforts.

The Youth Risk Behavior Surveillance System (YRBSS) monitors priority health-risk behaviors and the prevalence of obesity and asthma among youth and young adults. The YRBSS includes a national school-based survey conducted by the Centers for Disease Control and Prevention (CDC) and state, territorial, tribal, and local surveys conducted by state, territorial, and local education and health agencies and tribal governments.

One approach to data collection from the general population involves the use of symptom checklists in sample surveys. A list of symptoms that has been statistically validated is utilized to collect data for the calculation of a morbidity index. These are utilized to derive health status measures for both physical and mental illness. Usually there are 15 or 20 symptoms, since it is hard to retain respondents' attention much longer. While the symptoms are sometimes examined individually, the main use is in the calculation of an index. Typically, the number of symptoms is simply summed and this becomes the index score for that individual. In some cases, the symptoms may be weighted on the grounds that some symptoms may be more important in the determination of morbidity levels than others. For example, should occasional chest pains be given more weight than an occasional cough?

A primary rationale for the utilization of symptom checklists is the fact that much of the population is free of clinically identifiable disorders but is likely to have some, albeit minor, manifestations of ill health. Virtually everyone has vaguely defined symptoms of some type at various times, or clearly identifiable ones that cannot be linked to a particular clinical condition. It is further argued, with regard to both physical and mental conditions, that these "everyday" symptoms are more significant measures of health status than are the comparatively rare clinical conditions. Symptom checklists are also attractive because of their objective nature and generally agreed-upon definitions. Virtually everyone is going to agree as to what constitutes an “occasional cough” or “occasional dizzy spells,” but clinical diagnoses are often misunderstood by patients or obscured by the terminological complexity of the health care setting.

Symptom checklists usually are based on answers directly obtained from survey respondents. Respondents either complete a questionnaire that contains the checklist or provide responses to an interviewer who records them. In some rare cases, the checklist will include signs as well as symptoms, and clinical personnel will be involved in the data collection process to obtain test results. This approach is occasionally utilized, for example, in studies of psychiatric morbidity, in which case the clinician will typically administer various psychiatric tests. The index calculated in this manner generally reflects a combination of symptoms reported by the respondent and signs observed by the clinician.

Because of the lack of actual data on morbidity, some innovative approaches have been suggested that use proxy measures. One of these involves the use of data contained in prescription drug databases. This approach pioneered by Cossman et al. (2010) is based on the assumption that the drugs prescribed by physicians to people residing within a particular geographic area are indicative of the types of health conditions that characterize that population. Thus, the level of prescriptions written for hypertension or cholesterol control is thought to reflect the level of high blood pressure and hyperlipidemia within that population. When these synthetic estimates are compared to actual data, the prescription levels appear to provide a reasonable picture of health conditions within a population. While there are certainly concerns over the efficacy of this approach, it does have the potential to approximate morbidity levels for populations for which there are no other sources of morbidity data.

Increasingly, synthetic data are being utilized to estimate the level of morbidity within a population. Synthetic data are created by merging existing demographic data with assumptions about population change to produce estimates, projections, and forecasts. These data are particularly valuable given that census and survey activities are restricted because of budgeting and time considerations. This demand is being met by both government agencies and commercial data vendors.

Synthetic approaches are increasingly being used to generate estimates and projections of the incidence and prevalence of health conditions within a population. Since there are few sources of actual data on the use of health services and projections of future demand are often required, a variety of approaches have been developed for synthetically generating morbidity estimates and projections. The general approach involves applying known utilization rates to a current or projected population figure. To the extent possible, these figures are adjusted for, at a minimum, the age and sex composition of the target population. Utilization rates generated by the National Center for Health Statistics are the basis for most such calculations and the demographic data may be obtained from a variety of different sources.

The following provides a simple example of the generation of incidence rates for asthma for a defined population:

Age cohort	Males	Incidence rate/1,000	Estimated cases	Females	Incidence rate/1,000	Estimated cases
0–14	1,000	100	100	1,000	80	80
15–24	1,000	70	70	1,000	60	60
25–44	2,000	40	80	2,200	30	66
45–64	1,500	20	30	1,800	15	27
65+	500	10	5	800	5	4
Total	6,000		285	6,800		237

For this population of 12,800 with this age/sex distribution, an estimate of 522 cases of asthma is generated for the current year. This yields an incidence rate of 40 cases per 1,000 persons.

Estimates and projections of morbidity have become essential for virtually any planning, marketing, or business development activity in healthcare, and there has been growing pressure for the generation of increasingly detailed figures. However, there are at least three major concerns related to the use of such data. First, the estimates and projections are based on historical prevalence rates at a time when patterns of morbidity are undergoing change. Second, the results of such calculations are likely to vary widely depending on the source of demographic data (especially if there has been significant time since the last census was conducted). Third, estimates and projections become increasingly tenuous as the size of the geography becomes smaller. While synthetic morbidity rates may be fairly dependable down to even the county level, they tend to become unstable when sub-county units such as zip codes and census tracts are considered. Despite these caveats, the demand for estimates and projections of morbidity will continue to grow as long as there is interest in the effective delivery of healthcare in the U.S.

8.7 Sources of Morbidity Data

Because of the nature of morbidity data, there is no single organizational source of information on morbidity for the U.S. population. Certain federal agencies are charged with collecting and disseminating morbidity data, while government agencies at other levels (state and local) also collect morbidity data through various means but are less likely to be involved in disseminating it. Health systems and other providers routinely collect data on their patients and some contribute (voluntarily or involuntarily) data to statewide repositories. Similarly, health insurance plans include detailed data on health services utilization (including the diagnosis associated with each episode), and there is increasing pressure on health plans to share this information. Increasingly, regional health information organizations are emerging to collect patient data that can be used to determine morbidity levels to a certain extent. The sections below describe the primary sources of data on morbidity available to health demographers and others with an interest in morbidity data.

The National Center for Health Statistics (NCHS) is the primary source of morbidity data for the U.S. population. As a division of the Centers for Disease Control and Prevention (CDC), NCHS performs a number of invaluable functions related to data on health and healthcare.

One of the Center's responsibilities includes the compilation, analysis, and publication of vital statistics for the United States and each relevant subarea. The compilation and analysis of data on morbidity is another important function, and the Center has been responsible for the development of much of the epidemiological data available, for example, on chronic disease and AIDS.

In addition to the data compiled from various registration sources, the Center is the foremost administrator of healthcare surveys in the nation. Its sample surveys are generally large scale and include the community-based surveys and facility-based surveys discussed in the previous section. The data collected through NCHS studies are disseminated in a variety of ways. The Center's "publications" include annual books such as *Health, United States* (the "official" government compendium of statistics on the nation's health), and publications such as *Vital and Health Statistics* now distributed solely in electronic form. NCHS-generated data sets are being made increasingly available via the Internet and can be accessed at www.cdc.gov.

The parent organization for the NCHS, the Centers for Disease Control and Prevention (CDC), is also a major source of morbidity data. Surveillance activities now include programs in human reproduction, environmental health, chronic disease, risk reduction, occupational safety and health, and infectious diseases. The CDC is the primary source of data on notifiable conditions and maintains a variety of registries of reported cases for selected conditions (e.g., HIV/AIDS). Like the NCHS, the CDC distributes information on morbidity through various publications and via its website.

Other federal agencies may be sources of morbidity data for selected topics. For example, the various institutes within the National Institutes of Health conduct research on specific health conditions involving the collection and ultimate dissemination of information on their incidence or prevalence. The Center for Medicare and Medicaid Services compiles utilization data for Medicare beneficiaries, providing insights into the morbidity status of the senior population. The Department of Labor collects and disseminates data on occupationally related injuries and illnesses. The Department of Education collects data on learning disabilities and so forth.

State governments, typically through the state department of health, collect various types of morbidity data through various means. Through the department of health and other departments (e.g., labor, environment) state governments may compile data on injuries, illnesses and disabilities and serve as a repository for birth and death data which may indirectly provide information on morbidity. Some states have established repositories of hospital data that provide indirect evidence of morbidity for the participating localities. Local governments (i.e., county and city) typically collect much of the data that are ultimately compiled at the state level. States differ in their ability and willingness to disseminate morbidity data, so the availability of morbidity data differs from state to state.

As a result of their operations, health systems, hospitals and other providers of health services generate a considerable amount of data on the morbidity characteristics of their patients. The first step in any medical encounter is to diagnose the problem. These diagnoses become the basis for determining the morbidity characteristics of the provider's patients. While the data for any particular provider are likely to be proprietary, there is a growing movement involving the compilation of data from different providers into regional or state data repositories. While much of the motivation behind these efforts relates to more efficient patient care, the existence of such repositories potentially provides a resource that can be used to calculate morbidity levels for the populations served. As noted above, these data relate only to known cases (and primarily hospitalized cases) and, as such, do not necessarily provide a complete picture of the morbidity characteristics of the population in question. However, in the absence of actual morbidity data, these repositories potentially represent a valuable resource.

One other potential source of information on morbidity is the data collected through the operation of health insurance plans. The potential of the government-sponsored Medicare program mentioned previously is an example of insurance plans as a source of morbidity data. Insurance plans of necessity collect detailed data on the health characteristics and healthcare experiences of their members. Unlike a hospital, they include data on any encounter with the healthcare system based on claims filed by their members. The data represent, thus, a more complete picture of the health conditions of the insured. Like provider data, this information tends to be proprietary and not available to researchers. However, like hospital data, there is growing pressure for health plans to contribute to regional and statewide health data repositories. As this movement grows, health plan data may become an increasingly valuable resource (realizing, of course, that they only relate to those who participate in commercial health insurance plans).

8.8 Trends in Morbidity in the U.S.

The morbidity profile of any population shifts over time, partly in response to demographic changes. The morbidity profile of the U.S. population has changed, in fact, dramatically over the past 100 years. There has been a major shift from acute toward chronic health condition dominance in the United States. This is an important shift, because it is responsible for significant changes in the health status of the population and in the type of health services required. The trend away from acute conditions can be seen in part in the reduction of the incidence rates for many infectious and parasitic diseases. (See Exhibit 8.1 for a discussion of the epidemiologic transition).

There have been considerable fluctuations in the number of cases of the many communicable diseases even over the past 40 years. (See Exhibit 8.11). While there were approximately 47,000 reported cases of measles in 1970, for example, there were only around 66 in 2006. This same downward trend can be seen over the same time period in the data for mumps (105,000 to 314 cases); and hepatitis A (56,797 to 2,729 cases). Some diseases, syphilis and gonorrhea, for example, reported a steady decline for decades only to experience a resurgence in recent years. On the other hand, AIDS had been experience a steady increase for two decades, only to exhibit a sharp decline since the mid-1990s (National Center for Health Statistics 2007).

Today in the U.S., an estimated 80%, of contemporary health conditions are neither immediately fatal nor curable. Thus, a large proportion of our population is under lifelong management for hypertension, arthritis, diabetes, or some other chronic condition. For example in 2006, 34 million, 95 million, and 32 million American adults, had heart disease, high blood pressure, and/or diabetes, respectively (National Center for Health Statistics 2010a p. 2).

Chronic conditions are the leading cause of illness, disability, and death in the United States. Chronic diseases, including cardiovascular disease, cancer, chronic obstructive pulmonary disease, and diabetes are among the most prevalent, costly, and preventable of all health problems. In the United States, almost 125 million persons (45% of the population) have at least one chronic condition, and the medical costs for persons with chronic conditions account for almost 75% of the $1 trillion spent on health care each year in the United States. People with chronic conditions spend six times more per year on health care than those who are not chronically ill, and those who have a chronic condition that results in limitations in day-to-day functioning spend 16 times more than persons who have no chronic illness. The prevalence of persons who are overweight and obese, characteristics that have been associated with increased prevalence of and morbidity from type 2 diabetes, hypertension, arthritis, and some cancers, has more than doubled during the last 40 years.

The infectious but chronic disease receiving the greater amount of current attention is AIDS. The incidence increased from 199 new cases in 1981 to about 37,000 in 2008 (Centers for Disease Control and Prevention 2010: Web Site). The spread of this disease has become a major concern, since it is usually fatal in the absence of aggressive treatment and is spread by means of social interaction. By 2008, nearly over one million persons in the United States had been diagnosed (prevalence) as having AIDS and over 670,000 had died from the disease. Over 16,000 persons died from AIDS in 2008 alone (Exhibit 8.12) (National Center for Health Statistics 2010; Centers for Disease Control and Prevention 2010).

Exhibit 8.12 Changing Morbidity Patterns in the U.S. Selected Years

Disease	1970	1985	1996	2006
AIDS	NA	8,249	65,475	36,442
Hepatitis A	56,800	23,200	49,024	2,579
Hepatitis B	8,300	26,600	9,994	4,713
Malaria	3,051	1,049	1,542	1,524
Syphilis	91,000	68,000	11,110	26,598
Gonorrhea	600,000	911,000	308,737	356,266
Tuberculosis	37,100	22,200	19,096	13,754
Measles	47,400	2,800	295	66
Mumps	105,000	3,000	658	314
Pertussis (whooping cough)	4,200	3,600	6,467	15,632

Source: Centers for Disease Control and Prevention

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Chapter 9
Data Sources for Health Demography

9.1 Introduction

The health care industry has always presented something of a paradox. Although historically awash in data, it has been very difficult to convert these data into usable information. Health data have often not been very accessible even to the organizations that generate the data. When data sets have been accessible, they typically have been of limited use to health demographers and other analysts, since they were usually generated for some operational or administrative purpose. Further, even when data have been made accessible, the tools were not available for their efficient management and exploitation.

This situation has existed in the face of increasing demand for health-related data of all types, as healthcare organizations have striven to adapt to a rapidly changing healthcare environment. By the 1990s, organizations and professionals that historically had little interest in or need for health-related data found that efficient data gathering and analyses were requisites for maintaining successful operations. Today's healthcare environment is demanding further improvements in the quality, quantity, and specificity of the data used for marketing, planning and business development.

In fact, the demand for health-related data has grown far beyond the organizations directly involved in the provision of healthcare. Health plans, employers, policymakers, health attorneys, and a variety of other interests are increasingly requiring health-related data. Entities both inside and outside of healthcare are now using health data to address a range of business challenges, as well as for cost containment, quality monitoring and regulatory compliance.

The compilation of health data can be approached at two different levels: the community level and the organizational level. The former involves the analysis of community-wide health data, whether the "community" is the nation, a state, a county, or some other geographic unit. This macro-level approach historically has characterized public sector activities involving government agencies. Today, most

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healthcare organizations require community-level data for a variety of purposes and, indeed, the healthcare reform legislation of 2010 mandates periodic community assessments on the part of tax-exempt community hospitals. At the organizational level, data analysis focuses on the characteristics and needs of specific private sector entities such as hospitals, physician groups and health plans.

While it has been natural for healthcare organizations to turn first to internal information sources, data on the external environment have become increasing important as the healthcare industry has become more market driven. Data related to the external environment are sometimes difficult to locate and access but, relative to internal data, are more available to the public. The healthcare organization's ability to access, manipulate, and interpret external data sets is increasingly the difference between success and failure. At the same time, health planners rely heavily on external data for their activities.

Healthcare organizations routinely generate a large volume of data as a by-product of their normal operations. These include data related to patient characteristics, utilization patterns, referral streams, financial transactions, personnel records, and other types of information that almost always have a demographic dimension. To the extent that these data can be extracted from internal data management systems, they serve as a rich source of information on the organization and its operation. This chapter, however, explores sources of external data, since these are the data sets to which the health demographer is most likely to have access.

In addition to the internal/external distinction noted above, a useful distinction may also be made between primary and secondary data. Primary data collection involves the administration of surveys, focus groups, observational methods, and other studies for the stated purpose of obtaining information on a specific topic. Secondary data involve data gathered for some other purposes besides planning, marketing or business development, but that are nevertheless of value to health demographers.

Primary research requires a much more detailed treatment than can be afforded in this framework and is better addressed in a research methodology context. Further, primary research activities are usually focused narrowly on specific issues facing an organization at a particular time under certain conditions. While the value of primary research has become well established within health care, as evidenced by the growing number of patient satisfaction surveys and focus groups being conducted, these activities usually generate proprietary data that are not likely to be disseminated outside the institution. (A useful introduction to primary research for health demographers is provided in Berkowitz et al. 1997).

The purpose of this chapter is to identify and describe the broad range of secondary data sets of use to market researchers, administrators, and other decision makers in healthcare. There is no way, of course, that this discussion could be exhaustive, especially in view of the growing number of sources of health-related data available. While many of these information sources have been introduced in specific contexts earlier in the book, important characteristics of these sources, such as the frequency of publication, geographic specificity, and methodological limitations, are presented in this chapter.

A number of the data sets described here are not what most users would label "health data." However, health data is an elusive notion in that much of what affects the healthcare industry does not result directly from health-related events. During the 1990s, there was an increase in a demand for data thought in the past to be unrelated to healthcare, including data on such topics as employment, housing, and crime. This review of data sources has been expanded to include data sets that reflect the more general environment affecting health-related activities.

9.2 Data Collection Methods

The methods of data collection discussed in this chapter are divided into four general categories: censuses, registration systems, surveys, and synthetically-produced data. Censuses, registries, and surveys are the more traditional sources of demographic data, although synthetically produced statistics such as population estimates and projections have become standard tools for most planning, marketing and business development activities.

9.2.1 Census

A census involves a complete count of individuals (or entities) residing in a specific place at a specific time. The U.S. Census Bureau (within the Department of Commerce) has conducted population censuses since 1790. The census of population and housing is conducted every 10 years (in years that end in zero) and early results from the 2010 census were being tabulated as this volume was going to press. An economic census was initiated in 1810 and is conducted every 5 years in years that end in 2 and 7. The economic census involves a complete count of all US business operations. Exhibit 9.1 provides an overview of the 2010 census and discusses some of the issues surrounding its administration.

Exhibit 9.1 2010 Census of Population and Housing

In 2010, the US Census Bureau administered the 23rd decennial census. The 2010 data collection effort involved the mailing of questionnaires to every known household. Every household received a form with the ten core questions (the short form). In past censuses, a long form covering more than 50 topics was mailed to one in six households. That form was replaced for the 2010 census by the American Community Survey which collects data from a representative sample of households. (See Exhibit 9.4 for additional information on the American Community Survey). In addition to the mail-in option, Americans could complete the census questionnaire on line via

(continued)

Exhibit 9.1 (continued)

the Internet. Other forms of the questionnaire are used for individuals with non-household living arrangements such as individuals living in group quarters. Prior to the mailing of the questionnaires, postcards were mailed to every household to alert residents to the coming survey instrument. Included with the questionnaire were instructions for completing the form and an envelope for return mail.

The core questions in the 2010 census related to the information required for political redistricting purposes. These questions captured data on the age, sex, race/ethnicity and tenure of each household member as well as on the relationships of household members. The topics historically captured via the long form and now addressed by the American Community Survey include (in addition to those on the short form) the following categories of data:

- Composition of household
- Relationships of household members
- Tenure of household members/mobility status
- Citizenship status/national origin
- Language spoken
- Marital status
- Recent childbirth
- Education participation/completion
- Labor force/work status
- Occupation/industry
- Income level/characteristics
- Vehicle access/transportation to work
- Social services receipt (e.g., food stamps)
- Health insurance coverage
- Disability status
- Veteran status
- Housing characteristics

By definition, a census includes a complete count of the population. However, it is increasingly difficult to strictly apply this term to the decennial census conducted in the United States. While the decennial census ostensibly counts every resident, it falls short of a true census in two respects. First, every decade a certain segment of the population is missed in the enumeration resulting in some level of undercount. While the undercount is typically less than 3%, its mere existence creates myriad problems. This undercount tends to be concentrated among certain segments of the population, resulting in overrepresentation of some groups and underrepresentation of others. This fact has important implications, since the results of the census are used as the basis for reallocating Congressional seats and allocating government funds. Because of the undercount, the initial release of census data every 10 years produces a spate of lawsuits questioning the accuracy of the census.

The second factor diminishing the enumeration's value as a census is the fact that a large portion of the data on population characteristics has historically been obtained from a random sample of the nation's households. In 2000, for example, only ten questions were included on the short form that went to every household, while the long form, sent to one in six households includes over 50 questions. While the use of sampling significantly reduces the cost of taking a census, it generates figures that some might assume (sometimes incorrectly) to represent complete counts.

Typical census items elicit data on the number of persons residing in each living unit (e.g., house, duplex, apartment, and dormitory) and the relationship of those individuals to each other. On the "long form" administered to a sample of households, data are gathered on the age, race, ethnicity, marital status, income, occupation, education, employment status, and industry of employment for each resident. Questions related to the dwelling unit in which the respondent lives elicit information on the type of dwelling unit (e.g., apartment or duplex), ownership status, value of owned house, monthly rent, age of dwelling unit, and a number of other topics. Information on the 2010 census and its implementation are available at www.census.gov.

For the most part, health-related items are noticeably absent form the census, since very few have been mandated for collection through legislative action. The only directly health-related questions included in the 2010 census address functional disabilities and access to health insurance coverage. Additional questions related to fertility could be considered to have relevance for healthcare. As will be shown later, other government agencies have a much more significant role in the collection of health-related data than does the Census Bureau.

Census data are available for virtually every formally designated geographic unit in the United States. Statistics generated by the census are disseminated for states, counties, zip codes, metropolitan areas, and cities. Statistics are also produced for specially designated areas created by the Census Bureau, including blocks, census tracts, block groups, and block numbering areas.

Most census-generated data are now available CD-ROM and via the Internet. These databases – referred to as summary tape files (STF) – do not include the raw data (i.e., individual records) from the census but preselected aggregations of data. Public use microdata samples (PUMS) include raw data and will be available from the 2010 census, stripped of any information that would identify individual respondents. PUMS files involve a sample of records from areas containing at least 100,000 persons.

After the 1980 census, many private data vendors began to repackage census data and sell them to the public. In fact, joint public-private project were involved in converting census data to the ZIP Code level, a geographic unit with a great deal of utility for the business community. Private sector marketing of census data was even heavier after the 1990 census, with commercial data vendors providing population estimates and projections at the census tract level during the intercensal period. The expansion of private sector exploitation of the wealth of information provided through the census continued after the 2000 census. Similar packaging is already taking place using data from the 2010 census.

Economic censuses can be traced back to the early nineteenth century, although it was not until 1929 that continuous data gathering for a broad range of business entities was begun. The modern economic census was initiated in 1954 and is conducted every 5 years (currently in years ending in 2 and 7). The census covers businesses engaged in retail trade, wholesale trade, service activities, mineral industries, transportation, construction, manufacturing, and agriculture, as well as government services. The information collected through the economic census includes data on sales, employment, and payroll, along with other, more specialized data. These data are available for a variety of geographic units, including states, metropolitan areas, counties, and incorporated places of 2,500 or more population.

While it may appear that these data are unrelated to health issues, it should be kept in mind that information on business activities from the economic census are classified using the North American Industrial Classification system (NAIC). The NAIC system assigns a code to all businesses, allowing them to be grouped into standard categories for statistical purposes. These, aggregated data on businesses within the NAIC categories that involve health-related activities (e.g., physician practices) are available from this source. Statistics based on the economic census are distributed via CD-ROM and the Internet.

Data on health-related businesses (listed by NAIC code) available from the economic census for, for example, the Orlando metropolitan area can be found for a variety of enterprises. For example, the 2007 economic census found 1,740 physician offices with 16,176 employees and payrolls of $2.6 billion, 234 chiropractic offices with 994 employees and payrolls of $33 million, and 122 medical laboratories with 1,772 employees and payrolls of over $92 million (www.census.gov/econ/census07).

9.2.2 Registration Systems

A second method of data collection that generates information for health demography is represented by registration systems. A registration system involves the systematic registration, recording, and reporting of a set of events, institutions, or individuals. The implied characteristics of a registry include the regular and timely recording of the phenomenon in question. Most registration systems relevant to this discussion are maintained by some branch of government, although other sponsors of registration systems exist as well.

The best known registration activities in the United States are those related to “vital events”, such as births, deaths, marriages, and divorces. The most extensive registration systems are maintained by the National Center for Health Statistics, and these are discussed in more detail below. Other useful systems are maintained by the Centers for Disease Control and Prevention (CDC), the Social Security Administration (SSA), the Centers for Medicare and Medicaid Services (CMS), and Immigration and Customs Enforcement (ICE). Lists maintained by professional associations such as the American Medical Association and the American Hospital Association are placed in this category because such lists have many of the characteristics required of registries.

A variation on registration systems increasingly deployed by health demographers involves administrative records. Administrative records systems are not necessarily in tended to registries of all enrollees or members of a class of individual but to provide a record of the transactions of those who are involved. Thus, the list of all Medicare beneficiaries (enrollees) would constitute a registry but the data generated by virtue of the beneficiaries encounters with the healthcare system would be considered administrative records (since not all beneficiaries would use services during a given time period).

Administrative record can serve a useful function to the extent they provide access to sources of data not otherwise available. However, unlike other forms of data generation such as census and surveys, the raw data are not strictly under the control of those who establish the data file. Administrative records may be submitted by a variety of parties, creating inherent problems in data quality and standardization. A great deal of effort is currently is currently being expended to improve the accessibility of data maintained by federal agencies. For example, Medicare data, including the number of enrollees are now available for all U.S. counties, as are year-to-year migration data.

9.2.2.1 Vital Statistics

As noted above, vital statistics involves the collection of data births, deaths, marriages, and divorces. The collection of vital data has a long history in the United States, predating the Declaration of Independence by many years. In the United States the collection of data on vital events is initially the responsibility of local government (i.e., city or county government). A local court clerk's office is responsible for the recording of marriages and divorces, while the local health department is the primary collector of birth and death statistics. Data collected at the local level are forwarded to the appropriate vital statistic registry within the respective state governments. The state agency compiles the data from the various localities and subsequently transfers the data (in the case of births and deaths) to the National Center for Health Statistics (NCHS). The NCHS has the responsibility of compiling and publishing vital statistics for the nation and its various political subdivisions. Exhibit 9.2 provides more information on the National Center for Health Statistics.

A standard birth certificate is used in the United States to collect data on the time and date of birth, place of occurrence and the mother's residence, birth weight, pregnancy complications, mother's pregnancy history, mother's and father's age and race/ethnicity, and mother's education and marital status (Osterman et al. 2011). Data gathered on the standard death certificate includes age, race/ethnicity, sex, place of residence, usual occupation, and industry of the decedent, along with the location where the death took place. In addition, data are collected on the immediate and secondary causes of death, as well as on any other significant conditions. A separate certificate is used for fetal deaths. There is some variation in the content of birth and death certificates from state to state, although there are certain data elements that are always collected.

Birth and death statistics are traditionally available in government publications and increasingly electronically via the internet. The compiled statistics are typically presented for both the place of occurrence of the vital event (e.g., the location of the hospital) and the place of residence of the effected individual. Considerable detail is provided by the NCHS for a wide range of geographic units including states, metropolitan statistical areas (MSAs), counties, and urban places. Data for other geographic areas may be available through state and local governmental agencies. Yearly summary reports are produced and published by the National Center for Health Statistics, and periodic updates are available through the monthly vital statistics reports. Local and state health departments are increasingly making birth and death statistics available on line.

Marriage and divorce registration areas (MRAs and DRAs) are established using the same criteria as birth and death registration systems. Standard data collected on the marriage certificate includes age of spouse, type of ceremony (civil or religious), and previous marital status of spouse, as well as race and educational status of the bride and groom. The data available on marriages and divorces varies from state to state and, since the NCHS discontinued its marriage and divorce registries, there is no nationwide system for aggregating marriage and divorce data.

Exhibit 9.2 The National Center for Health Statistics

The National Center for Health Statistics (NCHS) is considered by many to be the Census Bureau of healthcare. As a division of the Centers for Disease Control and Prevention (CDC), the NCHS performs a number of invaluable functions related to data on health and health care. Since 1960, the Center has carried out the tasks of data collection and analysis, data dissemination, and the development of methodologies for research on health issues. The NCHS also coordinates the various state centers for health statistics.

One of the center's responsibilities includes the compilation, analysis, and publication of vital statistics for the United States and each relevant subarea. This is a massive task, and the results provide the basis for the calculation of fertility, mortality, marriage, and divorce rates. These statistics, in turn, provide the basis for various population estimates and projections made by other organizations. The compilation and analysis of data on morbidity is another important function, and the center has been responsible for the development of much of the epidemiologic data available, for example, on chronic disease and AIDS.

In addition to the data compiled from various registration sources, the center is the foremost administrator of healthcare surveys in the nation. Its sample surveys are generally large scale and fall into two categories: community-based surveys and facility-based surveys. The National Health Interview Survey (NHIS), in which data are collected annually from approximately 50,000 households, is perhaps the center's most important survey. The NHIS is the nation's

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Exhibit 9.2 (continued)

primary source of data on the incidence/prevalence of health conditions, health status, the injuries and disabilities characterizing the population, health services utilization, and a variety of other health-related topics.

The National Ambulatory Medical Care Survey (NAMCS) samples the patient records of 2,500 office-based physicians to obtain data on diagnoses, treatment, and medications prescribed, along with information on the characteristics of both physicians and patients. Important facility-based surveys include the National Hospital Discharge Survey and the National Nursing Home Survey. Other surveys that involve a sample from the community are the National Medical Care Utilization and Expenditures Survey (NMCUES), the National Health and Nutrition Examination Survey (NHANES), and the National Survey of Family Growth (NSFG). Another survey, the National Maternal and Infant Health Survey (NMIHS), involves a sampling of certificates of birth, fetal death, and infant death.

The data collected through NCHS programs are disseminated in a variety of ways. Much of the information is disseminated as printed material. The center's publications include annual "books" such as *Health, United States* (the "official" government compendium of statistics on the nation's health), and series of publications such as *Vital and Health Statistics*. These data are available today primary via the Internet at the NCHS website. The NCHS also sponsors conferences and workshops offering not only the findings from center's research but training in its research methodologies.

From the perspective of a user of health data, there are other resources that the center can offer. By contacting the appropriate NCHS division it is possible to obtain detailed statistics, many unpublished, on the topics for which the Center compiles data. Center staff members are also available to help with methodological issues and provide that "one number" that the health data analyst may require. In short, the NCHS is a service-oriented agency that serves a number of invaluable functions for those who require data on health and health care. Additional information is available on the National Center for Health Statistics at www.cdc.gov/nchs.

9.2.2.2 CDC Disease Surveillance

The Centers for Disease Control and Prevention (CDC) have been involved in disease-surveillance activities since the establishment of the Communicable Disease Center in 1946. Its initial agenda included the study of malaria, murine typhus, smallpox, and other diseases. In 1954, a surveillance section was established within the epidemiology branch of CDC to plan and conduct continued surveillance of communicable diseases. Surveillance activities now include programs in human reproduction, environmental health, chronic disease, risk reduction, occupational safety and health, and infectious diseases. The purpose of the surveillance system is monitor the occurrence of diseases defined as "notifiable" (i.e., reportable) by the Council of State and Territorial Epidemiologists (CSTE) and the dissemination information on disease incidence and prevalence.

Notifiable disease reports are received by CDC from 52 areas (Washington, DC, and New York City report separately) and five territories. The number of diseases and conditions reported is quite large and includes, among others, leprosy, mumps, toxic shock and human immunodeficiency virus (HIV). Statistics on notifiable diseases are published weekly by the CDC in its *Morbidity and Mortality Weekly Report* (MMWR) and compiled in an annual report made available by the Centers. Virtually all reports are published on line today. Time sensitive surveillance data (e.g., distribution of H1N1 cases) are disseminated to the relevant public health officers in the various states and territories. Additional information on data available from the CDC can be found at www.cdc.gov.

Data generated by the CDC's surveillance system must be interpreted with caution, since the reporting of cases of notifiable diseases is essentially voluntary. As the CDC notes, diseases that cause severe clinical illness and are associated with serious consequences are almost always reported. Less virulent diseases, on the other hand, are less likely to be reported. Data quality is significantly affected by the availability of diagnostic facilities and the priorities of officials who are responsible for reporting. Furthermore, while state laws and regulations mandate disease reporting, notification of the CDC is voluntary. As a result, underreporting is a problem with regard to some diseases, and further inquiry is recommended if these data are to be used.

In today's healthcare environment, existing methods of tracking have significant limitations. By definition, the list of notifiable diseases is weighted toward communicable diseases thereby excluding most chronic diseases. However, chronic conditions (along with behavioral health and lifestyle-related conditions) have come to be the main factors in both morbidity and mortality within modern, industrialized populations. Cardiovascular disease, cancer, diabetes, and depression have become leading contributors to mortality, replacing the acute conditions affecting past generations.

Although many chronic conditions are not routinely tracked as part of the public health agenda, our knowledge of these conditions has been advanced through NCHS surveys such as the National Health Interview Survey and the National Hospital Survey. Even so, indirect sources such as these limit our understanding of the epidemiology of chronic conditions, and, thus, the system's ability to monitor their prevalence. As a result, the CDC and other agencies are constantly taking steps to improve the monitoring and reporting of chronic conditions.

9.2.2.3 Immigration Data

Data on immigration patterns and the characteristics of immigrants historically have been of interest to health demographers because of the implications of these phenomena for population change. Today, however, data on immigration are of increasing interest due to the growth of illegal immigration and a growing appreciation of the health implications of immigration. Monitoring international migration is a responsibility of the federal government and the agency responsible for monitoring immigration and reporting on immigration trends is Immigration and Customs Enforcement (ICE), formerly the Immigration and Naturalization Service, within the Department of Justice. Data are collected related to legalization applications, refugees, asylum applicants, nonimmigrant entries, naturalizations, and enforcement and made available by means of published reports and the Internet. Most data are generated from immigrant visa information that, in theory, is available on everyone legally entering the United States. After a person is admitted to this country, visa and adjustment forms are forwarded to the ICE data-capture facility for processing. Information collected includes port of admission, country of birth, last residence, nationality, age, sex, occupation, and the ZIP Code of the immigrant's intended residence. Because of the increase in illegal immigration, a growing amount of data is generated as a result of border monitoring and internal police activities. Additional data on immigration can be obtained from www.ice.gov.

Data on immigration are made available through yearly statistical summaries, more frequent shorter reports, and via the Internet. While the published reports contain data for states and MSAs, tabulations by county and zip code are possible by accessing ICE data files.

9.2.2.4 Health-Related Registration Systems

Health Personnel

Registries constitute the main source of data on many categories of health personnel. Health professionals are typically registered with the sate in which they practice. In addition, many belong to professional associations whose rosters become de facto registries. As with other registries, the registration of health personnel involves the regular and timely recording of persons entering a given profession. Registries of health personnel, whether government or association sponsored, require constant updating, making them more prone to error than certain other types of registries.

The federal government is an important source of national data on health personnel in the United States. As a result of various federal mandates, the Department of Health and Human Services (DHHS) has been directed to collect and disseminate annual reports on the status of certain categories of health personnel in the US. These requirements have led to the establishment of registries for various types of healthcare workers. The Department also generates projections of the future personnel pool for selected healthcare occupations. A key agency within DHHS, the Health Resources and Services Administration (HRSA), maintains a national medical practitioner database. While there are limitations to the usefulness of this medical practitioner database, it does represent the universe of certain categories of health personnel as known to the federal government.

State governments often represent more direct sources of information for health personnel, since the various states have primary responsibility for the licensing and monitoring of virtually all health professions. As part of their administrative activities, they necessarily establish registries for specific categories of health personnel. The databases created at the state level for physicians, nurses, dentists, physician assistances and other categories of health personnel are typically comprehensive since health professionals typically must be registered before they can practice. However, the detail provided accuracy and usefulness for planning, marketing and business development purposes of the data collected vary widely from state to state.

Other sources of data on health personnel include the physician master file maintained by the American Medical Association (AMA) and the AMA's member surveys; medical, osteopathic, dental, and nursing school enrollments; the American Academy of Physician Assistants master file and subsequent surveys; the American Dental Association dental practice survey; the Inventory of Pharmacists; licensure information from the National Council of State Boards of Nursing; the National Sample Survey of Registered Nurses; and various surveys conducted by accrediting bodies, professional associations, and the American Hospital Association regarding allied health professions (e.g., laboratory technicians, dieticians, physical therapists).

Physician Supply

The records of the American Medical Association (AMA) represent a comprehensive registry of physicians, with the AMA maintaining a master file of physicians since 1906. The file contains data on virtually every physician in the United States, regardless of AMA membership. The data are collected and updated on an ongoing basis, and the data base presently contains about 940,000 records for medical doctors and other physician-level practitioners (e.g., osteopaths). This includes all known licensed physicians regardless of their activity status. A file is established for everyone entering medical school, and foreign graduates are added upon certification for residency training when they enter the country. A census of physicians is conducted periodically by the AMA in order to update the files, with changes made during the intercensal period via continuous checks of professional publications that note changes in physician activities. A wide variety of data is collected on physicians, including demographics (e.g., age, sex, and race) and practice-related data (specialty, group structure, activity level). The master file is also used as a sampling frame for periodic surveys of physicians that collect detailed information on characteristics of physician practices, earnings, expenses, work patterns, and fees (American Medical Association 2010). Certain data from the AMA master file are reproduced in the Area Resource File (ARF) maintained by the Health Resources and Services Agency within the Department of Health and Human Services.

Aggregated statistics from the master file are available for the entire nation, states, metropolitan areas, and counties in periodic publications such as the AMA's annual publication *Physician Characteristics and Distribution in the U.S.* (American Medical Association 2011a) and in secondary sources such as *Health United States, Statistical Abstract of the U.S.*, and the *County and City Data Book*. This database of physicians can be purchased from the AMA in print or electronic form. Other useful data available from the AMA include *Medical Group Practice in the US* and *Graduate Medical Education Directory*.

Other sources of physician data include the files of various specialty associations, state and local medical societies, and data sets created by commercial data vendors.

Increasingly, physician directories are being put on line. Some of these entities produce reports on the characteristics (including demographic) of those in their databases. However, many simply represent lists of physicians that are not very useful for demographic analysis.

State licensure agencies also maintain databases on physicians registered in the respective states. While this information is often available to the public, mere registration in a jurisdiction does not necessarily indicate an active practice. Further, these databases are likely to include only the barest of data required to carry out the mandated functions of the licensing agency. Specialty boards and other organizations also maintain registries on their members or certification recipients. While this information is often available in printed directories and increasingly via the Internet, the availability of the actual data bases varies.

Many local healthcare organizations have begun to develop and maintain databases for their particular service areas. Since most health care markets are local, national data bases are of limited usefulness. However, it is a considerable challenge to maintain such a data base successfully. Those that exist tend to be proprietary in nature.

Nurse Supply

Data on the number and characteristics of nurses are generated through the National Sample Survey of Registered Nurses conducted by the Bureau of Health Professions. Based on questionnaires sent to each licensed nurse in the United States, this serves as the only federal source of such data. Nurse supply estimates by states – including information on those who currently have licenses to practice, as well as those who are working part-time or full-time (and full-time equivalents) – are generated from a model that uses data from the National League for Nursing and the National Council of State Boards of Nursing (Health Resources and Services Agency 2010). In addition, state licensure boards maintain data on active (and sometimes inactive) nurses within their jurisdictions. These data vary in accessibility, content, and format.

Health Facilities

The federal government is the major source of nationwide data on health facilities. The Area Resource File (ARF) is a comprehensive database of health facilities maintained by HRSA within the Department of Health and Human Services. The ARF includes data on hospitals, nursing homes and other inpatient facilities, as well as ambulatory surgery centers and home health agencies and is kept current by periodically adding the names and addresses of newly established facilities licensed by state boards and other agencies. Annual surveys are used to update some information concerning existing facilities and new information is periodically acquired from other organizations (e.g., American Hospital Association).

The Centers for Medicare and Medicaid Services (CMS) is now making available a set of data files on health facilities and other providers of care. Its “Provider of Services" database includes every provider that has filed claims with the Medicare or Medicaid. This list covers 22 types of providers, including hospitals, nursing homes, ambulatory surgery centers, community health centers, and home health agencies. Although there are likely to be some providers who have not filed claims with Medicare or Medicaid, this number is small.

The nation's most complete hospital registry is maintained by the American Hospital Association (AHA). Data are compiled annually on the nation's approximately 5,000 hospitals. The database is continuously updated by means of an ongoing survey of the nation's hospitals. Data are gathered on the availability of services, utilization, financial information, hospital management, and personnel. In addition to its core hospital database, the AHA also maintains files on other types of facilities. These data are available for a variety of geographic units (including regions, divisions, states, counties and cities) through AHA published reports and CDs (American Hospital Association 2011b).

Since most health facilities are licensed by the state in which they operate, information is usually available from the state agency charged with that responsibility. Increasingly, local organizations such as planning and regulatory agencies and business coalitions have begun maintaining facilities databases. For facilities other than hospitals, some private data vendors have begun collecting and disseminating data. There are now vendors selling data on health maintenance organizations, minor emergency centers, freestanding surgery centers, and a variety of other types of facilities. Some of the commercial databases have developed to the point that they rival the "official" databases in usefulness.

There is currently no national database that provides information on the health facilities available for mental health care.

9.2.3 Surveys

A sample survey involves the administration of an interview form to a portion of a target population that has been systematically selected. The sample is designed so that the respondents are representative of the population being examined. This allows conclusions to be drawn for the total population based on the data collected from the sample.

The use of sample surveys has several advantages relative to the census and registry methods. Two of the major advantages are more frequent data collection and more in-depth treatment of selected health-related issues. The relatively small sample sizes for such surveys have the additional advantages of quicker turnaround time and easier manipulation than large scale operations such as the census.

On the other hand, surveys have their disadvantages. Since they involve a sample, there is some slippage in accuracy relative to censuses. Perhaps the most serious shortcoming related to health demography is the inability to compile adequate data for small geographic units due to small sample sizes.

The federal government is the major source of survey data related to healthcare. Primarily through the National Center for Health Statistics, the federal government maintains a number of ongoing surveys that deal with hospital utilization, ambulatory care patterns, nursing home and home healthcare utilization, medical care expenditures, and other relevant topics. The National Institutes of Health and the Centers for Disease Control and Prevention also conduct surveys that generate data of interest to health demographers. Some of the more useful federal surveys are discussed in Exhibit 9.3. Although not specific to healthcare, the American Community Survey (ACS) has been introduced by the Census Bureau as a replacement for the long-form data collection instrument for the decennial census. Exhibit 9.4 presents information on the ACS.

Commercial data vendors also conduct surveys that contain data useful to health demographers. At least two vendors conduct national surveys annually on health-related characteristics and health behavior. Other data vendors may extract health-related data from national syndicated surveys and package this information with their demographic data. Some of these data sets are considered proprietary and generally are only available to established clients. Other data may be available for sale to the public.

9.2.4 Synthetic Data

Synthetic data are created by merging existing demographic data with assumptions about population change to produce estimates, projections, and forecast data. These data are particularly valuable given that census and survey activities are constricted because of budgeting and time considerations. Consequently, there is a large and growing demand for information between years when data are actually collected. This demand is being met by government agencies and commercial data vendors.

Exhibit 9.3 National Health and Related Surveys

The combined agencies of the federal government represent the nation's largest data collection force. Led by the National Center for Health Statistics, federal agencies conduct a variety of surveys on health-related issues. The sections below describe a sample of the federal survey activities that have particular relevance for healthcare planning, marketing, and business development.

The *National Health Interview Survey (NHIS)* is an ongoing national survey of the U.S. non-institutionalized civilian population. Each year, a multistage probability sample of between 36,000 and 46,000 households (92,000–135,000 persons) is generated for inclusion and interview. The data gathered are quite detailed and the NHIS contains a number of demographic items. Demographic information collected includes age, race, sex, marital status, occupation, and income. Health questions relate to physician visits, hospital stays, restricted-activity days, long-term activity limitation, and chronic conditions. At some point, questions regarding AIDS knowledge and attitudes have been added to the survey. Food nutrition knowledge, smoking and other tobacco use, cancer, and polio are also subjects sometimes addressed.

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Exhibit 9.3 (continued)

The *National Hospital Discharge Survey (NHDS)* is a continuous nationwide survey of inpatient utilization of short stay hospitals. All hospitals with six or more beds reporting an average length of stay of less than 30 days are included in the sampling frame. A multistage probability sampling frame is used to select hospitals from the National Master Facility Inventory and discharge records from each of the hospitals. The sample has ranged from 192,000 to 232,000 discharge records each year from 1970 to the present. The information collected includes demographic, clinical, and financial characteristics of patients discharged from short-stay hospitals. The variables abstracted range from the age, race, sex, and marital status of the person discharged to source of payment, discharge status, diagnosis, and length of stay. Hospital information on bed size and type of ownership is also gathered.

The *National Ambulatory Medical Care Survey (NAMCS)* is a nationwide survey designed to provide information about the provision and utilization of ambulatory health care services. The target universe includes office visits made by ambulatory patients to physicians engaged in office practice. A multistage probability sampling frame is used to select physicians from the master files maintained by the American Medical Association and the American Osteopathic Association. Their records for a sample of office visits during a randomly assigned 1-week period are then examined. Recent samples contain about 70,000 records. Data regarding the age, race, ethnicity, and sex of the patient are gathered along with the reason for the visit, expected source(s) of payment, principal diagnosis, diagnostic services provided, and disposition of visit.

The *National Nursing Home Survey (NNHS)* is a national survey of nursing and related care homes, their residents, their discharges, and their staff, conducted periodically. The data are collected using a two-stage probability design. After facilities are randomly selected, residents and employees of the facility are sampled. Six separate questionnaires were used to gather data in the most recent survey, the most important of which focuses on current and discharged residents. The discharge file contains information on the age, gender, and marital status of the person discharged, along with primary diagnosis at admission, total monthly charges for care, and the number of physician contacts. The staff file includes an occupational code and work experience along with general demographic characteristics.

The *Medical Expenditures Panel Survey (MEPS)* gathers information on health status, access and use of medical services, associated charges, and sources of payment as well as insurance coverage for a sample of patients. Cosponsored by the Agency for Healthcare Research and Quality (AHRQ) and NCHS, MEPS is designed to generate data on the types of health services

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Exhibit 9.3 (continued)

Americans use, the frequency with which they use them, the amount paid for these services, and the source of payment. In addition, MEPS provides information on health insurance coverage.

The *National Long-Term Care Survey (NLTCS)* is a joint effort on the part of Duke University and the Census Bureau to gather national-level data on long term care aspects of the older population. The major portion of the survey has focused on follow-up interviews with persons included in the first NLTCS survey in 1982. The most recent follow-up survey was conducted in 2004. The survey has many components, focusing on issues ranging from household composition (if not living in an institutional setting) to the financial status of informal caregivers. Specific parts focus on activities of daily living, medical condition (e.g., diabetes), the need for special assistance, health insurance, health care costs, medical service providers, and institutionalized living.

The *Current Population Survey (CPS)* is the Census Bureau's initiative for gathering detailed demographic information between decennial censuses particularly as related to the labor force. This monthly survey of households conducted by the Bureau of Census for the Bureau of Labor Statistics provides a comprehensive set of data on the labor force, employment, unemployment, persons not in the labor force, hours of work, earnings, and other demographic and labor force characteristics. Since 1960, the sample size has ranged from 33,500 to 65,500 households. Of particular interest to the health care industry are the data on the extent and type of health insurance coverage for the total U.S. population.

The *National Survey of Family Growth (NSFG)* is a periodic survey conducted to gather information on fertility, family planning, and aspects of maternal and child health that are closely related to childbearing. It is a multistage probability sample of civilian non-institutionalized women aged 15–44. A wide range of information is collected through personal interviews including the age, race, marital status, education, income, and religion of each woman surveyed. Family planning data collected range from age at first contraceptive visit and contractive use to sources of services and services used, including how such services were paid for.

The *Behavioral Risk Factor Surveillance System (BRFSS)*, sponsored by the centers for Disease Control and Prevention was initiated in 1995 to collect information on the health behavior and lifestyles of the US population. Over 150,000 persons respond to the survey annually. Data are collected on such timely items as smoking patterns, alcohol and drug use, seat belt use, and obesity, as well as other factors that might contribute to one's health risk profile. States and localities have the option of sponsoring additional behavioral risk research through expanding the number of surveys conducted in their area or adding questions related to topics of interest to the community.

Exhibit 9.4 The American Community Survey

The American Community Survey (ACS) is an ongoing survey that provides data every year most U.S. communities. The ACS includes 69 questions on topics such as income, household expenses, employment, education, and work commutes. With full implementation in 2005, the sample included three million addresses throughout the U.S. and another 36,000 in Puerto Rico. In 2006, approximately 20,000 group quarters were added to the ACS database. Approximately 250,000 interviews are conducted each month with some 2.5% of the population administered the ACS in any given year.

Unlike the decennial census, the ACS involves continuous measurement of the topics under study. Continuous measurement has long been viewed as a possible alternative method for collecting detailed information on the characteristics of population and housing; however, it was not considered a practical alternative to the decennial census long form until the early 1990s. At that time, demands for current, nationally consistent data from a wide variety of users led federal government policymakers to consider the feasibility of collecting social, economic, and housing data continuously throughout the decade. The benefits of providing current data, along with the anticipated decennial census benefits in cost savings, planning, improved census coverage, and more efficient operations, led the Census Bureau to plan the implementation of what came to be called the American Community Survey (ACS).

The following criteria were considered important for an effective on-going survey:

- Data would be collected continuously by using independent monthly samples.
- Three modes of data collection would be used: mail-out, telephone non-response follow-up, and personal visit non-response follow-up.
- The survey reference date for establishing housing unit occupancy status, and for many characteristics would be the day the data were collected. Certain data items would refer to a longer reference period (for example, “last week,” or “past 12 months”).
- The survey’s estimates would be controlled to intercensal population and housing estimates.
- All estimates would be produced by aggregating data collected in the monthly surveys over a period of time so that they would be reported annually based on the calendar year.

Data generated by the ACS are presented for various levels of census geography. The lowest level is the census tract, although not all tracts are included in the data output. The results of the ACS are published in three temporal versions: 1-year data, combined 3-year data, and combined 5-year data. The more years that are combined the greater the sample size and the more reliable

(continued)

Exhibit 9.4 (continued)

the estimates. The sample is simply not large enough to produce accurate estimates for all geographies in any particular year. For larger geographies, 1 year of data may suffice but more often than not a smaller community or lower level of geography will necessitate the combining of years. Combined data, of course, have the disadvantage of representing different time periods, sometimes combining data separated by 4 years in time.

While the ACS does not have the statistical power of the one-in-six household long form used by the Census Bureau in the past and demographic purists raise some issues with the methodology, the benefit of having continuous data collection outweighs any drawbacks. The most direct way to access data from the American Community Survey is through the "American Factfinder" function on the Census Bureau website accessed at www.census.gov.

9.2.4.1 Population Estimates and Projections

Demographers have long used population estimates and projections in the absence of actual data and a variety of techniques are utilized to generate estimates and projections. Population estimates for states, MSAs, and counties are prepared each year as a joint effort of the Census Bureau and the state agency designated by each state governor under the Federal-State Program for Local Population Estimates (FSCPE). The purpose of the program is to standardize data and procedures so that the best quality estimates can be derived. Most states also generate population estimates and projections that are available through state agencies. However, these figures are often produced at irregular intervals, and thus may be quite dated. The reader is also encouraged to evaluate the quality of these data to the best of his or her ability. For additional information on population projections and estimates (see Smith et al. 2000).

Population estimates and projections generated by government agencies have historically been the only ones available. Today, however, a number of data vendors provide these figures. These vendor-generated data are often made available down to small units of geography (e.g., the census tract) and in greater detail (e.g., sex and age breakdowns) than government-produced figures. They offer the flexibility to generate estimates and projections for "custom" geographies (e.g., a market area) not available for government-generated statistics. The drawback, of course, is that some precision is lost as one develops calculations for lower levels of geography and for population components. However, the ease of accessibility and timeliness of these vendor-generated figures have made them a mainstay of health planners and researchers.

Issues have been raised concerning the quality of the synthetic data produced by both government agencies and commercial data vendors. Data users typically need the latest information possible, and in an effort to be expedient the question of quality sometimes has become a secondary concern. Any evaluation of the quality of synthetic data requires an understanding of the recency and quality of the historical data being used as a basis for the estimates and projections. Furthermore, attention must be paid to the methods and assumptions utilized to generate the figures. If, for example, one assumes that population growth in an area is gradual and can be described by a simple mathematical function, population estimates and projections will be reasonably accurate as long as the assumptions hold. However, to the extent that an assumption is wrong, the (incorrect) mathematical function will yield inaccurate estimates and projections. While it is not possible to be aware of all the nuances of data quality and method, users are urged to evaluate underlying assumptions critically and to ascertain the accuracy of the synthetic data that are available.

9.2.4.2 Health Services Estimates and Projections

A major category of synthetic data involves estimates and projections of health services demand. Since there are few sources of actual data on the use of health services and projections of future demand are often required, a variety of approaches have been developed for synthetically generating demand estimates and projections. The general approach involves applying known utilization rates (a proxy for demand rates) to a current or projected population figure. To the extent possible, these figures are adjusted for, at a minimum, the age and sex composition of the target population. Utilization rates generated by the National Center for Health Statistics are the basis for most such calculations, and the demographic data used may be obtained from a variety of different sources.

Commercial data vendors have led the way in the development of demand estimates and projections. Some vendors have developed calculations for the full range of inpatient and outpatient services, although these are often available only to established customers. Other vendors may provide selected data on, for example, the demand for services in a particular “service line”.

Demand estimates and projections have become essential for virtually any planning, marketing, or business development activity in healthcare, and there has been growing pressure for the generation of increasingly detailed figures. However, there are at least three major concerns related to the use of such data. First, the estimates and projections are typically based on historical utilization rates at a time when patterns of utilization are changing dramatically. Second, the results of such calculations are likely to vary widely depending on the source of demographic data (particularly in years distant from the most recent census). Third, estimates and projections become increasingly tenuous as the size of the geography becomes smaller. While certain demand rates may be fairly dependable down to the county level, they tend to become unstable when subcounty units such as ZIP Codes and census tracts are considered. A final consideration is the fact that the practice patterns of physicians vary widely from community to community, making demand estimates and projections for a particular geography suspect if national or even regional rates are applied. Given these caveats, any synthetically generated health services demand estimates and projections should be used with caution.

9.2.4.3 Occupational Projections

The Bureau of Labor Statistics (within the US Department of Labor) maintains data on all occupational categories within the economy, including healthcare occupations. As part of the Bureau's responsibilities, it produces projections on the size of various occupational categories in the United States for 10–15 years into the future. Six models are used to generate projections, each containing a number of variables reflecting different scenarios related to changes in the total labor force, the aggregate economy, industry demand, and industry employment, among other factors. Three sets of employment projections are generated based upon differing sets of assumptions. Of interest here are the various categories of clinical occupations (e.g., physicians, dentists) and nonclinical healthcare occupations (e.g., insurance claims managers, medical records personnel). In recent years, health-related occupations have been prominent among the occupations with the greatest projected growth. Exhibit 9.5 presents projections for the growth of selected health professions. For additional information see www.bls.gov.

Projections for various occupational categories are available from the Department of Labor through regularly published reports. The percentage distribution for the labor force (matrix coefficients) can also be obtained and these are sometimes used by other organizations to produce subnational occupational projections. See Exhibit 9.5 for an example of occupational projections.

Perhaps more directly related to healthcare are occupational data form the Bureau of Health Professions, BHP (within the Department of Health and Human Services).

Exhibit 9.5 Fastest Growing Healthcare Occupations Between 2008 and 2018 (Projected)

Occupation	Rank[a]	Increase (%)
Biomedical engineers	1	72
Home health aides	3	50
Personal and home care aides	4	46
Medical scientists	6	40
Physician assistant	7	39
Skin care specialists	8	38
Physical therapist aides	11	37
Dental hygienists	12	36
Dental assistants	14	35
Medical assistants	16	34
Physical therapist assistants	17	33
Occupational therapist aides	21	31
Pharmacy technicians	23	31

Source: Lacey and Wright (2009)

[a] Ranking among all occupations listed

The BHP is the federal agency responsible for monitoring the supply of certain categories of health professionals across the nation. The Bureau provides information on the training, distribution, utilization, and quality of personnel staffing the U.S. health delivery system. The Bureau also provides technical assistance to states, educational institutions, professional association, and other federal agencies concerning health personnel information and analysis. (Additional information on health professions can be obtained by accessing the BHP website at www.bhpr.hrsa.gov).

9.3 Sources of Data for Health Demography

There are numerous sources of data for health demography available today and the number of sources continues to grow. The sections below group these sources into four main categories: government agencies, professional associations, private organizations, and commercial data vendors.

It should be noted that the "products" available from these sources fall into two categories: (1) reports that summarize the data and (2) the actual data sets themselves. Historically, data access was essentially limited to summary tables provided by the organization, agency or vendor. Today, however, there is a trend toward providing the entire data set for use by health planners and other health data users. In reviewing the sources that follow, this distinction in format should be kept in mind. Exhibit 9.6 specifies sources of specific categories of data.

9.3.1 Government Agencies

Governments at all levels are involved in the generation, compilation, manipulation and/or dissemination of health-related data. The federal government, through the decennial census and related activities, is the world's largest processor of demographic data. Other federal agencies are major managers of data for the related topics of fertility, morbidity, mortality and migration statistics.

The federal government is a major generator of health-related databases. Through the National Center for Health Statistics, the Centers for Disease Control and Prevention, the National Institutes for Health, and other organizations, a large share of the nation's health data is generated. The Bureau of Health Resources (Department of Health and Human Services) maintains a master file of much of the health data compiled by the federal government entitled the *Area Resource File* (ARF). Other federal sources outside of health-related agencies, such as the Bureau of Labor Statistics (e.g., health occupations) and the Department of Agriculture (e.g., nutritional data), create databases of supporting data. The number and variety of databases generated by federal agencies is impressive, but the variety of agencies involves means that databases vary in coverage, content, format, cost, frequency and accessibility.

The National Center for Health Statistics annually publishes a useful compendium of health-related data entitled *Health, United States*. This publication includes data

Exhibit 9.6 Selected Sources of Health-Related Data

Information category	Source
Population data	
Size	ACS, Census, CPS, Vendors
Characteristics	ACS, Census, CPS, Vendors
Estimates and projections	Census, CPS, Vendors
Vital statistics	
Births	NCHS
Deaths	NCHS
Marriages	NCHS
Divorces	NCHS
Legal induced abortion	NCHS
Fertility	NCHS
Mortality	
Migration data	
Internal migration	ACS, Census, CPS, IRS
Immigration	ICE
Morbidity data	
Disease surveillance	CDC
Incidence/prevalence	NCHS
Health status	NCHS
Health risks	NCHS, BRFSS
Health personnel	
Physicians	AMA, AHA, HRSA, BLS, Census
Nurses	HRSA, AHA, BLS, Census
Dentists	HRSA, BLS, Census
Other	HRSA, AMA, BLS, Census
Health facilities	
Hospitals	NCHS, AHA
Nursing homes	NCHS
Mental health	NIMH

Legend: *ACS* American Community Survey, *AHA* American Hospital Association, *AMA* American Medical Association, *BLS* Bureau of Labor Statistics, *BRFSS* Behavioral Risk Factor Surveillance System, *CDC* Centers for Disease Control and Prevention, *CPS* Current Population Survey, *HRSA* Health Resources and Services Administration, *ICE* Immigration and Customs Enforcement, *IRS* Internal Revenue Service, *NCHS* National Center for Health Statistics, *NIMH* National Institute of Mental Health
Census: Decennial census

gleaned from NCHS as well as a variety of other federal agencies on health status, health behavior, health services utilization, healthcare resources, healthcare expenditures, and insurance coverage among other topics. The information provided in *Health, United States* is primarily at the national level, although some data at the state and regional level are provided. Additional information can be obtained from this document at www.cdc.gov/nchs/data/hus/hus10.pdf.

State and local governments are also major sources of health-related data. State governments generate a certain amount of demographic data, with each state having a state data center for demographic projections. Vital statistics data can often be obtained in the most timely fashion at the state level, in fact. States vary, however, in the types and quality of data they generate. University data centers may also be involved in the processing of demographic data. Local governments may generate demographic data for use in various planning functions. City and county governments may produce population projections, while county health departments are responsible for the collection and dissemination of vital statistics data.

9.3.2 Professional Associations

Industry associations represent another source of health-related data. Chief among these are the American Medical Association (and related medical specialty organizations) and the American Hospital Association. There are also other organizations of personnel (e.g., American Dental Association) and facilities (e.g., National Association for Home Care) that maintain databases on their members and on activities related to the organization's membership. These databases are typically developed for internal use, but are increasingly being made available to the outside parties.

A number of organizations have been formed in recent years that focus specifically on health data, while others have established formal sections that deal with health data within their broader context. The National Association of Health Data Organizations (NAHDO), for example, brings together disparate parties from the public and private sector that have an interest in health data. The National Association of County and City Health Officers (NACCHO) has become very active in terms of access to health data for local planning purposes. The Health Information and Management Systems Society (HIMSS) is one of the largest organizations that is addressing this issue as a collateral consideration to data management systems issues.

In recent years, many professional associations have made an increasing amount of information on their members available to the research and business communities. Not only do such organizations have an interest in exchanging information with related groups, but they also have recognized the revenue generation potential of such databases. Some of the databases provide by professional associations include only basic information, while others offer a wealth of detail.

9.3.3 Private Organizations

Many private organizations (mostly not-for-profit) collect and/or disseminate health-related data. Voluntary health care associations often compile, repackage and/or disseminate such data. The American Cancer Society, for example, distributes morbidity and mortality data as it relates to its areas of interest. Some organizations, like Planned Parenthood, may commission special studies on fertility or related issues and subsequently publish this information.

Many organizations repackage data collected elsewhere (e.g., from the Census Bureau or the National Center for Health Statistics) and present it within a specialized context. The Population Reference Bureau, a private not-for-profit organization, distributes population statistics in various forms, for example. Some, like the American Association of Retired Persons (AARP), not only compile and disseminate secondary data but are actively involved in primary data collection, as well as the sponsorship of numerous studies that include some form of data collection.

9.3.4 Commercial Data Vendors

Commercial data vendors represent a fourth category of sources of health-related databases. These organizations have emerged to fill perceived gaps in the availability of various categories of health data. These include commercial data vendors that establish and maintain their own proprietary databases, as well as those that reprocess and/or repackage existing data. For example, there are vendors that maintain databases on nursing homes, urgent care centers, or other types of facilities and makes this information available in a variety of forms. Major data vendors (e.g., ESRI Business Information, Claritas) that do not necessarily create health-related databases may incorporate health-specific databases into their business database systems. Some data conduct major nationwide health consumer surveys.

9.4 Future Directions

The success of the demographic enterprise depends on the availability of accurate, timely and detailed data, and this is particularly true for in the health demography arena. Fortunately, the sources of both demographic data and health-related data have become more plentiful and more accessible over time. Various federal agencies post data in various forms on the Internet and make information available in a variety of forms (usually electronic today and few print reports are any longer generated).

While changes the use of the American Community Survey for the collection of data originally collected through the decennial census relies on a smaller sample of the population than the one-in-six-household long form from the census, the more frequent data collection improves the timeliness if not the accuracy of the data. It is anticipated that the Census Bureau will take advantage of non-census sources of data in the future, accessing data from other federal agencies (e.g., Social Security, Medicare files) and interfacing with non-government databases. It is also anticipated that use of sophisticated modeling techniques will become more common in an effort to close gaps resulting from traditional data collection techniques.

The acquisition of accurate, timely and detailed health data will continue to be a challenge. While health data exchanges and regional e-health initiatives are being pursued across the country, issues surrounding data confidentiality will continue to hamper efforts at broad-based access to patient data. Various federal initiatives encourage more data sharing in healthcare, and over time better access to data is anticipated. Here, too, data modeling will be increasingly important since the most common types of health data related to ambulatory care are never going to be compiled in any but very complete data sets. Persistent gaps in key data elements will require greater emphasis on modeling techniques for the generation of health-relate data.

Geographic information systems are expected to find an increasing range of applications in health demography. Surprisingly, the healthcare field has been slow to adopt the use of GIS and its potential for spatial analysis. Particularly in the face of the provisions of the Patient Protection and Affordable Care Act of 2010 expanded capabilities with regard to the distributional analysis of health-related phenomena can be anticipated.

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Additional Resources

Bureau of Labor Statistics (Department of Labor) website: www.bls.gov.

Census Bureau (Department of Commerce) website: www.census.gov.

Centers for Disease Control and Prevention (Department of Health and Human Services) website: www.cdc.gov.

ESRI website: www.esri.gov (for GIS applications to health demography).

Health Resources and Services Administration (Department of Health and Human Services) website: www.hrsa.dhhs.gov.

Immigration and Customs Enforcement (Department of Justice) website: www.ice.gov.

National Center for Health Statistics (Department of Health and Human Services) website: www.cdc.gov/nchs.

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Chapter 10
The Demographic Correlates of Health Status

10.1 Introduction

As an applied treatise on demography and healthcare, this volume is particularly concerned with the demographic correlates of health status and health behavior. The study of health status focuses on the implications of demographic characteristics for the level and nature of morbidity within a population. The study of health behavior focuses on the extent to which demographic characteristics influence the actions of individuals and groups with regard to a range of health-related behaviors. This chapter and the next should provide the means whereby an analyst, knowing something about demographic conditions and prospects for demographic change, can make assumptions concerning the health status and health behavior of a particular population. This chapter focuses on the demographic correlates of health status, while Chap. 11 addresses the implications of demographic attributes for health behavior.

Decades of research have led to a better understanding of the demographic correlates of health status, and much of the "conventional wisdom" have been challenged. Despite this growing body of research, caution should be exercised in interpreting relationships between demographic variables and health status described below. The interplay of the numerous factors that influence health status is obviously complex, and studies that have simply explored the direct effects of a particular demographic variable on health status without controlling for the influence of other factors can generate misleading results. Quite often, when additional variables are controlled for, the impact of the original variable is reduced, eliminated, or otherwise modified.

An example of this phenomenon is the strong relationship that has been repeatedly found between race and health status. Virtually every indicator of health status is found to be more favorable for whites than for blacks, suggesting a direct correlation between race and health status (National Center for Health Statistics 2011). However, when other variables like income are taken into consideration, the relationship between race and health status is substantially reduced (Williams et al. 2010).

L.G. Pol and R.K. Thomas, *The Demography of Health and Healthcare*,
The Springer Series on Demographic Methods and Population Analysis 13,
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Every effort has been made in the sections that follow to identify variables that might affect the relationship under study. Since this cannot be done in every case and some relationships have not yet been explored, the research results reported here should be interpreted with caution.

10.2 Measures of Health Status

One of the major challenges in healthcare has been the development of an acceptable measure of health status. Attempts to develop a single indicator of health status have not been very successful, and specific measures continue to be utilized as indicators. Recent efforts toward developing a single indicator incorporating measures of mortality and morbidity that reflect health life-years have been more successful (Hyder et al. 1998), but no widely accepted overall indicated has emerged. Some examples of health status indicators are described below. Exhibit 10.1 addresses the development of health status indices.

10.2.1 Global Indicators

Indicators of health status that address the overall health condition for individuals or populations are referred to as "global indicators." The most direct – and the most subjective – approach to measuring health status involves self-assessments by survey respondents. With global indicators, survey respondents are typically asked to rate their health status on some type of scale. Although some scales may be relatively complex, the most common response categories are "poor," "fair," "good," "very good," and "excellent." Once such ratings have been obtained from a number of respondents, assessments of the health status of a population can be performed.

While self-reported ratings of health status are attractive in their simplicity, critics contend that they are too subjective. Indeed, the discussion in Chap. 2 of what constitutes health and illness clearly points to the dangers of this approach. One respondent's ill-health may be another's normal state, and it is difficult to control for these variations in perception. Recent research has found, in fact, that African American respondents and white respondents use a different framework for their self-evaluation, thereby limiting the value of comparative data (Brandon and Proctor 2010).

A reasonable correlation has been found between self-reported ratings of health status and more objectively derived indicators of health status. When self-assessments are correlated with responses to a symptom checklist, for example, a relatively strong correlation is evidenced (Proctor et al. 1998). That is, respondents with a large number of symptoms (either self-reported or observed) tend to rate their health status lower than those with few identified symptoms. Self-reported health status has even been shown to be a strong predictor of subsequent mortality (Moesgaard-Iburg et al. 2002). The landmark analysis by Rogers et al. (2000) found a high correlation between self-assessed health status and mortality rates (Table 10.1).

Table 10.1 Selected chronic conditions by type, sex, and age, 1985

Chronic conditions[a]

	Heart	Chronic hypertension	Bronchitis	Arthritis	Diabetes
Age					
Under 18	21.2	2.3[b]	55.5	2.2[b]	1.9[b]
18–44	40.4	64.1	40.5	52.1	9.1
45–64	129.0	258.9	54.3	268.5	51.9
65–74	276.8	426.8	67.0	459.3	108.9
75 and over	349.1	394.6	55.9	494.7	95.5
Sex					
Female	86.4	134.8	60.3	164.9	28.3
Male	78.5	114.8	38.3	89.7	24.0

Source: U.S. Bureau of the Census 1988. Statistical Abstract of the United States, 1988. Washington, DC: U.S. Government Printing Office, Table 172.

[a] Expressed as rates per 1,000 population

[b] Estimate does not meet standards of reliability or precision

Various community surveys have utilized global indicators as a means of obtaining a measure of health status based on self-reports. The major government study to take this approach is the National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics. The Center's 2009 study found that most respondents rated their health as "very good" or "excellent." However, 9.4% rated it as "poor" or "fair" (National Center for Health Statistics 2011) and significant differences were found based on demographic characteristics (discussed below).

10.2.2 *Specific Measures*

The level of sickness and/or disability characterizing a particular population (its morbidity level) is considered to be a reasonable approximation of health status for that population. Rather than rely on the perceptions of individuals, specific, objective indicators of health status are utilized (although some level of subjectively cannot be totally eliminated). Specific indicators of health status may be compiled for individuals or populations, although in the former case demographers will combine individual results into an aggregate figure.

Morbidity levels for individuals can be measured both subjectively and objectively. Given the subjective nature of many health conditions, a qualitative assessment of the health status of an individual or population may be made (including asking the individual to assess their own status through self-reports). A more objective assessment may involve the use of a quantitative assessment tool (e.g., a health risk assessment) or an actual clinical examination (Table 10.2).

As noted in Chap. 8, morbidity refers to the level of sickness and/or disability within the population. Measures of morbidity are certainly important, especially in a society where chronic conditions predominate, but they are particularly difficult to operationalize. Since there is no overall indicator of morbidity for individuals or populations, a variety of specific morbidity measures are utilized.

Table 10.2 Incidence of selected acute conditions by type and selected characteristics 1985

Acute conditions[a]				
	Infective and parasitic	Upper respiratory	Digestive	Injuries
Age				
Under 5	50.5	95.0	8.9	30.0
5–17	39.0	59.9	9.9	34.3
18–24	17.7	40.7	9.9	35.1
25–44	17.2	32.0	5.1	29.2
45–64	6.0	25.5	5.5	17.2
65 and over	5.1	20.6	5.4	18.5
Sex				
Female	22.6	44.2	7.8	23.9
Male	18.2	36.9	6.1	31.1
Race				
Black	14.9	38.5	9.7	23.8
White	21.7	41.2	6.6	27.8

Source: U.S. Bureau of the Census 1988, Statistical Abstract of the United States, 1988. Washington, DC: U.S. Government Printing Office, Table 171.
[a]Expressed as rates per 1,000 population

Much of what we know about the health status of the population is generated through sample surveys. Federal health agencies are the major collection point for data of this type. These data collection efforts allow for the identification of cases for a wide variety of conditions and the monitoring of the level of these conditions over time. Some of these data are drawn from institutional records (e.g., hospital records, clinic files) and estimates of health status are based on "known cases". Other efforts collect data directly from individuals through community surveys. These survey activities are thought to generate a more accurate picture of the health status of a particular population.

The use of symptom checklists in sample surveys is another approach to the development of morbidity indicators. A list of symptoms that has been statistically validated is utilized to collect data for the calculation of a morbidity index. These checklist items are used to derive health status measures for both physical and mental illness (Sacker et al. 2003). Usually there are 15 or 20 symptoms, since it is difficult to retain respondents' attention for much longer than that. While the symptoms are sometimes examined individually, the main use is in the calculation of an index. Typically, the number of symptoms is simply summed and this becomes the index score for that individual.

A primary rationale for the utilization of symptom checklists is the fact that much of the population is free of clinically identifiable disorders but is likely to have some, albeit minor, manifestations of ill health. Virtually everyone has vaguely defined symptoms of some type at various times, or clearly identifiable ones that cannot be linked to a particular clinical condition. It is further argued, with regard to both physical and mental conditions, that these "everyday" symptoms are

Table 10.3 Age-adjusted death rates for selected causes by sex and race[a] 1986

Race/sex categories	White males	White females	Black males	Black females
All causes	679.8	387.7	1,026.9	588.2
Diseases of heart	234.8	119.0	294.3	185.1
Cerebrovascular diseases	31.1	27.1	58.9	47.6
Malignant neoplasms	158.8	110.1	229.0	132.1
Respiratory system	58.0	23.1	83.9	23.3
Colorectal	17.2	12.0	19.3	15.2
Prostate	13.8	23.0	30.3	25.8
Chronic obstructive pulmonary disease	28.1	13.3	24.6	8.9
Pneumonia and influenza	17.5	9.9	27.2	13.1
Chronic liver disease and cirrhosis	12.2	5.4	20.8	9.3
Diabetes mettitus	9.1	8.1	17.9	21.4
Accidents and adverse effects	51.1	18.4	66.9	21.0
Motor vehicle accidents	28.7	11.9	29.2	8.5
Suicide	20.5	5.4	11.5	2.4
Homicide and legal intervention	8.4	2.9	55.9	11.8

Source: Department of Health and Human Services (1987). Vital Statistics of the United States, 1960–86. (Vol. II). Washington: U.S. Government Printing Office.

[a] Expressed as rates per 100,000 population

more significant measures of health status than are the comparatively rare clinical conditions. Symptom checklists are also attractive because of their objective nature and generally agreed-upon definitions. Virtually everyone is going to agree as to what constitutes an "occasional cough" or "occasional dizzy spells," but clinical diagnoses are often misunderstood by patients or obscured by the terminological complexity of the health care setting (Table 10.3).

Symptom checklists usually are based on answers directly obtained from survey respondents. Respondents either complete a questionnaire that contains the checklist or provide responses to an interviewer who records them. In some rare cases, the checklist will include signs as well as symptoms, and clinical personnel will be involved in the data collection process to obtain test results. This approach is occasionally utilized, for example, in studies of psychiatric morbidity, in which case the clinician will typically administer various psychiatric tests. The index calculated in this manner generally reflects a combination of symptoms reported by the respondent and signs observed by the clinician. The morbidity profiles of the individuals within a population can be combined to create a cumulative profile for the population. This allows for the development of an overall morbidity rate for that population (often presented in terms of an incidence or prevalence rate).

Another measure of health status is the amount of disability found within a population. Even more so than other aspects of morbidity, disability is difficult to operationalize. While it would appear simple to enumerate the blind, deaf, or otherwise handicapped, the situation is actually quite complex. A wide variety of other conditions that are not so clear-cut cloud the picture. Does lower back pain that interferes with work constitute a disability? When does an arthritic condition become disabling? How is mental retardation classified, and at what point? Even those disabilities that appear obvious defy easy categorization due to the subjective dimension of disability. There are many hearing impaired individuals, for example, that would take exception to being classified as disabled.

This definitional problem is partly resolved by the utilization of more objective and easily measured indicators as proxies for disability. One category of indicators focuses on "activities of daily living" (ADL). ADLs constitute a series of indicators related to the ability of individuals to care for themselves, solely or with assistance. Thus, the respondent is asked to what extent he can feed himself, dress himself, and go to the bathroom unassisted. Other indicators may address mobility, as in the ability to climb stairs, walk a certain distance without discomfort, and so forth. ADLs offer a fairly effective means of getting at the overall disability status of individuals by combining their responses into a score that indicates the individual's relative level of disability.

Disability as a measure of morbidity is particularly difficult to operational since what is considered a handicap can be highly subjective. As noted in Chap. 8 it is often necessary to use proxy measures of disability within the population. These most often take the form of "restriction" indicators. Thus, the number of work-loss days, bed-restricted days and level of activity limitation are often used rather than the proportion of individuals within the population with some type of handicap.

Much of what we know about health status is based on data drawn from various registries. For example, the Center for Disease Control and Prevention (CDC) maintains a variety of registries that track certain types of health problems. One long-standing registry track reportable (or notifiable) conditions, conditions that must by law be reported to health authorities. While notifiable conditions are important due to the potential for contagion associated with them, they are less useful today as health status indicators. It is important that public health officials are aware of the incidence and distribution of gonorrhea, hepatitis, Lyme disease, and pertussis, these are not conditions that have major implications for the health status of the population. (See Chap. 8 for more information on notifiable diseases.)

The health status measure of longest standing is mortality. This is considered the ultimate outcome measure in that death could be interpreted as a failure of the healthcare system. Its pervasive use, however, is probably more a function of its ready availability and its ease of interpretation than of its current relevance as a health status indicator. At the same time, the crude mortality rate is perhaps the least refined of the various measures of health status, unless it is adjusted to account for inter-population variations in demographic, socioeconomic, and healthcare utilization characteristics. The fact that the measure uses the total population as its denominator masks a great deal of subgroup differences. (See Chap. 6 for a fuller discussion of mortality rates.)

There are two major drawbacks to the use of mortality measures as proxies for health status today. First, in modern industrial societies so few people die that the calculation of mortality rates is not very meaningful. Second, with chronic disease predominating, the conditions from which people are dying does not provide a true reflection of the conditions that affect individuals within a population. Few people die as a direct result of a chronic disease, so the official cause of death

Table 10.4 Limitations of activities due to chronic conditions for selected demographic characteristics 1983 and 1987

Total with limitation of activity[a]

Characteristics	1983	1987
Total	13.8	12.9
Age		
Under 15 years	4.8	4.7
Under 5 years	2.1	2.1
5–14 years	6.2	6.2
15–44 years	8.5	8.1
45–64 years	24.3	22.3
65 years and over	40.2	37.5
65–74 years	37.6	34.7
75 years and over	44.4	41.9
Sex		
Male	13.9	12.9
Female	13.6	12.8
Race		
White	13.4	12.7
Black	17.5	16.0
Family income		
Less than $10,000	23.0	23.9
$10,000–$14,999	16.6	17.4
$15,000–$19,999	14.4	13.9
$20,000–$34,999	11.0	11.2
$35,000 or more	9.4	8.9

Source: Based on the National Health Interview Survey. Published in Department of Health and Human Services, Health, United States, 1989. Washington: U.S. Government Printing Office

[a] Figures expressed as a percentage

is likely to reflect some complication or consequence of one or more chronic conditions. Thus, the importance of chronic disease is likely to be minimized if mortality data are relied upon (Table 10.4).

A subsidiary issue here involves cause-specific mortality rates. As discussed in Chap. 6, some refinement can be introduced into mortality rates by calculating rates based on the specific cause of death. An overall mortality rate of 10 deaths per 1,000 residents really is an aggregate figure that combines the death rates for a wide variety of causes. Thus, the rate of 10 may be the end result of three persons per 1,000 dying from heart disease, two from cancer, and two from stroke. The remainder of the 10/1,000 rate reflects the aggregate mortality induced by hundreds of other causes of death. The emphasis on specific causes of death reflects the notion that some causes of death may be more important than others when it comes to health status. The use of cause-specific data makes comparisons between populations more meaningful.

One other frequently utilized mortality indicator is the infant mortality rate. Although this measure only applies to a limited segment of the population (i.e., those under 1 year of age), it is considered by many as more useful than the overall mortality rate. The premise is that the infant mortality rate is much more than an outcome measure for the healthcare system. Rather, the level of infant mortality is a function of environmental safety, diet, prenatal care, the educational and economic status of the parents, the age of the mother, the occurrence of neglect and abuse, and a number of other factors. Thus, infant mortality is seen as a proxy for a number of other indicators of health and well-being. As with the overall mortality rate, however, infant deaths occur rarely enough that measures of infant mortality have less salience as indicators of a population's health than they did historically. (See Chap. 6 for a more detailed discussion of mortality indicators.) Exhibit 10.1 describes efforts to develop a index.

Exhibit 10.1 Health Status Index

One of the more elusive measures in healthcare has been the health status index. Beginning with the social indicators movement of the 1960s, there has been periodic interest expressed in the development of an index that could be used to indicate the health status of a population or a population or community in either absolute or relative terms.

A health status index is a single figure that represents the health status of a defined population. It involves an attempt to quantify health status in objective and measurable terms. A health status index is constructed by combining a number of individual health status indicators into a single index. It can subsequently be used to compare the different populations in terms of their health and used as a basis for setting priorities and evaluating the appropriateness of proposed programs. It can also serve as a basis for allocating resources and as a tool for evaluating the effectiveness of existing programs.

A variety of indicators can serve as inputs in the creation of a health status index. It is common to include demographic characteristics such as racial composition, dependency ratios or educational attainment, as examples, as components of a health status index. These may be referred to as "proxy" measures of health status, in that they are not direct indicators of health conditions but can be assumed to indirectly indicate the level of health within a population.

In addition to this type of measure, the major categories of health status indicators considered for inclusion are morbidity indicators, outcome indicators, utilization indicators, and functional status indicators. Morbidity measures are obvious indicators of health status since they reflect the incidence and/or prevalence of various medical conditions. Thus, the extent to which a population is affected by various acute and chronic conditions constitutes an important component of any health status index.

Outcome measures reflect the extent to which the healthcare system is effective. Outcome measures include such indicators as death rates, infant death

(continued)

Exhibit 10.1 (continued)

rates, life expectancy, and potential years of life lost. Of these measures, the infant mortality rate is probably the most useful as a component of a health status index, since it represents far more than just the rate at which infant deaths occur; it speaks volumes about living conditions, nutritional levels, domestic violence, and a number of other dimensions of socioeconomic and health status.

Utilization measures may be used as components of a health status index. These could include indicators such as the hospital admission rate, the level of emergency room uses, the physician visit rate, and so forth. These measures tend to be among the more controversial since it could be argued alternately that these are positive or negative indicators.

Resource availability represents another important set of indicators. This category includes the ratio of hospital beds to the population, the ratio of physicians to the population, and other measures of resource availability. The rationale for the use of these indicators is that the level of resource availability should be correlated with higher health status. Although this too is controversial, such indicators are frequently employed in index construction.

Measures of disability constitute an additional category of health status indicators. These include a range of measures such as days of work lost, days of school lost, bed-restricted days, activity-restricted days, and so forth. The use of these measures reflects the notion that individuals who are limited in their functional abilities are a reflection of poor health status (regardless of the source of the limitation).

Once the indicators have been chosen, values must be assigned to each indicator. A number of different methodologies can be used for this process with the intent to come as close to scientific rigor and face validity as possible. Assuming that all indicators are to be equally weighted, one approach might be to score each indicator on a scale of 1–5, with 1 being the most negative and 5 the most positive. The scores for each indicator would be summed and then divided by the number of indicators to provide an average score for each geographic unit somewhere 1 and 5. The scores for each indicator could be summed and then divided by the number of indicators to provide an average score for each geographic unit. It should be noted that the absolute number generated through the process means little; its value is derived from the ability to compare it with other figures. This index number could be used, for example, to compare one community to another or track the health status of a particular community over time.

Current methodologies for constructing health status indices are certainly not without their critics. There are numerous conceptual, methodological, and practical issues that must be addressed in the development of a health status index. Nevertheless, the need to better understand the health characteristics of our communities – now bolstered by more rigorous reporting requirement for not-for-profit hospitals under healthcare reform – mandate continued efforts toward the development of defensible health status indices.

10.3 Demographic Correlates of Health Status

10.3.1 Introduction

Health conditions are not equally or even randomly distributed within a population but are their distribution is correlated with the demographic characteristics of that population. Compositional variables such as age, sex, and racial/ethnic classification allow demographers to infer a great deal about a population's health characteristics. There is increasing interest today in the persistence of disparities that exist between various subgroups within the U.S. population. This chapter expands the discussion from Chap. 4 in which compositional variables were introduced to describe and explain differentials in fertility, mortality and morbidity.

10.3.2 Biosocial Characteristics

10.3.2.1 Age

There has been long-standing acceptance of the notion that health status is linked closely with age. Conventional wisdom suggests that as a person ages, the more numerous and more serious health problems become. While there is some truth to this assertion, research conducted in recent years indicates that the situation is much more complex than had been previously thought. Patterns of morbidity, disability, and even mortality display complicated relationships with the age structure of the population.

As one would expect, positive assessment declines as people age. While about 74% of those aged 15–44 describe their health as excellent or very good, only 33% of those 75 and over feel the same way. On the other hand, these data might be regarded as somewhat surprising because over one-third of all persons 65 and over assess their health as excellent or very good.

Interestingly, the relationship between age and health problems is not clear cut. While conventional wisdom has held that the number of health problems increase as the population ages, this is a somewhat misleading notion. Although it is true that the prevalence of *chronic* conditions does in fact increase with age, and there appears to be a clear cumulative effect, the incidence of *acute* conditions actually declines with age. Thus, while the younger age cohorts are characterized by high rates of respiratory conditions, injuries, and other acute conditions, the elderly are relatively free of these. Instead, they are faced with a growing number of chronic conditions such as hypertension, arthritis, and heart problems. It has been suggested that the actual average *number* of conditions does not differ much from the youngest age cohorts to the oldest. The differential is primarily in the types of conditions common to the various age cohorts.

Not surprisingly, there is a clear correlation between age and the level of disability characterizing a population. The proportion of the population experiencing some level of activity limitation increases steadily with age, and the oldest age cohorts are characterized by limited-activity days several times as numerous as those for younger age cohorts. For example, 6% of the 15–44 age cohort in 2010 reported *some* limitation of activity. The comparable figure for the 65–74 age group is over 26% (National Center for Health Statistics 2011).

There is a well-documented relationship between the prevalence of mental illness and age, although the nature of the relationship has undergone substantial modification in recent years. Until the 1970s, it was believed that aging had a cumulative effect on mental health just as it did on physical health (U.S. Department of Health and Human Services 1999a, b), with the prevalence of mental illness thought to increase with advancing age. However, many observers argued that this pattern reflected selectivity in terms of the mental disorders measured, use of statistics on institutionalized patients, and the tendency to attribute many symptoms of old age to mental illness.

A more contemporary depiction suggests a non-monotonic and much more irregular relationship, primarily reflecting a rethinking of the conditions classified as mental disorders. The inclusion of alcoholism, drug abuse, and suicide under the heading of mental illness has created a “bulge” in the 15–25 age cohort. At the same time, attributing many symptoms of aging to Alzheimer’s disease has reduced the perceived prevalence of mental illness among the elderly. Further, the advent of adolescent treatment centers has meant that many more adolescents are being defined as mentally disturbed than in the past (Maughan et al. 2005).

The most well-established relationship has been the association between age and mortality. Overall, there is a direct and positive relationship between age and mortality in contemporary U.S. society. The 2007 age-specific mortality rate of 15/100,000 for those aged 5–14, the cohort with the lowest rate, increases gradually up through age 50. After age 50, the increase in the mortality rate is dramatic. The rate of 15 increases to 421/100,000 for the 45–54 age group and 5012/100,000 for the 75–84 age group. This same age-related pattern holds for all race-sex categories (National Center for Health Statistics 2010b).

Not only does each age cohort carry its particular risk of death, but the causes of death vary widely among the age cohorts. For example, the leading causes of death for infants (under 1 year) are birth defects, respiratory conditions, and infectious diseases. The leading causes for young adults are accidents and suicide; for young adult African Americans homicide is added to the list. The elderly are more likely to fall victim of the major killers: heart disease, cancer and stroke. Ultimately, each age cohort has its own peculiar cause-of-death configuration.

Because of the aging of the U.S. population, increasing attention must be paid to the relationship between age and health status. The growing number of elderly residents will result in an increasing number of cases of life-threatening conditions. At the same time, an aging population brings with it a growing number of persons with chronic conditions that must be “managed” in order to enhance the quality of life for those persons. These trends obviously have significant implications for health resource utilization, and this will be discussed in Chap. 11.

10.3.2.2 Sex

One of the most perplexing but important correlations discussed in this context is that between sex and health status. There is perhaps no other demographic variable for which differentials in health status are so clear-cut. Yet, at the same time, there is probably none for which more questions are raised concerning the validity of the findings and the possible explanations for the apparent relationship.

Any discussion of the relationship between sex and health status must begin with what has become a maxim: Women are characterized by higher levels of morbidity than men, but men have a much higher mortality rate. Although this is a somewhat simplistic summary of a complex situation, there is a great deal of evidence to suggest that, by any measure of morbidity one would care to use, women are “sicker.” On the other hand, there is no doubt that mortality rates are higher and life expectancy is considerably lower for males (Rogers et al. 2000).

When global measures are utilized, females tend to characterize themselves as being in slightly poorer health than males (National Center for Health Statistics 2011). The difference in perceived health status is narrow (males are slightly more positive), and much of the variance is probably explained by the older age structure of the female population. On more specific measures, however, females tend to score much higher (i.e., they report more symptoms). For reported conditions and diagnoses, females are characterized by higher incidence rates. While females report an even higher level of chronic conditions than acute conditions, these tend to be conditions that are not life-threatening. Although males are sick less often and report fewer symptoms, when men do become ill the condition is likely to be more serious or even fatal.

Comparable proportions of males and females are characterized by some level of activity limitation. Females, however, accumulate on the average more work-loss days, more school-loss days, and more bed-restricted days (National Center for Health Statistics 2011).

Males, while scoring “better” on the indicators of morbidity discussed above, are at greater risk of mortality. In effect, the age-adjusted mortality rate for males is slightly higher than that of females, with males recording a mortality rate of 810 per 100,000 in 2007 compared to 797 per 100,000 for females. For each of the 15 leading causes of death in 2007, males recorded a higher mortality rate, and for three causes the male/female ratio was over 3:1 (Xu et al. 2010). The mortality rate for males is in fact higher at every age. Indeed, the death rate for males is even higher than that for females during the prenatal period. At ages 15–24 and 35–44, the mortality rate for males is almost three times as high, indicating that the greater mortality risk characterizing males predates birth. The differential in sex-specific mortality rates translates into differential life expectancy, with females born in 2007 expected to live 80.4 years on the average compared to a life expectancy of 75.4 years for males (Xu et al. 2010).

For every condition except diabetes and sex-related disorders, the mortality rate is higher for males, with the excess mortality for each age cohort is attributable to a different cause. A major killer for infants is chronic respiratory disease, a condition more common among male infants. Accidents are the major cause of death for children aged 1–14, with males having approximately twice the risk of accidents. Homicide is a major cause of mortality for those 15–25, with males accounting for most of the homicide deaths. Similar patterns can be found for subsequent age cohorts and other health conditions (National Center for Health Statistics 2010b).

The relationship between sex and mental health status is fairly well documented, although the conclusions are not without controversy. As noted with physical health, females appear to be characterized by a higher level of psychiatric morbidity. Based on reported symptoms, clinical evaluations by community researchers, and frequency of presenting themselves for mental health care, females appear to be characterized by a higher level of mental disorder. However, this oversimplifies the situation since women exhibit higher scores on indices of depression, hysteria, and paranoia as well as on less severe mental disorders, men have higher scores for antisocial disorders, authority problems, and Type A behavior (World Health Organization n.d.). As with physical disorders, females tend to be characterized by milder, more common conditions such as neuroses. Males, on the other hand, tend to be characterized by more serious psychoses. A major exception is found in the case of depression, for which women report a rate twice as high as men (World Health Organization n.d.). As with physical illness, it appears that females are characterized by a greater occurrence of symptoms while males are afflicted with more extreme conditions.

It is beyond the scope of this book to evaluate the various explanations that are offered to account for these phenomena. There is evidence that women are more sensitive to the existence of symptoms of both physical and mental illness, that they are more willing to admit or report their symptoms, and that they more readily take action in response to perceived symptoms, thereby showing up more often in the data compilation (Gijsbers van Wijk and Kolk 1997). In U.S. society it is also more culturally acceptable for women to be ill.

Many observers suggest that females are not, in fact, “crazier,” but that differences in identified prevalence rates are a function of other factors (Eaton et al. 2011). These factors include a tendency for females to perceive symptoms as emotional rather than physical, the greater tendency for females to admit to symptoms of either kind, and the willingness of society to interpret females’ characteristics as emotional rather than physical.

Regardless of the ultimate explanation for these sex differentials, the implications for the provision of health services are clear. Women will continue to account for the majority of those with chronic conditions that will require long-term management, while males will continue to be characterized by a higher level of life-threatening conditions. Sex will continue to be a powerful predictor of levels of morbidity and mortality and of the types of conditions that characterize males and females, respectively. The fact that women will constitute an even greater majority of the patient population in coming years has significant implications for the future demand for health services.

10.3.2.3 Race/Ethnicity

Racial groups are defined based on one or more distinguishable physical attributes considered important in the particular society. In U.S. society and many others, skin color is the most important factor in racial categorization. Race is a clearly biosocial attribute, because it combines physical attributes with social connotations.

Ethnic group distinctions are based on differences in cultural heritage. Members of distinct ethnic groups have a common cultural tradition, including values and norms and perhaps even a language, that sets them apart from the larger society. While ethnic distinctions are not primarily biological, prolonged "inbreeding" often leads to the development of distinctive physical characteristics. For this reason the discussion of ethnicity and health status is included in this section. The major ethnic groups in U.S. society include Hispanics, Jews, and certain large national groups that, in some regions at least, have been able to maintain their ethnic identity.

When the various racial groups in the United States are examined in terms of health status, significant differences are found. The discrepancy by race (blacks are less positive) is substantial, however, and given that blacks have a younger age structure, the true differential is even larger. While only 8.7% of whites assessed their health as fair or poor in 2009, the figure was 14.2% for blacks despite a younger age structure. The major distinction is between whites and blacks, with Asian-Americans and American Indians manifesting less distinct health status characteristics (National Center for Health Statistics 2011). Differences in self-assessed health status should be interpreted with caution, however, since there are indications that members of different racial groups may use different criteria for assessing their own health status (Brandon and Proctor 2010).

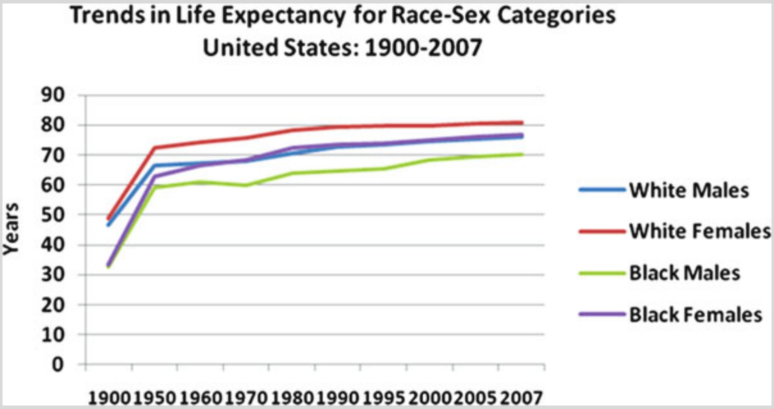
Clear-cut differences in morbidity found primarily between whites and African Americans. The number of symptoms, the number of illness episodes, and the severity of the conditions all place African Americans at a health status disadvantage. Although relatively more prone to acute health conditions, African Americans actually suffer higher rates of both acute and chronic conditions than whites. African Americans represent 12% of the population, for example, but account for 28% of the diagnosed hypertension (Lloyd-Jones et al. 2010). Further, all things being equal, African Americans contracting life-threatening conditions are more at risk of death than are whites with the same condition. (See, for example, American Lung Association 2011).

Differences in cause-specific morbidity exist between various racial and ethnic groups, with the epidemiology of cancer reflecting this phenomenon. Whites in the United States are more likely to suffer from colon/rectal cancer, breast cancer, and bladder cancer, for example, than are African Americans. On the other hand, the incidence of lung, prostate, stomach, and esophageal cancer is higher for African Americans. Specific ethnic groups are similarly likely to display unique cancer morbidity profiles. Polish-Americans suffer from relatively high levels of lung and esophageal cancer, for example, while among Italian-Americans bladder, intestinal, and pharyngeal cancer are more common. Japanese-Americans suffer from stomach cancer at rates many times higher than Japanese nationals, while cervical cancer is almost unknown among Jewish women. (See, for example, Seeff and McKenna 2003.)

Mortality rates for the black population are considerably higher than those for the white population. When mortality rates are examined for 2007, the overall mortality rate for the U.S. population is 8.0 per 1,000 population. The age-adjusted mortality rate for the white population as a whole was 7.7 deaths per 1,000 population, compared to a rate of 9.8 per 1,000 population for blacks (National Center for Health Statistics 2010b). Age-adjusted mortality rates for other groups in 2007 were 8.0 for Hispanics, 6.3 for American Indians and 4.2 for Asian-Americans. African Americans are characterized by higher mortality risks at nearly all ages and for nearly all causes (Rogers et al. 2000). (Note that all of these rates are age adjusted, thereby eliminating any distortion caused by differential age distributions.)

This mortality differential is reflected in life expectancy for the two racial categories. In 2007, life expectancy at birth for whites was 78.4 years compared to 73.6 years for blacks (National Center for Health Statistics 2011). The greatest race-sex differential is between white females (80.4 years) and black males (70.0 years). (Exhibit 10.2 presents trends in life expectancy for four race-sex categories.) Further, important differences exist between blacks and whites in terms of the common causes of death. To a great extent these differentials reflect the differences in morbidity characteristics discussed above. Whites in the United States are more likely to be characterized by chronic conditions, especially those associated with aging. Blacks and certain ethnic groups are more likely to be characterized by acute conditions. Further, nonwhites are more likely to be affected by environmentally caused health problems and life-threatening problems associated with lifestyles (such as homicide, suicide, and accidents). Consequently, the dominant causes of death among the white population are heart disease, cancer, and stroke. While these are important among various other racial and ethnic groups, blacks in particular are more likely to die as a result of infectious conditions, respiratory and digestive systems conditions, and the lifestyle-associated problems noted above.

Exhibit 10.2 Trends in Life Expectancy for Race-Sex Categories United States: 1900–2007



Much of the mortality advantage characterizing Asian-Americans and Hispanics has been attributed to the foreign born among these populations. Subsequent generations of Asian-Americans and Hispanics, it seems, do not fare as well in comparative mortality analyses. Interestingly, Native Americans have made the greatest gains of any group in reducing mortality in recent years, with an age-adjusted mortality rate in 2007 of 6.3 per 1,000 (National Center for Health Statistics 2010b). Native Americans record the lowest mortality for cancer of any group but by far the highest mortality rates for diabetes, suicide, and accidents.

Another relatively important cause of death for blacks is infant mortality. Although infant mortality has been dramatically reduced as a cause of death in the United States in this century, it continues to be a serious health threat for many groups of nonwhites. The infant mortality rate for African Americans in 2007 was two and a half times that for whites, 13.2 per 1,000 live births versus 5.6 (Mathews and MacDorman 2011). The rates for both groups have declined since the late 1980s, with the gap between the two actually narrowing in recent years. Other racial and ethnic groups recorded quite disparate rates of infant death. Certain Asian-American groups, for example, report much lower than average infant mortality, while Hispanics as a group record infant mortality rates between those of whites and blacks. Native Americans and native Alaskans historically have recorded very high infant mortality rates; however, since the 1950s, their rates have come to resemble the U.S. average. Infant mortality rates for selected groups 5.5 for Hispanics, 9.2 for American Indians and 4.8 for Asian-Americans (Mathews and MacDorman 2011). The Hispanic infant mortality rate is something of an anomaly, given the relatively poor health status of this population and this group's lower level of access to health services. The low Hispanic infant mortality rate is generally attributed to the emphasis on family in this culture.

Indicators of disability also are found to be higher among African Americans. Data from the 2010 National Health Interview Survey indicated that 12.2% of the white population had some limitation due to disability, compared to 16.5% of the African-American population (National Center for Health Statistics 2011). In addition, African Americans are characterized by higher levels of disability than whites, whether measured by the actual presence of handicaps or by such proxy measures as work-loss days and bed-restricted days.

The distribution of mental illness with regard to race and ethnicity has been of great interest to researchers and health professionals. Historically, it was believed that blacks and certain other racial and ethnic groups in U.S. society were characterized by worse mental health status than whites. Even after the scientific study of mental illness became established, evidence was developed that suggested higher rates of mental disorder among these groups. African Americans were most often singled out and depicted as a group as being disproportionately affected by psychotic behavior.

Researchers now believe that the impression of higher rates of mental disorder among blacks and certain other racial or ethnic groups is a function of at least three factors: (1) collection of data historically from public mental institutions; (2) a middle-class bias in the diagnosis of mental disorders; and (3) a failure to consider important intervening variables such as social class (Murali and Oyebode 2004). Current research suggests that differences in types of mental pathology make comparisons based on race problematic (Riolo et al. 2005).

To the extent that differences do exist, the disparity appears to be not in prevalence but in types of disorders. Blacks seem to be characterized by more severe forms of disorders (e.g., psychoses), and whites by milder forms (e.g., neuroses). The question of bias in both reporting and diagnosis still remains, but a considerable amount of evidence points in the direction of differential prevalence. This presumed differential in types of disorders, however, may reflect differences in education and occupational status. In fact, social class is often pointed to as the major contributing factor to prevalence differentials. This could explain apparent differences in both prevalence and types of disorders.

The relationship between mental disorder and ethnicity is even cloudier, given the wide variation in the types of ethnic groups in U.S. society. Some groups, such as Mexican-Americans, appear to be characterized by higher than average rates of disorder (U.S. Department of Health and Human Services 1999a, b). Others, such as Japanese- and Chinese-Americans, appear to be relatively "disease-free" (Meyers 2006). Once again, the observed differences may be a reflection of socioeconomic differences or even migration status. In any case, it is extremely difficult to compare subgroups of the population in terms of either prevalence or types due to numerous possible intervening variables. Exhibit 10.3 presents comparative statistics on selected chronic conditions classified by the three biosocial characteristics discussed in this section.

Exhibit 10.3 Self-Assessed Health Status for Adults by Selected Biosocial Characteristics, United States, 2010

Characteristic	Excellent (%)	Very good (%)	Good (%)	Fair (%)	Poor (%)
Total	36.0	30.4	23.9	7.4	2.2
Age					
Under 12 years	55.7	27.2	15.2	1.8	0.1
12–17 years	53.8	26.7	17.3	2.0	0.3
18–44 years	37.4	33.1	23.2	5.3	1.0
45–64 years	23.7	31.4	28.9	11.6	4.4
65–74 years	16.6	29.7	32.5	16.0	5.1
75 years and over	11.6	24.5	35.5	30.6	7.7
Sex					
Male	36.7	30.4	23.7	7.0	2.2
Female	35.3	30.4	24.2	7.8	2.3
Race/Ethnicity					
White	37.6	30.9	22.7	6.8	2.1
Black	27.7	36.8	30.5	11.6	3.3
Asian	36.3	30.8	24.8	6.6	1.6
American Indian	22.7	31.7	27.6	13.6	4.4
Hispanic	30.8	27.7	28.5	10.4	2.7

Source: National Center for Health Statistics (2011). *Summary Health Statistics for the U.S. Population: National Health Interview Survey, 2010*. Bethesda, MD: National Center for Health Statistics.

10.4 Sociocultural Characteristics

10.4.1 Introduction

Sociocultural characteristics refer to those traits that characterize individuals related to their position or statuses in society. While biosocial traits are ascribed essentially at birth, sociocultural traits are typically acquired through the actions of the individual. Sociocultural traits are important not only because they indicate one's place in society, but also because of their correlation with health status.

10.4.2 Marital Status

Early on in the study of the demographic correlates of health status, it was concluded that marital status was a predictor of both health status and health behavior (Verbrugge 1979), although (as will be shown) the relationship is actually a highly complicated one. The categories of marital status for the discussion below will be never married, married, divorced, and widowed. The term "single" has generally been eliminated from research terminology since it can be interpreted to mean never married, widowed, or divorced. Most researchers by the mid-1980s counted couples living together as married. Separated individuals are not treated in a consistent manner in the literature but are most often listed under their official status, which is married. Some studies, however, list these couples as divorced if they are legally separated. This group is small enough however that this "married but separated" category does not distort the relationships identified by researchers.

In general, it is held that health status, both mental and physical, is higher for the married in U.S. society than for any other marital status. Married individuals are found to have lower levels of morbidity and mortality and to perceive themselves as being in much better health. Married persons also report a higher level of physical and psychological well-being than their unmarried counterparts (Shoenborn 2004). It has also been found that married individuals, when affected with a health condition, suffer less serious problems, face a more favorable prognoses, and report a more favorable outcome.

These patterns hold, incidentally, for every age cohort. In fact, the advantage for the married increases with age for some conditions. While the prevalence of chronic conditions for the married and never married is approximately the same for the 18–24 age cohort, the NHIS found that one-third of the never married in the 45–64 age group suffer from chronic disabilities, compared to one-fifth of the ever married.

The outstanding exception to these patterns relates to the incidence of acute conditions. Married men and women report slightly more acute conditions than never married men and women. However, the married are still better off than the divorced and widowed on this indicator of morbidity. It has been suggested, as in the case with sex differentials, that the never married may suffer fewer episodes of acute conditions but are affected by more serious and prolonged conditions.

The incidence of injuries also represents something of an exception; while married people are less prone to injuries than never-married and divorced individuals, they are more at risk for injuries than are the widowed. Married persons may also be more likely to have these acute conditions diagnosed.

Although never married, divorced, and widowed individuals have poorer health overall than the married, there is no clear-cut ranking among these three groups. The relative health status of members of these three groups actually depends on the measure that is being utilized. Although the never married are better off on some measures of morbidity, they are more likely to commit suicide or die as a result of homicide or an accident. The never married are also at greater risk of developing mental illness (Cotton 1999).

With regard to disability, only 13% of married people were found to have physical limitations in the 2009 National Health Interview Survey, compared to 15% or more for those in other marital status categories. The pattern is similar with regard to other indicators of disability. However, the NHIS found that married individuals report more work-loss days per year (3.4) compared to 2.8 days for the never-married, but less than the 5.4 days reported for the divorced and 6.0 days for the widowed (Pleis et al. 2010).

The preponderance of research now indicates that the different marital statuses are at varying risks of mental illness although the data are limited. The 2009 NHIS found, for example, that 3.5% of the married reported chronic nervousness, a much lower figure that that for the never married (5.1%), the divorced (6.6%) or the widowed (11.9%). The consensus is that the married are much better off overall in terms of mental health than are those in any of the other marital categories. There is less consensus concerning the category at greatest risk; different studies have variously identified the never married, the divorced, and the widowed.

Evidence for the importance of marital status as a predictor of health status can be drawn from data on changes in health status that accompany changes in marital status. When individuals shift from one status to another, changes in health status are frequently seen. The change is probably the most extreme when the shift is from the married to the divorced or widowed category (Aseltine and Kessler 1993).

Such a general overview tends to mask a number of variations in the overall patterns noted. If figures for the various categories are decomposed on the basis of other variables and if specific health problems are considered, substantial variation is indicated by the data. For example, while married individuals are healthier overall and married females are in relatively good physical health, married females have been found to account for a large amount of the depression reported among the mentally ill. Similarly, married males are better off than the unmarried in general, but are likely to have higher mortality rates than never-married females. In fact, married males are the one found to suffer the most deterioration (both physically and mentally) in making the transition from married to unmarried statuses.

Limited research has been conducted on the mortality implications of marital status and household characteristics. However, recent work by Rogers et al. (2000) found that married individuals living with their spouses and children are at the lowest risk of mortality of any marital status/living arrangement combination. Situations that are characterized by high mortality levels include unmarried individuals who live with their parents, members of particularly large families, and single parents with three or more children living in a household.

As for many of the demographic variables discussed, the relationship may not be as direct as it appears. There are those that argue for marital status-specific disorders and others that contend that reliance on marital categories overlooks differences between sexes. Another school of thought suggests that it is not marital status per se that correlates with risk of mental disorder but living arrangements. That is, those living alone (regardless of marital status) are at greater risk of mental disorder (Australian Bureau of Statistics 1997). Until the complexities of these relationships can be unraveled, it appears that marital status will be retained as a reasonable predictor of the prevalence of mental disorder at the group level at least.

Marital status also has implications for health insurance coverage which, in turn, has a demonstrated relationship with health status. Exhibit 10.4 describes the relationship between health insurance coverage and health status.

Exhibit 10.4 Health Insurance Coverage and Health Status

The United States is unique among modern, industrialized nations with regard to the financing of health services for its citizens. Most similar countries have national healthcare systems with a single mechanism (usually taxes) through which individuals pay for the healthcare they receive. Although in the US the government does play a role in the financing of healthcare, this is primarily through the Medicare and Medicaid programs (for the elderly and indigent, respectively). For those not qualifying for Medicare or Medicaid, their primary option if commercial insurance (either through group or individual plans), often provided through one's place of employment. In recent years the proportion of US residents covered by employer-sponsored insurance has declined, while the proportion covered under government programs has increased. A significant portion of the population is uninsured and this number (now approaching 50,000,000) continues to grow. Of those who do have insurance, almost one in five has two or more different types. The extent to which an individual or family has health insurance varies with the situation and is liable to change over time and it is not unusual for a patient to have his medical costs covered through some combination of sources (e.g., Medicare, Medicaid and out-of-pocket payments). The table below indicates the estimated distribution of insurance coverage types for the US population in 2009 (based on the American Community Survey).

Insurance source	Percent (%)
Commercial insurance	60
Medicare	10
Medicaid	13
Other federal insurance[a]	2
Uninsured	15

[a] Military insurance, Veterans Administration, other federal

(continued)

Exhibit 10.1 (continued)

Data generated through the National Health Interview Survey indicate a correlation between type of insurance coverage and health status (National Center for Health Statistics 2011). For those under 65 years of age, 4.1% of those with private insurance reported poor or fair health status, compared to 22.3% of those on Medicaid. Only 9.8% of the uninsured considered themselves in poor or fair health, no doubt reflecting the fact that many young adults are uninsured. Not surprisingly, 28.6% of those 65+ (with Medicare coverage) reported poor or fair health status. Some 28.5% of those on Medicaid reported limitations due to chronic disease, compared to only 5.7% of those with commercial insurance and 7.8% of the uninsured. Again, not surprisingly, 33.2% of those 65 and over and covered by Medicare report such limitations.

In terms of the prevalence of specific conditions, as above the major differences are between those with private insurance and those covered under Medicaid. Differences were found for example in the prevalence of diabetes (5.3% vs. 12.3%), kidney disease (07% vs. 3.9%) and arthritis (14.7% vs. 23.7%).

The relationship between presence of and type of health insurance and health status is a complicated one, and it is not always clear what the nature of the relationship actually is. However, for our purposes it can be argued that type of insurance coverage is a reasonable predictor of health status in general and the prevalence of certain health problems in particular.

10.4.3 Income

Since income is the measure of socioeconomic status must frequently linked to health status, used either directly or as a proxy for social class. It has been found that no matter what indicator is utilized, there is generally an inverse relationship between income and health status. This is true whether the indicators are outcome measures, disability measures, or (as will be seen in the next chapter), utilization measures. There is a strong inverse relationship between income level and morbidity for both physical and mental disorders. As income increases, the prevalence of both acute and chronic conditions decreases. When symptom checklists are utilized, the lower the income, the larger the number of symptoms identified. Not surprisingly, members of lower-income groups assess themselves as being in poorer health than do the more affluent. While 21.8% of those living at or below the poverty level considered themselves in poor or fair health, only 4.3% of those with household incomes four times the poverty level (e.g., $100,000 or more) reported poor or fair health (National Center for Health Statistics 2011).

Not only are there more episodes of both acute and chronic conditions recorded as income decreases, but the severity of the conditions is likely to be greater when income is lower. When afflicted by acute conditions, the poor tend to have more prolonged episodes characterized by greater severity. Interestingly, in a society that has become characterized by chronic health conditions, acute disorders remain surprisingly common among the lower income groups. In fact, the disease profile of many low-income communities more closely resembles that of a developing country than it does the United States.

There is also an inverse relationship between income and indicators of disability. Among the population with annual household incomes in 2010 less than $35,000, 20.6% reported some limitation of activity due to chronic conditions. This figure drops dramatically to 8.9% for the $35,000–49,999 income group. The rate continues to drop to a level of only 6.6% for those with household incomes of $100,000 or more (National Center for Health Statistics 2011). The lower the income, the greater the number of bed-disability days, work-loss days, school-loss days, and restricted activity days.

The mortality rate for the lowest income is considerably higher than that of the most affluent in some communities, even after adjusting for age. This assertion has been recently affirmed by the landmark study by Rogers et al. (2000). The poor are also characterized by relatively high levels of infant mortality and even maternal mortality. Virtually all infant mortality in the United States today is accounted for by the lowest income groups, and maternal mortality (which has been virtually eliminated society-wide), is disturbingly common among the poor.

Early on in the study of the social epidemiology of mental disorder, it was asserted that the lower classes were more prone to psychiatric pathology than the affluent (Hollingshead and Redlich 1958). However, more recent studies have failed to consistently demonstrate a clear relationship. What has been demonstrated is the fact that the relative prevalence of mental illness by social class depends heavily on the type of disorder examined. Even so, for some disorders apparent correlations with other variables (e.g., race and age) are moderated when socioeconomic status is controlled (Mossakowski 2008). A more recent study (Jitender et al. 2011) found a direct relationship between income levels and psychiatric symptoms, with the number of DSM indicators increasing with lower income.

Although the possibility of diagnostic bias is always present, the preponderance of evidence indicates that different disorders characterize those at different socioeconomic levels. Further, those at the lower levels are likely to be characterized by the severe disorders. This explains why early studies concluded that mental disorders were concentrated within lower-income groups; the available statistics were for schizophrenia and from public mental hospitals. It is still felt that schizophrenia, certain forms of depression, and sociopathy are more common among lower income groups. Manic-depression and neuroses appear to be more common among upper income groups. The rate of suicide, it should be noted, is much higher for the affluent than for the non-affluent. This, however, is generally attributed to differing styles of coping characterizing various socioeconomic groups.

10.4.4 Education

The relationship between educational level and health status presents the same pattern as for income. Those at higher educational levels are likely to rate themselves as being in better health than those with less education (National Center for Health Statistics 2011). Typically, the higher the educational level, the lower the morbidity level. This is true for both acute and chronic physical conditions. These relationships also hold for indicators of disability. For example, an analysis of data from the National Health Interview Survey found an inverse relationship between educational levels and chronic conditions, limitation of activities, and number of bed days for disability.

The pattern with regard to mortality also resembles that for income. The death rate for the poorly educated is much higher than for those with higher educational achievement (National Center for Health Statistics 2010b). Like the poor, the causes of death for the poorly educated are more likely to be the acute problems associated with less developed countries than the chronic conditions characterizing much of American society. Also like the poor, they are likely to be characterized by lifestyle-related deaths such as homicides and accidents. Education, in fact, has been recently shown to demonstrate a stronger influence on mortality than income (Rogers et al. 2000).

Infant mortality, once a leading cause of death, has been virtually eliminated from the groups with the highest educational levels. The poorly educated, however, account for the bulk of infant deaths. The correlation between educational level and infant mortality rates is reflected in differences in low birth weight babies and premature births for those at different educational levels. Nine percent of mothers with less than a high school education deliver low birth weight babies, while this figure drops to 5.5% for women with 1 or more years of college (National Center for Health Statistics 2010a, b).

The relationship between educational level and mental illness, like that for physical illness, appears fairly clear cut. In fact, some researchers have suggested that the income differentials noted above are in reality a function of differing levels of education. As the level of education increases, there appears to be an increase in the prevalence but a decrease in the severity of disorders. The better educated appear to be more characterized by neurotic conditions, while those less educated appear to be more frequently psychotic. Ironically, the rate of suicide is much higher among the better educated, but this is generally attributed to the differing means of coping characterizing various educational levels.

As with income, the relationship does not necessarily reflect the level of education per se but the differential consequences of varying educational levels. Those with less education also are likely to have more financial problems, poor housing conditions, and unsafe environments, all contributing to an unhealthy situation (Exhibit 10.5).

Exhibit 10.5 Self-Assessed Health Status for Adults by Selected Sociocultural Characteristics, United States, 2010

Characteristic	Excellent (%)	Very good (%)	Good (%)	Fair (%)	Poor (%)
Total	36.0	30.4	23.9	7.4	2.2
Education					
Less than high school	15.6	22.1	34.8	19.9	7.5
High school diploma	21.6	30.1	32.5	12.2	3.6
Some college	25.7	33.9	28.1	9.5	2.8
Bachelor's degree or higher	38.5	35.6	19.8	4.7	1.5
Family income					
<$35,000	26.1	26.5	29.8	12.8	4.7
$35,000–$49,999	31.8	31.9	26.3	8.0	2.0
$50,000–$74,999	36.0	32.6	23.9	6.2	1.4
$75,000–$99,999	40.4	34.0	20.7	4.1	0.8
$100,000 or more	49.4	31.0	15.3	3.5	0.8
Health insurance coverage under 65 years					
Private insurance	45.1	32.7	18.1	3.4	0.7
Medicaid	25.8	23.5	28.4	15.0	7.3
Other insurance	33.9	24.9	24.7	11.4	5.1
Uninsured	32.9	29.2	28.1	8.1	1.7
Over 65 years					
Medicare	13.1	26.2	34.9	19.3	6.6

Source: National Center for Health Statistics (2011). *Summary Health Statistics for the U.S. Population: National Health Interview Survey, 2010*. Bethesda, MD: National Center for Health Statistics.

10.4.5 Occupation, Industry and Employment Status

Occupation can be examined in terms of occupational status (e.g., blue-collar, white-collar, professional) or in terms of specific occupations. In the first case, there is a direct and positive relationship between the status of the occupation one holds and health status. In general, the higher the occupational prestige, the better the health status. Those at lower occupational levels tend to be characterized by higher rates of morbidity and disability. Like the poor and the uneducated, they tend to be characterized both by more conditions and by more serious conditions. Levels of disability (as measured by restricted activity days and lost days from work and school) are higher for lower occupational levels.

At the same time, mortality rates and longevity vary directly with occupational status. Mortality rates for professionals are significantly lower than those for unskilled laborers, for example. A study in Great Britain found a clear link between mortality and occupational status, with age-standardized death rates for the lowest occupational group (unskilled laborers) being approximately twice that of the highest (professionals) (Geyer and Peter 1999). Additional research by Rogers et al. (2000) has reaffirmed this finding. The causes of death for those lower in terms of occupational status are similar to those for the poor and uneducated.

Although attempts have been made to link mental disorder with occupational status, the results have been less clear-cut. Occupational status is a difficult concept to operationalize and is further complicated by American society's complex stratification system. It has been argued that an association exists between occupational status and mental health status in that the lower the former, the higher the latter. Such a monotonic relationship has not been adequately demonstrated, however.

The relationship between various occupations and industries and health status can also be examined. It is found that certain occupations tend to be characterized by inordinately high levels of both morbidity and mortality. High-morbidity occupations often include those whose workers are exposed to environmental risks. Similar patterns have been identified for mortality, although the occupations most affected may be different. Thus, healthcare workers are characterized by high levels of work-related injuries and illnesses but very low levels of work-related deaths. The single most dangerous occupations today is cell phone tower workers, having recently edged out commercial fisherman and lumberjacks. Some professions such as psychiatry and dentistry are noteworthy for their high suicide rates.

It is also found that certain industries tend to be characterized by inordinately high levels of both morbidity and mortality. Among the standard industrial categories utilized by the U.S. Department of Labor the industry recording the highest level of occupational illnesses and injuries is manufacturing, with a rate of 373 per 1,000 workers in 2008. This compares to a rate of 10 per 1,000 for utilities workers. The highest death rates by industry in 2008 were recorded by farming/fishing/forestry with 30.4 deaths per 100,000 employed workers. This compares to finance and insurance with a 0.3 deaths per 100,000 workers (National Center for Health Statistics 2010b). While healthcare worker were characterized by a relatively high level of occupation-related illness and injury, the death rate for healthcare and social assistance workers was only 0.5 per 100,000.

One other consideration when examining occupational categories is the issue of employment status. This issue may be more significant than that of occupational differentials and has garnered renewed attention in the light of current high levels of unemployment. When the employed are compared to the unemployed, clear-cut differences surface in terms of physical and mental illness. The unemployed appear to be sicker in terms of most health status indicators; they have higher levels of morbidity and higher levels of disability than the employed. While it could be argued that poor health leads to unemployment, it has been found that otherwise healthy individuals who have undergone loss of employment often develop symptoms of health problems. In fact, even perceived threats to job security have been associated with an increase in morbidity (Ferrie et al. 1998). It has also been suggested that, among those who cannot find employment, developing an illness serves as something of a rationale for a failure to find work.

Research by Rogers et al. (2000) demonstrated that the employed tend to have a lower risk of mortality than the unemployed. Interestingly, the analysis also found that individuals who were not in the labor force (i.e., neither employed nor looking for employment) were at the greatest risk of mortality of all employment statuses.

The same pattern holds for employment status and mental illness. The unemployed tend to be characterized by higher levels of mental illness symptoms than the employed. In fact, for both physical and mental disorders, it has been suggested that the lack of social integration resulting from unemployment serves as a "trigger" for various health problems.

10.4.6 Religion

Perhaps the least well documented relationship of a demographic variable with health status is to the link between religion and health status. Religion is relatively poorly studied in U.S. society, and information linking religion affiliation or religiosity with health status is fragmented. However, a growing body of empirical evidence suggests that religious involvement has beneficial effects on health status and mortality rates (Oman et al. 2005).

Donahue and Benson (1995) found religious commitment to be associated with higher perceived well-being among adolescents. Studies also have associated higher frequency of church attendance with lower blood pressure, mortality from cardiovascular disease and physical disability (Oman et al. 2005). The lifestyles associated with strict religious groups such as Mormons and Seventh Day Adventists have been found to contribute to their higher health status. Some religion-specific differentials in morbidity that have been found are typically not in terms of overall prevalence, but in regard to group-specific conditions. For example, the Jewish population in the United States is characterized by higher levels of some conditions and lower levels of others. However, it is usually argued that these differences reflect cultural variations rather than religious differences.

Hummer et al. (1999) found a clear relationship between church attendance and mortality rates. People who never attend church services exhibit a risk of death 1.87 times that for those who attend services 2 or more times per week. This calculates out to a 7-year difference in life expectancy (at age 20) between non-attenders and frequent attenders.

The findings on the association between religion and mental illness are not particularly clear-cut (Levin 2010). However, several studies have indicated that religion serves as something of a deterrent to the onset of psychiatric problems (Exhibit 10.6) (Kendler et al. 2003).

Exhibit 10.6 Age-Adjusted Prevalence of Selected Health Conditions for Adults by Selected Characteristics, United States, 2010

Characteristic	Diabetes (%)	Kidney disease (%)	Arthritis (%)	Asthma (%)	Cancer (%)
Total	8.8	1.7	21.6	8.2	8.2
Age					
18–44 years	2.8	0.7	7.1	8.1	2.2
45–64 years	12.3	2.0	30.3	8.4	9.9
65–74 years	22.0	3.5	49.0	8.7	20.4
75 years and over	21.7	10.0	4.7	7.4	27.2
Sex					
Male	9.8	1.6	18.8	5.8	7.9
Female	8.0	1.7	24.1	10.3	8.6
Race/ethnicity					
White	8.2	1.6	21.8	8.0	8.8
Black	12.9	2.8	22.4	7.8	5.3
Asian	9.1	0.9	12.1	10.5	3.1
American Indian	16.3	1.1	25.5	10.5	11.0
Hispanic	13.2	2.1	15.6	6.9	2.7
Education					
Less than high school	14.7	3.1	24.6	7.7	7.1
High school diploma	10.6	1.8	26.4	7.2	8.6
Some college	10.3	2.2	27.7	9.6	10.7
Bachelor's degree or higher	7.1	1.0	20.2	10.6	10.4
Family income					
<$35,000	11.2	2.7	24.6	9.9	7.9
$35,000–$49,999	9.4	1.9	21.6	8.1	8.6
$50,000–$74,999	9.0	1.2	22.6	7.6	8.0
$75,000–$99,999	40.4	34.0	20.7	6.9	9.2
$100,000 or more	49.4	31.0	15.3	7.7	8.7
Health insurance coverage under 65 years					
Private insurance	5.3	0.3	14.7	7.7	5.1
Medicaid	12.3	3.9	23.7	13.9	6.4
Other insurance	12.8	2.6	27.0	11.3	8.1
Uninsured	5.6	1.4	11.7	6.6	3.0
Over 65 years					
Medicare	13.1	26.2	34.9	7.2	21.6

Source: National Center for Health Statistics (2011). *Summary Health Statistics for the U.S. Population: National Health Interview Survey, 2010*. Bethesda, MD: National Center for Health Statistics.

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Chapter 11
Demographic Correlates of Health Behavior

11.1 Introduction

This chapter focuses on the relationship between various demographic characteristics and the response of individuals and groups to health-related conditions – that is, their health behavior. Chapter 10 examined the demographic correlates of health status, and this chapter represents a natural extension of that discussion. *Health behavior* might be broadly defined to include formal health services utilization as well as the informal health behavior exhibited by a population. Some of these actions are taken by individuals who have been formally diagnosed as ill. However, much health behavior is carried out by relatively healthy individuals who are attempting to maintain or enhance their existing health status or to prevent a decline in health status.

The earliest discussions surrounding patterns of behavior in response to health threats are found in the literature of the 1950s. Many consider the early work by Parsons (1951) on the "sick role" as the first scientific treatment of health behavior. Since then, a considerable amount of research has been accumulated on the responses of individuals and groups to ill health. The significance of the concept of health behavior cannot be overemphasized in a society that is as highly "medicalized" as the United States is today.

The concept of health behavior can be interpreted broadly to include virtually any action aimed at restoring, preserving, and/or enhancing one's health status. From a medical perspective, the focus is on the formal utilization of health services. Physician visits, hospital admissions, outpatient procedures and drug prescriptions are typically are examples of indicators of the volume and types of health behavior. Although it is this type of indicator is the major focus of this chapter, health behavior also includes such activities as preventive health practices, fitness and wellness

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practices, self-medication and treatment, and diet-related activities. This discussion, then, must necessarily include the gamut of health behavior from regular toothbrushing to heart transplantation. In recent years, health behavior has become a topic of discussion in regard to national and regional health policy. Efforts to reduce childhood obesity, for example, involve changes in the health behavior of children, parents and school officials.

It has become increasingly clear that variations in demographic characteristics are reflected in health behavior perhaps to a greater extent than health status. There are enough biological underpinnings to morbidity and mortality to keep them from being totally "social" constructs. The variations in health behavior, however, are infinite and very much influenced by demographic characteristics. Despite the observed correlation between health status and the use of some services, most health behavior is ultimately elective.

Individuals sometimes choose to utilize health services because these services are ordered; however, if all dimensions of health behavior are considered, it is obvious that a great deal of volition is involved in the use of services. This is clearly demonstrated by the fact that there are four health status-health utilization combinations found in U.S. society: those with "real" illnesses that utilize health services; those with real illnesses that do not utilize health services; those without real illnesses that utilize health services; and those without real illnesses that do not utilize services.

The discussion below focuses primarily on the demographic correlates of formal measures of health services utilization. This approach reflects both conventional usage and the fact that data on formal participation in the healthcare system are more readily available than are data on informal forms of health behavior. However, in those cases where information is available on such activities as dieting, exercise, self-medication, and preventive care activities, their demographic correlates are discussed.

11.2 Indicators of Formal Health Behavior

11.2.1 Health Services Utilization

Health professionals have developed a number of measures for determining the extent to which health services are utilized. Some of these indicators (e.g., hospital admissions or discharges) are generated through the routine administrative record-keeping of health facilities. Others (e.g., physician office visits or drugs prescribed) have been developed independently as indicators of activity within the healthcare system. Thus, some of the indicators represent standards for the industry while others are "functional" indicators that measure activity within healthcare. Regardless of the origin of the indicator, each measure of health behavior discussed below can be linked to specific demographic characteristics.

11.2.2 Physician Utilization

Perhaps one of the most useful indicators of health services use is the level of physician utilization. The physician, of course, is the pivotal practitioner in the healthcare system and the "gatekeeper" for most other types of service utilization. This is a more direct measure of utilization levels than hospital admissions in that virtually everyone uses a physician's services at some time. Hospitalization is a relatively rare occurrence for most of the population.

Typically, utilization statistics are based on physician office visits. In some cases, however, the level of physician contact might be calculated with the inclusion of telephone contact and physician visits of hospitalized patients. Physician utilization might be calculated in terms of annual visits per 1,000 population. For example, a community of 10,000 might be expected to generate 30,000 physician visits per year. More commonly, however, utilization is derived in terms of the number of annual visits per person or as the proportion of the population that has visited a physician. In 2008, Americans averaged 3.2 physician visits per year and 79% of the population had visited a physician at least one time in the last year (National Center for Health Statistics 2011a). Clear-cut patterns exist with regard to the level of physician utilization that can be linked to demographic characteristics.

Average figures should be viewed with some caution. The distribution of visits is often not bell-shaped. "Frequent flyers," those who visit physicians early and often, increase the average significantly whole those who rarely visit a physician bring the average down. It is best to examine the distribution of visits before reaching any conclusion.

Physician utilization varies by specialty, so in many cases rates for physician visits are figured separately for the various specialties. Primary care physicians are likely to be visited more often than specialists. In fact, planners might gauge the efficiency of an area's health care system by making a comparison of the visit rates for various specialists. Interestingly, specialty utilization varies on the basis of demographic characteristics. Members of groups with certain attributes (e.g., age, income levels, educational levels, ethnic background) display different patterns of physician utilization.

11.2.3 Utilization of Other Health Care Personnel

There are other types of personnel for whom utilization rates might be calculated. Most of these, like physicians, are independent practitioners who practice without supervision of other medical personnel. Examples of these are dentists, optometrists, podiatrists, chiropractors, nurse practitioners, and physician assistants, as well as various mental health counselors and therapists. Other health care personnel who generally cannot operate independently but for whom utilization rates might be calculated include home health nurses and related personnel, physical therapists, and speech therapists.

Dentist utilization, like physician utilization, might be calculated in terms of annual visits per 1,000 population. For example, a community of 10,000 might be expected to generate 15,000 dentist visits per year. More commonly, however, utilization is calculated in terms of the number of annual visits per person or the proportion of the population that has visited a dentist. Clear-cut pattern linkages between the level of dental utilization and demographic characteristics can be identified. Similar methods may be applied to other health personnel as well. A visit or utilization rate per 1,000, the average number of visits per person annually, or the proportion of the population using the particular type of therapist might be calculated.

These nonphysician medical practitioners and paraprofessionals have been growing in number at a much faster rate than physicians and dentists and are playing a growing part in the provision of care. The roles of many of these practitioners have been expanding, often to the point of competing with physicians for certain types of patients. Their role in the U.S. health care system is also worth noting in that various demographic traits are correlated with utilization of some of these practitioners. For example, individuals who utilize podiatrists can generally be differentiated demographically from those who use orthopedic surgeons for similar problems. The same is true for those who use chiropractors rather than physicians for back problems.

11.2.4 Treatments Administered

Some of the most direct indicators of health services utilization are those calculated for various diagnostic tests and therapeutic procedures. While hospital admissions and physician visits give a general picture of health services utilization, rates for specific procedures provide a much more detailed description of the functioning of the healthcare delivery system. Diagnostic procedures include the various clinical tests that are performed to determine the nature and causes of a health problem. A large proportion of them, in fact, are performed on “well” individuals who are simply obtaining routine preventive examinations. Therapeutic procedures are the treatments directed toward curing or managing a particular health problem; these are usually categorized as surgical or medical. The former type of procedure is usually “invasive” in that it involves an incision in the patient. Medical procedures are typically those that involve the administration of drugs, topical applications, or some ameliorative treatment such as physical therapy. The trend, however, has been toward performing an increasing proportion of both diagnostic and treatment procedures on an outpatient basis. For example, between 1980 and 2006 the proportion of all surgeries performed on an outpatient basis increased from 16.3% to nearly two-thirds (Cullen et al. 2009). Utilization rates for diagnostic and therapeutic procedures are generally calculated like the rates above.

Fairly detailed information is now available on procedures that are performed on an inpatient basis. Data from the National Hospital Discharge Survey, the Medicare program, and other sources allow a relatively accurate calculation of treatment rates. Data on the performance of diagnostic and therapeutic procedures done on an outpatient basis are not as complete. Information on procedures performed in physician offices is fragmented, with the most accurate information being collected through a sampling of cases for a sample of physician offices through the National Ambulatory Medical Care Survey. Many other types of outpatient facilities (e.g., freestanding diagnostic centers) are so recent in development that meaningful data are not always available. Nevertheless, enough information is available to develop reasonable estimates for the level for utilization of most outpatient procedures. The surveys referred to in this section are described in Chap. 9.

Given the hundreds of different diagnostic and therapeutic procedures that are performed, the utilization patterns are understandably complex. However, when the demographic correlates of utilization are explored, the picture is somewhat simplified. Wide variations exist in use rates for various procedures, and many of these can be linked to demographic factors. Certainly educational and income levels influence the number and type of procedures received, and many other examples can be cited. Granted, part of the difference in utilization patterns (e.g., from region to region) can be attributed to variations in physician practice patterns. Even these variations can be indirectly linked to the demographic characteristics of the practice's patients. As will be seen, variations in use rates for diagnostic and therapeutic procedures are very much a function of demographic characteristics.

11.2.5 Hospital Admissions

One of the most frequently utilized process indicators historically has been hospital admissions. By the middle of the twentieth century, the hospital had become the center of the U.S. health care system. It is only appropriate that the operation of the system be monitored on the basis of hospital utilization. The terms *admissions* and *discharges* are used to refer to episodes of inpatient hospital utilization. Although they are often utilized interchangeably to refer to a episode of hospitalization, they technically refer to different processes, one being the act of entering a hospital and other being the act of leaving a hospital.

Although the numbers are generally comparable, a noteworthy exception is found with regard to maternity cases. One person (a pregnant woman) is admitted to the hospital, but two persons (the mother and newborn infant) are discharged. Given the fact that childbirth is a leading reason for hospitalization in the United States, this distinction becomes important in the tracking of hospital utilization. Other factors that may sometimes result in discrepancies between the numbers of admissions and discharges for a particular institution are the differential defining of expired patients or internal transfers as discharges. Most hospitals today follow conventionally accepted guidelines for such definitions. It is important, however, when working with hospital data sets to clarify the criteria utilized in allocating patients to the admission and discharge categories.

The hospital admission/discharge rate is generally stated in terms of a number of recorded admissions or discharges per 1,000 population. Some other denominator may be occasionally utilized, or the rate might be converted into a proportion of the population that has been hospitalized. For example, the hospital admission rate for the United States in 2009 of 74 admissions per 1,000 population might be expressed in terms of more than 7 out of every 100 residents (or 7.4%) being hospitalized during that year (National Center for Health Statistics 2011b). Although the latter presentation may be more intuitively understandable to the general public, it masks the possibility of multiple admissions on the part of those that are hospitalized more than once in the specified year.

Despite a shift from inpatient care to outpatient care, the hospital admission rate remains an important indicator of the volume of utilization of health services. It serves as a proxy for a variety of other indicators, since hospital admissions are correlated with tests performed, surgeries performed, and other related activities. Since hospital care is so labor- and capital-intensive, one admission carries a great deal of weight in terms of its significance for overall health care expenditures. It is certainly important to health planners because of the investment required for hospital care and the amount of resources consumed during a hospital episode.

Under certain circumstances, admission rates will be provided specific to a particular category of patient. For example, an age-specific hospital admission rate, or one based on area of residence and/or category of diagnosis, might be utilized. Thus, for planning and policy purposes, the admission rate for those under 65 years of age might be compared to that for those over age 65, the rate for Medicare patients may be compared to that for commercially insured patients, or the rate of admission for respiratory problems compared to that for circulatory problems. While such comparisons have utility in their own right, they are particularly useful when comparing admission patterns for different hospitals or different geographic areas. With this information available, the various standardization techniques discussed in Chap. 3 can be applied.

One other consideration is the reporting of hospital admissions by type of hospital. Since there are several of different types of hospitals that could be considered, a global indicator such as hospitalization rate per 1,000 population masks important distinctions within the numerator. Most of these institutions would be classified somewhat interchangeably as “general,” “community,” “acute care,” or “medical/surgical” facilities. However, there are large numbers of hospitals that do not fall into one of these categories. Included among these are hospitals specializing in a particular problem (e.g., mental illness or tuberculosis), in a particular population (e.g., children or veterans), or in a non-acute type of problem (e.g., long-term care or rehabilitation).

An additional indicator of hospital utilization is the extent to which hospital emergency departments are patronized. Many more people utilize emergency departments than are hospitalized each year and the level of emergency department use reflects other aspects of healthcare delivery (e.g., availability of community physicians). In 2009, 20.8% of children under 18 reported at least one emergency department visit. A similar figure (20.7%) was recorded for adults in that year (National Center for Health Statistics 2011b).

11.2.6 Patient Days

An indicator related to hospital admissions is hospital patient days. This indicator is calculated, like hospital admission rates, with respect to the number of patient days generated per 1,000 population. In some ways this indicator is a better reflection of the utilization of resources than is hospital admissions. Measuring patient days serves to adjust for variations in length of stay for various conditions. Two hospitals with comparable admission levels may generate quite different numbers of patient days because of differences in their patient mix. For example, Hospital X and Hospital Y may both report 5,000 annual admissions, but record patient-day totals of 15,000 and 30,000, respectively. This would happen, for example, if the former were a woman's hospital specializing in obstetrical care and the latter were a general hospital with a more typical patient mix.

Like admission rates, patient days may be calculated in terms of diagnosis, type of hospital, patient origin, and payer category. Changes in reimbursement procedures, in fact, have made the patient day more of a standard unit for resource utilization than the admission episode.

11.2.7 Length of Stay

One other indicator related to hospitalization is the average length of hospital stay. This is typically reported in terms of the average number of days a patient remains in the facility. For example, the average length of stay (ALOS) at a general hospital in 2007 was 4.8 days (National Center for Health Statistics 2011b). On the other hand, the ALOS for a maternity hospital would typically be less than 3 days, and for a psychiatric facility length of stay may be measured in weeks. This indicator has been important historically, since it has been a good measure of resource utilization and because many insurance and governmental healthcare programs have reimbursed hospitals on a per diem rate. Changes in reimbursement procedures in the mid-1980s, however, have given a different meaning to the average length of stay in that such entities are increasingly limiting the number of days for which they will provide reimbursement. For this reason, hospitals have become more sensitive to ALOS as a predictor of reimbursement levels and as an indicator of the efficiency of their operations.

11.2.8 Nursing Home Admissions

The other major institutional indicator of health care utilization is nursing home admissions. The nursing home admission rate is usually calculated in the same manner as the hospital admission rate and expressed in terms of nursing home admissions per 1,000 population or as a percentage of the population admitted to nursing homes.

This represents something of an incidence rate, and quite often a prevalence rate might be found more useful. That is, the level of nursing home use might be expressed in terms of the number of patients resident in nursing homes at a particular point in time, rather than the number of admissions during some time period. In this case, the number of annual admissions is less meaningful due to the long tenure of most nursing home residents.

The rate of nursing home utilization is often expressed in terms of the population aged 65 years or older. This allows for a more precise depiction of nursing home utilization, as well as comparison between populations with differing characteristics. In addition, a variety of nursing home types are emerging that will require more precise indicators of utilization. Until recently, the two types of nursing homes were those providing actual nursing care and those providing custodial care with medical backup. The introduction of such variations as "step-down" facilities (between a hospital and a nursing home), hospital-based skilled nursing facilities, chronic care facilities, life-care facilities, and geriatric day hospitals have complicated the calculation of this indicator. The extent of these changes reflects the growing significance of nursing care in U.S. society.

11.2.9 Other Facilities Indicators

There are several other facility indicators that might also be mentioned. While not all of them have the significance of hospital admissions, each is important in its own way. All, in fact, have a particular linkage with some aspect of demographic composition. These additional facilities for which utilization rates may be calculated include hospital emergency rooms, hospital outpatient departments, freestanding emergency centers, freestanding minor medical centers, freestanding surgery centers (surgicenters), and freestanding diagnostic centers. Some of these facilities have come to compete with traditional sources of care, especially hospitals. As the emphasis has shifted toward more outpatient care, these indicators have become increasingly important.

Utilization rates for these facilities may be calculated in the same manner as hospital and nursing home admission rates. In actual practice, however, there seems to be more interest in determining the proportion of the population that uses a particular type of facility during a certain time period. As will be seen, there are demographically-based differences in the rates of utilization of these facilities.

11.2.10 Insurance Coverage

An indirect indicator of the level of health services utilization is the type and extent of health insurance coverage for individuals and families. Historically, this would have simply involved the calculation of the proportion of the population covered. However, the 1970s and 1980s witnessed a proliferation in the variety of financial arrangements available for reimbursing for health services. Traditional insurance coverage, whether through an individual policy or a group policy sponsored by an employer or some other organization, is referred to as indemnity insurance. Since the coverage is usually offered through a for-profit insurer, it is often referred to as commercial insurance or private insurance. This insurance is strictly reactive and only comes into effect in response to an illness episode.

The Medicare and Medicaid programs were established in the mid-1960s, the former to provide medical insurance for the elderly and the latter to insure the poor. Medicare is available to all citizens aged 65 years and older, to some individuals under 65 if certain conditions are met, and to the disabled. Medicaid, although federally sponsored, is administered through the various states, who provide matching funds. The degree of participation is left up to the individual state, so that a wide range of benefits are available among the states. Individuals must qualify in terms of income to participate in the Medicaid program. There are a few other health insurance programs that are federally funded such as coverage for military retirees and dependents.

The extent of insurance coverage is important at the societal level, since it is a gauge of the ability of U.S. citizens to pay for the health services they receive and reflects the extent to which this function is provided for society-wide. At the institutional level, the type of reimbursement available from patients becomes a crucial determinant of revenue for hospitals and other providers. Each type of insurance involves different patterns of coverage, rates of reimbursement, and payment arrangements.

Insurance coverage is typically calculated in terms of the proportion of the population covered by all types of insurance or covered under a particular insurance program. The level and type of coverage may be calculated with either individuals or households as the denominator. A typical breakdown may include the percentage of the population covered by: commercial or private insurance, Medicare, and Medicaid. There are a few other miscellaneous categories of coverage (such as state-sponsored workman's compensation programs), and there is also a category for those without coverage, usually identified as either "self-pay" or "no insurance."

A major concern from a health systems perspective in the early twenty-first century is the growing number of Americans who lack health insurance. A variety of factors have resulted in as many as 50 million Americans without any health insurance and millions more who are considered underinsured. Like most other indicators here, there are demographic correlates to insurance coverage, the nature of which have been changing over time. Historically, those lacking insurance were primarily young adults, the unemployed and self-employed, the poor and near-poor (who do not qualify for Medicaid), including disadvantaged racial and ethnic minorities. Given that most commercial insurance is sponsored by employers it is not surprising that those without stable employment lack insurance. However, over the past two decades the picture has changed significantly as employers are reducing their support for health insurance or eliminating this benefit altogether. This means that a growing number of the uninsured are actually employed including many in well-paying jobs. This development has changed the profile of the uninsured and affected the labor market, as a growing number of Americans take jobs or remain in jobs primarily because of the health insurance benefits.

The relevance of the discussion here is reflected in the fact that various demographic categories of the population are characterized by different mixes of insurance.

The relationship is so strong that if one knows certain demographic characteristics for a particular population, the payer mix can be rather accurately estimated. Conversely, if one has information on the insurance mix of a population, it is possible to estimate some of its demographic characteristics. (See Chap. 2 for a more detailed discussion of healthcare financing.)

11.2.11 Drug Utilization

The level of drug utilization is another indicator of the use of health services that is sometimes used. This typically focuses on the consumption of prescription drugs, since these (rather than over-the-counter medicines) are thought to more closely reflect actual utilization of the formal healthcare system. While the level of drug prescription can be determined from physician and pharmacist records, rates of consumption of nonprescription drugs must be determined more indirectly.

Rates of drug utilization are typically calculated in terms of the number of prescriptions written – for example, the number of prescriptions written within a given year per 1,000 population. Alternatively, the average number of prescriptions written annually per person may be calculated. Moreover, this may be adjusted to include only those persons with any prescriptions written. Occasionally, the level of drug consumption might be estimated based on the quantities of pharmaceuticals prescribed. All of these approaches are flawed to a certain extent, due to the fact that a drug prescribed is not necessarily a drug consumed. Even if the drug is consumed, it may not be taken in the dosages or at the frequencies prescribed. Rates that are calculated should be seen more as an indicator of activity level of the health care system rather than actual behavior on the part of patients.

In any case, there are important demographic differences in the level and types of drugs prescribed and nonprescription drugs purchased. Part of these differences can be attributed to variations in lifestyles characterizing different groups in society. Interestingly, another part can be attributed to the prescription patterns of physicians in relation to patients with varying demographic traits.

11.3 Demographic Correlates of Health Behavior

11.3.1 Biosocial Characteristics

11.3.1.1 Age

Age is considered by many to be the best single predictor of the utilization of health services. Age is related not only to the level of service utilization but to the type of services used and the circumstances under which they are received. This is true whether the indicator is for inpatient care, outpatient care, tests and procedures performed, insurance coverage, or virtually any other measure of utilization. It is also true for measures of informal health behavior.

There are several reasons for the close association between age and health behavior in its various forms. As indicated in Chap. 10, the distribution of health problems within the population is highly age specific. Different conditions are associated with each age cohort, resulting in demands for differing types of services. In addition, age is likely to be related to living conditions and marital status, and these in turn influence service utilization and informal health behavior. Another factor is the relationship between age and lifestyle. The attitudes and perceptions components of lifestyles, as well as values, have historically changed with age. Attitudes toward one's health and toward the healthcare delivery system are likely to vary with age. Younger people are generally more accepting of innovations and alternative care arrangements. Older people tend to be more traditional in their use of services and practitioners, although as the baby boomers age, much of the conventional wisdom is being questioned.

Not surprisingly, age differences exist in the utilization of physician services. With the exception of the youngest age cohorts, there is a direct relationship between age and number of physician office visits (National Center for Health Statistics 2011a). The elderly overall visit physicians one and a half times as often as all nonelderly taken as a group. Thus, in 2007 those aged 75 and over were the highest users of physicians with an average of 6.9 office visits, compared to 2.1 for those under 15, the cohort least likely to use physician services. These figures track to a certain extent differential access to care within the population. In 2010, for example, 97.5% of those 75 and older had a regular source of physician care, compared to only 75.4% of those 18–44 (National Center for Health Statistics 2011c).

A significant difference exists in the utilization of specialists by age of the patient. As age increases, the utilization rate for primary care physicians decreases and that for specialists increases. The increase in chronic problems with age means that more specialized services are necessary. While populations aged 45 and under are more likely to use general or family practitioners, OB-GYNs, and pediatricians (for their children), the older age cohorts are relatively more likely to patronize medical and surgical specialists such as cardiologists, oncologists, and urologists Over 50% of the visits for those 65 and older are to medical or surgical specialists, compared to only 12.6% for those under 15 (National Center for Health Statistics 2011b). Thus, the age structure of the population becomes a key factor in the types of physicians needed by a particular community.

Similar rate differentials are found for other health care practitioners. For example, among adults the "middle-aged" (the 45–64 cohort) visited dentists are a higher rate (64.8%) than did other age cohorts. Interestingly, those 75 and older were least likely to report a dentist visit (54.9%), reflecting the commonplace nature of dentures within this age (National Center for Health Statistics 2011c).

Although some diagnostic tests and therapeutic procedures may be performed throughout the age spectrum, most clinical procedures have a particular age configuration. For example, some tests and procedures are typically performed only on children. Women of childbearing age tend to be virtually the only utilizers of certain other tests and procedures. In general, diagnostic procedures are less frequently performed on those under age 45 than they are on those over 45. Exhibit 11.1 addresses an important issue relative to the aging of the population.

Although it has become a truism in U.S. society that the consumption of health services increases with age, this primarily reflects the heavy weight accorded to hospital care. The rate of hospitalization for individuals under 45 is very low, with the lowest rate (37.8/1,000) being recorded for the under-18 age cohort. The only exception to low rates at the younger ages, of course, is for women during their childbearing years. After 45, however, the admission rates begin to increase with a major jump in hospitalization rates from the 45–64 age cohort to the 65–74 cohort. Those 65 and over recorded an admission rate of 350.8 per 1,000 in 2006, a rate ten times that for the least hospitalized cohort (National Center for Health Statistics 2010). Looked at differently, only 2.3% of those 12–17 years reported one or more hospital stays in 2009, compared to 15.9% of those 65 and older.

Further, the average length of stay increases from the 15–24 age group to the 65- and-over cohort, from 3.7 to 5.6 days (National Center for Health Statistics 2010). Historically, the greatest jump in admissions has been at the 60–65 age break; however, with the improved health status of the elderly in U.S. society, by the later years of the twentieth century age 70 or older had become the breakpoint at which hospital utilization soars.

Within this framework of overall high rates for the elderly and generally low rates for the nonelderly, there are some important variations. To the extent that health problems are age specific, there are conditions that have a very different configuration from that above. Childbirth has already been mentioned as one example; those admitted for tonsillectomies or myringotomies (ear tubes) are virtually all children, while those admitted for alcoholism and drug abuse treatment are more likely to be in the 20–35 age range. The most frequent reasons for hospitalization for those under 15 are acute conditions associated with the respiratory and digestive systems. For those aged 15–44, there are major differences related to sex. Childbirth and related conditions account for nearly half of the female hospitalizations, while injuries and mental disorders are the most common among males. For the 45–64 and 65- and-over cohorts, heart disease and cancer predominate (National Center for Health Statistics 2010).

In terms of emergency department utilization (for true emergencies), the youngest and the oldest age cohorts report the most visits. More than one-fourth (25.6%) of children under 6 reported at least one emergency department visit in 2009, while 28.8% of those 65 and older reported at least one visit. The lowest rate of emergency department use was recorded by those 45–54. Children under 1 year of age had the highest use rate (885 per 1,000) in 2007, while the lowest rate (254 per 1,000) was recorded for the 5–14 cohort (National Center for Health Statistics 2011c).

The discrepancy between the elderly and the nonelderly in terms of admissions is magnified with respect to patient days. The seriousness of conditions for which the elderly are hospitalized means that long lengths of stay are generated. For example, a general hospital with an average length of stay of 6 days may record an ALOS of 10 days for elderly patients. Alternatively, a hospital that reports that 35% of its admitted patients are 65 or older may find that 50% of its patient days are accounted for by the elderly (National Center for Health Statistics 2011c).

The relationship between nursing home utilization and age is predictable. Few nursing home residents are under 65 with this age cohort accounting for 11.7% of residents in 2004 (National Center for Health Statistics 2009). Within the nursing home population itself, there are significant differences in age distribution. Those 85 and older account for nearly half (45.7%) of nursing home residents. Those 65–74 on the other hand account for only 11.7% of residents. Overall, fewer than 4% of those aged 65 and older and those 75–84 resided in nursing homes in 2004. However, 14% of those aged 85 and over were institutionalized. As the American population has aged, the average age of nursing home residents has increased proportionately. Similar age distributions are seen for those receiving home health care (although with 75–84 being the modal age cohort) and hospice care (National Center for Health Statistics 2009).

Insurance coverage in terms of both its presence and type varies with age. Since the introduction of Medicare, the elderly have been the one group with essentially universal coverage because of Medicare. Because of a variety of children's health insurance programs, only 7% of those under 18 are uninsured (Martinez and Cohen 2011). On the other hand, adults under 25 and those 25–44 are the least well insured of any age cohort, with 26% and 28%, respectively, lacking coverage. Differences in type of coverage can also be identified. Older age cohorts (e.g., 45 and older) are more likely to have traditional indemnity insurance than are those under 45. The under-45 group is more likely than the older group to be enrolled in a health maintenance organization or some other form of managed care.

Utilization of prescription drugs tends to increase with age, reflecting to a great extent the use of drugs for the management of the chronic health problems that tend to accumulate with age. Those aged 65 and older constitute the age cohort with by far the highest rate of prescription drug use, reporting that 90.5% were on a least one prescription drug (2005–2008 average). On the other hand, only 25.3% of those under 18 were on one or more prescription drugs (National Center for Health Statistics 2011a).

The population aged 65 and over is markedly different from younger age cohorts in terms of most health behavior. In addition, there are several linear relationships, such as breakfast eating (percentage going without declines with age), perceived stress (declines with age), and heavy drinking (declines with age). The remaining factors show less clear patterns, though differentials do still exist. The percentage having never smoked is highest at the youngest and oldest ages.

As was the case with physical illness, the quantity and type of mental health services utilized vary dramatically with age. The very young utilize few such services, while the utilization rate for other cohorts varies widely. In terms of inpatient care for the mentally ill, the elderly have historically been overrepresented, although this may be a reflection of selective data. By the 1970s, young adults had become overrepresented among psychiatric inpatients. This shift reflects changes in institutionalization policies and the redefinition of certain behaviors as mental illness.

Among those diagnoses with depression, the utilization of mental health services increases with age. Those 50 and over are most likely to obtain treatment for their depression (86.3%), while the only 44.7% of those 18–25 sought treatment

(The Substance Abuse and Mental Health Services Administration 2011). However, other research has found that overall younger adults requiring treatment were three times more likely to receive it than older adults (Karlin et al. 2008). According to the National Institute of Mental Health, the rate of psychiatric hospitalization for non-elderly adults was 995 per 100,000 in 2007 (Blader 2011). This compares to 807 per 100,000 for the elderly. The rate for children under 12 was only 283 per 100,000 but that for teenagers (969) was comparable to that for adults. All of the age cohorts exhibited increases in psychiatric hospitalization rates over the past decade except for those 65 and over. The elderly actually exhibited a decrease in admission rates.

The inclusion of alcoholism, drug abuse, and suicide under the heading of mental illness has created a "bulge" on the part of the 15–25 age cohort among those treated for mental illness. On the other hand, attributing many symptoms of aging to Alzheimer's disease has reduced the perceived prevalence of mental illness among the elderly. Further, the advent of adolescent treatment centers has meant that many more teenagers are being defined as mentally disturbed than in the past.

For outpatient mental health care overall, the 15–35 age cohort appears to dominate. This pattern is probably more a function of help-seeking by females in these age cohorts than of mental problems in this age group. The picture is further complicated when source of treatment is considered. Those utilizing community mental health center services, which have become the most common settings for care, tend to have demographic characteristics different from those utilizing psychiatrists or psychoanalysts. Further, those utilizing medical doctors or clergymen for mental health counseling also differ in terms of their demographic characteristics.

Exhibit 11.1 The Elderly Are Not as Old as They Used to Be

The aging of the American population is a more complex process than meets the eye. Summary figures on the increasing proportion of the population that is 65, 75 or 85 years of age or the increase in the median age tell only part of the story. Indeed, the characteristics of the "elderly" have been steadily changing and the older population is "younger" than it used to be.

While this may sound confusing, it really is quite straightforward. At the beginning of the twentieth century and as recently as 60 years ago, a man or woman who was age 65 or over was considered "old." In those times many had lived "hard" lives, working in dangerous and physically demanding occupations, and few imaged living to much less beyond "retirement age." Many men never retired. They just worked until they died. Women tended to outlive their husbands but not by many years.

Despite the many health threats that came to light during the later years of the twentieth century, the average elderly person today is healthier than his or her parents – in both an objective sense (e.g., increased life expectancy and lower morbidity rates) and in a subjective sense (e.g., higher self-assessments of health status). Overall, persons reaching age 50 or 60 can expect more

(continued)

Exhibit 11.1 (continued)

person-years without serious illness and disability than those in previous generations, and they feel better about their health.

The resulting "younger" older populations has become the target of a number of health services providers and many other companies that try to associate their products or services with healthy senior living. Indeed, one increasingly sees advertisements featuring "mature" and attractive models or spokespersons. Whether it is an advertisement for Centrium ("it's a great time to be silver") or a pitch to look 20 years younger by having a facelift, marketers contend their healthcare products will make seniors fit and attractive. Undoubtedly, some of those efforts to look and feel better not only encourage some elderly to report that they feel better (and report an increase in self-assessed health status), but in fact cause them to be physically better off because they are exercising more or eating healthier foods.

Because there is a self-fulfilling dimension to the process of being a healthier senior, thinking that one is a healthier senior, and exhibiting behavior that is consistent with both the physical and psychosocial dimensions of health, there is every reason to believe that the elderly, in general, will continue to be healthier. This fact should not be lost on any organization that offers health products or services to the older population.

11.3.1.2 Sex

In U.S. society, females are more active than men in terms of health behavior and are much heavier users of most health services. Part of the heavier utilization attributed to females in U.S. society can be explained by their higher reported levels of morbidity. As noted in Chap. 10, women report more symptoms and more illness episodes than men. The relative complexity of their reproductive systems also necessitates more use of health services. It should also be noted, however, that women are also more conscious of health services that are available and are more willing to utilize them. It appears that sex role differentiation in U.S. society has encouraged utilization of health services by females and discouraged their use by males.

The average number of annual physician office visits (for all physicians) for females in 2007 was 3.5/1,000, compared to 3.7/1,000 for males (National Center for Health Statistics 2011b). These figures suggest a reversal of past trends where females were heavier users of physician services. At the same time, 21.5% of males did not have a regular source of care, compared to only 12.8% of females (National Center for Health Statistics 2011c). Obviously, the rate of utilization for the range of specialties varies by sex. OB-GYNs are utilized almost exclusively by females, while men are overrepresented among the patients of urologists. Similar rate differentials are found for other health care practitioners. For example, females utilize dentists at a higher rate than males, with 64.1% of females having visited a dentist in 2010 compared to 56.3% of males (National Center for Health Statistics 2011c).

The hospital admission rate (for general hospitals) for males in 2007 was 93.7 per 1,000 males and 114.4 per 1,000 females in the population (National Center for Health Statistics 2007). Some 6.2% of males reported at least one hospital stay, compared to 9.3% of females. Much of the female hospitalization can be accounted for by childbirth, which remains one of the leading causes of hospitalization. When tertiary care is examined, males tend to be predominant. Females averaged 4.6 days per hospital stay in 2007, compared to 5.3 days for males. The shorter length of stay associated with childbirth tends to reduce the patient days generated by females.

Historically, males, particularly adolescents and young adults, have been more likely to utilize hospital emergency rooms for true emergencies, primarily due to the large number of injuries and accidents occurring among this sub-population. However, figures from 2007 indicate emergency department use rates of 370 per 1,000 for males and 418 per 1,000 for females, suggesting a reversal of historical patterns.

Despite comparable hospital admission rates, females tend to be subjected to one and a half times as many procedures on the average once admitted (National Center for Health Statistics 2010b). This differential primarily reflects the heavy use of services by obstetrical patients, and when older age cohorts are examined, it is found that among those 65 and older males are subjected to a much greater number of procedures.

As expected, females comprise the majority of nursing home residents. The nation's nursing home population is over 70% female. For the 85- and-over cohort, the female proportion is over 83% (National Center for Health Statistics 2009), reflecting the preponderance of females in the older cohorts. The higher mortality rate for males, coupled with the fact that when males become ill they are less likely to survive, means that there are more female candidates for nursing home admission. Further, males surviving into the older age cohorts are likely to have a wife to care for them. This is not true for females surviving to advanced ages; they typically outlive their spouses.

The distribution of insurance coverage has historically not been related to sex. Insurance policies typically involve family coverage, so calculations are made in terms of the head (presumably male) of the household. With the changes that have occurred in family structure during the past two decades, this stance is requiring modification. Today, federal figures indicate that 13.5% of females nationwide lack health insurance compared to 17.1% of males (Martinez and Cohen 2011). Many households headed by females lack health insurance or are covered only under the Medicaid program. It is often the case that the children in the household are covered under some program but the adults are uninsured.

Females are much heavier users of prescription drugs in the United States than are males. For the 2005–2008 period, some 52.4% of females reported at least one prescription drug, compared to 41.7% of males (National Center for Health Statistics 2011c). This partly reflects the greater participation of females in the health care system and their more assertive behavior in seeking out cures. However, if calculations are made eliminating those who have received no prescriptions, females still retain an edge. One explanation offered for this has been the practice of physicians. A tendency for physicians to prescribe more drugs for females than for males, all other things being equal, has been documented.

Females tend to be heavier users of mental health services than are males. For example, the 2003–2004 National Health and Nutrition Examination survey found that 8% of females and 7% of males reported seeing a mental health professional in the previous year. Given equal levels of depression, 74.2% of women reporting seeking care, compared to 65.0% of men (The Substance Abuse and Mental Health Services Administration 2011). The over-representation of women, however, primarily reflects use of outpatient services; when inpatient mental health care is examined, males appear to be heavier utilizers of these services. Females exhibit higher levels of utilization regardless of the type of therapist. For psychiatrists, clinical psychologists, social workers, and even general practitioners and clergymen, females constitute the majority of the patients or clients.

In terms of mental hospital admissions, females do not hold the same edge as for outpatient services. Females have slightly higher admission rates to private psychiatric hospitals and general hospitals, but significantly lower admission rates to public mental institutions. This is explained to a certain extent by contemporary patterns of mental hospitalization. The conditions most likely to warrant institutionalization are the extreme psychotic conditions such as schizophrenia and manic-depression. Males tend to have higher rates of the former, and females of the latter. However, depressed patients are much more likely to be admitted to general hospital psychiatric wards than they are to mental hospitals. Women, therefore, turn up less often in the mental hospitalization statistics.

In addition, by the late 1980s, substance abuse had become a leading cause for mental hospital admission. The various types of substance abuse tend to be much more common among males. Another reason for the apparent discrepancy between outpatient and inpatient treatment rates for women is their likelihood of being admitted to a private mental facility, if not into a general hospital. Males are proportionately more likely to be admitted into public facilities. For both inpatient and outpatient mental health treatment, females are overrepresented among those voluntarily seeking care and males among those involuntarily seeking care. Exhibit 11.2 describes a changing pattern of health behavior in the U.S.

Exhibit 11.2 Behavioral Risk Factors and the Decline of Smoking in the United States

There are a number of behaviors that have been linked to increased morbidity, lower levels of satisfaction with one's health and, ultimately, to **reduced** life expectancy. While the rule of moderation holds for most behaviors, in some instances any risk at all linked to some behaviors is considered undesirable. It is well documented that too much drinking, being overweight, driving without a seatbelt, working in or near carcinogens, and eating processed foods, among other things, can be deleterious to one's health. And, we also know that some behaviors are worse than others; for example, not brushing one's teeth twice a day is not as risky as having unprotected sex with multiple partners.

(continued)

Exhibit 11.2 (continued)

Issues related to behavioral risk are confounded by the fact that there is not always agreement over behavioral guidelines within the medical community, and on-going research often leads to recommended changes in behavioral guidelines. With regard to the former, there is debate over how often a woman should have a mammogram once she reaches age 40. The American Medical Association, following recommendations of the American Cancer Society, has established guidelines for annual mammograms for women age 40 and over. However, many physicians and a number of researchers disagree that an annual mammogram beginning at age 40 is the standard that should be applied.

As another example, recent research has shown that a moderate level of alcohol consumption is linked to a lower incidence of heart disease. The researchers do not recommend that all nondrinkers begin drinking, **of** course, but this research indicates that a higher level of alcohol intake than was previously thought is not only acceptable but has some health advantage.

There are several behaviors that are known to be related to more frequent sickness and quicker death where use in moderation is not even recommended. Cigarette smoking is one of those behaviors and the one that has received the greatest attention in the popular media in recent years. The table below indicates the percentage of persons smoking by age and sex for four time periods: 1965, 1985, 1995 and 2005. Younger teens, whose percentages have increased in recent years, are not included in the table. As the table shows, smoking percentages are higher for males than for females for all time periods, although significant convergence has been exhibited over time. Rates of smoking overall have declined sharply since 1965, with males 18–24 experiencing the greatest decline. While smoking rates are clearly lower in 2005, it is still the case that almost 25% of the adult population smokes cigarettes.

Cigarette smoking continues to be one of the most serious health concerns for individuals as well as for public health in the United States. Growing concern has been voiced over the impact of second-hand smoke. Numerous campaigns have been launched to reduce the level of tobacco use, and this will remain a focus of public health initiatives for the foreseeable future.

Cigarette Smoking of Adults in the United States 1965–2005

Age cohort (years)	Males				Females			
	1965	1985	1995	2005	1965	1985	1995	2005
18–24	54.1	28.0	27.8	28.0	38.1	30.4	21.8	20.7
25–34	60.7	38.2	39.5	27.7	43.7	32.0	26.4	21.5
35–44	58.2	37.6	31.5	26.0	43.7	31.5	27.1	21.3
45–64	51.9	33.4	27.1	25.2	32.0	29.9	24.0	18.8
65 and over	28.5	19.6	14.9	8.9	9.6	13.5	11.5	8.9

National Center for Health Statistics (2011)

11.3.1.3 Race and Ethnicity

A correlation has been found between racial and ethnic characteristics and the utilization of certain types of health services. In fact, a persistent concern voiced by health professionals relates to the disparities that exist with regard to the services used and treatment received by various racial and ethnic groups. The most clear cut differences have been identified between the health behaviors of blacks and whites. Certain Asian populations and ethnic groups also display somewhat distinctive utilization patterns. To a limited extent, differences in utilization may be traced to differences in the types of health problems experienced. Many of the differences reflect variations in lifestyle patterns and cultural preferences. For some racial and ethnic groups, in fact, differences in health care utilization patterns may have little relationship to differences in health status.

In general, whites tend to utilize physicians at a rate higher than do members of other racial and ethnic groups. Whites in the United States average 3.2 physician office visits per year; this compares to 3.1 visits for African Americans, and 3.0 visits for Hispanics (National Center for Health Statistics 2011b). African Americans were less likely to have a regular source of care than whites but Hispanics were the least likely to have a regular source (National Center for Health Statistics 2011c). Whites are overrepresented among the patients of specialists, while African Americans are more likely to utilize primary care physicians. Hispanics are even less likely to visit a specialist. These differences in utilization patterns reflect differences in lifestyle, income, education, access to care, and cultural preferences.

Significant differences are found in the use of dental services for various racial and ethnic groups. In 2010, 61.4% of whites and 63.1% of Asian Americans reported having visited a dentist during the previous year. On the other hand, only 47.7% of Hispanics, 51.0% of African Americans and 53.0% of American Indians reported a dental visit in the previous year.

Some ethnic group members utilize alternative types of care in the form of "traditional" healers. Thus, their physician utilization rate does not provide a full picture of their health care utilization. However, there is debate over whether or not members of certain racial and ethnic groups use more complementary or alternative therapies or if it is a matter of use of different types of therapies (Barnes et al. 2008).

Differences are found in the types of tests and procedures performed on members of various racial and ethnic groups. Some of these differences may reflect the perceptions and practice patterns of providers in their management of members of various groups. It has been found, for example, that African Americans are likely to be subjected to more invasive forms of treatment than whites, all things being equal. At the same time, African Americans are less likely to receive more complex diagnostic and treatment procedures than are whites (National Institute on Minority Health and Health Disparities 2003). It is believed, however, that these patterns are more a reflection of the socioeconomic status of the patients and the conditions under which care is received than a function of racial differences.

The hospital admission rate for whites tends to be almost 20% lower than that for African Americans, despite the older age structure of the white population. In 2009, 7.8% of whites reported at least one hospital stay, compared to 8.6% for African

Americans, 8.2% for American Indians, 5.2% for Asian Americans and 6.5% for Hispanics (National Center for Health Statistics 2010c).

Although whites generate a greater number of patient days per 1,000 population, their average number of patient days per hospital episode is not that different from the figure for African Americans. In fact, when African Americans are hospitalized they tend to record longer lengths of stay, presumably because they have more serious conditions on the average at the time of hospitalization. As with admissions, there is no consistent pattern with regard to patient days and length of stay for other racial and ethnic groups.

African Americans record by far the highest rate of emergency department visits with 31.1% reporting at least one hospital admission in 2009. This compares to figures of 20.4% for whites, 13.2% for Asian Americans, and 19.5% for Hispanics (National Center for Health Statistics 2011c).

Whites are overrepresented among the nursing home population. While whites represented approximately 82% of the U.S. population, in 2004 they accounted for over 86% of the nursing home population. African Americans and other racial and ethnic groups tend to be underrepresented, although the proportions of racial and ethnic groups other than non-Hispanic whites have been slowly increasing. Rates of nursing home utilization in 2004 were 54.3 per 100,000 for whites, compared to 49.9 for African Americans, and 15.1 for all other racial/ethnic groups. In 2004 less than 4% of nursing home residents were Hispanic (National Center for Health Statistics 2009).

The underrepresentation among African Americans is particularly noteworthy in view of the heavy burden of chronic disease and disability affecting this population. These differences are partially explained in terms of the ability to pay, since nursing home care is typically paid for out-of-pocket or through the Medicaid program. That means that nursing home residents are either relatively affluent or relatively poor. The absence of African Americans, Asian Americans, and various other ethnic group members from nursing homes, however, is probably more a reflection of cultural preferences and the relatively strong family and social support systems that characterize some ethnic groups than it is of economic factors (Medical News Today 2007). It may also reflect the higher mortality rates characterizing certain nonwhite populations prior to the elderly years described in the previous chapter.

There are some differences in insurance coverage in terms of racial and ethnic characteristics, although these too are thought in large part to reflect economic factors rather than racial/ethnic factors. Today, 11% of non-Hispanic whites, 17% of African Americans, 15% of Asian Americans and 29% of Hispanics do not have health insurance of any kind (Martinez and Cohen 2011). Whites tend to have higher levels of private insurance than African Americans and members of certain other groups. To a great extent this reflects differences in employment levels, since most private insurance today is provided through employment. The proportion of Medicaid coverage is higher for blacks than for other racial and ethnic groups. Hispanics represent an interesting situation, in that they have low levels of insurance but are willing to pay high out-of-pocket costs to obtain care.

Whites are also heavier consumers of prescription drugs. This partly reflects their heavier use of physician services that might lead to the prescribing of drugs. It also reflects the fact that whites constitute a higher proportion of the elderly than they do of the general population. Selective mortality within younger age cohorts leaves fewer blacks to suffer the chronic conditions of old age. Members of most other racial and ethnic groups tend to use prescription drugs at a much lower rate than whites (Schnore et al. 2004). This pattern essentially holds for over-the-counter drugs as well.

The use of mental health services for blacks and certain ethnic groups is inversely related to the identified need for services. Whites are has historically been overrepresented in most treatment settings, while African Americans have been overrepresented in public mental hospitals and the psychiatric wards of general hospitals. This pattern holds for the second largest racial/ethnic group – Hispanics – as well. It should be noted that blacks face a greater likelihood of involuntary commitment, and this accounts for some of the difference in hospital utilization.

Other ethnic groups display disparate patterns of mental health care utilization. Jews, for example, tend to be heavy utilizers of many types of mental health services. Certain Asian American populations, on the other hand, are underrepresented in all mental health treatment settings.

Exhibit 11.3 illustrates the correlation between selected demographic characteristics and physician utilization.

Exhibit 11.3 Annual Physician Visits by Selected Demographic Attributes: Various Years

Age**	
0–14	2.8
15–24	2.0
25–44	2.5
45–64	3.7
65–74	7.1
75 and over	7.6
Sex**	
Male	2.9
Female	3.8
Race**	
White	3.4
African American	3.2
Asian American	3.0
American Indian	3.0
Hispanic	3.0
Income*	
Less than $33,000	2.2
$33,000–$60,000	2.7
$60,000+	3.2
Education*	
Low	2.5
Moderate	2.6
High	3.0

Source: National Center for Health Statistics (2006, 2011a)
Note: Combined visits to primary care physicians, surgical specialists and medical specialists
*1999-2000 data and **2007 data

11.3.2 Sociocultural Characteristics

11.3.2.1 Marital Status

Marital status is a relatively effective predictor of health behavior and the utilization of health services, just as it is of health status. Marital status is related not only to levels of service utilization but to the type of services utilized and the circumstances under which they are received. This is true whether the indicator is for inpatient care, outpatient care, tests and procedures performed, insurance coverage, or virtually any other measure of utilization. It is also true for measures of informal health behavior. The categories of marital status used for the discussion below will be never married, married, divorced, and widowed.

Research by the National Center for Health Statistics has found differences in the use of physician services based on marital status. Unfortunately, recent NCHS reports have not included marital status as a variable. Based on 1989–1990 data, widowed individuals report the most physician visits per year, while the never married report the least. More recent data from the National Health Interview Survey indicates that in 2009 only 8.5% of the widowed report not having a regular source of medical care, whereas 20.7% of the never married report no regular source of care (National Center for Health Statistics 2011c).

These figures must be interpreted with care, however, since the volume of physician visits varies widely, as noted above, by sex. The rate of contact for males is lower than that for females in every marital status category, although little difference exists from one marital status to another for men. The patterns of utilization of dentists and other health professionals are similar for the various marital statuses. While the married have fewer dental problems, they are more regular utilizers of dentists than are those in other marital status categories. Some 64.9% of the married in 2010 reported a dental visit during the past year, compared to 55.8% of the never married, 53.9% of the divorced and 50.2% of the widowed (National Center for Health Statistics 2011c). Again, the widowed are the most likely to wear dentures thereby limiting their need for dental care.

The age-adjusted rate of hospitalization for married individuals is relatively low. Admission rates for the never married also tend to be relatively low, while those for the widowed and divorced are high by comparison. If rates of admission for various conditions are considered, the variation among marital statuses is even more pronounced. The pattern identified for the various marital statuses in terms of patient days is similar to that for admissions. Observed differences in length of stay, however, probably reflect other factors than marital status.

The relationship between nursing home utilization and marital status is one of the most clear-cut to be discussed in this section (National Center for Health Statistics 2009). Few (20.2%) nursing home residents are married in 2007. The bulk of nursing home residents are widowed (53.2%), although there are small numbers who are divorced (10.2%) and never married (14.8%). Married individuals requiring nursing care are often maintained in the home and cared for by a spouse.

Limited recent research is available on the use of mental health services by marital status and the existing data are too inconclusive for presentation here.

Insurance coverage, in terms of both its presence and type, varies with marital status. The married have by far the best insurance coverage, typically with a private insurance plan. Never married individuals are the least likely to have insurance of any type, with the divorced and widowed intermediate. Based on the 2011 National Health Interview Survey, 13% of the married lacked health insurance, compared to 27% of the never married, 5% of the widowed and 22% of the divorced (Martinez and Cohen 2011). Medicare coverage is somewhat higher among the divorced and widowed because they are older on the average than the married and never married. Unmarried heads of household have the highest rate of Medicaid coverage.

Although there are some exceptions, utilization of prescription drugs tends to be higher for the married. This partially reflects the higher use of physician services on the part of the married. Those in the unmarried categories are found historically to have higher rates of utilization of nonprescription drugs.

11.3.2.2 Income

Income is probably one of the better predictors of health behavior and the utilization of health services. Income is related not only to levels of service utilization but to the types of services utilized and the circumstances under which they are received. This is true whether the indicator is for inpatient care, outpatient care, tests and procedures performed, insurance coverage, or virtually any other measure of utilization. It is also true for measures of informal health behavior.

As indicated in Chap. 10, the distribution of health problems within the population is highly income specific. There is a direct and negative relationship between income level and health status measures such as morbidity and mortality. This results in a demand for health services that varies in level and type of service on the basis of income. In addition, income is likely to be related to living conditions and lifestyle, and these in turn influence service utilization and informal heath behavior. The attitudes and perceptions components of lifestyles, as well as health-related values, have been clearly documented to vary by income.

In the past, significant differences have existed in the utilization of physicians in relation to income. Historically, the number of annual physician visits per capita increased with income, although the highest income groups always represent something of a anomaly. The lowest income groups tended to be infrequent users of physician services. This reflected a lack of family physicians and the use of alternative sources of care such as public health clinics. This situation has changed due to the availability of government-sponsored insurance programs and efforts at offering physician services in underserved communities. Health programs for the poor have reduced differences in access to care by income, although the lower income groups continue to be underrepresented among the patients of private practice physicians.

According to the 1999–2000 figures, the least affluent recorded 2.2 physician visits annually compared to 3.2 for the most affluent (National Center for Health Statistics 2006). At the same time, 25.3% of the poor reported no regular source of healthcare, compared to 8.6% of the most affluent (National Center for Health Statistics 2011c).

A significant difference exists in the utilization of specialists by the income of the patient. As income increases, the utilization rate of primary care physicians decreases and that of specialists increases. This is something of a reflection of the fact that the affluent are likely to be somewhat older than the non-affluent and thereby to have more chronic conditions. It also reflects the prestige dimension of medical specialists. Their presumed greater expertise and their higher rates make them appealing to the well established.

The patterns of utilization of dentists and other health professionals are similar to those for physicians. There is a direct and inverse relationship between income and dental care utilization. The more affluent see dental care as a preventive service, while the least affluent see it as an expensive service only to be used in emergencies. Thus, in 2010 only 43.7% of those with household incomes under $35,000 had visited a dentist in the previous year. The use of dentists increases steadily with income, with 80.7% of those with household incomes over $100,000 reporting a dental visit (National Center for Health Statistics 2011c). No clear cut income differences are found in the use of podiatrists, physical therapists, and mental health counselors. Chiropractors tend to be patronized primarily by those from working-class backgrounds.

Income is also a useful predictor of the types of clinical services that will be utilized. Although diagnostic tests and therapeutic procedures are typically performed as necessary in the eyes of the physician, many clinical procedures have a particular income configuration. For example, the non-poor report a mammography rate 1.5 times that of the poor (National Center for Health Statistics 2011c). This disparity is further reflected by the high proportion of elective surgery performed on the affluent. An obvious example is cosmetic surgery. Cosmetic surgery and other elective procedures performed to improve the appearance of the affluent are almost never performed on the poor.

Hospitalization rates tend to decrease directly with income. The rate of hospitalization for the poorest segment of the U.S. population is the highest of any income group, reflecting the higher incidence of health problems. The hospitalization rate for those household reporting incomes under $35,000 was 99/1,000 in 2009 compared to 64/1,000 for households reporting incomes over $100,000 (National Center for Health Statistics 2011b). Further, after admission, the length of hospital stay is also longer on the average for the lower income groups.

Those in the lowest income groups were most likely to utilize hospital emergency departments. In 2009, 31.5% of those in the lowest income category reported at least one emergency department visit, compare to 16.3% of those in the highest income category (National Center for Health Statistics 2011c). This phenomenon is explained by the lack of family physicians among lower-income patients, their lack of accessible services other than emergency rooms in inner city areas, the hospital emergency room's obligation to provide treatment, and the now well-established cultural preference for emergency room care.

The differences noted for admissions and length of stay reflect the types of conditions for which different income groups are admitted. These differences further appear to reflect disparities in lifestyle. The higher fertility levels of the lower income groups result in a higher rate of admissions for childbirth and related problems. The relatively unhealthy and unsafe environment in which the lower income groups are likely to live results in a higher rate of emergency admissions, especially for children. Admission rates for psychotic conditions and substance abuse problems tend to be higher for the least affluent. The pattern of longer stays for the less affluent is complicated somewhat by unexpected cases of shorter lengths of stay for lower income patients because of their limited ability to pay for services.

The relationship between nursing home utilization and income is not very clear cut. In fact, the more affluent and the least affluent are likely to be more highly represented among the nursing home population than those in between. This is partially explained in terms of the patient's ability to pay. Nursing home care is typically paid for either out-of-pocket or through the Medicaid program. This would suggest that nursing home residents are either relatively affluent or relatively poor.

The relationship between insurance coverage and income is fairly clear-cut. The more affluent the person, the better the coverage typically is. The lowest income groups are the least well insured in terms of commercial insurance. They do, however, often qualify for Medicaid coverage, which covers some of their health care needs. According to the 2011 NHIS survey, 17% of those living in poverty lacked health insurance compared to 10% of the non-poor (Martinez and Cohen 2011). In the later years of the twentieth century, the group the "near poor" emerged as the group with the least tenable position insurance-wise, and 31% of this group lacked health insurance at the time of the survey. This is the working-class population that may not have employer-sponsored insurance due to the nature of the employment but are not poor enough to qualify for Medicaid. Middle-income groups are more likely to be enrolled in some form of managed care, due to the nature of their employment, and 81% of the non-poor had private insurance compared to 18% of the poor. A newly emerging group of underinsured involves the postemployment-pre-Medicare population. This includes those individuals in the 55–65 age range who have left the labor force (and employer-sponsored insurance) but are not yet eligible for Medicare benefits (Pol et al. 2000).

Although there are some exceptions, utilization of prescription drugs tends to increase with income. This reflects the fact that the affluent visit private physicians more frequently than the non-affluent. Since drugs are the treatment of choice, almost regardless of the condition, prescriptions are abundantly written.

Exhibit 11.3 illustrates the correlation between demographic characteristics and frequency of physician use.

Exhibit 11.3 Length of Time Since Last Physician Visit for Those 18 and Older by Selected Demographic Attributes 2010

	Percent		
	6 months or less to 1 year	6 months	More than 1 year
Age			
18–44	57.2	16.4	26.4
45–64	71.4	13.9	8.5
65–74	84.8	9.2	6.0
75 and over	88.2	7.9	3.9
Sex			
Male	59.3	16.2	24.5
Female	73.4	14.6	12.0
Race			
White	66.9	15.1	18.0
African American	66.2	16.3	17.5
Asian American	60.2	17.6	22.2
American Indian	64.6	10.0	25.4
Hispanic	57.2	15.9	26.9
Income			
Less than $35,000	61.7	14.0	24.3
$35,000–$49,999	63.4	16.3	20.3
$50,000–$74,999	67.9	15.5	15.4
$75,000–$99,999	68.7	17.4	13.9
$100,000+	73.1	15.5	11.3
Education			
Less than high school	59.8	12.8	27.4
High school diploma	63.5	23.7	20.8
Some college	70.8	14.5	14.7
Bachelor's degree or higher	72.2	15.9	11.9
Marital status			
Never married	62.2	15.3	22.5
Married	68.3	15.9	15.8
Widowed	64.5	15.2	20.3
Divorced	66.3	15.1	18.6

Source: National Center for Health Statistics (2011c)

11.3.2.3 Education

The relationship between education and health behavior resembles that of income, although some of the relationships are stronger. In fact, some have suggested that utilization differentials linked to income actually reflect educational differences. Education is related not only to levels of service utilization but to the types of services utilized and the circumstances under which they are received. Educational attainment demonstrates a particularly close association with health behavior in its various forms.

Significant differences exist in the utilization of physicians in relation to education. Physician utilization is considerably higher for the best educated than for the least with there being a steady increasing the number of annual physician visits per capita as education increases. Based on figures from 1999 to 2000, the lowest educational groups record the lowest rates of physician visits with an average of 2.1 per year; this compares to 3.0 per year for those with the most education (National Center for Health Statistics 2006). These differences were reflected in access to a regular source of care, with 26.6% of the least educated reporting no regular source of care compared to 10.4% of the best educated (National Center for Health Statistics 2011c).

A significant difference exists in the utilization of specialists by education of the patient. As education increases, the utilization rate for primary care physicians decreases and that of specialists increases. This partly reflects the prestige dimension of medical specialists and the knowledge required to select a specialist. The presumed greater expertise of specialists makes them appealing to the well educated.

The patterns of utilization of dentists and other health professionals are similar to those for physicians. There is a direct and inverse relationship between education and the use of dental services. The better educated see dental care as a preventive service, while the least educated are less likely to appreciate its benefits. Only 37.2% of the least educated cohort (those with less than a high school education) reporting visiting a dentist in previous year in 2010. The use of dental services increases steadily with 77.6% of those with at least a bachelor's degree having visited a dentist in the previous year (National Center for Health Statistics 2011c). No clear-cut educational differences are found in the use of optometrists, podiatrists, and physical therapists. The use of various types of mental health counselors tends to increase with education. Chiropractors tend to be patronized primarily by those with poor educational backgrounds.

Education is something of a predictor of the types of services that will be utilized. Although diagnostic tests and therapeutic procedures are typically performed as necessary in the eyes of the physician, certain clinical procedures that have a correlation with income also are differentiated on the basis of education. This is reflected in the high proportion of elective surgery performed on the better educated.

The rate of hospitalization for the least educated segments of the U.S. population is very low, despite the fact that the incidence of health problems is greater for the poorly educated than for any other group. The better educated, although less affected by health problems, have much higher rates of hospitalization. Some 10.2% of those with less than a high school education reported at least one hospital stay in 2009, compared to the 7.6% recorded by those with at least a bachelor's degree (National Center for Health Statistics 2011a, b, c). This is thought to be a function of a better appreciation of the benefits of healthcare and better insurance coverage on the part of the better educated.

The relationship between nursing home utilization and education is not very clear-cut. Educational differences are found, however, in the use of other types of facilities. Less educated groups are heavier users of hospital emergency room care, especially for nonemergency conditions. On the other hand, better educated populations are more likely to utilize freestanding emergency clinics or minor medical clinics. The better educated are also more likely to utilize other outpatient settings, such as freestanding diagnostic centers or surgicenters. Those with higher educational levels are likely to be highly mobile and to be supportive of innovative and/or cost-effective forms of care.

Insurance coverage in terms of both its presence and type varies with education. The better educated the individual, the better the coverage typically is. The lowest educational groups are the least well insured in terms of private insurance. Based on the 2011 NHIS, 23% of those with less than a high school education were uninsured, compared to only 12% of those with at least a bachelor's degree (Martinez and Cohen 2011). The least educated do, however, often qualify for Medicaid coverage, which covers some of their health care needs. The better educated are more likely to be enrolled in some form of managed care due to the nature of their employment.

Although there are some exceptions, utilization of prescription drugs tends to increase with income. This reflects the fact that the better educated visit the physician more frequently than the poorly educated. Exhibit 11.5 addresses the demographic correlates of health disparities.

Exhibit 11.5 Demographic Attributes and Disparities in Health Services Utilization

Access to health care is a central aspect of health care quality. Defined as "the timely use of personal health services to achieve the best health outcomes", access to care is an important measure of health disparities. It is also important to consider receipt of care. Because racial and ethnic minorities are disproportionately represented among low socioeconomic populations, healthcare disparities among racial and ethnic minorities are often highly correlated with disparities that fall along socioeconomic lines. Relevant findings on disparities in the use of health services are presented below.

While most Americans have health insurance, many minority groups and poor patients are more likely to be uninsured or insured through public programs. Approximately 83% of the general under-65 population has health insurance at a given point in time and 17% are uninsured. However, the uninsured are not equally divided among all demographic groups. Specifically, blacks (20%) and American Indians or Alaska Natives (AI/AN) (38%) are more likely than whites (15%) to lack health insurance. Hispanics (35%) are more likely than non-Hispanic whites (12%) to lack health insurance. Similarly, poor (34%), near poor (32%), and middle income (14%) persons are more likely than high income persons (5%) to be uninsured.

In general, racial and ethnic minorities and individuals of lower socioeconomic status are less likely to have a usual source of care. For instance, approximately 87% of the population has a specific source of ongoing care

(continued)

Exhibit 11.5 (continued)

and 13% lack such a source of care. Hispanics (24%) are more likely than non-Hispanic whites (11%) to lack a source of ongoing care. Similarly, the poor (20%) are more likely than those with high incomes (8%) to report no ongoing source of care. The differences are less pronounced between the races: blacks (14%) and Asians (15%) are only slightly more likely than whites (12%) to lack a specific source of ongoing care. Racial and ethnic minorities and people with low incomes are also more likely to report having a clinic, hospital outpatient department or emergency department (ED) as their usual source of care. These institutional providers are often suboptimal sources of primary care. Many individuals without alternate sources of care frequently rely on hospital EDs to meet essential health care needs.

An important barrier to adequate care is the ability to gain referral to a specialist. Problems with access to specialists are disproportionately borne by certain populations. For example, 31% of Hispanics, compared with 19% of non-Hispanic whites, report trouble obtaining referrals. Similarly, 26% of blacks, compared with 20% of whites, have some problem obtaining referrals. Low income populations, too, experience difficulties: the poor (29%) and the near poor

Although only 5% of the population report that their health care is affected by race or ethnicity, certain populations more frequently cite this sentiment than their comparison groups. For example, blacks (17%) and Asians (13%) believe that their race affects their care more often than whites (3%). Hispanics (15%) more frequently believe that their race and ethnicity affects their care than non-Hispanic whites (1%). The poor (9%) and near poor (8%) are more likely than persons in high income families (3%); and persons with less than a high school education (10%) are more likely than college attendees (5%) to share this belief.

Blacks, Hispanics, and those of low socioeconomic status are less likely than whites, non-Hispanic whites, and those of high socioeconomic status to report having a routine office or outpatient visit in the past year. Racial and ethnic minorities also have fewer overall outpatient visits and are less likely to report receipt of prescription medications and dental visits. Those with lower incomes and less education are less likely to receive routine care, but are more likely to receive acute care. For example, the poor (17%) and high school dropouts (16%) are more likely to make emergency room visits, respectively, than high income persons (10%) and those with at least some college education (10%). Individuals of lower socioeconomic status are also more likely than their high socioeconomic counterparts to report inpatient hospitalizations.

Mental health treatment or counseling is reported less often by racial and ethnic minorities. Although the prevalence of mental disorders for racial and ethnic minorities in the United States is similar to that for whites, differences in provision of care can be observed. Compared with whites, minorities have

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Exhibit 11.5 (continued)

less access to mental health care, are less likely to receive needed mental health care services, and often receive poorer quality mental health care when in treatment. Racial, ethnic, and socioeconomic differences in the use of psychiatric medications and of psychiatric outpatient, emergency, and inpatient services have also been documented. Blacks (8%) and Asians (4%) are less likely than whites (12%), and Hispanics (6%) are less likely than non-Hispanic whites (13%) to receive any kind of mental health treatment or counseling. Similar differences are noted for receipt of outpatient mental health care and for receipt of prescription medications as part of mental health treatment. Even among adults with serious mental illness, blacks and Hispanics are less likely to receive any kind of mental health treatment. In contrast, blacks are more likely than whites to be hospitalized for mental health treatment and have higher rates of admission to specialty mental health organizations.

When health care needs are not met by the primary health care system, rates of avoidable admissions may rise. Compared with non-Hispanic whites, non-Hispanic blacks typically have higher rates of avoidable admissions while Asians and Pacific Islanders typically have lower rates. Rates of admission for bacterial pneumonia are higher among non-Hispanic blacks (473 per 100,000 population) and lower among Asians and Pacific Islanders (190 per 100,000) compared with non-Hispanic whites (335 per 100,000). Rates of avoidable admissions are also higher for persons who live in poorer neighborhoods.

Source: Based on National Institute on Minority Health and Health Disparities (2003)

11.3.2.4 Occupation and Employment Status

Occupation and employment status are perhaps not surprisingly associated with different health behaviors. Occupation can be examined in terms of occupational status (e.g., blue collar, white collar, professional) or in terms of specific occupations. Occupation and occupational status have been found to be correlated with health behavior and the utilization of health services. Occupational status is related not only to levels of service utilization but to the types of services utilized and the circumstances under which they are received. This is true whether the indicator is for inpatient care, outpatient care, tests and procedures performed, insurance coverage, or virtually any other measure of utilization. It is also true for measures of informal health behavior.

There are several reasons for the close association between occupation and health behavior in its various forms. Different levels of morbidity are associated with each occupational status category, resulting in demands for differing levels and types of services. Further, various occupations tend to be associated with certain lifestyles, a factor with implications for both health status and health behavior.

To a limited extent, the use of health services by members of the various occupational status categories corresponds with the differentials in health status identified. Other demographic attributes concomitant to occupational status, such as income and education, also tend to influence health behavior and the use of health services. In general, those in higher occupational categories require fewer services because they are healthier. Yet, they utilize more of certain types of services because they are more aware of the need for preventive care and tend to have better insurance coverage. Occupational status seems to be particularly important in terms of informal health behavior (e.g., diet and exercise) due to the influence of coworkers.

Some differences related to occupational status are found in the utilization of physician services. Despite the higher incidence of health problems among the lower occupational statuses, these individuals tend to use physicians, dentists and other health professionals less often. Here, as above, income, education, and insurance coverage play an important role in the use of physician services. Some selectivity does occur with regard to certain health professionals. Those in lower occupational statuses are more likely to use chiropractors than those in higher ones. While those in lower status occupations utilize less outpatient mental health services than those at higher statuses, despite greater identified need, the counselor of choice is seldom a psychiatrist. Less formal sources, such as social workers or clergymen, are likely to be accessed.

The rates of hospitalization for various occupational categories demonstrate patterns similar to those for the income categories discussed above. That is, the higher occupational groups have somewhat higher admission rates. This pattern may reflect the fact that age increases with occupational status. If rates of admission for various conditions are considered, the variation among occupational statuses becomes more pronounced.

The pattern identified for the various occupational statuses for patient days is comparable to that for admissions. However, the lower status occupational categories make up for any differences in admissions by recording more patient days. Differences in length of stay for the various occupational categories reflect differences in the reasons for admission (Elixhauser and Owens 2006).

The relationship between nursing home utilization and occupational status probably reflects income differences more than any other variable. The section on income above should be consulted. Some differences are found in the use of other types of facilities on the basis of occupational status. Income and educational levels no doubt play a role here and the type of insurance coverage available (which is primarily a function of employment status) is important in the type of service utilized.

Insurance coverage in terms of both its presence and type varies considerably with occupational status. This, in fact, is one of the keys to differentials in service utilization. There are important exceptions, however, in unionized occupations where those in relatively low status positions have extensive coverage. On the other hand, small-scale employers and many service occupations do not offer insurance for their employees. Individuals in these situations find that Medicaid may not be available to them either, since they are often not indigent enough. In terms of employment status, only 18% of the employed lacked health insurance in 2011, compared to 49% of the unemployed (National Center for Health Statistics 2011a, b, c).

Although there are some exceptions, utilization of prescription drugs tends to be higher for those at higher occupational levels. This partially reflects the higher use of physician services on the part of these groups. Those in the lower occupational categories are found to have higher rates of utilization of nonprescription drugs (Frone 2006).

Differences in health behavior based on employment status are probably greater than those among the various occupational categories. The unemployed, in fact, use less of all types of health services. The only exception might be higher use of hospital emergency rooms and public health facilities.

The primary explanation for this differential, of course, is the lack of insurance on the part of the unemployed. Commercial insurance is usually employer-sponsored, and the purchase of policies on the part of individuals is often financially prohibitive. The inability to pay for services becomes an important factor in use levels. This situation is complemented by lower educational levels and lack of coworker support in the appreciation of the need for various health services.

The unemployed are also likely to be characterized by informal health behavior that contributes to the poor health status. They are less likely than the employed to eat and sleep properly, to exercise, and to abstain from risk-increasing behavior such as smoking and drinking.

11.3.2.5 Religion and Religiosity

The association between religious affiliation and degree of religiosity and health behavior is probably the most idiosyncratic of those discussed in this chapter. These relationships have been exposed to limited research so that clear patterns are difficult to discern. Further, in contemporary U.S. society religious affiliation and participation tend to be associated with so many other variables that it is difficult to break out the influence of these variables per se. Given the lack of concrete data on the relationship between religion and its various dimensions and health behavior, no conclusions will be presented here.

Exhibit 11.6 summarizes the impact of current demographic trends on the demand for health services.

Exhibit 11.6 The Implications of Demographic Trends for the Demand for Health Services

Current demographic trends will have more influence on the future demand for health services than any other factor. Trends in each of the demographic compositional variables will have an impact on the types and volume of specific types of health services required as well as total health services. Changes in the age distribution of the population will a major consideration, but trends in sex distribution, racial and ethnic composition and marital status all have implications for the demand for health services. Changes in household income, educational levels, occupational and industrial characteristics and, notably, health insurance coverage will all play a role. While the changing age distribution drives much of

(continued)

Exhibit 11.6 (continued)

the discussion below, virtually every other demographic attribute can be expected to directly or indirectly affect the demand for health services.

The aging of the U.S. population is considered by many the major factor in changing demand for health services. The median age has been steadily rising and with increasing age comes more and different demands for health services. Within this overall trend, however, there are subtrends that should be noted – the surge of the baby boomers into the senior years and the declining proportions of children and young adults, for example – that have significance for the demand for health services. The fastest growing age cohort for the foreseeable future will be the 85 and over age group, a group that consumes a disproportionate share of health services. On the other hand, the 15–24 age cohort is expected to decline in importance and, while this group is not a heavy user of health services, it does consume a significant portion of certain types of services (e.g., substance abuse, trauma). A shortfall of young adults also has implications for fertility levels. Accompanying the aging of the population is the feminization of the population, as women constitute an ever-increasing proportion of the population. Not only do women use more health services than men, but they use different services.

The most direct implication of the demographic changes that are occurring is the changing nature of the dominant health problems. As the population ages there is a shift from primarily acute health conditions (e.g., respiratory problems, allergies, accidents) to chronic health conditions (e.g., diabetes, heart disease, arthritis). This shift understandably has significance for the types of services that are needed. Changes can be expected in the demand for ambulatory care, hospital care, the types of tests and procedures required, and the types of medical and surgical specialists required. The table below provides examples of the changes that can be expected in the demand for certain services (from 1980 to 2020).

Change in Demand for Selected Medical Procedures

Procedure	Change in demand 1980–2020 (%)
All inpatient procedures	+49
Prostatectomy	+117
Pacemaker insertion	+97
Endoscopy	+86
Lens extraction	+82
Hernia repair	+74
Caesarian section	–2
Tonsillectomy	+20
Hysterectomy	+22

(continued)

Exhibit 11.6 (continued)

The demographic trends will also be reflected in the changing demand for specialty services. The table below indicates expected changes in demand for selected specialties for the 1980–2020 period.

Change in Demand for Selected Specialties

Procedure	Change in demand 1980–2020 (%)
Cardiovascular	+82
OB-GYN	+12
Internal medicine	+63
Pediatrics	+22
Ophthalmology	+64
Dermatology	+38
General surgery	+52

11.4 Policy Implications

The noteworthy correlation between demographic characteristics and health behavior – particularly the use of formal health services – has major implications for health policy. Further, the fact that the disparities that exist in the use of health services and in the manner in which services are delivered to various segments of the populations further emphasizes the importance of demographic information for policy setting. The Patient Protection and Affordable Care Act of 2010 was initiated to a great extent as a result of changing demographic patterns affecting health services utilization. Virtually every other health policy issued being discussed today reflects the contribution that demographics is making to changing health status and changing patterns of services utilization.

Clearly, there is an interface between health policy and population policy and the implementation of one type of policy cannot be addressed without consideration for the implications of that policy for the other arena. Chapter 12 reviews trends in both demographics and healthcare and addresses twenty-first century public policy issues within the context of a dynamic environment for both population and healthcare.

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Chapter 12
Health Demography and Public Policy

12.1 Introduction

The interface between demography and healthcare at the policy level is reflected in both population policies and health policies. In fact, it is difficult to separate population policies and health policies due the impact they have upon each other. The enactment of healthcare policies will inevitably have implications for the demographic processes of the society, affecting fertility levels (e.g., through abortion policies), morbidity patterns (e.g., through health insurance coverage), and mortality (e.g., through research funding priorities). Healthcare policies may even affect immigration patterns, as in the case of now-abolished policies prohibiting the immigration of people infected by AIDS.

Before focusing on the factors that are influencing both healthcare policy and population policy, it would be helpful to define the concepts that are being used. A "policy" is may be thought of as a high-level overall plan embracing the general goals and acceptable procedures especially of a governmental body. This definition, however, is fairly broad and it is helpful to consider the various types of policies that could be enacted. These include:

- **Macro policies** – overarching policies affecting many areas of public policy (usually on part of federal government)
- **Public policies –** policy approaches focusing on a particular issue (usually on the part of government)
- **Organizational policies** – policies affecting behavior within an organization
- **Professional policies** – policies guiding professional behavior

In the U.S., macro-level policies related to population are essentially non-existent, and anything that comes close to a population policy is more often than not a derivative of a policy promulgated in healthcare or some other societal arena. Most broad "policies" that are introduced by various levels of government should be considered in the "public policy" category. There are organizational-level and professional-level

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policies related to healthcare and, to a lesser extent, to population issues. However, these policies more often than not represent a “trickle down” effect from broader public policies. As an example, the 2012 executive ruling by the Obama administration that health insurance plans must include coverage for contraceptives represents a national “policy” in support of reproductive management. However, the primary impact will not be at the national level but is reflected in the implications this policy has for the professional policies of organizations that provide health services. Thus, health insurance companies will be required to provide contraceptive services as part of their insurance plans. Further, companies that offer health insurance to their employees will be required to include such coverage as a benefit. In both cases, it should be noted, provisions are made for those parties whose religious beliefs prohibit the use of birth control.

A useful definition of public policy has been provided by Longest (2010):

> Public policies are authoritative decisions that are made in the legislative, executive or judicial branches of government. These decisions are intended to direct or influence the actions, behaviors or decisions of others.

Obviously, the U.S. is faced with a number of issues in a variety of arenas. However, only some of these issues rise to the level where they are become matters of public policy. Most problems start out as “private” problems, affecting only the individuals involved. However, there are situations when a problem becomes widespread and begins to have societal implications. Thus, the decision on how many children to have is a personal decision made by individuals and couples and, as such, should not have implications for public policy. However, if these individual decisions result in consequences for society they may rise to the level of public interest. If, for example, members of a population are having too few babies to replace the population, this becomes a matter of public concern (as it has in many European countries today). On the other hand, if members of the population are having too many babies resulting in an unmanageable population explosion, this becomes a matter of public concern (as in the case of China in the past and India).

Similar situations can be found with regard to health policies. Referring back to the acquisition of health insurance by individuals in the U.S., this has historically been a personal matter mediated in some cases through the role of employers or government-sponsored health plans. Since the 1980s, however, individuals have faced increasing barriers to the acquisition of health insurance at a time when healthcare costs are skyrocketing. By the end of the twentieth century, tens of millions of Americans were not covered by health insurance. Limitations on coverage have been limited to a number of more obvious health-related issues, e.g., fewer physician visits, as well as other concerns. Non-coverage has been found to be a major contributor to the soaring bankruptcy rate in the U.S. as a result of overwhelming medical bills. Tens of thousands of Americans are dying unnecessarily every year simply because they do not have a means to pay for their healthcare. Thus, what was once considered a personal issue has risen to the point of a public policy issues and led to the incorporation of numerous provisions in the Patient Protection and Affordable Care Act of 2010. In the case of both population and healthcare issues, a problem moves from the private sphere to the public when it entails a substantial social or individual difficulty that cannot easily be addressed by the affected parties and can not be ignored by society. Exhibit 12.1 discusses the assumptions underlying U.S. healthcare policy and the role of demographics.

Exhibit 12.1 Assumptions Underlying U.S. Healthcare "Policy"

Historically, what passes for healthcare policy in the United States has been driven by certain assumptions related to the nature of health and illness and the role of the healthcare delivery system. Like many assumptions, many of these have not been explicitly stated nor have they been systematically validated. Further, these assumptions may fail to take into consideration a number of factors related to health demography. Examples of the assumptions include:

- Health can be attained by eliminating the symptoms of ill-health
- Medical intervention is the primary means of curing sickness and prolonging life
- Western "allopathic" medicine is the only appropriate approach for addressing ill-health
- Treatment is a more appropriate use of resources than prevention
- More care is better – medical "overkill" is better than "under kill"
- The healthcare system, not the individual, is responsible for the health of the individual
- The individual, not the group, is the focal point for the healthcare system

The policies that characterize our healthcare system reflect in one manner or another these assumptions, and, clearly, they reflect the influence of the private healthcare sector in setting policy. Nevertheless, established assumptions clearly overlook the role that demographic characteristics and trends play in the history of healthcare in the U.S. For starters, most of the improvement in health status during the twentieth century is not attributed to medical advances; the primary contributor was changing demographic characteristics – rising incomes, higher educational levels, and improved housing conditions. Second, to the extent that health problems continue to exist (or even worsen) within the U.S. population, these problems are concentrated among demographic segments of the population that are not amenable to improvement using traditional medical approaches. Finally, it has become increasingly clear that the health status of the population cannot be improved one patient at a time. This has spawned the trend toward "population health" wherein the focus of health amelioration efforts is not the individual but various demographically defined segments of the population. Ultimately, effective healthcare policy relies on an understanding of the demographic trends that affect the U.S. population.

Although we write of policies related to health and healthcare above, government agencies in the United States historically have not promulgated any official overarching national healthcare policy, although there is a good deal of legislation designed to effect one or more elements of the healthcare system. In most industrialized countries, on the other hand, national health policies are established and implemented by the central government, typically as part of a broader social policy agenda. In the United States, however, no such central mechanism for policy setting exists. In fact, national policies are established very indirectly and often by default rather than through deliberate action. The lack of a formal healthcare policy, in fact, serves as a policy statement in its own right. Policy is also set through the budgetary process, and realistically this is essentially the only practical way in which the federal government can influence the direction of the nation's healthcare system. This form of indirect policy setting often takes place in an uncoordinated fashion, with budgeting efforts generally existing independent of any overarching societal goals.

There are a variety of reasons why effective policy setting does not occur at the national level in the United States. It has already been noted that there is no formal mechanism in place for setting national goals and priorities. In addition, the federalist system under which U.S. political system operates mitigates against a strong influence on the part of the central government. In fact, about the only option available to the federal government in terms of influencing policy is through the control of federal expenditures. In addition, strong vested interests make it difficult to establish consensus on the acceptable degree of government involvement in healthcare, much less on the nature of that involvement. There is disagreement among policy makers concerning the role of the public and private sectors in the provision of health care, revenue shortfalls and budget deficits, and a changing demographic environment.

At the national level, policies are in place to influence the supply of health professionals through licensing requirements and limits placed upon the number of new graduates from professional schools. The health manpower authority of the Public Health Service Act to a certain extent determines the supply of physicians, dentists, nurses, and allied personnel by channeling federal spending in such a manner as to influence the distribution of physicians in the U.S. Thus, physicians can participate in the National Health Service Corps (NHSC) through which the federal government pays all or a portion of their education costs in exchange for a commitment to work in an underserved area for a specified period of time.

While population policies are typically fairly clear-cut, healthcare policies are less straightforward, and the term health care policy has various meanings to a variety of consumer and provider constituencies. At the macro level, *healthcare policy* refers to the actions of national, state, and/or local organizations related to the access and provision of health care, although "policy" may be set through inaction. Examples of policies include, for example, legislation and regulations regarding Medicare reimbursement, federal agency decisions on how to allocate money earmarked for medical research, and local public laws and regulations affecting the treatment of indigent patients at tax-supported hospitals. Moreover, policy encompasses the joint actions of private and public agencies. Private organizations such as the American Medical Association, the American Hospital Association, and the American Cancer Society contribute to the formulation of health policy in the United States today.

Population policies, where they exist, tend to be more straightforward and direct with regard to the activities that are to be regulated. These policies are typically related to demographic processes such as fertility and mortality (and their implications for population growth and change) and immigration. There are no U.S. agencies, however, charged with monitoring and/or controlling population growth although the U.S. Department of Justice has overall responsibility for immigration policy.

Perhaps the most clear-cut example of federal influence on healthcare policy is the impact that the introduction of the Medicare and Medicaid programs has had on the nature of the healthcare delivery system. By controlling the financing mechanism, and virtually no other aspect of the process, the federal government has set “policy” with regard to the provision of care. By determining the healthcare procedures that would be covered under the Medicare program, for example, the federal government went a long way toward specifying the types of services that would be provided, since unreimbursed services were less likely to be offered by healthcare providers. Medicare regulations had the spillover effect of influencing the level of reimbursement offered by private health insurers.

Another example of federal efforts to influence the direction of the healthcare system has been the formulation of goals for health promotion developed by the U.S. Public Health Service within the Department of Health and Human Services during the 1980s. The HealthyPeople initiative identified goals for many different aspects of healthcare, from reducing the burden of diseases, improving access to care, and creating a more informed patient population. While there was no mechanism for enforcing the pursuit of the goals outlined in the HealthyPeople program, all federal agencies and any entity receiving funds from the DHHS had to specify the ways in which they would pursue those goals. The most recent attempt at a major public policy initiative is embodied by the Patient Protection and Affordable Care Act (PPACA) of 2010 discussed in Exhibit 12.2.

Exhibit 12.2 Health Insurance and the Patient Protection and Affordable Care Act of 2010

For years, questions had been raised about the effectiveness of the U.S. healthcare system in meeting the needs of the American population. While the system’s treatment modalities and technology were unrivaled anywhere in the world, serious concerns were raised because of the persistent poor health status of the U.S. population compared to populations in other industrialized countries. In the U.S., morbidity levels were higher and life expectancy was shorter and the continued high infant mortality rate was a particularly troubling factor. One aspect of the U.S. healthcare system that has come under particular scrutiny is the mechanisms in place for financing the purchase of health services. The U.S. is the only industrialized country

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that does not have some form of national health system. Instead, American healthcare consumers typically purchase care through a third-party insurer or, alternatively, pay for care out of pocket. Nearly one-half of the population is covered under one of the two major federally sponsored insurance programs – Medicare and Medicaid. A similar proportion is insured by a private – typically for-profit – health insurer. Without insurance coverage, few healthcare consumers could afford any but the most basic primary care. Due to deficiencies in health insurance arrangements, many patients suffered from unnecessary and life-threatening delays and, in fact, tens of thousands of deaths each year were attributed to a lack of health insurance coverage. And, unlike in the past, a growing number of the uninsured were actually employed, historically a condition that almost assured access to affordable insurance coverage.

Over the past 20 years an increasing proportion of Americans without health insurance has increased dramatically, with 16% or more of adults lacking healthcare coverage. These 50 million or more uninsured are joined by millions more who are underinsured in that their coverage is not adequate to meet many healthcare needs. Other millions of healthcare consumers have some form of health insurance but put off care because of high deductibles or co-pays that must come out of pocket on the front end. Certain demographic segments of the population are particularly affected by these trends. As these trends emerged, accusations of abuse by the health insurance industry became too vocal to ignore any longer. There was evidence that health insurers arbitrarily raised premiums with no real justification, rescinded the coverage of patients for questionable reasons when the covered party made a claim, refused to cover individuals (even members of families with existing plans) because of some pre-existing health condition, and generally failed to meet their responsibilities to the consumers enrolled in their plans. While the major health insurers were cutting back on the services they provided and refusing to honor claims, they were recording record profits.

When the Obama administration began to tackle the issues surrounding healthcare in this country, it was obvious that there were limitations to the extent of the reform possible and that there would be serious opposition to many of the reforms that appeared to be necessary. The one area in which the Obama administration did introduce a more aggressive policy related to the private insurance industry. Thus, far from being a healthcare "overhaul" as often portrayed by the media, the legislation enacted might best be characterized as a private health insurance reform initiative. The need to respond to the apparent abuses by health insurers was considered too significant and too urgent to ignore.

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Exhibit 12.2 (continued)

In order to address the issues related to healthcare finance as well as other issues related to the operation of the healthcare system, the Patient Protection and Affordable Care Act of 2010 (PPACA) was enacted. This new federal policy with regard to the health insurance industry resulted in the enactment of the following provisions (among others):

- Health insurance companies could no longer arbitrarily rescind coverage
- Health insurance companies could not deny coverage based on a pre-existing condition
- Under a family plan, individual family members could not be “carved out” of the coverage for any reason
- Family members could be retained on a family policy until the age of 26
- Health insurance companies could not raise premiums beyond a certain level with justifying the increase to the federal government
- Health insurance companies could not charge women a higher rate than men
- All citizens would be required to have health insurance coverage by a specified point in the future (the so-called individual mandate)

The PPACA contained many other provisions that will not be specified here, and many of the provisions above are scheduled to be phased in over a period of time. Some of these provisions face tests in the courts. Regardless of the ultimate disposition of the PPACA and its various provisions, this legislation represents an attempt to set policy with regard to the financing of healthcare particularly as it relates to private insurers. There are likely to be numerous consequences of these provisions that can be related back to demographics. The provisions will affect under-insured young adults, women and members of certain racial and ethnic groups. It will affect the job market as workers who have faced limited occupational options due to their need to have employer-provided health insurance get more options. Additional provisions of the PPACA will raise the threshold for participation in the Medicaid program for the indigent by allowing enrollment of individuals whose income is up to 134% of the poverty level. The expectation that a growing number of citizens will have insurance that they have not had before will have an impact on the establishment of health facilities and the training and deployment of health professionals. While the PPACA affected a limited portion of the overall healthcare system, its implications for the health status and health behavior of much of the U.S. population are likely to be significant.

Health policies can be divided into direct and indirect components as well. Direct policies refer to those legislative efforts designed purposefully to affect the delivery and quality of health care. Examples would include the funding and research agenda for the National Institutes of Health and the Centers for Disease Control and Prevention. Indirect policies are those whose basic intent is to affect some non-health care outcome, although in the process the provision of healthcare is affected. For example, federal tax reform regulations related to health insurance coverage ostensibly address revenue collection. However, by affecting tax-related issues for employers and individuals these regulations affect patterns of health insurance coverage and ultimately patterns of care. Numerous provisions in the PPACA have both direct and indirect dimensions. Requirements meant to assure that not-for-profit hospitals are providing adequate community benefits affect not only the not-for-profit hospitals themselves but the communities in which these hospitals operate.

The interaction between policy and demographics can be illustrated through a number of examples. As the U.S. population continues to age (demographic determinant), the prevalence of chronic conditions and incidence of deaths due to heart disease and cancer increase. Policies are in place to ameliorate the conditions and reduce deaths attributable to these causes (health care consequence). To the extent that the policies are effective, an increase in life expectancy and a further aging of the population (demographic consequences) are likely to come about. Moreover, policy changes would be required to address the conditions of the new population composition. Programs that focus on lowering the number of unwanted pregnancies (health care determinant) can help bring about a reduction in the birth rate and a decline in the total number of births (demographic consequence). The 2012 regulation promulgated by the Obama administration mandating that insurance companies provide contraception coverage as part of their plans is an example of the potential indirect affects of legislation. Again, the consequences of the policy are likely to lead to a refocusing of policy.

12.2 Factors Influencing Health Policy

12.2.1 Demographic Trends

As noted throughout this book, the United States is currently undergoing unprecedented demographic changes, and these changes have numerous implications for health policy. Demographic change also has implications for population policy which in turn have implications for the healthcare needs of the population. Population growth has slowed, and without continued immigration, the population of the nation would decline. At the same time, the population is aging, generating more deaths and producing an age structure that will soon be dominated by those over age 40. The fact that the older age cohorts, particularly the oldest old, are among the fastest growing groups in the U.S. has significant implications for the health status of the population and, by extension, for healthcare needs. Even as the first baby boomers enter retirement, the burden of chronic disease is increasing and placing growing pressure on the Medicare program. (See Exhibit 12.3 for a discussion of the implications of an aging population for Medicare.)

Demographic trends drive much of the discussion related to health policy in the U.S. and this has never been more apparent than it is today. Current fears over the solvency of the Medicare program are driven almost solely by the prospect of an increasingly older population placing greater and greater demands on the Medicare program. Along these same lines, the shift from a predominance of acute conditions to chronic conditions calls for a restructuring of the healthcare system and a redirected approach to care in the face of the need to maintain the health of millions of older Americans with chronic disease.

Exhibit 12.3 Demographic Implications for the Future of Medicare

The aging of the "baby boom" generation in the United States is placing strains on the financial sustainability of the Medicare program, the government-funded program that insures care for those 65 and older. Between 2010 and 2020 the number of Americans over 65 will increase by 14.5 million. Although the senior population is healthier than in previous generations, the senior years tend to be characterized by expensive-to-manage chronic disease and the inordinate medical expense involved in treatment during the last months of life. Medicare funding cannot match cost growth as the number of Medicare beneficiaries is increasing much more rapidly than the number of workers. Today, there are 3.9 workers for every beneficiary; by 2030, there will only be about 2.4 workers for every beneficiary. There are concerns that, unless the system is drastically changed, in less than 10 years the funds supporting the Medicare program will no longer support the demand for services.

Although obtaining health services, even for seniors, can be considered a personal concern, the establishment of the Medicare program in 1965 moved healthcare for seniors into the policy arena. For decades, however, the program has operated smoothly and stayed under the public policy radar. Today, the growing pressure being placed on Medicare has made the program's viability an increasingly public issue, and policy makers are struggling with the prospect of the program's inability to sustain itself into the future.

Medicare's core program (Part A Hospital Insurance) is funded by the hundreds of millions of employees who will subsequently receive benefits during retirement. When they turn 65, eligible citizens are automatically enrolled in Part A, which pays for inpatient services, continued treatment or rehabilitation in a skilled-nursing facility, and hospice care for the terminally ill. The money paid by employees to the Hospital Insurance Trust Fund is not directly saved for their own personal future health expenses but covers the medical bills of the people who are currently enrolled in Medicare.

Medicare's costs are projected to rise initially because the number of people receiving benefits increases rapidly as the large baby boom generation retires. However, once society has absorbed the retirements of the baby boom

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Exhibit 12.3 (continued)

generation, Medicare's costs are projected to continue to rise. This growth is fueled by expected increases in the utilization and cost of health care, and the more recent addition of Medicare Part D which covers the use of prescription drugs. In particular, the continued development of new technology is expected to cause per capita health care expenditures to continue to grow faster than the economy as a whole. So, while long-term projections of Medicare's costs are subject to demographic and economic uncertainties, they are also subject to an additional layer of uncertainty caused by increases in general healthcare costs and additional benefits.

The ultimate question is: Are burgeoning Medicare costs the result of demographic trends or the function of some other development? While conservative politicians interested in limiting the role of the federal government point to the rapidly increasing senior population as the culprit, thus suggesting no hope for the future solvency of the program, demographic trends may, in fact, not be the explanation. Clearly, there are more seniors today and their numbers will continue to grow. However, today's seniors are relatively healthy and are not expected to consume more health services per capita than previous generations. In reality, the long-term costs of Medicare are primarily driven by the same factors that have caused skyrocketing healthcare costs: increases in the number and intensity of the services provided for health conditions and the increasing costs of these services.

As with many policy-related issues, the apparent explanation for the problem may not be the real explanation. Medicare policies that rely primarily on shifting more costs onto seniors, who are mostly lower-income, are misdirected and, in any case, not sustainable over the long term. Arguably, the source of the problem does not arise from demographics but from failings in the healthcare system that affect all segments of the population. Seniors are simply more visible because of the government-funded aspect of the Medicare program. The Medicare "problem" will be addressed, it is argued, only when the burgeoning costs of healthcare are addressed.

Sources: National Committee to Preserve Social Security and Medicare (2009), Nielson (2009)

The growth rates of racial and ethnic minorities in the United States, particularly those for blacks and Hispanics, far exceed that of the white population. The increasing contribution of immigrants and racial/ethnic minorities to population growth implies that the United States is again becoming a land of diverse cultures and languages. Health behaviors in these populations are different as well. As discussed in Chap. 8, this compositional shift is generating a different demand structure for health services. As noted previously, by the first third decade of the twenty-first century, fully one-third of the population of the United States is expected to be part of a racial or ethnic minority group.

Along with marked changes in the racial/ethnic composition of this country, there have been major shifts in the income structure. The income discrepancy between what can be labeled the "haves" and "have nots" is widening with an increasing proportion of national wealth concentrated at the very top while incomes for the middle and working classes stagnate. Since 1970, the number of persons at or below poverty level has increased substantially and the economic downtown beginning in 2008 has resulted in record modern poverty levels. There are significant demographic differences between impoverished individuals and the more affluent. This is particularly true with regard to health status, with the poverty-level population suffering from a higher level of health problems than the non-poverty population. This situation is exacerbated by the lack of health insurance among the poor. The health of children has been somewhat addressed through federal policies encouraging the establishment of children's healthcare programs. Nevertheless, much of the low-income population suffers from a lack of health insurance for other members of the household, exacerbating the challenges they face in obtaining necessary care.

The regional redistribution of the population also has implications for health and healthcare. Although rates of internal migration have fallen in recent years, the American population remains relatively mobile, with one in six persons moving each year. This mobility rate has an impact on the distribution of population which, in turn, affects the distribution of health resources. Each of these flows can have important implications for health care providers. In-migrant, out-migrant, and net migration data with respect to rural to urban, city to suburb, and region-to-region flows are seen as major contributors to changing health care needs in areas that are either net exporters or net importers of people. For example, a migration stream from the Midwest to central Florida may bring not only a large population with demographic characteristics different from the receiving area (e.g., older or younger), but one with a different set of tastes and preferences for the types of health care offered. It is often the case that receiving communities do not have the healthcare resources to meet the needs of a growing population, while communities of origination are faced with a "surplus" of healthcare resources. This is most often the case with rural hospitals that are faced with a declining patient base but are placed under a lot of pressure to remain open. There is no mechanism in the U.S. for assigning physicians to areas of need, with each physician essentially free to locate wherever desired. A few "policies" have been introduced that encourage physicians to go into primary care or to practice at least temporarily in areas of physician shortage, but those policies have had mixed success.

The demographic trends described above have numerous implications for health insurance. There is a growing population that does not have access to health insurance and another large segment of the population is underinsured. Increased unemployment also means an increase in the population eligible for employer-sponsored insurance. Limits on participation in Medicaid mean that large numbers of the population who are poverty level for all practical purposes are not eligible for the program. The impact of aging on the Medicare program has been discussed above and, even here, there is a growing number of Americans aged 55–65 who are not yet eligible for Medicare but have lost access through retirement or job loss to employer-sponsored insurance. These situations have led to a rethinking of our policies related to the financing of health services and the problems created by these situations were thought serious enough to lead to the introduction of the PPACA.

At the same time, existing policies related to health insurance have implications for health status and health behavior. Individuals without health insurance are less likely to seek health services, often to the detriment of their own long-term health and ultimately to the health of society. Even the insured are reluctant to seek care during periods of economic hardship given the increasing out-of-pocket costs associated with healthcare. In fact, the recent economic downturn has led to an increase in the number of patients delaying care. Given that a significant portion of health insurance is provided through private (often for-profit) companies, health insurers have been free to operate as they saw fit (and often without concern for their policy holders). Perceived abuses within the health insurance field resulted in the enactment of the Affordable Care Act which, in the final analysis represented more of a health insurance reform bill than anything else. Exhibit 12.4 illustrates an example of the impact of immigration policy on healthcare.

Exhibit 12.4 U.S. Immigration Policy and the Supply of Physicians

The past three decades have witnessed a steady increase in the participation of foreign-trained doctors in the U.S. healthcare system. Referred to as foreign (or international) medical graduates (FMGs or IMGs), these doctors account for 27% of the physicians practicing medicine in the United States today. The average American knows little about this aspect of medical care. However, if one requires the services of an anesthesiologist, a psychiatrist, or certain other specialists, there is a good chance that the care will be provided by someone who went to medical school in a foreign country.

In medical circles the continued influx of FMGs and the implications of their presence in American health care remain somewhat controversial issues. Organized medicine has always voiced concern over the quality of training that foreign physicians receive, contending that it does not meet American medical school standards. In the 1980s, with physicians facing increased competition for patients and revenue, the threat of additional competition from foreign-trained doctors led to attempts to limit immigration, introduce more difficult qualifying examinations, and preclude foreigners from specialty training and licensure.

Since World War II, FMGs have become an increasingly significant component of the U.S. physician pool. At present, more than 228,000 FMGs are in practice in this country and nearly 30% of physicians enrolled in residency

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Exhibit 12.4 (continued)

training programs at various hospitals and other health care facilities received their medical degrees in another country. An undetermined number of FMGs (possibly in the tens of thousands) are in this country attempting to obtain residency positions or licenses to practice. Most of these are “alien FMGs,” who are typically citizens of foreign countries who have received their basic training (i.e., the M.D. degree) in their homelands and subsequently immigrated to the United States for specialty training and, for most, the establishment of practices. Some are “U.S. FMGs,” American citizens who have received medical school training overseas and subsequently returned to the this country for residency training. Some of these have been educated at long-established medical schools in Europe; most, however, have attended newly created medical schools in the Caribbean or Mexico. The numbers of U.S. FMGs, however, remain small compared to alien FMGs.

The medical education process should be briefly described in order to place this discussion in context. In the United States and in most other countries, individuals enter medical school with an undergraduate degree. The medical school curriculum includes approximately 2 years of basic science training, followed by 2 years of clerkship. These third and fourth years are spent essentially as apprentices, with students rotating through various clinical departments in addition to attending classes. At the end of this program, ranging from 3 1/2 to 5 years, medical students are awarded an M.D. degree. In the United States, at least 2 years of postgraduate or residency training is required for licensure. While in residency training, physicians provide much of the charity care that is offered and staff hospital emergency rooms. In effect, in today’s medicine the actual training in patient care takes place during the residency program.

Although there has been some influx of FMGs into the United States throughout this century, the size of the current pool is primarily the result of national policies formulated during the 1960s. At that time, it was widely held that a severe physician shortage existed. Measures were taken to facilitate the immigration of FMGs to fill the gap until an adequate supply of American-trained physicians could be established. These policies resulted in an influx of large numbers of FMGs, with several thousand entering practice annually from the early 1970s to the present. By the mid-1970s, however, concerns over a shortage were replaced by fears of a physician surplus. The number of domestically trained physicians had increased dramatically, and large numbers of alien physicians had been added to the manpower pool. In response to these developments, immigration policies were made more restrictive, and more difficult qualifying examinations were introduced for FMGs. Both formal and informal measures were introduced to discourage entry of FMGs into training and practice, and legislation was proposed to limit the entry of U.S. FMGs into the market.

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Exhibit 12.4 (continued)

During the 1970s and 1980s, the circumstances under which immigration occurred changed significantly. Previously, immigrant physicians entered under temporary visas, and most returned to their homelands. By the 1970s, however, the majority of FMGs were seeking permanent immigration status with the intention of practicing medicine in this country. The earlier immigrants typically entered by means of a formal exchange program, while the later ones were more likely to obtain entry though a nonmedical status, such as tourist, student, family reunification, or even refugee. Even those who entered on a temporary exchange basis often subsequently petitioned for a change of status once here.

The changing basis for admission was accompanied by a change in the national origin of the FMGs. This, perhaps, contributed to the controversy as much as issues of quality and competition. In the years immediately following World War II, the typical physician-immigrant was from Europe. However, by the late 1960s, the influx was dominated by Asian immigrants, particularly those from India and the Philippines. While both of these groups continue to be important, they have been joined by large numbers of physicians from Southeast Asia and Iran. By the 1980s, increasing numbers of immigrants were arriving from Latin America. Many of these newer immigrants entered as refugees, often without complete documentation of their medical background. During the late 1970s, this flow was augmented by thousands of U.S. FMGs.

There are numerous sub-issues involved here that relate to testing, training requirements, licensure requirements, and even the issue of discrimination, which is currently being explored by the legal system. What is important to focus on for this brief discussion is the significance of physician-immigrants for the U.S. health care system. Opponents of FMGs argue that foreign-trained physicians are less qualified to provide care than American-trained physicians. They are increasingly arguing that they are contributing to physician oversupply and causing unnecessary competition. These opponents are primarily representatives of organized medicine–presenting the view of medical schools, specialty associations, and practicing physicians–that have a vested interest in limiting physician supply.

On the other hand, FMGs and their supporters contend that foreign-trained physicians have historically made important contributions to U.S. medical teaching, research, and practice. There is evidence that FMGs enter specialty areas that are considered undesirable by domestic medical school graduates. Further, they are found to practice in areas (such as inner cities and rural communities) in which American-trained physicians are reluctant to practice. Many residency programs contend that FMGs are essential for the provision of care to their indigent patients, particularly in inner-city hospitals that are not attractive to U.S. medical school graduates.

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Exhibit 12.4 (continued)

Regardless of the merits of the above arguments, one fact is clear. FMGs will continue to be a major factor in U.S. medical care for the foreseeable future. Each year thousands of FMGs enter practice, despite the increased restrictions. In actuality, the presence of foreign physicians in the U.S. has become so commonplace that they receive less and less notice.

12.2.2 Developments in Health and Healthcare

A number of developments related to health and healthcare system have implications for policy. These include the increased burden of chronic disease resulting from an aging population and the growing number of uninsured both noted above, and the distribution of health services among others. Though the population of the United States continues to grow, albeit slowly, the number of hospitals has declined since 1975. Hospitals and similar facilities require considerable capital investment for construction and maintenance. There is likely to be an imbalance between supply and demand during periods of significant population growth or decline. Facility shortages exist in many areas experiencing rapid population growth, while other places are considered to have an oversupply, in part because population growth has slowed, ceased, or become negative. While many of these institutions adjust to the change in demographic environment by reducing the number of beds or creating regional centers for treatment, the oversupply remains costly to providers and consumers alike.

In recent years, policy makers have become concerned with the supply of facilities in rural areas. Many rural counties in the United States have been losing population for at least four decades. For some, the history of loss is much longer. As the population declines – and ages – the critical mass of persons required to support a facility is no longer there and, despite some valiant and creative efforts, many institutions close. The remaining population is left with reduced access to health services and in some instances, it can be argued, virtual denial of care. Furthermore, the lack of facilities renders many communities less attractive to live in, perhaps affecting further migration (both in and out) and most certainly making it harder to attract and retain health care personnel.

Since most health insurance in the United States is employer sponsored, its availability reflects the willingness and ability of employers to offer this benefit. In recent years, the lack of health insurance coverage for a growing number of Americans has received a great deal of congressional and media attention. As indicated above, addressing this issue is a major objective of health care policy change proposals.

Noncoverage variation is large across demographic segments. While less than 1% of the population aged 65 and over is without coverage, more than 21% of those persons 16–24 years of age have neither private nor government health insurance.

As noted in previous chapters, members of racial and ethnic minorities are more likely to be uninsured. Given the increasing proportion of the U.S. population that is black or Hispanic, and all other factors being the same, a continued increase in the number and percentage of persons without coverage should be expected.

Coverage, as would be surmised, is closely associated with income, especially poverty status. Despite the availability of Medicaid programs for the indigent and the spread of children's health insurance programs, the poor are still less likely to be covered for healthcare expenses. Given that income and employment data do not indicate that a reduction in poverty-level persons or persons in low-wage jobs is about to occur, and that the income gap between the haves and have-nots is in fact increasing, and that many formerly employed and insured have lost their coverage, the number of persons without health insurance is likely to increase without a change in policy.

The lack of health insurance coverage, at the very least, denies a large segment of the population ready access to health care. Besides the lack of treatment for certain types of less serious maladies, early diagnosis for more serious illnesses does not occur, resulting in more pain and suffering along with more expensive treatments at a later point in time. In fact, it can be argued that the provision of subsidized health care insurance (and therefore care) is in the long run much less expensive than the current system, which places relatively little emphasis on prevention and early diagnosis. While access to care is closely related to concerns over national health care policy, health insurance, and the availability of facilities and personnel, to some extent it is an issue in its own right. Many private citizens and policy makers have argued that access to quality care is an inalienable right of all Americans.

Historically, the federal government has encouraged the provision of hospital care to those with limited ability to pay by providing funds for construction of hospitals and by offering tax-exempt status to not-for-profit hospitals that are providing an overall community benefit (in addition to specifically agreeing to provide a certain amount of charity care). Because of perceived abuses of the policy, the PPACA of 2010 mandates that hospitals that have been accorded not-for-profit, tax-exempt status by the Internal Revenue Service demonstrate that they are providing enough community benefits to justify that status. Again, the federal government does not have a specific policy that favors not-for-profit hospitals over for-profit hospitals, but by attempting to regulate the status of certain categories of hospitals it puts a *de facto* policy in place.

In areas where growth is small, or perhaps losses are being experienced, the same determinants of policy apply. New markets may be emerging (e.g., a rapid increase in the population aged 70 and above), and some of the competition may choose to leave the market or alter their service offerings. Being in this type of market area forces an institution either to be more efficient than they might be under different demographic conditions or to leave the market. New niches must be carefully explored, and a strategy that deviates from the standard service offerings may be called for. While it is not likely that a new OB unit would be needed in a slow or negative population growth area, the restructuring of an existing unit might be appropriate given shifts in preferences for OB services. Thus, the first hospital to implement a change in service offerings is likely to have a competitive advantage over the remaining service providers.

12.3 Policy Implications for Health and Healthcare

Obviously, healthcare policies have implications for healthcare and examples of this have been previously provided. However, policies formulated in other arenas may also have implications for health and healthcare. For example, within the educational arena policies related to school lunches and other free or discounted nutritional resources may affect the health of school children. In the criminal justice system, policies related to health service available to the incarcerated has direct implications for the health of the affected parties. In fact, it has been suggested that in many ways prisoners are the only segment of society that is guaranteed comprehensive health services with few barriers to access and virtually no costs. Policies enacted by the Environmental Protection Agency and other environmentally oriented agencies have both direct and indirect implications for the health of the population. Tax policies affect the extent to which employers offer their employees health insurance and, by extension, the level of health insurance coverage within the workforce.

We have previously noted the implications for health and healthcare of the limited population policies that are in place. The impact of immigration policy on the physician pool noted earlier in this book and policies encouraging the immigration of nurses and other health personnel have a significant impact but these are far from the only implications of immigration policy for healthcare. The screening process for HIV-positive immigrants has already been noted, and fears over the spread virus H1N1 led to the introduction of restrictions on international travel. Perhaps more significantly, policies related to illegal aliens in the U.S. have major implications for the health of these aliens. Many individuals illegally in the country (and some legally here) are reluctant to utilize health services because of the fear of detection and deportation.

While the U.S. does not have any explicit fertility management policies in place, there are certain regulations that indirectly affect the level of fertility and the health of mothers and babies. The most obvious of these policies relates to the availability of abortion services which were declared to be legal and constitutional by the U.S. Supreme Court in 1973. The availability of abortion services (although still relatively limited) resulted in approximately 1,000,000 less births per year for over 30 years. Further, by providing abortions under regulated conditions the health of the pregnant woman was protected more so than in the case of illegal abortions or even for that matter childbirth. It could also be argued that in the absence of these abortions many babies would have been born under adverse conditions (e.g., premature, underweight) and/or into unhealthy, unsafe and dangerous environments. Recent regulations requiring insurance companies to provide contraception services to covered women also have implications for both fertility rates and the health of mothers and babies.

12.4 Intended and Unintended Consequences of Policies

Regardless of the type of policy implemented or its origin, every policy has both intended and unintended consequences. Intended consequences are obviously those that the policy was meant to bring about. Unintended consequences are circumstances that arise from the implementation of a policy that were unanticipated or anticipated but emerged with different characteristics from those anticipated. Up until the last 20 years, the cancer research policies of the National Institutes of Health focused almost exclusively on finding a cure for cancer in its various forms. Virtually no resources were devoted to the prevention of cancer or an understanding of the social and cultural factors that contributed to cancer morbidity. As intended, progress was made in the treatment of known cases of cancer and many lives were ultimately saved or prolonged. At the same time, however, the number of cancer cases within the U.S. population continued to rise and cancer remained the second most common cause of death. Thus, an unintended consequence was the steady rise in the number of cases of cancer due to a lack of aggressive prevention.

An excellent example of the consequences of a policy – both intended and unintended – is embodied by China's one-child policy described in Exhibit 12.5

Exhibit 12.5 Unintended Consequences of China's One-Child Policy

The Communist government established in China in the 1950s was faced with the problem of a runaway birth rate and the resulting overpopulation. China's one child policy was established by Chinese leader Deng Xiaoping in 1979 to limit communist China's population growth. Although intended as a temporary measure, it is still in place over 30 years later. The policy limits couples to one child. Couples who become pregnant with a subsequent child face fines, pressure to abort, and even forced sterilization. The rule has not been universally applied with citizens living in rural areas and minorities living in China not subject to the law. IUDs, sterilization, and abortion are China's most popular forms of birth control, although the government has begun providing more education and support for alternative birth control methods.

The one-child policy has been successful at reducing population growth in China, with its current population of 1.3 billion reflecting the preclusion of over 300 million births since the policy's enactment. The strict enforcement of this policy has had implications for both population characteristics and health status. The one-child policy has led to a preference for male infants, high levels of abortion, child neglect and abandonment, and even the infanticide of female infants. The result of such draconian family planning has resulted in the disparate ratio of 114 males for every 100 females among babies from birth through children 4 years of age. Normally, 105 males are naturally born for every 100 females. Today, there are an estimated 30 million "excess" males in China with as many as 50 million unattached males expected by 2030.

The fact that tens of millions of males do not have partners has led to an epidemic of prostitution in the country. This, in turn, has led to an upsurge in sexually transmitted infections and especially HIV/AIDS. There are predictions

(continued)

Exhibit 12.5 (continued)

that China will have more AIDS cases in a few years than any other region of the world. Also with implications for health, In 2007, there were reports that in the southwestern Guangxi Autonomous Region of China, officials were forcing pregnant women without permission to give birth to have abortions and levying steep fines on families violating the law. As a result, riots broke out and some may have been killed, including population control officials.

Now that millions of sibling-less people in China are now young adults in or nearing their child-bearing years, a special provision allows millions of couples to have two children legally. If a couple is composed of two people without siblings, then they may have two children of their own, thus preventing too dramatic of a population decrease.

12.5 Healthcare Policy in the Twenty-First Century

Given a population that is older, chronic disease dominated, and in need of increasingly high levels of health care resources, new policies will be required to preserve the level of care that has come to be taken for granted. The issues discussed earlier (access to care, long-term care, adequacy of health insurance) must all be addressed, most likely through a public-sector/private sector joint effort. The cost of indigent care and more expensive care will have to be shared by all. However, other concerns are emerging – some of which have strong moral dimensions – and these will emerge in the debate of the next century.

While the population overall is aging, numerical increases are also expected for the 15- and-under age cohort, as well. As shown earlier, younger persons are more likely to be at or below the poverty level than older persons. The resulting population is one with a segment that is older, in need of more care, and very dependent on federal programs, coupled with a much younger segment with fewer, but nevertheless significant, health care needs but for whom there is limited ability to pay for care. Policy makers who wish to address the health care needs of the entire population adequately must be cognizant of this dual-sector market that has developed.

The most expensive types of care today are associated with heroic efforts to keep critically ill patients alive. At the individual level many of these costs are understood, and the number of persons who want to limit efforts through mechanisms such as living wills has increased markedly in recent years. At the national level, there is virtually no policy on this issue, and some would argue that too many resources are being utilized in these efforts. Those resources, it is argued, could be better expended on a larger and less ill population. As the population ages, the number of persons requiring heroic efforts will grow disproportionately, becoming a heavier burden on health resources. The financial strain placed on an already overburdened system is likely to result in the development of standards (medical and moral) that specify the circumstances under which heroic efforts cease.

Many of the policy issues confronting planners in the last decade of the twentieth century will be of concern in the twenty-first century. Given a continued slowing of growth, the health care burden of an older population must be continuously addressed. Priorities regarding the direction of research, who will have access to care, the role of deinstitutionalized living, and environmental reform – to name but a few issues – will have to be addressed in light of radical demographic and service demand shifts. The increase in the per capita cost of care may slow as reforms are instituted, but the overall cost will grow rapidly, especially as baby boom cohorts begin to enter their less healthy years. Policy makers will have to search for better methods to contain costs while, at the same time, guaranteeing that health care is still available to most, if not all, of the population. Medical breakthroughs will undoubtedly reduce the cost of very expensive diseases (e.g., AIDS), but sickness and death are inevitable. Being saved from one malady generally means being stricken, albeit later, by another.

Overall, demographic conditions and change driven by population size, composition, and distribution, fertility, mortality, and migration influence both the demand for and supply of health services and, therefore, the direction of health policy. Policy makers recognize the more general relationships, but a more in-depth understanding of the complexity of these interconnections between demography and health issues would provide decision-making bodies with a much better foundation for the formulation of legislation.

A combination of demographic reality and the rapid increase in the cost of all healthcare will drive health policy in the future. The rise in the percentage of GDP spent on healthcare is not sustainable. Given shifts in the U.S. population composition, the number of persons in the U.S. who do not have health insurance will rise, driving large segments of the population to even more expensive care sources (e.g., emergency rooms). The rise in childhood and adult obesity over the longer run is resulting in a less healthy society, and will drive up the need for services. These are the facts.

Policies of the future must focus more strongly on disease prevention, which in the longer term will drive the demand for and cost of services downward. Realistic reviews of existing programs with respect to services covered and age at which eligibility begins must take place. Yes, Medicare eligibility may need to begin at 67, 68 or 69, and a shift to an older age would only reflect part of the increase in life expectancy since the inception of the program. However, without an effort to integrate the disparate preventative and private elements of a healthcare system the health of the U.S. will continue to lag in several dimensions, and costs will remain high.

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