ANNUAL REVIEW of
Gerontology and Geriatrics

Volume 3, 1982

ANNUAL REVIEW of
Gerontology and Geriatrics

Volume 3, 1982

ANNUAL REVIEW of
Gerontology and Geriatrics

Volume 3, 1982

Carl Eisdorfer, Ph.D., M.D.
EDITOR-IN-CHIEF

Richard W. Besdine, M.D.
Vincent Cristofalo, Ph.D.
M. Powell Lawton, Ph.D.
George L. Maddox, Ph.D.
K. Warner Schaie, Ph.D.
ASSOCIATE EDITORS

Bernard D. Starr, Ph.D.
MANAGING EDITOR

Contents

Introduction

The study of gerontology and, more particularly, the clinical application of knowledge concerning the aged in both the social and medical sectors is undergoing dramatic growth. This expansion of training and clinical activity is underway despite the impact of federal budget cuts in training and most areas of human services. In addition to this expanding base of care, the trajectory of which is years old, there is an increase in the involvement of many individuals previously only tangentially related to gerontology and geriatrics. Consequently, the interest in the growing data base of knowledge concerning aging is accelerating. The net effect of this growth has been and will continue to be salutory provided that we do not let a concern with immediate clinical and service activities overtake our knowledge and overshadow the need for a vastly expanded base of both basic and clinical research across the spectrum of sciences and the caring disciplines.

This volume continues the tradition of providing information in depth across the diverse fields that are the underpinnings of gerontology and geriatrics. It includes reviews that focus on an understanding of the aging process and the clinical issues involved in the delivery of care and services to the aged. An important review (Chapter 1) on the mechanisms of the immune system is featured. This subject has been the focus of increased attention as a basis for the aging process itself and for various types of pathology in the aged.

Reviews of changes in social roles with aging (Chapter 3) and time course and time perspective in later life (Chapter 4) are designed to help us examine important conceptualizations as they involve the aging. Similarly, the discussion of the genetics of pharmacokinetics (Chapter 2) has a bearing on future developments both in clinical care and in our understanding of the genetics of the aging process. A pair of reviews (Chapters 5 and 6) report on psychological and psychosocial features in national and cultural settings and attest to vigorous activity in many areas of gerontological research outside the United States.

Reviews of the recent clinical research in infectious disorders (Chapter 7) and specific aspects of the psychopharmacology of aging

describe important pragmatic areas of clinical care. Two reviews, one comprised of studies on depression in the aged, the other concerned with the psychopharmacology of depression are presented in Chapters 8 and 9, respectively. Depressive disorders may be the most prevalent of the clinical psychopathological problems suffered by older persons. These two reviews describe activities that address this set of disorders. The review of recent research in nutrition (Chapter 10) covers the prevention of illness and the process of aging.

Psychodiagnostic assessment of the aged (Chapter 11) has been identified as an area of increasing concern by persons delivering services to the elderly. The difficulties in available clinical psychological examination techniques used with patients in later life are recognized. An effort is being made to develop more objective approaches to evaluating the aged. Expanded opportunities in education for older adults has made psychological assessment a subject in need of more careful analysis and development of methodology. The expansion of educational programs for the aged remains a relatively new area for investigation despite its enormous potential for affecting the lives of older persons. A review of this topic (Chapter 13) is very much in order as a stimulus to increasing activity.

The major impact on national policy of issues involving health care and the specific legislative concerns with Medicare, Medicaid, and long-term care makes the review in Chapter 12 particularly relevant. Since the aged utilize a significant proportion of health care services, any policy impacting on the aged will affect the entire system of health care services and other human services.

CARL EISDORFER, PH.D. M.D.
JUNE 1982

Acknowledgment

Contributors

Richard W. Besdine, M.D.
Hebrew Rehabilitation Center
for Aged;
Beth Israel Hospital;
Division on Aging
Harvard Medical School
Boston, Massachusetts

Carroll L. Estes, Ph.D.
Aging Health Policy Center
University of California
San Francisco, California

Barry J. Gurland, M.R.C.P.
Center for Geriatrics and
Gerontology
Columbia University;
New York State Office of
Mental Health
New York, New York

William R. Hazzard, M.D.
Division of Gerontology and
Geriatrics
University of Washington
Seattle, Washington

Jordan Jacobowitz, M.A.
Department of Psychiatry
Hadassah-Hebrew University
Hospital
Jerusalem, Israel

Robert Kastenbaum, Ph.D.
Department of Communications
Arizona State University
Tempe, Arizona

Philip R. Lee, M.D.
Institute for Health Policy
Studies
Center for Advanced Study in
the Behavioral Sciences
Stanford University
Palo Alto, California

Prof. Dr. Ursula M. Lehr
Psychology Institute
University of Bonn
Bonn, West Germany

Lauren LeRoy, C. Phil.
Aging Health Policy Center
University of California
San Francisco, California

Howard Y. McClusky, Ph.D.
Institute of Gerontology
University of Michigan
Ann Arbor, Michigan

Leslie A. Morgan, Ph.D.
Department of Sociology
University of Maryland
Catonsville, Maryland

Robert Newcomer, Ph.D.
Aging Health Policy Center
University of California
San Francisco, California

Gilbert S. Omenn, M.D., Ph.D.
Department of Medicine (Medi-
cal Genetics) and
Department of Environmental
Health
University of Washington

Seattle, Washington;
Woodrow Wilson School of Public and International Affairs
Princeton University
Princeton, New Jersey

Allen Raskin, Ph.D.
Pharmacologic and Somatic Treatments Branch
National Institute of Mental Health
Rockville, Maryland

Richard M. Rose, M.D.
Division of Pulmonary Medicine
New England Deaconess Hospital
Boston, Massachusetts

K. Warner Schaie, Ph.D.
Department of Individual and Family Studies
Pennsylvania State University
University Park, Pennsylvania

Joel Shanan, Ph.D.
Department of Psychology
Hebrew University;
Department of Psychiatry
Hadassah-Hebrew University Hospital
Jerusalem, Israel

Gregory W. Siskind, M.D.
Department of Medicine
Cornell University Medical College
New York, New York

Vicki Stone, Ph.D.
Ethel Percy Andrus Gerontology Center
University of Southern California
Los Angeles, California

John A. Toner, Ed.D.
Harlem Valley Psychiatric Center;
Center for Geriatrics and Gerontology
Columbia University;
New York State Office of Mental Health
New York, New York

Marc E. Weksler, M.D.
Department of Medicine
Cornell University Medical College
New York, New York

Bonnie S. Worthington-Roberts, Ph.D.
Child Development Center
University of Washington
Seattle, Washington

Forthcoming

THE ANNUAL REVIEW OF
GERONTOLOGY AND GERIATRICS, Volume 4

Tentative Contents

Biological Sciences

This page intentionally left blank

CHAPTER 1
The Effect of Aging on the Immune Response

Gregory W. Siskind, M.D., and
Marc E. Weksler, M.D.
Department of Medicine
Cornell University Medical College
New York, New York

INTRODUCTION

This review attempts to place in perspective a large body of knowledge concerning immune senescence. We have not attempted to offer an encyclopedic compilation of the literature. Rather, we have made a synthesis of data from our own laboratory and the laboratories of other investigators which is germane to the hypothesis that the involution of the thymus after sexual maturity plays a critical role in the senescence of the immune system. We have discussed in detail results of clinical studies and have employed studies in experimental animals to extend and amplify conclusions drawn from investigations in man.

THYMIC INVOLUTION AND AGING

The involution of the thymus after puberty was recognized long before the immunologic function of the organ was discovered. In the early 1930s careful anatomical studies showed that the mass of the human

thymus, which is well maintained until 15 years of age, rapidly decreases after sexual maturity (Boyd, 1932). By the age of 45 or 50 the lymphoid mass of the human thymus is only 15 percent of its maximum. In the early 1960s an immunological function of the thymus was first suggested. The crucial role of the thymus in the generation of mature peripheral lymphoid cells is now well established. The thymus is required for the normal differentiation of a subpopulation of lymphocytes, the so-called thymic derived lymphocytes or T cells. Precursors of T lymphocytes arise in the bone marrow and migrate to the thymus, where their differentiation continues. Although the differentiation process is not completely understood, it is known that both the microenvironment of the thymus and hormones produced by the thymus are important. There is some evidence that the T cells exported from the thymus are not fully mature and must undergo an additional differentiation event in the peripheral lymphoid organs. In the absence of a normal thymus, the peripheral T-cell system fails to develop and there are marked defects of delayed hypersensitivity and in the development of cytotoxic T cells as well as of helper and suppressor T-cell activities which are important in regulating the immune response. After sexual maturity, the thymus begins to involute and presumably loses its capacity to facilitate the differentiation of pre-thymic T-cell precursors. It is, therefore, logical to consider the contribution of thymic involution to the age-related changes in immune function.

One marker of human T-cell maturation, which is acquired in the thymus, is the receptor for sheep erythrocytes (SRBC). The presence of this receptor has offered a convenient method to enumerate T lymphocytes. Mature T lymphocytes form "rosettes" with SRBC. The age-associated decline in the capacity of the human thymus to stimulate the maturation of T lymphocytes is manifested by an age-related decrease in the percentage of cells in the thymus which can bind SRBC. At 20 years of age 85 percent of thymic lymphocytes bind SRBC, while at 50 years of age only 65 percent of thymic lymphocytes bind SRBC and at 80 years of age the incidence falls to 50 percent (Singh and Singh, 1979).

The progressive decline in the capacity of the thymus to mediate the differentiation of T cells has also been demonstrated by transplantation studies in experimental animals. Thymus glands from mice of different ages have been transplanted into young, syngeneic, thymectomized recipients (Hirokawa and Makinodan, 1975). Glands from newborn to three-month-old mice were the most effective in mediating the differentiation of T-cell precursors. Over the age of three months there was a progressive, age-dependent loss in the capacity of the

thymus to reconstitute irradiated mice to be capable of producing peripheral T cells and manifesting thymic-dependent immune function.

The influence of the thymus on lymphocyte maturation had been thought to be limited to the T-lymphocyte subpopulation. Recently, however, the thymus has also been found to play a role in the differentiation of the B-cell population (Sherr et al., 1978; Szewczuk et al., 1978, 1980). Using a cell transfer system, it was shown that thymus cells are required for the B-cell population to differentiate so as to be capable of producing a normal, high-affinity, heterogeneous antibody response. The age of the donor determines the capacity of the thymocytes to bring about this maturation of B-cell population. Thus, thymocytes from mice over six months of age are severely impaired in their capacity to mediate B-cell differentiation as compared with thymocytes from younger mice.

During the past 10 years, several putative thymic hormones (thymopoietin, thymosin, facteur thymique serique) have been isolated and purified and the amino acid sequence of several determined. The serum concentration of each of these hormones has been shown to decline with age. Thymopoietin activity in human serum is well maintained between birth and 30 years of age. Thereafter, a linear decline in serum thymopoietin activity is noted until it reaches undetectable levels in healthy humans over the age of 60 years (Lewis et al., 1978). The concentration of facteur thymique serique (FTS) in human serum begins to fall after the age of 20 and becomes undetectable after the age of 50 (Bach et al., 1972). The concentration of thymosin alpha 1 in human serum appears to decline even earlier. Thus, the progressive decline in thymic mass is reflected, after a few years, in a progressive decline in the serum concentrations of thymic hormones.

Despite the involution of the thymus gland, most studies have found that the relative and absolute number of T lymphocytes in the blood of humans does not change between the ages of 20 and 90 years (Gupta and Good, 1979). Studies in normal long-lived mice have also shown that the number of splenic T lymphocytes does not change with age (Stutman, 1972). However, in short-lived, autoimmune prone mice an age-associated decrease in the number of T lymphocytes in the spleen has been reported. The maintenance of the number of T cells in aged humans and experimental animals, despite the involution of the thymus gland and the decline in the serum concentration of thymic hormone, appears superficially paradoxical. However, it is important to appreciate that the number of T cells present depends not only on the rate of T-cell production, but also on the rate of T-cell destruction. Since T cells are extremely long-lived cells, it is possible that the resid-

ual thymic function present during middle and old age is sufficient to replace the small number that die. It should also be remembered that the total T-cell population has not been measured. Usually, only one (the blood or the spleen) of a number of distinct lymphoid compartments is sampled and the T-cell complement in this compartment found to be unchanged with age. It remains a definite possibility that the total number of T cells within the body of young and old individuals is actually different.

SENESCENCE OF THE IMMUNE RESPONSE

An effect of age on the immune system was first noted more than 50 years ago when the serology of human blood group substances was being studied. The serum concentration of antibody to the erythrocyte A and B antigens was found to decline with age (Thomsen and Kettel, 1929). Subsequently, the concentration of "natural" anti-SRBC antibody in humans was shown to decline with age (Paul and Bunnel, 1932), the highest levels being in 15- to 20-year-old individuals.

More recently, the effect of age on the immune response of humans to *Salmonella* flagellin was studied (Roberts-Thompson et al., 1974). Old persons produced lower titers of IgG antiflagellin antibody than did young individuals. In contrast to the age-related decline in the antibody response to foreign antigens, the incidence and concentration of autoantibodies is higher in the aged (Hallgren et al., 1973). As we shall repeatedly emphasize in this review, an important generalization regarding immune senescence is that with increased age there is a decrease in the response to foreign antigens but an increase in the response to self-antigens. It is interesting that despite the decreased immune response to foreign antigens by aged subjects, there is little or no corresponding decline in serum immunoglobulin concentration (Hallgren et al., 1973). It is possible, although not proven, that the decreased antibody response to foreign antigens is balanced by the increasing response to autologous antigens so that the total immunoglobin concentration remains essentially constant. Or to express the matter in somewhat different terms, over the course of life there may be a progressive shift in the quantitative distribution of elements (B and T cells) which normally exist, in a steady state, in a network of interacting idiotypes and anti-idiotypes. This shift in distribution within the network appears to be characterized by an increased number of self-reactive clones. In this manner, the total production of immuno-

globulin would remain constant despite a shift in the types of antibodies being produced. It is also possible, although not proven, that repeated exposure to common environmental antigens results in a shift in the distribution of antibody specificities within the network.

A decrease in the antibody response to foreign antigens and an increase in autoantibodies have also been observed in old experimental animals. Thus, the response of mice to sheep erythrocytes decreases with age while the level of antinuclear antibody rises (Singhal et al., 1978); and the response of mice to trinitrophenylated (TNP)-SRBC decreases with age while the response to TNP-mouse erythrocytes remains constant (Naor et al., 1976). These findings suggest that the characteristic age-associated changes in immune competence are the consequence, not only of a deficiency of thymic function, but also of an alteration in the regulation of the immune system.

The age-related decline in thymus-dependent immunity affects not only the antibody response to most antigens (that is, to T-dependent antigens) but also delayed hypersensitivity tumor and graft rejection, and T-cell mediated resistance to mycobacterial, viral, and fungal infection. Delayed cutaneous hypersensitivity to a variety of antigens has been studied in humans of various ages (Roberts-Thompson et al., 1974). Subjects over the age of 60 are significantly impaired in reactivity. A lower percentage of humans over the age of 70 have positive skin reactions to tuberculin than do persons under 70 (Waldorf et al., 1968). The loss of T-cell mediated immunity to *Mycobacterium tuberculosis* probably contributes to the clinical observation that reactivation tuberculosis is more frequent among the elderly. The age-related decrease in delayed cutaneous hypersensitivity is not due simply to a decline in immunological memory resulting from a prolonged interval between sensitization and challenge. When young and old humans were exposed for the first time to dinitrochlorobenzene (DNCB) and were challenged shortly thereafter, only 5 percent of subjects under 70 years of age failed to manifest a contact sensitivity reaction, while 30 percent of the subjects over 70 were not sensitized (Waldorf et al., 1968). Thus, there is a definite defect in the capacity of many elderly persons to develop or manifest contact-type hypersensitivity. In fact, it is the general impression that the aged show a more profound defect in delayed hypersensitivity (and contact sensitivity) than in serum antibody production.

The age-related impairment in antibody production and delayed hypersensitivity, which was observed in the clinical studies summarized above, could be due to either a primary defect in the immune system or an inability of a normal immune system to function in a defective

internal environment. This question has been examined by studying the response of lymphocytes from old humans in vitro and by studying the behavior of lymphocytes from old experimental animals after transfer into young, genetically identical recipients. Under these circumstances, the intrinsic function of lymphocytes can be evaluated in the absence of influences from other physiological changes that accompany aging and might compromise immune function. Data obtained by both experimental approaches are consistent with the view that a major portion of the defective immune function of the aged is due to intrinsic defects in their peripheral lymphoid cell populations.

T lymphocytes from humans proliferate when cultured with an antigen to which they have been immunized. The in vitro proliferative response to tuberculin purified protein derivative (PPD) by lymphocytes from patients with tuberculosis was studied by Nilsson (1971). Lymphocytes from old patients incorporate less thymidine when cultured with PPD than do lymphocytes from young patients. That is, the in vitro proliferative response of T lymphocytes to antigen is inversely correlated with age, suggesting an intrinsic defect in the function of T lymphocytes from elderly persons. Similarly, the proliferative responses of T lymphocytes from aged humans to the plant lectins, phytohemagglutinin (PHA) and pokeweed mitogen (PWM), and to allogeneic or autologous non-T lymphocytes are impaired (Weksler and Hutteroth, 1974; Fernandez and MacSween, 1980).

The basis for the age-associated defect in human T-cell proliferation has been studied in detail (Inkeles et al., 1977). Although the total number of T cells is the same in old and young humans, there is only one-half the number of mitogen-responsive T cells in the blood of healthy old subjects as compared with young subjects. This conclusion is based upon the results from three independent experimental approaches: (1) limiting dilution analysis, (2) susceptibility of dividing cells to viral infection, and (3) thymidine incorporation in the presence of colchicine. There is no demonstrable difference in the capacity of T cells from old and young subjects to bind PHA. That is, the number and affinity of lymphocyte receptors for PHA are the same in T-cell preparations from young and old subjects. Not only is the number of mitogen-responsive T cells reduced in old donors, but the capacity of mitogen-responsive T cells to divide repeatedly in culture is impaired (Hefton et al., 1980). This was established by measuring the number of lymphocytes dividing for the first, second, or third time after 72 hours in culture with PHA. At that time, although the number of T cells dividing for the first time is comparable in cultures of lymphocytes from old and young donors, the number of T cells from old donors

dividing for a second or third time is only one-half and one-quarter, respectively, of that observed in cultures of lymphocytes from young donors. This defect in the proliferative capacity of lymphocytes from old subjects may be comparable to defects reported in the proliferative capacity of other types of cells from old subjects (Hayflick, 1965). Fibroblasts (Martin et al., 1970) and arterial smooth muscle cells (Bierman, 1978) from old humans have both been found to divide fewer times in culture than do cells of these types obtained from young persons.

The molecular basis of the proliferative defect observed in lymphocytes from old humans has been investigated. Recent studies have indicated that a T-cell product, T-cell growth factor (TCGF), which is secreted during culture, is necessary for T-cell proliferation. The production of TCGF by lymphocytes from young and old humans has been compared (Gillis et al., 1981). Lymphocytes from old humans produce only half as much TCGF in culture as do lymphocytes from young donors. Not only do lymphocytes from old humans produce less TCGF but they are also defective in their response to TCGF. That is, TCGF stimulates proliferation of T cells from young persons but does not stimulate the proliferation of T cells from old persons. This appears to be due, at least in part, to the inability of lymphocytes from old donors to bind TCGF. Whether this is the consequence of a decrease in the number and/or the affinity of TCGF receptors has not been determined.

Prostaglandins, which appear to be important cell regulatory molecules, have also been implicated as contributing to the impaired proliferative responses of lymphocytes from old persons. T lymphocytes from old donors are more sensitive to the inhibitory effects of prostaglandins of the E series, which are produced in culture by blood monocytes (Goodwin and Messner, 1979). In addition, indomethacin, which blocks prostaglandin synthesis, augments the proliferative response of T lymphocytes from old donors. The greatest degree of augmentation is observed in cultures of lymphocytes from donors whose lymphocyte proliferative responses are the most impaired in the absence of indomethacin. It has also been reported that macrophages from old individuals secrete more prostaglandins of the E series than do macrophages from young donors (Rosenstein and Strausser, 1980).

Recently, techniques have been developed to study antibody production by human lymphocytes in culture. Both T-dependent and T-independent antibody synthesis can be stimulated in vitro by formalinized staphylococci. The staphylococci act as polyclonal activators of B cells, and the response is generally assayed in terms of the number of

plaque-forming cells (PFC) observed with SRBC as targets. Using this assay, an age-associated defect in antibody production by cultured, unfractionated human lymphocytes is seen (Kim et al., 1981). However, when purified B-cell preparations are studied, there is no significant difference between the responses of cells from old and young donors. With young subjects, more PFC are generated in cultures of unfractionated lymphocytes than in cultures of purified B lymphocytes. In contrast, with old subjects, more PFC are generated in cultures of purified B lymphocytes than in cultures of unfractionated lymphocytes. These results suggest that the age-associated changes in the peripheral lymphoid cell population are mainly the consequences of alterations in the non-B-lymphocyte population. The non-B-cell population appears to augment the B-cell response in the young but to suppress the response in the aged. The conclusion that B lymphocytes are relatively unimpaired in the aged human is supported by studies showing comparable proliferative responses by B lymphocytes from young and old donors. Thus, thymidine incorporation by purified B-lymphocyte preparations incubated with either staphylococci or anti-human immunoglobulin antibody is comparable with preparations from young and old subjects.

Macrophages clearly play critical roles in the immune response. They appear to be involved in antigen processing and presentation and in the generation of factors that stimulate lymphoid cells. In addition to their role in the afferent limb of the immune response, macrophages are also involved, as phagocytic cells, in the effector limb of the immune response. These complex functions of macrophages have not as yet been defined in detail. Consequently, the role of macrophages in contributing to the age-associated changes in immune function has been difficult to evaluate. The recent observation that the addition of lipopolysaccharide to human macrophages stimulates the release of a factor that replaces murine T cells in the in vitro primary antibody response of murine lymphoid cells to SRBC offers a new approach to the assay of human macrophage function. The capacity of macrophages from old and young humans to produce this T-cell replacing factor (TRF) has been measured and no difference detected (Kim et al., 1981). These studies suggest that macrophages from elderly humans are not impaired in their function, at least with respect to the production of TRF.

Thus, at the cellular level, the principle cause of the defective immune function of elderly humans appears to lie in the T-cell population. Macrophage and B-cell functions are relatively intact in the aged. It should, however, be pointed out that only relatively crude assays of

human macrophage and B-cell function have been examined so far. It would, therefore, not be surprising if further study revealed subtle age-associated deficits in the function of these cell types. In this regard, it is worth noting that evidence for defective B-cell function in aged experimental animals has been reported (DeKruyff et al., 1980b; Dobken et al., 1980). The overall data thus suggest that, in humans, T-cell function is altered in two ways with age: (1) a decreased responsiveness to appropriate stimuli probably leading to decreased T-helper activity and decreased delayed hypersensitivity responses; and (2) an increased suppressor activity which affects B-cell responses and possibly also T-cell responses.

The immunobiology of aging has also been extensively studied in mice. The availability of inbred strains has permitted genetic analysis of life span and immune senescence and has allowed the use of cell transfer methods which are not possible in the outbred human species.

The fact that different species, and strains within a species, vary in their life span suggests a genetic control of aging. Until recently, little was known about the number or location of genes that regulate life span. Theoretical interpretation of paleontological evidence of changes in the life span of man suggests that less than a thousand genes are involved in regulating life span (Cutler, 1975). In mice, some of the genes that regulate life span are located in the major histocompatibility complex. This is relevant to immune senescence since the major histocompatibility complex contains genes that influence immune function. Congeneic mice, identical except for small segments in the major histocompatibility complex, have different life spans (Smith and Walford, 1977). Furthermore, mouse strains with the longest life span tend to have their immune competence maintained for the longest period. These findings suggest the possibility that genes within the major histocompatibility complex modulate life span and influence the rate of immune senescence. Some data suggesting a similar relationship between HLA type and life span in man have been reported (Greenberg, 1979).

It has long been known that mice show an age-related decline in their antibody response to the T-dependent antigen SRBC. These early observations have been extended recently by the use of hapten-protein conjugates which permit a more detailed characterization of the immune defect. In studies using the T-dependent antigen dinitrophenylated bovine gamma globulin (DNP-BGG), it was found that, in addition to the age-related decline in total antibody production, there is a preferential loss of high-affinity antibodies and of IgG antibodies (Goidl et al., 1976). The preferential loss of high-affinity antibodies has impli-

cations both for the health of old animals and for the mechanism underlying immune senescence. High-affinity antibody probably affords more effective protection against infection than does low-affinity antibody. Thus, the increased susceptibility of old animals to infection may reflect, at least in part, the loss of high-affinity antibody production. Since binding a number of cell surface antigen receptors is probably one of the signals required to activate lymphocytes, the affinity of antigen receptors must play a crucial role in the induction of the immune response. If the affinity of antigen receptors is low, a higher concentration of antigen would be required to activate the cell. The loss of high-affinity lymphocytes may thus explain the observation that a higher dose of antigen is necessary to elicit a maximum immune response in old as compared to young animals (Makinodan and Adler, 1975). If a higher concentration of antigen were required to initiate an immune response, an infectious disease would progress further before an immune response began and host resistance developed. Lack of high-affinity lymphocytes in the aged could also explain the observation that an increased dose of tolerogen is required to induce immunologic unresponsiveness in old animals (De-Kruyff et al., 1980a; Dobken et al., 1980). As a consequence, it is possible that low concentrations of autologous antigens, which are sufficient to maintain self-tolerance in young animals, are not adequate to maintain self-tolerance in older animals. Such a defect in the maintenance of self-tolerance could be responsible for the increased frequency of auto-antibodies in the aged.

The production of high-affinity antibody and the shift to IgG antibody production both depend upon normal T-cell helper function (DeKruyff and Siskind, 1979). The preferential loss of high-affinity and IgG antibody with age could thus be directly related to the involution of the thymus and the consequent decrease in helper T cells. This conclusion is supported by the findings: (1) that the age-related loss of high-affinity and IgG antibodies is accelerated after thymectomy; and (2) that old mice given the thymic hormone thymopoietin regain their capacity to make IgG and high-affinity antibodies (Weksler et al., 1978). The primacy of thymic involution in immune senescence is also suggested by the fact that, despite reports of an age-related decrease in the response to T-independent antigens (Callard et al., 1977; DeKryuff et al., 1980b; Dobken et al., 1980), the response to T-dependent antigens is, in general, more depressed in old mice than is the response to T-independent antigens (Makinodan and Adler, 1975). Whether the reported age-related change in the response to T-independent antigens is due to an intrinsic defect in B-cell function, is secondary to increased suppressor T-cell activity, or

is due to a failure of the thymus gland of old animals to mediate B-cell differentiation has not been definitively established. However, in vitro and cell transfer studies, as discussed below, suggest that all three factors are probably involved.

The cellular basis for the age-associated defects in the immune response of experimental animals has been extensively investigated by in vitro cell culture methods. Such studies have usually employed mouse lymphocytes and have, in general, yielded results which are comparable to those obtained in studies with human subjects. For example, the response of T-lymphocytes from old mice to plant lectins or allogeneic lymphocytes declines with age (Adler and Chrest, 1979). As in the case of man, the decreased response to plant lectins is due to a decline in the number of mitogen-responsive T cells and to an impaired capacity of the mitogen-responsive cells to divide repeatedly in culture. Other in vitro parameters of T-cell function, including the generation of cyto-toxic T cells in mixed lymphocyte culture, also decline with age. A primary, specific PFC response, to either a T-dependent or a T-inde-pendent antigen, can be generated in cultures of murine spleen cells. The in vitro PFC response to the T-dependent antigen SRBC was found to be markedly impaired with cells from aged animals (DeKruyff et al., 1980b). A reduced response is already seen at 12 months of age, and by 18 months of age the response is reduced to less than 5 percent of the maximal PFC response observed between the ages of three and six months. Several distinct age-associated changes in the immune sys-tem contribute to the impaired response of aged mice to SRBC. A deficiency of helper T cells, excessive suppressor T-cell activity, and an intrinsic defect in B-cell function have all been demonstrated. The evidence for an intrinsic, age-associated defect in B-cell function con-sists of the findings that the anti-DNP PFC response of spleen cells from aged mice to the T-independent antigen DNP-polyacrylamide beads (DNP-PAA) is impaired even after the spleen cell population is depleted of T cells. This implies that the reduced PFC response cannot be due solely to a suppressive effect of non-B lymphocytes but must be due, at least in part, to an intrinsic defect in the function of the periph-eral B-cell population (DeKruyff et al., 1980b). These studies also demonstrated, by mixed cell-culture experiments, an age-associated increase in suppressor T-cell activity. It has been reported that the in vitro proliferative response of B lymphocytes to mitogen declines with age. However, it is important to note that response of B cells to lipopolysaccharide (LPS) declines less with age than does the response of T cells to PHA (Gerbase-DeLima et al., 1974). It should be em-phasized that in most studies where the response to a B-cell mitogen,

such as LPS, was impaired, the cellular basis of the defect remains uncertain since T cells have generally not been removed from the cell preparations prior to culture. T-cell preparations from old mice have been shown to have increased nonspecific suppressor activity; therefore, removal of T cells is necessary to distinguish an intrinsic defect in B-cell function from T-cell-mediated suppression of the B-lymphocyte response.

Cell transfer studies with inbred mice have provided additional insights into the immune deficiency of aging. In such studies, the function of lymphocytes from old and young animals is compared after their transfer into lethally irradiated, syngeneic, young recipients. This technique permits a direct assessment of the in vivo function of lymphocytes from old and young mice in the absence of any influence by age-associated physiological or pathological changes that may exist in old animals. Thus, such studies can help distinguish between host effects on immune function, that is, defects arising from the internal environment of the old animals, and defects intrinsic to the cell population being studied. Classic studies by Makinodan and Adler (1975) established that 90 percent of the age-associated defect in the PFC response of mice to SRBC is due to defects intrinsic to the peripheral lymphoid cell population of the aged animals while only 10 percent of the defective PFC response can be attributed to the internal environment of the old host. Subsequently, it was shown that the preferential loss of high-affinity and IgG antibody production by old animals also results from intrinsic changes in the peripheral lymphoid cells (Goidl et al., 1976). These transfer studies have also shown that suppressor cell activity increases with age. Thus, the immune response by lethally irradiated recipients of a mixture of spleen cells from old and young donors is lower than the response of mice reconstituted with cells from young donors alone. Spleen cells from 12-, 24-, or 34-month-old mice, when transferred together with spleen cells from 2- to 3-month-old mice, inhibit the response of recipients by 60, 80, and 90 percent, respectively, as compared to the responses of recipients given only spleen cells from 2- to 3-month-old donors. It is interesting that the suppression induced by spleen cells from old mice does not preferentially affect high-affinity antibody production. This suggests that increased suppressor activity, while probably contributing to the immune defect of aging, does not totally account for it. The results are thus comparable to those obtained in the in vitro studies described above, in which it was shown that deletion of suppressor T cells from the spleen cell population of old mice increased their response to a T-independent antigen but did not restore the response to the level achieved

by cells from young mice (DeKruyff et al., 1980b). The fact that le-thally irradiated young mice, reconstituted with spleen cells from old donors, manifest the impairments in high-affinity antibody production and IgG PFC response characteristic of old animals permitted us to carry out a series of studies that provide considerable insight into the cellular basis of immune senescence. The high-affinity and IgG anti-body responses of irradiated recipients of spleen cells from old donors are restored if thymocytes from young donors are transferred together with the spleen cells from old donors (Goidl et al., 1976). Further-more, residence for eight weeks of spleen cells from old donors in young irradiated recipients possessing an intact thymus gland results in a reversal of the age-associated defects in high-affinity and IgG anti-body production. No reversal of the age-associated immune defects is seen in thymectomized recipients of spleen cells from old donors. Fi-nally, the age-associated defects of old spleen cells can be reversed by incubation with the thymic hormone thymopoietin prior to cell transfer (Weksler et al., 1978). The importance of thymic involution in leading to immune senescence is also suggested by the observation that adult thymectomy accelerates the appearance of age-associated immune de-fects (Weksler et al., 1978).

Taken together, available data support the view that the age-associated defects in immune function are mainly the result of changes in the T-cell compartment of the immune system. Available results are consistent with the hypothesis that thymic involution plays a critical role in the sequence of events leading to immune senescence. The experiments demonstrating a reversal of certain of the age-associated defects in immune function following treatment with thymic hormone are of particular interest since they offer a potential therapeutic strat-egy for modifying the immune deficiency of aging.

AGING AND THE REGULATION
OF THE IMMUNE RESPONSE

The involution of the thymus gland and the decline in the serum con-centration of thymic hormone precede the age-associated loss of im-mune function. This temporal relationship suggests that immune senes-cence might be simply the result of a progressive deficiency in thymic function. Furthermore, the decreases in thymic mass and serum thymic hormone concentration are probably the most regularly occurring age-

associated changes in the immune system. When other parameters of immune function are examined, there is inevitably marked individual variability among aged subjects, some exhibiting profound defects and others completely normal function. In fact, with most parameters of immune function, variability clearly increases with age. In contrast, thymic involution and decrease in thymic hormone concentration occur in an exceedingly regular fashion with relatively little individual variation. These findings also suggest a primary role for thymic involution in controlling the age-associated changes in immune function. However, a deficiency of thymic function does not seem to account fully for the complexity of immune senescence. Thus far, it has not been possible to associate immune senescence with the loss of a specific lymphocyte subpopulation or immunoglobulin class. While one might view immune senescence as an immunodeficiency state (in fact, the most common immunodeficiency), the perturbations of immune functions observed in immune senescence tend to be more complex and varied than are seen in most other immunodeficiency states. This wide range of immunological perturbations (e.g., increased autoantibody formation, decreased ease of tolerance induction, increased monoclonal immunoglobulin production, increased incidence of circulating immune complexes) is not usually associated with the classical immune deficiency diseases. However, since the immune system is a network of interacting and countervailing elements, it is possible that thymic involution results, not only in immune deficiency, but also in alterations in immune regulation.

It has been known for some years that the incidence of autoantibodies in humans and experimental animals increases progressively with age. Less than 5 percent of healthy humans under 40 years of age have autoantibodies to thyroglobulin, DNA, or immunoglobulin (rheumatoid factor). In contrast, 30 to 40 percent of the healthy individuals over the age of 80 years have one or more of these autoantibodies (Hallgren et al., 1973). It is important to note that elderly persons with these autoantibodies do not have the typical clinical manifestations of autoimmune disease observed in young persons with autoantibodies. This is not to say that these autoantibodies do not have pathologic significance. An immunologic theory of aging has been proposed (Walford, 1969) which rests upon the thesis that autoimmune damage to cells and tissues contributes to the actual process of aging. Not only can autoantibodies directly damage cells and tissues but, in addition, the coexistence of autoantibodies and the antigens with which they react can lead to the presence of immune complexes in the circulation. Recently, it has been found that nearly half of the healthy persons

studied over the age of 65 have high levels of circulating immune complexes (Day and Weksler, 1980). The pathogenic role of circulating immune complexes in vascular and renal diseases is well documented. Whether healthy older subjects with high levels of immune complexes are at increased risk of developing such diseases as compared with age-matched subjects who do not have circulating immune complexes is not known. We believe that the role of circulating immune complexes as potential factors leading to chronic tissue damage is an important area for future investigation. The possibility exists that such complexes might contribute to a variety of different types of chronic tissue damage including atherosclerotic vascular disease.

The presence of autoantibodies in elderly humans is not the only evidence of impaired regulation of B-cell function. Altered B-cell regulation is also suggested by the presence of benign monoclonal gammopathies, the incidence of which increases significantly with age (Axelsson et al., 1966). These proteins are not associated with the bony lesions or malignant transformation of plasma cells, as are seen in myeloma, and would thus appear to be manifestations of impaired B-cell regulation rather than neoplastic disease. Animal studies have also revealed an increase in the frequency of benign monoclonal immunoglobulins with age and, furthermore, have indicated that the incidence of these monoclonal proteins in old animals is increased after thymectomy (Radl et al., 1980). Thus, thymic involution may also play a role in the development of benign monoclonal gammopathies in the aged.

Protection against autoantibodies presumably depends upon a number of mechanisms that are thought to be involved in the induction and maintenance of self-tolerance. Autologous antigens which are present at low concentrations are believed to induce helper T-cell tolerance and activate suppressor T cells. Since the activation of autoreactive B cells probably requires helper T-cell activity, T-cell tolerance presumably serves as a primary defense mechanism against autoantibody production. Suppressor T cells most likely serve as a "backup" system to control the expression of autoreactive B cells which might, at times, be activated by mechanisms that bypass the requirement of T cell help. Autologous antigens present at high concentrations may also induce a specific B-cell tolerance. Other mechanisms, such as anti-idiotype antibodies, are probably also involved in self-tolerance. All of these mechanisms for the induction and maintenance of self-tolerance are affected by age. It has been shown that both B- and T-cell tolerance is more difficult to induce in older animals (DeKruyff et al., 1980a; Dobken et al., 1980; Fujiwara and Cinader, 1974; McIntosh and Segre, 1976).

Administration of the B-cell tolerogen DNP-D-GL prior to immunization with DNP-BGG dramatically reduces the anti-DNP PFC response in young mice. Far greater amounts of tolerogen are required to induce comparable degrees of unresponsiveness in older mice (Dobken et al., 1980). This resistance to tolerance induction was shown, by cell transfer studies, to be an intrinsic property of the peripheral B-cell population of older mice. The detailed mechanism for the age-related decrease in the ease of B-cell tolerance induction is not known. It is known, however, that B-cell tolerance is more readily induced in high-affinity than in low-affinity B cells (Davie et al., 1972; DeKruyff and Siskind, 1980; Szewczuk and Siskind, 1977). The reduced affinity of the B-cell population of aged mice may thus contribute to the lack of susceptibility to tolerance induction. A defect in the capping of the surface immunoglobulin of B cells from aged rats following treatment with anti-immunoglobulin antibody has been reported (Woda and Feldman, 1979). Such an age-related alteration in the behavior of B-cell membrane immunoglobulin might also contribute to the age-related decrease in ease of B-cell tolerance induction. It is interesting that, as with a number of other parameters of immune function, the decrease in ease of tolerance induction begins relatively early (about six months of age) in the life span of long-lived BALB/c mice (Dobken et al., 1980).

The effect of age on the ease of induction of helper T-cell tolerance has also been studied (DeKruyff et al., 1980a). The model employed was the induction of carrier-specific unresponsiveness by the injection of ultracentrifuged BGG, followed by challenge with DNP-BGG. The reduction in the anti-DNP PFC response, as a consequence of the prior injection of BGG tolerogen, was taken as an assay of helper T-cell tolerance. It was found that a higher dose of tolerogen is required to induce the same degree of T-cell unresponsiveness in older mice. Cell transfer studies showed that the altered ease of tolerance induction is an intrinsic property of the peripheral T-lymphocyte population of the aged mice. As with B-cell tolerance induction, the relative resistance to T-cell tolerance induction begins fairly early in life (at about six months) in long-lived BALB/c mice. The mechanism of the increased resistance of T cells from older mice to tolerance induction has not been elucidated. It was suggested above that a loss of high-affinity antibody-producing cells might contribute to the increased resistance of B cells to tolerance induction. Whether a similar mechanism might operate at the T-cell level is not known. There is some evidence for an age-related loss of T cells with high-affinity receptors for antigen. It has been reported that the affinity of cytotoxic T cells

for target cells is lower in old than in young mice (Zharhary and Gershon, 1980).

Over the past 10 years it has become clear that suppressor cells play an important role in the regulation of the immune response. While most attention has been devoted to T lymphocytes with suppressor activity, there is evidence that non-T lymphocytes, including monocytes and B lymphocytes, can also "down-regulate" the immune response. Altered suppressor-cell activity has been reported in several diseases characterized by immune deficiency or autoimmunity. In general, high levels of suppressor activity have been associated with immune deficiency and low levels of suppressor activity with autoimmunity. The alterations in the immunologic system associated with aging include both decreased immune responses to foreign antigens (immune deficiency) and the presence of autoantibodies (autoimmunity). It has been suggested that this paradox might result from different subpopulations of suppressor cells being involved in regulating immune responses to self- and to foreign antigens. There is considerable evidence that spontaneous suppressor activity for foreign antigens is increased in old humans and old experimental animals. Thus, the human non-B-lymphocyte population (monocytes and/or T lymphocytes) from old donors inhibits the in vitro synthesis of antibody by autologous B cells. Similarly, spleen cells from old mice suppress the in vitro and in vivo antibody responses of syngeneic spleen cells from young mice. In studies where more precise assessment of the age-related changes in suppressor activity were carried out, suppressor activity increased markedly after 12 months of age, approximately one-third the maximal life span for mice (DeKruyff et al., 1980b). In contrast to the increase in spontaneous, apparently nonspecific, suppressor activity with age, mitogen-induced suppressor activity has been reported to remain constant or decrease with age (Hallgren and Yunis, 1977).

Exposure of lymphocytes to LPS in vivo or in vitro induces autoantibody formation. LPS bypasses the requirement for T-cell helper function and directly activates B cells, including autoreactive ones. Spleen cells from old mice incubated in vitro with LPS produce more autoantibodies than do spleen cells from young mice (Goidl et al., 1981; Meredith et al., 1979). This suggests an increased incidence of autoreactive B cells in aged animals.

It has generally been felt that the increased incidence of autoantibodies in the aged reflects abnormalities in the normal mechanisms of regulation of the immune system, such as a decrease in suppressor-cell activity. However, most studies of aging in man and in long-lived mouse strains have revealed an age-related increase in suppressor ac-

tivity. While the possibility exists that a different subset of suppressor cells is involved in regulating responses to autologous and to foreign antigens, no evidence for such a dichotomy exists. The fact that two of the mechanisms involved in down-regulating the immune system (suppressor-cell activity and auto-anti-idiotype antibody production, see below) are both increased in aging suggests that a failure of these regulatory mechanisms is not the cause of autoantibody production in the aged. In fact, the age-related increase in the activity of mechanisms involved in down-regulating the immune response suggests that they might actually be activated as protective mechanisms in an effort to prevent or turn off autoantibody production. According to this hypothesis, the decreased magnitude of the immune response seen in the aged is actually an undesirable side effect of the normal operation of homeostatic mechanisms which are attempting to protect against the consequences of autoantibody production. A plausible hypothesis is that a decline in the capacity to induce B- and T-cell tolerance leads to a loss of self-tolerance and, in the face of constant stimulation by self-antigens, an increase in autoantibody production. This is reflected in the increased incidence of self-reactive B cells detected after LPS stimulation in vitro. It is further hypothesized that the autoimmune responses that follow the loss of self-tolerance result in the stimulation of suppressor-cell activity and auto-anti-idiotype antibody production, both of which are normal down-regulatory mechanisms. It should be noted that certain autoantibodies may react with regulatory T cells and thereby contribute to the disregulation of the immune system. For example, some elderly humans have an autoantibody with specificity for a population of suppressor T cells (Strelkauskas, 1980). This could result in abnormalities of immune regulation leading to the perpetuation of the autoimmune state.

A set of autoantibodies is now recognized which plays an important role in the normal regulation of the immune response. An idiotype is defined as the antigen combining site of an antibody molecule when it is considered as an antigenic determinant. Anti-idiotype antibodies are antibodies specific for the antigen combining site of another antibody molecule. Depending upon their class and concentration, anti-idiotype antibodies can act to depress or to augment an immune response. Thus, the idiotype and the anti-idiotype antibody form a mutually stimulatory and inhibitory pair. It has been shown that during a normal immune response an animal produces not only antibody specific for the foreign antigen but also auto-anti-idiotype antibody specific for the idiotype of the antibody to the foreign antigen (Goidl et al., 1979; Schrater et al., 1979). It has further been shown that such

auto-anti-idiotype antibodies can specifically inhibit secretion of anti-body by interaction with idiotype on the surface of B lymphocytes (Goidl et al., 1979; Schrater et al., 1979). Jerne (1974) has suggested that the immune system exists as a steady-state network of interacting idiotypes and anti-idiotypes. It seems possible that, in this way, the immune system acts to regulate itself. It should be emphasized that idiotype-specific regulatory interactions probably operate both at the T- and B-cell levels and at the serum antibody level. There is considerable evidence that some suppressor T-cell activity is actually idiotype specific (Sy et al., 1980). Recent studies have shown that there is an increased production of auto-anti-idiotype antibody in old mice (Goidl et al., 1980). This down-regulation contributes to the apparent immune defect in aged mice. Finally, it has been shown that idiotype expression changes with age (Goidl et al., 1980)—that is, the set of DNP-specific idiotypes produced by mice in response to DNP-Ficoll changes with age. This represents an additional age-related change in B-cell function and regulation.

In summary, a complex set of changes occurs with age in the mechanisms which are normally involved in regulating the immune system. These changes can explain both the immunodeficiency and the enhanced autoreactivity that occur in old humans and experimental animals. It can be reasonably hypothesized that resistance to tolerance induction results in an increased susceptibility to the activation of auto-reactive B lymphocytes and leads to autoantibody formation. Increased suppressor-cell activity and increased auto-anti-idiotype antibody production appear to excessively down-regulate the immune response and contribute to the immunodeficiency of aging. It is suggested that the activation of suppressor activity might be secondary to the autoimmune phenomena that occur in the aged. Such a view implies that the increased suppressor activity in the aged represents a defense mechanism against autoimmunity and that its effect on the immune response to extrinsic antigens is an undesirable side effect of a normal regulatory mechanism.

BIOLOGICAL SIGNIFICANCE OF IMMUNE SENESCENCE

It has been suggested that immune senescence plays an important role, not only in the development of diseases that prevent animals from reaching the maximal life span of the species, but also in establishing

the maximal life span of the species. The finding that genes of the major histocompatibility complex influence both the rate of immune senescence and life span suggests a close relationship between the immune system and aging. Furthermore, two procedures which increase the life span of animals, undernutrition and reduction in body temperature of poikilotherms, are associated with marked effects on the immune system. Among humans there is a wide variation in immune competence after middle age, and preliminary evidence points to an association between immune competence and life expectancy. Thus, old humans with autoantibodies (MacKay, 1972), with low suppressor activity (Hallgren and Yunis, 1980), or with greatly impaired cutaneous delayed hypersensitivity (Roberts-Thompson et al., 1974) are at increased risk of death. Whether the loss of immune competence truly identifies individuals who are at high risk of early death requires confirmation by prospective studies. To establish that a causal relationship exists between immune senescence and early death would require the demonstration that procedures which maintain immunologic vigor prolong survival.

Regardless of whether future work does or does not sustain an immunologic theory of aging, it is almost certain that immune senescence plays an important part in the increased susceptibility of old humans to the diseases that accompany aging. The increased incidence of infection clearly can be related to the loss of immune competence. It is also likely that immune senescence contributes to the increased incidence of neoplastic disease among the elderly. Finally, the disordered state of self-tolerance, the formation of autoantibodies, and the circulation of immune complexes may cause or accelerate a variety of disease states, including atherosclerotic vascular disease, as a result of chronic, low-grade tissue damage. Thus, studies of the effects of age on the immune system and of the relationship of the immunologic system to the diseases associated with aging may offer means to influence the development of these diseases through therapeutic modification of the immune system. However, it is important to bear in mind that the progressive, programmed decline in thymic function may well be an evolutionarily developed, protective mechanism against overwhelming autoimmune disease. If this hypothesis were true, then premature intervention to increase immune function might have greater negative than positive consequences. It is thus crucial to learn more about the changes in immune function which accompany aging, their biologic consequences, and their evolutionary significances.

REFERENCES

Adler, W. H., and Chrest, F. J. 1979. The mitogen response essay as a measure of immune deficiency of aging mice. In G. W. Siskind, S. D. Litwin, and M. E. Weksler (Eds.), *Developmental Immunobiology*. New York: Grune and Stratton, p. 233.

Axelsson, U., Bachmann, R., and Hallen, J. 1966. Frequency of pathological proteins (M-components) in 6,995 sera from an adult population. *Acta Med. Scand.* 179:235.

Bach, J. F., Papiernick, M., Levasseur, P., Dardenne, M., Baros, A., and LeBrigand, H. 1972. Evidence for a serum-factor secreted by the human thymus. *Lancet* 2:1056.

Bierman, E. L. 1978. The effect of donor age on the in vitro life span of cultured human arterial smooth-muscle cells. *In Vitro* 14:951.

Boyd, E. 1932. The weight of the thymus gland in health and in disease. *Am. J. Dis. Child.* 43:116.

Callard, R. E., Basten, A., and Waters, L. K. 1977. Immune function in aged mice. II. B-cell function. *Cell. Immunol.* 31:26.

Cutler, R. G. 1975. Evolution of human longevity and the genetic complexity governing aging rate. *Proc. Natl. Acad. Sci. (USA)* 72:4664.

Davie, J. M., Paul, W. E., Katz, D. H., and Benacerraf, B. 1972. Hapten-specific tolerance. Preferential depression of the high affinity antibody response. *J. Exp. Med.* 136:426.

Day, N., and Weksler, M. E. 1980. Unpublished observation.

DeKruyff, R., and Siskind, G. W. 1979. Studies on the control of antibody synthesis. XIV. Role of T cells in regulating antibody affinity. *Cell. Immunol.* 47:134.

DeKruyff, R. H., and Siskind, G. W. 1980. Studies on the control of antibody synthesis. XVI. Effect of immunodepression on antibody affinity. *Cell. Immunol.* 49:90.

DeKruyff, R. H., Rinnooy Kan, E. A., Weksler, M. E., and Siskind, G. W. 1980a. Effect of aging on T-cell tolerance induction. *Cell. Immunol.* 56:58.

DeKruyff, R., Kim, Y. T., Siskind, G. W., and Weksler, M. E. 1980b. Age related changes in the *in vitro* immune response: increased suppressor activity in immature and aged mice. *J. Immunol.* 125:142.

Dobken, J., Weksler, M. E., and Siskind, G. W. 1980. Effect of age on ease of B-cell tolerance induction. *Cell. Immunol.* 55:66.

Fernandez, A., and MacSween, J. 1980. Decreased autologous mixed lymphocyte reaction with aging. *Mechanisms of Ageing and Development* 12:245.

Fujiwara, M., and Cinader, B. 1974. Cellular aspects of tolerance. V. The *in vivo* cooperative role of accessory and thymus derived cells in responsiveness and unresponsiveness in SJL mice. *Cell. Immunol.* 12:194.

Gerbase-DeLima, M., Wilkinson, J., Smith, G. S., and Walford, R. L. 1974. Age related decline in thymic independent immune function in a long-lived mouse strain. *J. Gerontol.* 29:261.

Gillis, S., Kozak, R., Durante, M., and Weksler, M. E. 1981. Immunological studies of aging. Decreased production of and response to T-cell growth factor by lymphocytes from aged humans. *J. Clin. Invest.* 67:937.

Goidl, E. A.., Innes, J. B., and Weksler, M. E. 1976. Immunological studies of aging. II. Loss of IgG and high avidity plaque-forming cells and increased suppressor cell activity in aging mice. *J. Exp. Med.* 1445:1037.

Goidl, E. A., Schrater, A. F., Siskind, G. W., and Thorbecke, G. J. 1979. Production of auto-anti-idiotypic antibody during the normal immune response to TNP-Ficoll. II. Hapten-reversible inhibition of anti-TNP plaque-forming cells by immune serum as an assay for auto-anti-idiotypic antibody. *J. Exp. Med.* 150:154.

Goidl, E. A., Thorbecke, G. J., Weksler, M. E., and Siskind, G. W. 1980. Production of auto-anti-idiotypic antibody during the normal immune response. Changes in auto-anti-idiotypic antibody response and the idiotype repertoire associated with aging. *Proc. Natl. Acad. Sci. (USA)* 77:6788.

Goidl, E. A., Michelis, M. A., Siskind, G. W., and Weksler, M. E. 1981. Effect of age on the induction of autoantibodies. *Clin. Exp. Immunol.* 44:24.

Goodwin, J. S., and Messner, R. P. 1979. Sensitivity of lymphocytes to prostaglandin E_2 increases in subjects over age 70. *J. Clin. Invest.* 64:434.

Greenberg, L. J. 1979. Aging and immune function in man: influence of sex and genetic background. In S. K. Singhal and N. R. Sinclair (Eds.), *Aging and Immunity.* New York: Elsevier/North-Holland, p. 43.

Gupta, S., and Good, R. A. 1979. Subpopulation of human T lymphocytes. X. Alterations in T, B, third population cells and T cell with receptors for immunoglobulin M or G in aging humans. *J. Immunol.* 122:1214.

Hallgren, H. M., and Yunis, E. J. 1977. Suppressor lymphocytes in young and aged humans. *J. Immunol.* 118:2004.

Hallgren, H. M., and Yunis, E. J. 1980. In D. Segre and L. Smith (Eds.), *Immunological Aspects of Aging.* New York: Marcel Dekker.

Hallgren, H. M., Buckley, C. E., Gilbersten, V. A., and Yunis, E. J. 1973. Lymphocyte phytohemagglutinin responsiveness, immunoglobulins and autoantibodies in aging humans. *J. Immunol.* 111:1101.

Hayflick, L. 1965. The limited *in vitro* lifetime of human diploid cell strains. *Exp. Cell. Res.* 37:146.

Hefton, J. M., Darlington, G., Casazza, B. A., and Weksler, M. E. 1980. Immunological studies of aging. V. Impaired proliferation of PHA responsive human lymphocytes in culture. *J. Immunol.* 125:1007.

Hirokawa, K., and Makinodan, T. 1975. Thymic involution: Effect on T differentiation. *J. Immunol.* 114:1659.

Inkeles, B., Innes, J. B., Kuntz, M. M., Kadish, A. S., and Weksler, M. E. 1977. Immunological studies of aging. III. Cytokinetic basis for the impaired response of lymphocytes from aged humans to plant lectins. *J. Exp. Med.* 145:1176.

Jerne, N. K. 1974. Towards a network theory of the immune system. *Ann. Immunol.* (Paris). 125(C):373.

Kim, Y. T., Siskind, G. W., and Weksler, M. E. 1981. Cellular basis of the impaired immune response of elderly humans. In A.S. Funci and B. Ballieux (Eds.) *Human B cell functions: activation and immuno-regulation.* New York: Raven Press.

Lewis, V. M., Twomey, J. J., Bealmear, P., Goldstein, G., and Good, R. A. 1978. Age, thymic involution and circulating thymic hormone activity. *J. Clin. Endocrinol. Metab.* 48:145.

MacKay, I. 1972. Ageing and immunological function in man. *Gerontologia* 18:285.

Makinodan, T., and Adler, W. H. 1975. Effects of aging on the differentiation and proliferative potentials of cells of the immune system. *Fed. Proc.* 34:153.

Martin, G. M., Sprague, C. A., and Epstein, C. J. 1970. Replicative life span of cultivated human cells. Effects of donor's age, tissue and genotype. *Lab. Invest.* 23:86.

McIntosh, K. R., and Segre, D. 1976. B- and T-cell tolerance induction in young-adult and old mice. *Cell. Immunol.* 27:230.

Meredith, P. J., Kristie, J. A., and Walford, R. L. 1979. Age increases expression of LPS induced autoantibody-secreting B cells. *J. Immunol.* 123:87.

Naor, D., Bonavida, B., and Walford, R. L. 1976. Autoimmunity and aging: The age-related response of mice of a long-lived strain to trinitrophenylated syngeneic mouse red blood cells. *J. Immunol.* 117:2204.

Nilsson, B. S. 1971. Reactivity to PPD and phyto-hemagglutin in relation to PPD skin reactivity and age. *Scand. J. Resp. Dis.* 52:39.

Paul, J. R., and Bunnell, W. W. 1932. Anti-SRBC aggultination with age. *Am. J. Med. Sci.* 183:90.

Radl, J., DeGlopper, E., Van den Berg, P., and Van Zwieten, M. J. 1980. Idiopathic paraproteinemia. III. Increased frequency of paraproteinemia in thymectomized aging C57BL/KaLwRij and CBA/BrRij mice. *J. Immunol.* 125:31.

Roberts-Thompson, I. C., Whittingham, S. I., Youngchayud, V., and MacKay, T. R. 1974. Ageing, immune response and mortality. *Lancet* 2:368.

Rosenstein, M. M., and Strausser, H. R. 1980. Macrophage-induced T-cell mitogen suppression with age. *J. Reticuloendothel. Soc.* 27:159.

Schrater, A. F., Goidl, E. A., Thorbecke, G. J., and Siskind, G. W. 1979. Production of auto-anti-idiotypic antibody during the normal immune response to TNP-ficoll. I. Occurrence in AKR/j and BALB/c mice of hapten-augmentable, anti-TNP plaque-forming cells and their accelerated appearance in recipients of immune spleen cells. *J. Exp. Med.* 150:138.

Sherr, D. H., Szewczuk, M. R., and Siskind, G. W. 1978. Ontogeny of B-lymphocyte function. V. Thymus cell involvement in the functional maturation of B-lymphocytes from fetal mice transferred into adult irradiated hosts. *J. Exp. Med.* 142:196.

Singh, V., and Singh, A. K. 1979. Age-related changes in human thymus. *Clin. Exp. Immunol.* 37:507.

Singhal, S. K., Roder, J. C., and Duwe, A. K. 1978. Suppressor cells in immunosenescence. *Fed. Proc.* 37:1245.

Smith, G. S., and Walford, R. L. 1977. Influence of the main histocompatibility complex on ageing in mice. *Nature* 270:727.

Strelkauskas, A. 1980. Autoantibodies to a regulatory T cell subset in human aging. In D. Segre and L. Smith (Eds.), *Immunological Aspects of Aging.* New York: Marcel Dekker.

Stutman, C. 1972. Lymphocyte subpopulations in NZB mice: deficit of thymus-dependent lymphocytes. *J. Immunol.* 109:602.

Sy, M. S., Dietz, M. H., Germain, R. N., Benacerraf, B., and Green, M. I. 1980. Antigen- and receptor-driven regulatory mechanisms. IV. Idiotype-

bearing I-J+ suppressor T cell factors induce second-order suppressor T cells which express anti-idiotype receptors. *J. Exp. Med.* 151:1183.

Szewczuk, M., and Siskind, G. W. 1977. Ontogeny of B-lymphocyte function. III. *In vivo* and *in vitro* studies on the ease of tolerance induction to B lymphocytes from fetal, neonatal and adult mice. *J. Exp. Med.* 145:1590.

Szewczuk, N. R., Sherr, D. H., and Siskind, G. W. 1978. Ontogeny of B lymphocyte function. VI. Ontogeny of thymus cell capacity to facilitate the functional maturation of B lymphocytes. *Eur. J. Immunol.* 8:370.

Szewczuk, M. R., DeKruyff, R. H., Goidl, E. A., Weksler, M. E., and Siskind, G. W. 1980. Ontogeny of B lymphocyte function. VIII. Failure of thymus cells from aged donors to induce the functional maturation of B lymphocytes from immature donors. *Eur. J. Immunol.* 10:918

Thomsen, O., and Kettel, K. 1929. Die Starke der menschlichen isoagglutinine und entsprechenden Blutkorper-chenrezeptoren in verschiedenen lebensaltern. *Z. Immunforsch.* 63:67.

Waldorf, D. S., Willkens, R. F., and Decker, J. L. 1968. Impaired delayed hypersensitivity in an aging population. *J.A.M.A.* 203:831.

Walford, R. 1969. *The Immunologic Theory of Aging.* Copenhagen: Munksgaard.

Weksler, M. E., and Hutteroth, T. H. 1974. Impaired lymphocyte function in aged humans. *J. Clin. Invest.* 53:99.

Weksler, M. E., Innes, J. B., and Goldstein, G. 1978. Immunological studies of aging. IV. The contribution of thymic involution to the immune deficiencies of aging mice and reversal with thymopoietin. *J. Exp. Med.* 148:996.

Woda, B. A., and Feldman, J. D. 1979. Density of surface immunoglobulin and capping on rat B lymphocytes. I. Changes with aging. *J. Exp. Med.* 149:416.

Zharhary, D., and Gershon, H. 1980. T-cytotoxic reactivity of senescent mice. Fourth International Congress of Immunology, Paris, Abstract 3.8.37.

Pharmacogenetics

GILBERT S. OMENN, M.D., PH.D.
DEPARTMENT OF MEDICINE (MEDICAL GENETICS)
DEPARTMENT OF ENVIRONMENTAL HEALTH
UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

WOODROW WILSON SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS
PRINCETON UNIVERSITY
PRINCETON, NEW JERSEY

INTRODUCTION

Pharmacogenetics is the study of genetically determined differences among individuals in their responses to pharmacologic agents. These responses include both therapeutic and adverse effects. The differences are of three types:

1. Heterogeneity of clinical disease or syndrome—a problem in diagnosis;
2. Differences in rate of metabolism of the drug—a problem in dosage; and
3. Differences in tissue susceptibility to the drug at the sites of action for therapeutic or adverse effects—a problem in the choice of agent.

There are examples of each of these categories that are important in clinical practice and instructive in clinical and experimental investigation. Claude Bernard (1856) called drugs and toxins "reagents of life" and recommended their study as excellent probes of vital processes.

27

Drugs are used in everyday practice in very large populations of geriatric patients; more rational use can improve clinical care and provide new information about responses of aging organs to biochemical perturbations.

SPECIAL ASPECTS OF PHARMACOLOGY IN THE AGED

In many ways, biological variation seems to increase in the elderly, and aging may diminish the margin between safe and toxic doses. Thus, recognition of individual differences in responses to drugs is all the more important in the elderly.

Older persons and old animals tend to suffer a diminution in functional reserve and absolute function of vital organs. On the other hand, it is essential not to attribute to the healthy elderly all the problems due to organ-specific diseases which are more prevalent among the elderly. It is unjust and inappropriate to lump all elderly persons together, without recognizing the large numbers of healthy elderly and the gradations of function and disease effects. About 11 percent of our population is over age 65 at present; by the year 2030 this group is expected to comprise more than 20 percent of a much larger population. It is helpful to subdivide the over-65 population by age into 65–74, 75–84, and 85+ subgroups, with increasing prevalence of illness, dependency, and need for long-term care. Even among the 85+ population, however, more than 40 percent have few or no functional limitations requiring personal care or assistance from others (Yarbrough et al., personal communication).

As a group, the elderly take more medications than younger persons. In 1976 the elderly spent $2.8 billion for drugs and drug sundries, 25 percent of the national total (Vestal, 1979). Several studies have shown that older patients have a roughly two-fold greater incidence of adverse reactions to drugs. Because the incidence of adverse reactions rises with the number of drugs administered, elderly with multiple diseases requiring various medications are significantly predisposed to complications arising from drug use and drug interactions. Independent of overt diseases, physiological changes that accompany aging may alter responses to drugs as a result of differences in pharmacokinetics (time course of absorption, distribution, biotransformation,

and excretion) or in pharmacodynamics (effects at sites of action). Body composition, an important determinant of drug distribution in body tissues and fluids, changes with age. Total body water is 10–15 percent less and body fat 10–20 percent greater in the elderly, compared with young subjects (see Vestal et al., 1978). Thus, actual lean body mass is reduced as a proportion of total body weight. Drugs which are distributed mainly in body water or lean body mass will have higher blood levels in the elderly if the dose is based upon body weight or surface area. The same phenomenon affects measures of renal function (Rowe, 1981). The doses of many drugs excreted primarily by the kidneys are adjusted routinely to compensate for decrease in renal function, particularly digitalis preparations and aminoglycoside antibiotics. However, these adjustments are nearly always based upon serum creatinine values. Muscle mass, from which creatinine is derived, falls with age at roughly the same rate as the glomerular filtration rate, so age-related loss in renal function (GFR) is not reflected in an elevation in serum creatinine. To avoid overdoses in this situation, it is necessary to determine creatinine clearances or use the nomogram of Rowe (1981).

In administering drugs, physicians must become familiar with the pharmacokinetic and pharmacodynamic features of the individual agents in order to anticipate problems arising from alterations in protein binding, from metabolic capacity of liver, from excretory clearances through renal, biliary, or pulmonary routes, or in responsiveness of many specific organs. It is likely that discrepancies between or among different studies of plasma protein binding, absorption, clearance, or metabolism of a specific drug may be due to both genetic and pathological differences in the subjects or patients, as well as such confounding variables as diet, tobacco use, alcohol consumption, caffeine consumption, other medications, and pollutants. In the case of antipyrine, there was ten-fold interindividual variation in plasma half-life and six-fold variation in metabolic clearance, while intra-individual variation was within ±10 percent (Vestal et al. 1975). Metabolic clearance of antipyrine decreased with age, but most of the effect was attributed to cigarette smoking, which stimulates drug-metabolizing activity in younger subjects but has little such effect in older persons. When Vestal et al. (1975) performed multiple regression analysis to the interindividual variance, age accounted for 3 percent and smoking for 12 percent of the variance, leaving 85 percent of the variance to "other factors." It is likely that genetically determined variation is a substantial contributor.

METHODS OF ANALYSIS IN PHARMACOGENETICS

Population Surveys

The first clue to pharmacogenetic relationships usually comes from population surveys. The population group may be patients or volunteer subjects, men or women, of various ethnic or racial groups. Observable variables after a drug is administered include the desired therapeutic effect, any adverse effects, plasma concentration, rate of metabolism, concentration of urinary products, and biochemically assayed effects of the drug at its sites of action. If there are differences across ethnic groups, genetic factors may be suspected, since frequencies of certain genes, including those affecting drug metabolism and responses to drugs, may vary across such population groups. If the distribution of results is bimodal, with rapid and slow metabolism, for example, it is appropriate to investigate further these two newly defined groups in the population. If the distribution is continuous, it is appropriate to investigate the individuals (and their relatives) at the extremes for possible genetic predispositions.

Twin Studies

Twin studies have been performed for a number of drugs. Comparison of monozygotic (identical) and dizygotic (fraternal) twins for rates of concordance (both respond or fail to respond) or for intrapair correlation in a quantifiable measure, such as rate of metabolism, permits estimation of the extent to which variation is due to inherited factors. The twin method does not provide any evidence about the mode of inheritance, because only one generation is examined. Nevertheless, clear-cut evidence for a remarkably high degree of genetic influence on widely varying rates of metabolism has been reported by Vesell and his colleagues for such drugs as antipyrine, dicumarol, phenylbutazone, ethanol, and halothane (Vesell and Page, 1968a,b,c; Vesell et al., 1971). For antipyrine (see above), the intraclass correlation coefficients were 0.85 for MZ twins and 0.47 for DZ twins; simple calculation of the heritability coefficient gave a value of 0.98, on a scale where 1.0 indicates total genetic control of the observed variation (Vesell and Page, 1968b). Had their subjects represented the age range and smoking behavior in Vestal's study, the estimate of heritability might have been reduced significantly. Contributions of environmental

variables also can be assessed in twins; the same twin pairs can be compared on chronic versus acute administration of a drug or for effects of diet or smoking.

Family Studies

Family investigations are valuable in dealing with heterogeneous mechanisms that may underlie all three types of pharmacogenetic differences. Family studies have the important advantage that the same mechanism for a particular diagnosis or for an unusual response to the drug is more likely to be responsible in all affected members of one family than in a series of unrelated individual patients. If a bimodal distribution of side effects or blood level was obtained in a population survey, families of individual probands from each of the modal subpopulations should be tested. If the pattern of variation is more nearly continuously distributed, distinctive subpopulations may still account for individuals with extreme values of blood level, urinary excretion rate, or some other measurable parameters. Studies of the families of such individuals may reveal a bimodal distribution of that parameter, suggesting a specific genetic mechanism occurring at too low a frequency in the general population to produce a discernible "hump" in the distribution curve of the whole population. More commonly, polygenic mechanisms will be responsible, meaning that gene actions vary in the many steps of absorption, metabolism, clearance, and drug action. With polygenic inheritance, relatives of probands with extreme low drug levels will have a distribution curve shifted to lower values, and relatives of probands with high drug levels will have a similar curve shifted to higher values.

Family studies that include spouses may permit differentiation of environmental and genetic sources of variation as well. In the case of phenylbutazone (Whittaker and Evans, 1970), a series of normal subjects gave a frequency distribution resembling a continuous curve with a skew toward higher values for plasma concentration of the drug. The regression of offspring values upon mid-parent values was significant; however, a positive correlation was found also between husbands and wives, suggesting an effect due to common environment. Phenylbutazone is metabolized by enzymes in liver microsomes which are induced to a variable degree by food additives, foodstuffs, many drugs, insecticides, and other agents. Therefore, Whittaker and Evans (1970) pretreated their subjects with phenobarbitone, a potent inducer. When all subjects were

induced fully, the skewed distribution was normalized; the husband–wife correlation became negligible, and the relative contribution of polygenic factors to the total variation was readily demonstrated.

Physiological Studies

Physiological investigations can provide a middle ground between clinical or behavioral observations and biochemical mechanisms. Mutant genes may produce significant variation in the heart or brain detectable by electrocardiogram (ECG) or electroencephalogram (EEG). There are abnormal genes which produce prolongation of the Q-T interval on the ECG. Affected persons are often asymptomatic, but have a high risk for arrhythmias and sudden death (Omenn, 1977). Drugs which affect cardiac conduction should be avoided in these patients. The complex electrical phenomena recorded in the EEG are determined almost entirely by genetic factors, according to Vogel (1970) and Vogel et al. (1979). MZ twins share, not only identical EEG patterns, but also similar maturational transitions in the EEG in adolescence and in later life. Analysis of pedigrees pointed to a polygenic mode of inheritance of the normal EEG, with several specific variant EEG patterns inherited as Mendelian autosomal dominant traits. Four percent of Vogel's population had a monotonous tall alpha pattern, and 7 percent had a low-voltage alpha pattern. In addition, between 5 and 10 percent—higher with age and among females—had a beta wave pattern, with multifactorial determination. It will be interesting to correlate these EEG patterns with various psychometric measures, with responses to physiological stimuli (photic, auditory, sleep), and with responses to pharmacologic agents in a series of subjects of various ages.

Many other physiological measures which show individual variation could be analyzed in families and twin pairs for genetic effects and then could be related to differential susceptibility to drugs both as a function of those genetic differences and as a function of age. These measures include visual functions, auditory functions, evoked cortical potentials, nerve conduction velocity, heart rate, hormonal activities, and various diurnal rhythms.

Biochemical Studies

Biochemical studies are essential to understand the mechanisms of gene action. The likelihood of defining specific genetic mechanisms increases as investigations reach closer to the primary gene product, such as en-

zymes or proteins. As discussed below, mutations in the genes for plasma pseudocholinesterase and for red blood cell glucose-6-phosphate dehydrogenase are expressed directly by the altered properties of these enzymes, but only indirectly by the adverse responses to certain drugs in individuals carrying such mutations. Determination of qualitative patterns of metabolities may reveal the enzymatic conversion responsible for inactivating or transforming the drug (hydroxylation, glucuronidation, acetylation, hydrolysis, etc.). If rates of conversion are altered, the appropriate enzyme activity may be inferred from the changed pattern of metabolites and may be assayed in blood cells or fibroblasts from skin biopsies or liver biopsies, in decreasing order of feasibility. If a mutation in the structural gene for the enzyme is the basis for the differential drug response, it may be possible to identify altered kinetic or electrophoretic properties of the enzyme. Differential drug responses also may be due to differences in rate of absorption, plasma protein binding, renal clearance, or tissue responsiveness. These processes, especially drug receptor-mediated processes, now can be studied biochemically.

Animal Studies

Animal data must be interpreted with some caution. One cannot assume that other species metabolize drugs with the same pathway as does man; many exceptions have been reported (Omenn, 1976). Nevertheless, strain differences and species differences in the metabolism of specific drugs may provide useful models for the enzymatic steps involved and for correlation of metabolic degradation rates with therapeutic and adverse physiological or behavioral effects. Animal strains with markedly different longevity or different patterns of age-related diseases (Storer, 1966; Omenn, 1980) may be useful in seeking models for pharmacogenetic and pharmacokinetic aspects of aging. When there are differences across species in metabolism of drugs or in responses to drug action, there is a higher likelihood of inter-individual variation as well.

PHARMACOGENETIC ASPECTS
OF CLINICAL DIAGNOSIS

This subject is treated here very briefly, because it makes reference to all of clinical differential diagnosis. A problem of particular importance for elderly persons is depression, which is probably even more

heterogeneous in causation than among younger depressed patient groups (see Chapters 8 and 9 in this volume). Depression and drug-induced depression are important causes of what is labeled senile dementia and may be reversible in many such patients. Fatigue or alcoholism also may be due to depression, and depression may present with specific somatic complaints. Unless subtypes of depression can be distinguished, an antidepressant medication that is described as working well in "only" 25 percent of patients may be dismissed as relatively ineffective, when—hypothetically—it may be highly effective for one or more particular subclasses of patients. Friedel and Raskind (1976) recommended doxepin over amitriptyline or other tricyclic antidepressants, both because of lower cardiotoxicity and because of higher efficacy, as long as plasma levels were monitored to assure adequate blood levels of doxepin and its active metabolite.

Elderly patients may respond differently than younger patients to a whole array of antidepressant, anti-anxiety, and antipsychotic agents (Friedel and Raskind, 1976). Better interpretation of such studies will require genetic and pathophysiological delineation of clinical subclasses of these patients.

Pare and colleagues reported some years ago that two groups of depressed patients could be differentiated by their responses to MAO inhibitors and tricyclic compounds (Pare et al., 1962; Pare and Mack, 1971). In their experience, patients who responded to one class of antidepressant tended not to respond to the other. Patients showed the same pattern of pharmacologic responsiveness during a subsequent episode of depression, which might have been precipitated by quite different life stresses. Also, relatives who had affective disorders shared the pattern of responsiveness or nonresponsiveness of the proband patient. Obviously, such information is useful in choosing the therapy for these patients. Angst (1964) obtained comparable results with imipramine in family studies. While additional studies with placebo controls have long been needed to substantiate these findings, it is conceivable, based upon the biogenic amine hypothesis of affective disorders, that inherited variation in particular steps in biogenic amine biosynthesis and metabolism could produce differences in the mechanism of depression and also in the effectiveness of drugs in ameliorating depressive symptomatology. Such inherited variation may be involved also in predisposition to drug-induced depression. About 10 percent of individuals treated with reserpine for high blood pressure will develop depression (Harris, 1957), often with a personal or family history of depression; the other 90 percent of patients so treated appear to be relatively more resistant to this ad-

verse effect, possibly due to resistance to the known biogenic amine-depleting effects of reserpine.

Among the many other examples of clinical heterogeneity due to genetically determined entities with marked differences in response to common drugs, the uses and contraindications of digitalis stand out. Digitalis is generally indicated, of course, for acute congestive heart failure, though its efficacy in chronic congestive heart failure in the elderly has been challenged in recent years, and it is ineffective in patients with hyperthyroidism, which may be hard to recognize in elderly patients. Of special interest here, digitalis is contraindicated in cases of congestive heart failure due to dynamic obstruction to the outflow tract; this disorder, known as idiopathic subaortic hypertrophic stenosis or asymmetric septal hypertrophy, is inherited as an autosomal dominant trait, often becomes manifest clinically only in middle life, and is made worse by the enhanced contractility produced by digitalis (Epstein et al., 1974; Omenn, 1977).

PHARMACOGENETIC ASPECTS OF METABOLISM OF SPECIFIC DRUGS

Succinylcholine (Suxamethonium)

Because of its rapid onset and short duration of action, this depolarizing muscle relaxant is used widely in premedication for anesthesia, as well as for electroconvulsive therapy. The short duration of action is due to hydrolysis of the drug by the plasma enzyme pseudocholinesterase (PsChE). Suxamethonium will paralyze breathing for many hours in the 1 in 2,500 Caucasians who has an atypical form of the enzyme. Thus, an otherwise perfectly normal individual is genetically susceptible to a drug-induced catastrophe because the enzyme required to inactivate the drug does not function properly. In the absence of the drug, there are no known abnormalities. Clear differentiation of homozygous normal, heterozygous carriers, and homozygotes for the atypical gene is feasible with a variety of laboratory methods based upon the inhibition of PsChE activity with enzyme inhibitors (Kalow, 1972). Several additional rather rare variant forms of PsChE have been detected which also predispose to suxamethonium sensitivity. On the other hand, there is another variant, PsChE-Cynthiana, which causes resistance to the action of suxamethonium, because the mutant enzyme is three times more active than the normal enzyme.

In the clinical use of suxamethonium, inquiry regarding personal or family history of sensitivity is important. Equipment for sustained artificial respiration should be available. Enzyme replacement therapy for this genetic defect can be accomplished by intravenous infusion of purified enzyme or of normal plasma. If the physicians or nurse/anesthetists are unaware of this problem, patients with this predisposition may be counted among the unexplained surgical deaths. A simple screening test for PsChE sensitivity is available (Morrow and Motulsky, 1968). It is of interest that the frequency of the atypical PsChE gene is much lower in black and in Oriental populations, and the frequency of suxamethonium sensitivity likewise is very low.

Isoniazid, Hydralazine, Phenelzine:
Acetylation in the Liver

The antituberculosis agent isoniazid (INH), the antihypertension agent hydralazine, the antileprosy agent dapsone, and the monoamine oxidase (MAO) inhibitor antidepressant phenelzine all are metabolically inactivated by acetylation in the liver. The enzyme responsible is an N-acetyl-transferase. The activity of this enzyme is determined by a single gene, with "slow acetylators" having a less active enzyme. The phenotypes of slow and rapid acetylation are readily demonstrated by measurement of the serum concentration and urinary excretion two or six hours after administration of isoniazid or of a more easily assayed agent, sulfamethazine (Evans, 1969). Approximately 50 percent of blacks and Caucasians, but only 15 percent of Orientals, are slow acetylators. Side effects from the drugs inactivated by this acetylating enzyme occur almost exclusively in the patients who are slow acetylators and thereby have higher circulating levels of the active drug on standard doses. These adverse effects include peripheral neuropathy from INH, lupuslike syndrome from hydralazine, and gastrointestinal symptoms from phenelzine.

Diphenylhydantoin (Dilantin)

There is a wide range of plasma levels among subjects receiving a regular oral dose of 300 mg diphenylhydantoin per day, ranging from 3 to 18 μg/ml and correlating with certain psychophysiological test parameters (Ideström et al., 1972). The hydantoins are metabolized primarily by hydroxylation, followed by conjugation to form a glucuro-

nide. Induction and inhibition of microsomal hydroxylation by many drugs, food additives, and other compounds contribute to this variation. In addition, there are some patients in several families who can metabolize only 2 mg/kg/day, whereas most subjects are capable of metabolizing up to 10 mg/kg/day (Kutt, 1971). Slow metabolism leads to continuous accumulation of unmetabolized drug in the body and to toxic symptoms. The genetic and biochemical mechanisms for the defective hydroxylation have not been elucidated thus far.

There is a significant interaction of Dilantin with isoniazid, which involves the acetylator phenotype of the patient. Kutt (1971) investigated patients with seizure disorders who had developed positive PPD skin tests or frank tuberculosis and then received isoniazid in addition to Dilantin. The prescribing physician in such circumstances may be unaware that the patient is already taking Dilantin. Those patients who developed signs of Dilantin toxicity (nystagmus, ataxia, drowsiness) were exclusively slow acetylators of INH. INH is one of several drugs (also allopurinol, nortriptyline, methylphenidate, and L-dopa) which inhibit the activity of the drug-metabolizing microsomal enzymes in the liver. Such drug–drug interactions are especially important in the elderly, with their arsenals of drugs from multiple prescriptions.

Debrisoquine: Hydroxylation by
Hepatic Monooxygenases

Recessively inherited deficiencies of drug metabolism involving hepatic monooxygenases in humans have been reported by several groups (Inaba et al., 1980; Sloan et al., 1978). At least four drugs are metabolized much more slowly in 5 to 7 percent of Caucasian populations surveyed in Britain, Germany, and Canada: debrisoquine (alicyclic hydroxylation), sparteine (N-oxidation), guanoxan (aromatic oxidation), and phenacetin (O-deethylation). These researchers have begun to test panels of drugs which are subject to oxidative metabolism by the liver. Dilantin (above), amobarbital, antipyrine, and sulfinpyrazone are not affected by the biochemical abnormality uncovered by study of debrisoquine. It is likely that the biochemical lesion will be found in one of the cytochrome P450 proteins, since the affected oxidative steps are cytochrome P450-dependent reactions. Inaba et al. (1980) recommend sparteine as the screening compound for this pharmacogenetic polymorphism, because of its high clearance.

The "poor metabolizers" identified by the debrisoquine-sparteine polymorphism are much more sensitive to hypotensive effects from

debrisoquine, an adrenergic blocking drug related to guanethidine. Orthostatic hypotension is common in the poor metabolizers (Idle and Smith, 1979), and optimal dose requirements vary across a forty-fold range in patients (Eichelbaum, 1981). Elderly patients with high blood pressure are especially vulnerable to these hypotensive side effects.

This polymorphism is almost certainly important in the oxidative steps that convert procarcinogens like aflatoxin to the carcinogenic intermediates. Extensive metabolizers would be expected to be at higher risk and poor metabolizers at lower risk for cancers triggered by exposures to such substances in foods or other contacts with the environment. Evidence in favor of that hypothesis has been reported for primary liver cancer and other gastrointestinal cancers: there were fewer poor metabolizers than expected in a group of 59 such patients studied in Nigeria (Idle et al., 1981).

Phenformin-induced lactic acidosis is another serious side effect apparently due to failure to metabolize the phenformin and determined by this drug-metabolizing polymorphism (Idle and Smith, 1979).

Nortriptyline

This widely used antidepressant has been studied extensively by Alexanderson and Sjöqvist (1971). They have studied populations, twins, and families and have examined absorption, plasma protein binding, volume of distribution, and elimination rate. Patients treated with the same dose of nortriptyline showed wide differences in the steady-state plasma levels, ranging between 10 and 275 ng/ml. There was very little intra-individual variation when subjects were tested again two years after the first determination. Studies of plasma levels of nortriptyline in 19 MZ and 20 DZ twin pairs not previously exposed to the drug showed very much greater intrapair differences for the DZ twins, consistent with a large genetic contribution to the observed variance in plasma level. Family studies (Asberg et al., 1971) of three probands with very high plasma nortriptyline levels showed no simple Mendelian pattern of transmission for slower metabolism of the drug; instead, analysis of the data indicated polygenic control of the metabolism of this agent. The distribution of drug levels in relatives of "high" probands was shifted to higher values than in the general population. This pattern of polygenic control of individual differences in drug level or action is probably much more common than the single-gene pattern exemplified by atypical PsChE and slow acetylation and summarized in Table 2–1.

Table 2–1
Pharmacogenetic Traits with Proved Mendelian Inheritance

Common Traits	Population	Frequency	Drugs Involved	Adverse Effect	Inheritance
G6PD deficiency	Tropical & sub-tropical populations (ancestry)	1–35% (males)	Antimalarials, sulfas, other oxidizing agents	Hemolysis	X-linked recessive
Slow acetylator	Caucasians, blacks Orientals	50–60% 10–15%	Isoniazid, phenelzine, hydralazine, dapsone	Side effects of each drug	Autosomal recessive
Methemoglobin reductase partial deficiency	Caucasians ?others	1%	Dapson, chloroquine, primaquine	Cyanosis	Heterozygous expression of rare autosomal recessive
Deficient oxidation	Caucasians ?others	5–7%	Debrisoquine, guanoxan, sparteine, phenacetin	Side effects of each drug	Autosomal recessive
Rare Traits					
Succinylcholine (suxamethonium) sensitivity	Caucasians	1:2500	Suxamethonium	Cessation of breathing	Automosal recessive
Malignant hyperthermia	General	1:20,000	General anesthetics, suxamethonium	High temperature, muscular rigidity	Autosomal dominant (?heterogeneous)
Wafarin resistance	Not applicable (rare families)	Very rare	Oral anticoagulants	Require 25× conventional dose	Autosomal dominant
Unstable hemoglobins	Not applicable	Very rare	Oxidant drugs	Hemolysis	Autosomal dominant

Based upon Motulsky (1972), Vesell (1973), Omenn and Motulsky (1978).

The primary metabolic conversion appears to be hydroxylation, but several different metabolic conversions may be involved in inactivation of nortriptyline. Alexanderson and Börga (1973) found variation in the pattern of metabolites among individuals; levels of the main metabolite (10-hydroxy-nortriptyline) varied considerably and should be studied further for possible single-gene control of this metabolic step. Other commonly used tricyclic antidepressants (amitriptyline, imipramine, desmethylimipramine) also showed marked individual variations in plasma concentration on a given daily dose, with a significant correlation between steady-state plasma levels of nortriptyline and the others in the same individuals. The major step in hydroxylation of nortriptyline may be controlled by the genetic polymorphism that accounts for the wide differences in metabolism of debrisoquine and sparteine (Eichelbaum, 1981).

Ethanol

Careful studies of the distribution and elimination of intravenously infused ethanol in 25 young (age 20–56 years) and 25 older (age 57–81 years) subjects showed no change in rate of elimination with age (Vestal et al., 1977). A significantly higher peak blood level was observed with age, however, attributed to the smaller volume of body water and decreased lean body mass.

In a study of MZ and DZ twins, Vesell et al. (1971) demonstrated that the rate of ethanol elimination from the blood was largely determined by genetic factors. In an effort to assess effects of chronic ingestion of alcohol, the same workers tested healthy prisoners before and after three months of regular alcohol intake and found little intraindividual variation.

The major enzymatic step is the oxidation of ethanol to acetaldehyde by liver alcohol dehydrogenase (ADH). Smith et al. (1973) described multiple bands of ADH on starch gel electrophoresis, attributed to three ADH gene loci in the liver. Earlier, von Wartburg and Schurch (1968) reported that 15 to 20 percent of European Caucasian subjects had an atypical liver ADH when compared with other subjects; their test involved assay of ADH activity at pH 8.8 and 11.0, the atypical ADH being associated with several-fold higher in vitro activity at pH 8.8. This difference now has been correlated with electrophoretic variation at the ADH-2 locus. In Japanese subjects, the frequency of the atypical ADH is very much higher, approaching 90 percent of subjects tested on liver specimens at autopsy (Fukui and Wakasugi, 1972; Stama-

toyannopoulos et al., 1975). Harada et al. (1980) have confirmed and extended these findings on ADH and shown, in addition, that 52 percent of Japanese have an unusual pattern of aldehyde dehydrogenase isozymes, with lower activity in metabolizing the highly potent acetaldehyde, which may well mediate certain intoxicating and toxic effects of ethanol. The change in aldehyde dehydrogenase isozyme pattern was associated with a marked change in sensitivity to disulfiram, an inhibitor of this enzyme, occasionally used to discourage ingestion of alcohol.

Aryl Hydrocarbons

The first metabolic conversion of some drugs *activates* rather than inactivates their biological effects. For example, the enzyme aryl hydrocarbon hydroxylase (AHH) activates a variety of exogenous hydrocarbon compounds, including many drugs, insecticides, steroids, and chemical carcinogens (Heidelberger, 1973). Polycyclic hydrocarbons found in cigarette smoke and automobile exhaust are hydroxylated to highly reactive epoxides. The substrates induce an increase in AHH activity, but the extent of induction varies widely among individuals and among mouse strains. In animals, gene mutations affecting cytochrome P450 functions determine AHH inducibility; no reliable test has been developed yet for humans. The finding by Vestal et al. (1975) that cigarette smoking fails to induce drug-metabolizing activity against antipyrine *may* be a clue that induction of AHH is less susceptible to smoking in elderly persons as well. Direct study of this extrapolation will be necessary.

PHARMACOGENETIC ASPECTS OF TISSUE
OR ORGAN SENSITIVITY TO DRUGS

Susceptibility of Red Blood Cells to
Hemolysis by Oxidizing Agents

Glucose-6-phosphate dehydrogenase (G6PD) is the first enzyme of the energy-generating pentose-phosphate shunt pathway, essential to maintain the integrity of the red blood cell. Deficiency of G6PD occurs with significant frequency in many population groups originating in subtropical and tropical countries such as Africans, Southeast Asians, Indians, and Mediterraneans. Many drugs, including primaquine and

other 8-aminoquinoline antimalarials, sulfas, nitrofuran derivatives, phenacetin, and probenecid, can precipitate acute hemolytic anemia in these otherwise healthy but genetically predisposed individuals (Motulsky, 1972). The drug does not interact directly with the abnormal enzyme; rather, the red cells are more susceptible to drug injury. Many different mutations affecting G6PD cause enzyme deficiency. The Mediterranean type G6PD deficiency (about 3 to 5 percent of American males of Greek, Italian, or Sardinian ancestry) is more severe than the Negro type (about 15 percent of American black males); thus, a larger number of oxidizing drugs are a threat.

Beutler (1978) has published a painstaking analysis of the primary literature and the drug/infection interactions in an effort to determine which drugs are a significant hazard in G6PD-deficient individuals and which can, in fact, be given safely in usual therapeutic doses. Commonly used drugs now put in that "safe" category include acetaminophen, aspirin, colchicine, isoniazid, L-dopa, phenacetin, phenylbutazone, phenytoin, probenecid, procaine amide, quinidine, sulfadiazine, sulfisoxazole, and tripelenamine.

Hemolytic anemia caused by eating fava or broad beans (favism) occurs only in some G6PD-deficient persons. A second genetic abnormality is required to produce susceptibility to favism, possibly involving defective glucuronidation of some compound in the bean (Cassimos et al., 1974). Interestingly enough, long before G6PD deficiency was known, the Pythagoreans were said to have surrendered to their enemies rather than flee through a field of fava beans. Also, in Greek mythology a particular sect allowed women but not men to eat the fava beans (Graves, 1955); this practice is consistent with the X-linked recessive inheritance of G6PD deficiency (only rarely affecting women).

Susceptibility to Cyanosis from Methemoglobinemia

Many of the same oxidizing drugs which can produce hemolysis in G6PD-deficient individuals may produce methemoglobinemia in individuals with mild methemoglobin reductase deficiency (Cohen et al., 1968). Such persons are heterozygous carriers for the autosomal recessive type of methemoglobinemia, a rare defect causing marked cyanosis early in life. Parents of such patients are obligatory carriers and have normal or almost normal methemoglobin levels under usual living conditions. However, when challenged by methemoglobin-inducing drugs, such carriers have relatively insufficient enzyme to reduce methemoglobin, and methemoglobinemic cyanosis results. Conceptu-

ally, this situation is a very important type of drug reaction, since simple arithmetic indicates that even for a rare autosomal recessive disease there are many carriers in the population. For example, if a disease frequency is 1 per 10,000, 2 percent of the population would be carriers; at 1 per 40,000, one percent would be carriers. There are a great many different inborn errors in metabolism and other autosomal recessive diseases. Although each one is rather rare, it is likely that many individuals in the normal population are carriers for one or several of these abnormal genes and may be susceptible or resistant to certain drugs or other environmental agents as a result.

Malignant Hyperthemia from Anesthetics

A single autosomal dominant gene can make otherwise healthy individuals susceptible to malignant hyperthermia from inhalational anesthetics (halothane, methoxyflurane, ether) or muscle relaxants (succinylcholine). The drugs trigger a rapid rise in temperature (as high as 112°F), progressive muscular rigidity, tachycardia, hyperventilation, myoglobinuria, metabolic and respiratory acidosis, hyperkalemia, and—in two-thirds of reported cases—death from cardiac arrest (Britt and Kalow, 1970). Halothane has been shown (Britt et al., 1973; Moulds and Denborough, 1974) to inhibit calcium storage capacity of isolated sarcoplasmic reticulum and release calcium into the myoplasm, causing contracture in muscle biopsies from survivors to an extent far greater than in biopsies from normal persons. These muscle preparations are also more sensitive than normal to rigor induced by succinylcholine, potassium chloride, or caffeine, though no case is known in which ordinary use of caffeine has produced this calamitous effect. The underlying defect or defects remain to be elucidated.

Glaucoma from Corticosteroids

Increased intra-ocular pressures and changes of glaucoma are a common and significant problem in aging. Population and family studies in younger persons have shown that the baseline intra-ocular pressure and the increment in pressure produced by topical or systemic corticosteroids are under genetic control, probably a single autosomal gene (Armaly, 1968; Becker, 1967). When corticosteroids are administered to elderly patients, baseline pressures should be measured and an increase in pressure should be monitored.

Caffeine-induced Wakefulness

Caffeine in the form of pills or coffee or tea will arouse some, but not all, individuals. Large interindividual differences have been reported among healthy volunteers in the degree of wakefulness after caffeine ingestion (Goldstein et al., 1965). Similar variation from little or no effect to persistent wakefulness has been noted by elderly patients. Seemingly paradoxical behavioral reactions of sedation from caffeine or restless from barbiturates may be less a phenomenon of old age than a reflection of individual differences persisting into old age. It would be interesting to correlate such effects with parameters measurable during sleep EEG recordings.

Susceptibility to the Effects of Ethanol

There is considerable evidence for individual variation in susceptibility to the acute effects of alcohol on the central nervous system in man (Omenn, 1975). Although there are significant correlations between blood alcohol concentration and such psychophysiological test parameters as flicker fusion frequency, tapping speed, reaction time, coordination, and standing steadiness, there are also considerable interindividual differences (Ideström and Cadenius, 1968). Ahrens (1971) described three EEG patterns of response after acute alcohol ingestion, ranging from pronounced changes at modest blood alcohol levels to major alterations at very high levels to bioelectrically indifferent subjects. Different brain sensitivity to effects of alcohol has been demonstrated in comparisons of BALB/c and C57 black mice (McClearn, 1972).

Striking ethnic differences, presumably due to genetic factors, have been observed in the vasomotor response to acute alcohol ingestion. Adults of Oriental background typically respond to even small amounts of alcohol with a marked facial flushing reaction, increased peripheral pulse pressure, and increased skin temperature. The reaction is already well established in newborn Chinese infants (Wolff, 1972). American Indians and racially hybrid population groups in Hawaii also show this vasomotor sensitivity. It is not known whether these differences reflect differences at the level of the autonomic nervous system or in the blood vessels themselves. It is possible that the highly active atypical alcohol dehydrogenase, perhaps combined with decreased aldehyde dehydrogenase, as described by Harada et al. (1980), leads to rapid appearance and persistence of acetaldehyde in sufficient concentration to produce the vasomotor reactions.

Alcoholism affects some 10 million people in the United States, including many elderly persons. Just as reserpine precipitates depression in only 10 percent of patients with hypertension treated with reserpine, chronic abuse of alcohol and poor diet leads to cirrhosis of the liver in only 10 to 15 percent of patients with alcoholism and leads to chronic pancreatitis, cerebellar degeneration, and Wernicke-Korsakoff psychosis in even smaller proportions. Virtually nothing is known yet about the factors in liver, pancreas, and brain which determine susceptibility to these serious complications, except for the Wernicke's component of nystagmus, ophthalmoplegia, and ataxia. Wernicke's signs are due to depletion of thiamine and tend to occur in patients with a variant form of the thiamine-dependent enzyme transketolase, and to patients who are more sensitive to a given deficiency of thiamine (Blass and Gibson, 1977).

Taste Sensitivity

The ability to taste a particular concentration of phenylthiocarbamide (PTC) is a common human genetic polymorphism. Non-tasters (30 percent of Caucasians; 2 to 10 percent of blacks) are homozygous for a recessive gene, while tasters are heterozygous or homozygous for the dominant taster allele. More detailed studies of "threshold" for tasting a series of concentrations of PTC have shown, however, that multiple genes are involved (Stern, 1973). It is possible that individual variation in tasting the bitter taste of saccharin may be determined by the PTC phenotype. Differences in sensitivity of receptors in taste buds would take on more significance if such differences were shown to be correlated with differences in sensitivity of receptors in the peripheral and central nervous system. For example, Knopp et al. (1966) reported that patients who are most sensitive to extrapyramidal effects of trifluoperazine (a phenothiazine) have lower taste thresholds to quinine. Individual differences in taste sensitivity might also be important in food aversions and dietary idiosyncrasies of elderly persons.

Reactions of the Autonomic Nervous System

Marked individual differences in the effects of atropine on heart rate and of phenylephrine on pupillary dilatation are examples of differing responsiveness of the autonomic nervous system (see Smith and Rawlins, 1973), but there are no genetic analyses of these findings. Highly

sensitive and specific assays now permit biochemical investigation of the activity of the sympathetic nervous system in humans. Weinshilboum (1978) has shown genetically determined variation in both dopamine beta-hydroxylase and catechol-O-methyl transferase; no neurological or behavioral differences have been associated with these findings thus far. The peripheral blood platelet is being recognized as a potential "window" on the central nervous system. The platelet contains monoamine oxidase (MAO) with some properties similar to those of brain mitochondrial MAO. Twin studies indicate a major genetic component to the variance in quantitative activity of platelet MAO, but the relationship to MAO in brain is far from clear. MAO activity in both platelets and brain from human subjects increases with age (Omenn and Cheung, 1976; Robinson et al., 1971, 1972) and at least one amine, norepinephrine, decreases with age, correlated inversely with MAO activity in brain (Robinson et al., 1972). It is not known whether such changes in biogenic amine metabolism contribute to the high prevalence of depression in the elderly.

Platelet uptake of serotonin is an excellent mimic of the reuptake of serotonin into presynaptic neurons, though uptake of dopamine into platelets is entirely different from its reuptake in brain (Omenn and Smith, 1978a). Studies of the kinetics of serotonin uptake into platelets and of competitive inhibition of uptake by tricyclic antidepressants showed no significant differences as a function of age, either in humans (Omenn and Smith, 1978b) or in monkeys (*Macaca nemestrina*) (Omenn et al., 1979).

DRUGS AND THE AGING PROCESS

Life span seems to be a characteristic for each species, determined as part of some genetic program. Many efforts have been made to increase life span or to improve the quality of life, especially with regard to cognitive and memory functions. In man a large class of "geriatric drugs" has been promoted as having efficacy in at least some patients in retarding or reversing intellectual impairment and behavioral regression. These drugs include stimulants and analeptics, such as pentylenetetrazol, amphetamines, methylphenidate, deanol, pipradrol, and magnesium pemoline; vasodilators such as papaverine and cyclandelate; ergot alkaloids; beta-adrenergic blockers such as propranolol; and procaine amide preparations (see Omenn, 1976). Other maneuvers, in-

cluding hyperbaric oxygenation, biofeedback regimens, megavitamin therapy, and hormone treatments have been championed as well. The standard criteria of randomization of patients, significant follow-up periods, and objective measures for improvement or maintenance of function must be applied in evaluating such reports. In addition, investigators should give special attention to the likely heterogeneity of mechanisms for aging and for declining organ function in their patient groups and to the likelihood that different regimens, if effective at all, will be differentially effective in different patients for the reasons reviewed in this article.

FUTURE DIRECTIONS

The importance of geriatric medicine and of pharmacology in the clinical care of elderly patients continues to grow. Older patients have been excluded systematically from major drug development protocols and clinical trials. It is essential that older patients, with and without certain complicating diseases, be included in appropriate drug development and drug testing protocols. The National Institute on Aging is now working together with other NIH Institutes to implement such a policy.

Because of the likelihood of a smaller margin of safety in doses that produce therapeutic and adverse effects, individualization of drug treatment may progress more rapidly in the care of the elderly than in medicine in general. Practical techniques for monitoring blood levels of specific drugs will be useful clinically and will generate much valuable information for investigators. Pharmacologic information will be used to screen patients for potential susceptibility due to variation in metabolism of whole classes of drugs. Responses to drugs will be investigated as critical clues to the heterogeneity of common categories of disease.

REFERENCES

Ahrens, R: On the forensic psychiatric significance of alcohol loading tests under EEG control. *Electroenceph. Clin. Neurophysical.* 30:269, 1971.
Alexanderson B, Börga O: Urinary excretion of nortriptyline and five of its metabolites in man after single and multiple oral doses. *Europ. J. Clin. Pharmacol.* 5:174, 1973.

Alexanderson, B, Sjöqvist F: Individual differences in the pharmacokinetics of monomethylated tricyclic antidepressants: role of the genetic and environmental factors and clinical importance. *Ann. N.Y. Acad. Sci.* 179:739, 1971.

Angst J: Anti-depressiver Effekt und genetische Faktoren. *Arzneim Forsch.* 14:496, 1964.

Armaly MG: Genetic factors related to glaucoma. *Ann. N.Y. Acad. Sci.* 151:861, 1968.

Asberg M, Price-Evans DA, Sjöqvist F: Genetic control of nortriptyline kinetics in man: a study of the relatives of propositi with high plasma concentrations. *J. Med. Genet.* 8:129, 1971.

Becker B: Topical corticosteroids and intraocular pressure. In B Becker, RC Drews (Eds), *Current Concepts in Ophthalmology*, Vol. 1. St. Louis: C.V. Mosby Co., 1967, pp. 132–147.

Bernard C: Physiological analysis of the properties of muscular and nervous systems by means of curare. *Comptes Rendus des Seances de l'Academie des Sciences* 48:825, 1856.

Beutler E: Hemolytic Anemia in Disorders of Red Cell Metabolism. New York: Plenum Medical Book Company, 1978, pp. 77, 79.

Blass JP, Gibson GE: Abnormality of a thiamine-requiring enzyme in Korsakoff syndrome. *N. Engl. J. Med.* 297:1367, 1977.

Britt BA, Kalow W: Malignant hyperthemia. A statistical review. Aetiology unknown. *Canad. Anaesth. Soc. J.* 17:293, 1970.

Britt BA, Kalow W, Gordon A., Humphrey JG, Rewcastle MB: Malignant hyperthermia: an investigation of five patients. *Canad. Anaesth. Soc. J.* 20:431, 1973.

Cassimos C, Malaka-Zafiriu K, Tsiures J: Urinary D-glucaric acid excretion in normal and G6PD-deficient children with favism. *J. Pediatri.* 84:871, 1974.

Cohen FR, Sachs JR, Wicker DJ, Conrad ME: Methemoglobinemia provoked by malarial chemoprophylaxis in Viet Nam. *N. Engl. J. Med.* 279:1127, 1968.

Eichelbaum M: Polymorphism of drug oxidation in man: novel findings. *Tr. Pharmacol. Sci.* 2:31–34, 1981.

Epstein SE, Henry WL, Clark CF: Asymmetric septal hypertrophy. *Ann. Intern. Med.* 81:650, 1974.

Evans DAP: An improved and simplified method of detecting the acetylator phenotype. *J. Med. Genet.* 6:405, 1969.

Friedel RO, Raskind MA: Psychopharmacology of aging. In MF Elias, BE Eleftherious, PK Elias (Eds), *Special Review of Experimental Aging Research.* Bar Harbor, Maine: EAR, Inc., 1976, pp. 105–132.

Fukui M, Wakasugi C: Liver alcohol dehydrogenase in a Japanese population. *Jap. J. Legal Med.* 26:46, 1972.

Goldstein A, Warren R., Kaizer S: Psychotropic effects of caffeine in man. I. Individual differences in sensitivity to caffeine-induced wakefulness. *J. Pharmacol. Exp. Ther.* 149:156, 1965.

Graves R: *The Greek Myths,* Vol. I. Baltimore: Penguin Books, 1955, p. 348.

Harada S, Misawa S, Agarwal DP, Goedde HW: Liver alcohol dehydrogenase and aldehyde dehydrogenase in the Japanese: Isozyme variation and its possible role in alcohol intoxication. *Am. J. Hum. Genet.* 32:8, 1980.

Harris TH: Depression induced by Rauwolfia compounds. *Am. J. Psychiatry*, 113:950, 1957.

Heidelberger C: Current trends in chemical carcinogenesis. *Fed. Proc.* 32:2154, 1973.

Ideström C-M, Cadenius B: Time relations of the effects of alcohol compared to placebo. *Psychopharmacologia* (Berl.) 13:189, 1968.

Ideström C-M, Schalling D, Carlqvist V, Sjöqvist F: Acute effects of diphenylhydantoin in relation to plasma levels. *Psychol. Med.* 2:111, 1972.

Idle JR, Smith RL: Polymorphisms of oxidation at carbon centers of drugs and their clinical significance. *Dr. Metabol. Rev.* 9:301–317, 1979.

Idle JR, Mahgoub A, Sloan TP, Smith RL, Mbanefo CO, Bababunmi EA: Some observations on the oxidation phenotype status of Nigerian patients presenting with cancer. *Can. Let.* 11:331–338, 1981.

Inaba T, Otton SV, Kalow W: Deficient metabolism of debrisoquine and sparteine. *Clin. Pharmacol. Ther.* 27:547, 1980.

Kalow W: Pharmacogenetics of drugs used in anesthesia. In *Human Genetics, Proceedings, Fourth International Congress Human Genetics*, Paris, Sept. 1971. Amsterdam: Excerpta Medica, 1972, pp. 415–427.

Knopp W, Fischer R, Beck J, Teitelbaum A: Clinical implications of the relation between taste sensitivity and the appearance of extrapyramidal side effects. *Dis. Nerv. Syst.* 27:729, 1966.

Kutt H: Biochemical and genetic factors regulating Dilantin metabolism in man. *Ann. N.Y. Acad. Sci.* 179:705, 1971.

McClearn GE: Genetics as a tool in alcohol research. *Ann. N.Y. Acad. Sci.* 197:26, 1972.

Morrow AC, Motulsky AG: Rapid screening method for the common atypical pseudocholinesterase variant. *J. Lab. Clin. Med.* 71:350, 1968.

Motulsky AG: History and current status of pharmacogenetics. In *Human Genetics, Proceedings, Fourth International Congress Human Genetics.* Amsterdam: Excerpta Medica, 1972, pp. 381–390.

Moulds RFW, Denborough MA: Biomedical basis of malignant hyperthermia. Identification of susceptibility to malignant hyperthermia. *Brit. Med. J.* 2:241, 1974.

Omenn GS: Alcoholism: a pharmacogenetic disorder. In J Mendlewicz (Ed), *Genetics and Psychopharmacology.* New York: S. Karger, 1975, pp. 12–22.

Omenn GS: Pharmacogenetics and aging. In MF Elias, BE Eleftheriou, PK Elias (Eds), *Special Review of Experimental Aging Research.* Bar Harbor, Maine: EAR, Inc., 1976, pp. 31–51.

Omenn GS: Genetics and cardiovascular disease. In JT Willerson, C Sanders (Eds), *Clinical Cardiology.* New York: Grune & Stratton, 1977, pp. 453–464.

Omenn GS: Behavior genetics of aging. In DG Stein (Ed), *The Psychobiology of Aging: Problems and Perspectives.* New York: Elsevier, 1980, pp. 1–20.

Omenn GS, Cheung S: Pharmacogenetic analysis of monoamine oxidase activity in human and macacque brain. *Proc. 7th Ann. Mtg. Amer. Soc. Neurochem.*, Vancouver, B.C., March, 1976.

Omenn GS, Motulsky AG: Eco-genetics: genetic variation in susceptibility to environmental agents. In BH Cohen, AM Lilienfeld, PC Huang (Eds), *Genetic Issues in Public Health and Medicine,* Springfield, Ill.: C.C. Thomas, 1978, pp. 83–111.

Omenn GS, Smith LT: A common uptake system for serotonin and dopamine in human platelets. *J. Clin. Invest.* 62:235, 1978a.

Omenn GS, Smith LT: Platelet uptake of serotonin and dopamine in Huntington's disease. *Neurology* 28:300, 1978b.

Omenn GS, Smith LT, Hanson DR: Pharmacogenetic investigations of platelet uptake of serotonin. III. Serotonin uptake in platelets and in brain synaptosomes from young and aged *Macaca nemestrina*. In DM Bowden (Ed), *Aging in Non-Human Primates*. New York: Raven Press, 1979, pp. 100–105.

Pare CMB, Mack JW: Differentiation of two genetically specific types of depression by the response to antidepressant drugs. *J. Med. Genet.* 8:306, 1971.

Pare CMB, Rees L, Sainbury MJ: Differentiation of two genetically specific types of depression by the response to antidepressants. *Lancet* 2:1340, 1962.

Robinson DS, Davis JM, Nies A, Colburn RW, Davis JN, Bourne HR, Bunney WE, Shaw DM, Coppen AJ: Aging, monoamines, and monoamine oxidase levels. *Lancet* 1:290, 1972.

Robinson DS, Davis JM, Nies A, Ravaris CL, Sylwester D: Relation of sex and aging to monoamine oxidase activity of human brain, plasma, and platelets. *Arch. Gen. Psychiatry* 24:536, 1971.

Rowe JW: Aging and renal function. *Ann. Rev. Gerontol. & Geriatr.* 2:161, 1981.

Sloan TP, Mahgoub A, Lancaster R, Idle JR, Smith RL: Polymorphism of carbon oxidation of drugs and clinical implications. *Brit. Med. J.* 2:655, 1978.

Smith M, Hopkinson DA, Harris H: Studies on the properties of the human alcohol dehydrogenase isozymes determined by the different loci ADH_1, ADH_2, and ADH_3. *Ann. Hum. Genet.* 37:49, 1973.

Smith SE, Rawlins MD: *Variability in Human Drug Response*. London: Butterworth, 1973, pp. 2–3.

Stamatoyannopoulos G, Chen S-H, Fukui M: Liver alcohol dehydrogenase in Japanese: high population frequency of atypical form and its possible role in alcohol sensitivity. *Am. J. Hum. Genet.* 27:789, 1975.

Stern C: *Principles of Human Genetics*, 3rd ed. San Francisco: W.H. Freeman & Co., 1973.

Storer JB: Longevity and gross pathology at death in 22 inbred mouse strains. *J. Gerontol.* 21:404, 1966.

Vesell ES: Advances in pharmacogenetics. *Prog. Med. Genet.* 9:291, 1973.

Vesell ES, Page JG: Genetic control of drug levels in man: phenylbutazone. *Science* 159:1479, 1968a.

Vesell ES, Page JG: Genetic control of drug levels in man: antipyrine. *Science* 161:72, 1968b.

Vesell ES, Page JG: Genetic control of dicumarol levels in man. *J. Clin. Invest.* 47:2657, 1968c.

Vesell ES, Page JG, Passananti GT: Genetic and environmental factors affecting ethanol metabolism in man. *Clin. Pharmacol. Ther.* 12:192, 1971.

Vestal RE: Aging and pharmacokinetics: impact of altered physiology in the elderly. In A Cherkin (Ed), *Physiology and Cell Biology of Aging*. New York: Raven Press, 1979, pp. 185–201.

Vestal RE, McGuire EA, Tobin JD, Andres R, Norris AH, Mezey E: Aging and ethanol metabolism. *Clin. Pharmacol. Ther.* 21:343, 1977.

Vestal RE, Norris AH, Tobin JD, Cohen BH, Shock NW, Andres R: Antipyrine metabolism in man: influence of age, alcohol, caffeine, and smoking. *Clin. Pharmacol. Ther.* 18:425, 1975.

Vestal RE, Wood AJJ, Branch RA, Wilkins GW, Shand DG: Studies of drug disposition in the elderly using model compounds. K Kitani (Ed), *Liver and Aging.* New York: Elsevier/North Holland, 1978, pp. 343–358.

Vogel F: The genetic basis of the normal human electroencephalogram (EEG). *Hum. Genet.* 10:91, 1970.

Vogel F, Schalt E, Kruger J, Propping P, Lenhert KF: The electroencephalogram (EEG) as a research tool in human behavior genetics: psychological examinations in healthy males with various inherited EEG variants. I. Rationale of the study, material, methods, heritability of test parameters. II. Results. III. Interpretation of the results. *Hum. Genet.* 32:1, 1979.

von Wartburg JP, Schurch PM: Atypical human liver alcohol dehydrogenase. *Ann. N.Y. Acad. Sci.* 151:936, 1968.

Weinshilboum RM: Human biochemical genetics of plasma dopamine β-hydroxylase and erythrocyte catechol-*O*-methyltransferase. *Hum. Genet. (Suppl.)* 1:101, 1978.

Whittaker JA, Evans DAP: Genetic control of phenylbutazone metabolism in man. *Brit. Med. J.* 4:323, 1970.

Wolff PH: Ethnic differences in alcohol sensitivity. *Science* 175:449, 1972.

This page intentionally left blank

Behavioral and Social Sciences

This page intentionally left blank

Social Roles in Later Life: Some Recent Research Trends

Leslie A. Morgan, Ph.D.
Department of Sociology
University of Maryland Baltimore County
Catonsville, Maryland

For many years the concept of social role has served as a touchstone for research in social geronotology. Social role as a concept has pinpointed major conceptual issues of loss and transition in the lives of individuals as they age. Throughout the history of social geronotology the terminology of "role theory" appears in articles and books with great frequency. Even a cursory review of this literature reveals the great regularity with which the concepts, if not the hypotheses, of role analysis are applied. Indeed, if one were to attempt a review of all such works, it could constitute nearly all of the articles on the sociology and social psychology of aging.

The purpose of this review is to synthesize major trends in role-related research on later life, focusing on the major trends and issues apparent in the literature of the last few years. In order to bring some structure to this review, it is first necessary to examine the use of role concepts and theories as they are specifically applied in the study of aging and later life. These applications are derived from a long social science tradition in the study of social role, reviewed elsewhere (Biddle and Thomas, 1966; Sarbin and Allen, 1968). Following an overview of theoretical considerations, we shall turn to the empirical studies focusing on specific roles of later life.

RECENT THEORETICAL DEVELOPMENTS

Studies of social roles in later life have generally based themselves on the concepts of life space, role loss, and rolelessness. The process of social aging has itself been characterized as a change in social roles, both number and content, over the life course (Riley, 1976). The product of this change is a reduced role set, a potentially diminished life space, and secondary negative consequences, such as alienation or anomie (George, 1980).

Historically most of the analyses of social roles related to later life have focused their inquiry on a single role of the set occupied by an aging person. Most of these analyses have proceeded without major theoretical grounding or developed hypotheses, resulting in a disjunction between theory and research.

A significant departure from this approach is that of Williams and Wirths (1965), who explored the changes over time in the role configurations of aging individuals in their entirety. Their study followed individuals in order to explore alterations in their social life space, focusing on role involvement and life satisfaction. Williams and Wirths, in dealing with the entire role sets of panel members, utilized a more holistic and theoretically based approach to the study of social roles in later life then is found in most of the remaining research.

Based in this theoretical tradition, there have been some interesting recent theoretical developments in the area of social roles that are uniquely related to later life. Much of this theoretical work derives from a set of related questions regarding continuity and change in role incumbency and enactment over the life course.

Typology of Social Roles

The first recent theoretical work (Rosow, 1976) elaborates a typology of role and status designed to give researchers a more adequate framework for dealing with life cycle transitions and social roles among the elderly. Rosow critiques the traditional Lintonian (Linton, 1936) assumption that status and role are necessarily reflective of each other. He suggests instead a typology of four types of social roles, emphasizing two that fall outside the traditional status role perspective: (1) informal roles: those lacking a well-articulated social position, but providing expectations for behavior in a socially recognized role and (2) tenuous roles: those having a structured status but entailing few expec-

tations for behavior. He argues that informal roles, although weakly linked to social positions, serve particular group functions and are characterized by patterned social activity. Rosow asserts that informal roles encompass many of the "problem" cases that had troubled earlier roles analyses, which were based on the assumption of status/role inseparability.

With aging Rosow postulates an increase in the tenuous social roles and separate patterns of decline in both traditional "institutional" roles and those he defines as informal. Although the number of various roles an aging person occupies may not be seen to drop as severely as suggested by some other approaches, Rosow asserts that aging, nonetheless, results in an overall decline in role expectations facing the individual. The tenuous roles, which are hypothesized to become relatively more important with aging, echo the earlier conceptualization of the "roleless role" of aging (Burgess, 1960). Further, the informal type of role, while apparently providing a resolution for some of the ongoing debate regarding patterned social behavior not attached to recognizable or official social position, does little to operationally resolve the problem posed by Rosow himself: When does a role exist? Unless they become more concretely defined, informal roles could become the catchall for personality traits, characterization, and transient social identities without providing much benefit in terms of concrete hypotheses or explanatory models.

Role Transitions

A second major theoretical focus provided by a recent book by Linda George (1980) emphasizes the issue of role transitions. George, employing the Lintonian tradition of conceptualizing role and status, defines role transitions as "situations in which both the status and its accompanying role are *changed* (for example, the transition from single person to spouse) or *lost* (for example, retirement, which represents loss of the work status and role)" (1980, p. 140). This formulation differentiates between shifts or changes in the *content* of role behavior or expectation and changes in the actual occupancy of a particular status. Following a long tradition of role literature applied to later life, the approach emphasizes consequences of role transitions in terms of social stress.

Starting with the issue of defining roles and statuses, George moves through a review of the major connections among role, identity, resources, and social stress. Both sociological and social psychological

theories relating to role transitions are reviewed, focusing not on their causes but on the general hypothesis that such transitions induce stress in the aging individual. Drawing from earlier theoretical work on social status, identity, and human development, George synthesizes elements especially pertinent to a model of role transitions and social adjustment in later life.

George's model, modified from House's (1974) work on social stress, emphasizes individual variation (resources, perceptual frameworks, etc.) and specific parameters of the situation as mediators of the eventual outcome of role transitions.

Although they are not outlined in detail, the author suggests that the model includes empirically testable causal connections. Remaining chapters of George's book review the existing research literature on several major role losses of later life in terms of the model she outlines. Major contributions of this work are: (1) a careful overview of theoretical issues in the study of social roles, (2) delineation of a concrete model which lends itself to operationalization and falsification, and (3) a detailed review of much of the relevant research literature. Judgments regarding the validity of the model must await further research designed specifically to test its propositions.

Evaluated Role Identities

The third of these recent theoretical works (Gordon, 1976) focuses on the significance of *evaluation* of role performance for self-concept. Gordon, utilizing the human development perspective tradition in social psychology, outlines an 11-stage model of the typical contemporary life cycle, with the last two stages emphasizing later life. The final two stages, each initiated by a loss (work and health, respectively) are explained by Gordon in terms of significant others and the major development dilemmas faced by the aging individual. The first of these stages, retirement, lasts from the end of work to the onset of severe illness. The significant others suggested by Gordon are "remaining family, lover(s), long-term friends, neighbors" (p. 409). In this list of significant others Gordon implies that older people experience limited prospects for establishing new, meaningful relationships in retirement. The significant individuals are limited to those who have been involved in earlier stages of life, echoing other theoretical discussions of the curtailed role and interaction horizons for older persons in contemporary society.

In a similar vein, disability, the stage which lasts from the onset of major illness to death, typically has as significant others remaining

family, friends, medical professionals, and care-givers (Gordon, 1976). Gordon's listing of significant others clearly implies that significance is defined by ongoing interaction, rather than salience of relationships (past or present) to the individual.

While this stage model is conceptually interesting, it is unfortunate that in his elaboration of it Gordon reaches only late adolescence, due to limitations of space. In very briefly outlining some of the major issues for later stages, however, he suggests a corollary to prior theorizing which deals specifically with aging.

> As roles are relinquished but not replaced by new and more prestigeful roles, then behavior, sentiment, motives, interpretation of events, and evaluated self-conceptions will tend to become disorganized and painful [Gordon, 1971:79].

As is clear from this corollary, the association between role loss with aging and negative outcomes is far from disappearing from the literature. In this article Gordon does little to develop the potential in his stage model for new hypotheses pertaining to evaluated role performance, significant others, or developmental tasks. Hopefully, further elaboration of this approach will flesh out the implications of the stages in later life.

Overview of Theoretical Approaches

There have been several recent endeavors to systematize what has been a rather loosely defined set of hypotheses regarding social roles in later life. The status of theorizing regarding social roles in later life has, however, apparently not progressed very far in intent from early conceptualizations focusing on the lack of structural role involvement among older persons. We have witnessed considerable elaboration of the original role/integration/quality of life perspective, especially in George's (1980) recent work, but remain with this same central hypothesis.

It is notable that this line of theoretical development follows the activity/disengagement debate and has done little to resolve it. We still do not have clear evidence from role-related research that disengagement theory is incorrect, or that it can be affirmed. Recently, the connection between social integration (via social roles) and morale has been critiqued as being too simplistic to be very informative (Liang et al., 1980). Liang and his associates suggest including a subjective measure as the mediative variable in determining the relationship between roles and well-being in later life (1980).

One additional issue meriting mention is a hypothesized connection between changes in the age structure of society and the role–opportunity structure for older persons in society. Attention has been given to the contribution of the age structure of society, in conjunction with modernization, in delimiting the area of role behavior made available and socially sanctioned for the elderly (Cowgill and Holmes, 1972; Ragan and Wales, 1980). Some commentators suggest that the changing age structure, in and of itself, may have a positive influence on the availability of social positions for older individuals, especially among secondary roles. This availability would then be expected to enhance social integration and morale of the older segment of the population (Uhlenberg, 1979). This issue seems to merit further evaluation and development into concrete hypotheses.

From examining these various theoretical threads and perspectives, it is clear that there is no consistent theoretical approach within the gerontological literature to the study of social roles. Sociologists and social psychologists differ in terms of their perspectives, the level of analysis, and the important questions to ask. Further, there are some basic debates regarding the use of concepts and terminology of role theory that remain unresolved. This makes more difficult the consistent and appropriate application of theoretical models of empirical work.

RESEARCH ON SOCIAL ROLES OF THE ELDERLY

The remainder of this review will focus more concretely on selected findings from recent research regarding social roles in later life. In these studies many of the theoretical trends outlined above will be apparent. We deal first with the primary roles and next with secondary roles in later life. A final section will draw together some major trends in the study of social roles among the elderly.

Primary Roles

The primary social roles, typified by familial roles, have always been deemed of great significance to the lives of older people, as they are to people of all ages. There has been a consistent connection in the research literature between strong primary-role integration and well-being in the later years. Palmore (1979), in his study of successful agers in the Duke longitudinal panel, found that most successful agers were

characterized by strong primary relationships. Similarly, Shanas (1979), summarizing many years of her research, has reinforced the importance of kinship roles for individuals experiencing losses of later life, and the continued importance of kin support in dealing with other role transitions.

Parental Role

Parent–child relationships are generally characterized by change with the passage of time and aging, rather than a role transition (George, 1980). Rights and responsibilities of parenthood change, but it continues as a persistent, albeit somewhat less demanding status for most aging individuals. Recent articles and reviews have reinforced consistent findings over the past 20 years of contact and support between the generations, norms of separate residency, and intergenerational independence (Bengtson and DeTerre, 1980; Lopata, 1973; Shanas, 1979; Troll et al., 1979).

The major transition, associated with child launching in the middle years, the so-called empty nest, assumes to result in stress for mothers. Several research studies, reviewed elsewhere, have substantiated the finding that this role transition is not uniformly stressful and may be associated with increased marital satisfaction and happiness in post-parental life (see George, 1980). George emphasizes, however, that although the empty nest period may not be disruptive to the long-term adaptation of aging parents, the transition itself may be associated with disruption and stress (1980).

A large segment of the work concerning parental roles focuses on the content of changes in and satisfaction with intergenerational relations in the family (see Bengtson and DeTerre, 1980; George, 1980; Troll et al., 1979). First, studies point to the changing demographic trends, which determine the eventual configuration of families as they age and the availability of continuing parental statuses into old age. Decreased family size, for example, will result in fewer younger relatives available to older persons in future cohorts (Bengtson and De-Terre, 1980; Kobrin, 1976; Treas, 1977).

A second dimension of relationships, besides their sheer availability, is the amount and type of contact between parents and children. Contact can take the form of visiting or of mutual assistance between family members. Contact continues to be significant in level and salient to older family members, as evidenced by numerous studies of intergenerational relationships (see George, 1980; Bengtson and DeTerre,

1980; Troll et al., 1979). In-person contacts are enhanced by telephone for more distant children, and nonmarried parents received more contact than still-married individuals (see Troll et al., 1979). Women, as has long been the case, remain the kin-keepers and maintain the contacts between the generations. Shanas (1979) concludes that there has not been significant change or decline in the performance in family roles over the last 20 years, despite the persistence of the myth of alienation between the family and its older members.

The recent review by George (1980) reminds us of the vulnerability of a common assumption that assistance within the family system flows from younger to older, more dependent members. Most of the studies she reviews emphasize reciprocity of helping among family generations, and broad variations based on class, sex, and race. Research has consistently reported that the older generation is very frequently the givers of aid, not just the recipient (Troll et al., 1979). Providing assistance to children who are grown seems to be a continuing aspect of the role of parent in old age.

A final aspect of parent–child relationships in later life which received consideration in the literature is that of satisfaction with interaction. Satisfaction is based on expectations and whether they are being met by one's current situation. Bengtson and Black (1973) point out the underresearched nature of affect and quality of kinship relationships, due to the relative difficulty of measuring these traits. Seelbach (1978) has researched the topic of expectations of filial responsibility and relation to morale. In a predominantly black and poor sample, respondents were likely to have higher expectations of their children with increasing age or if they were widowed or ill. Little actual support was received by sample members, the highest level being given to females. This lack of support is interpreted by Seelbach to reflect the potential for strain in family relationships arising from reliance on children for major support in old age (1978). Findings from this analysis are among very few studies exploring role expectations, rather than role occupancy issues.

Seelbach's findings are closely related to the issue of changing norms and expectations for relations between adult children and aging parents (Hess and Waring, 1978; Ragan, 1979). Development of social institutions specifically to provide the care and support of older persons in society is hypothesized to permit kin relationships to become more voluntaristic in nature. This is thought to signal a basic change over historical time in form, and possibly quality, of parental roles in later life (Anderson, 1977; Hess and Waring, 1978; Shanas and Sussman, 1977). The effect of more voluntaristic relations on the quality of intergenerational relations is yet to be tested in research.

Spousal Roles

Other primary roles which received regular attention are the roles of husband and wife. The status of spouse has been a major involvement available to elderly persons, especially males, up to the present time. Couples' years in postparental life and in postretirement (Glick, 1977) have increased.

A recent review of literature pertaining to older couples (Troll et al., 1979) outlines some consistent issues addressed in the study of spousal roles in later life. It points out: (1) sex differences in the outcomes of being married in later life, (2) debates over the shift in power between couples as the members age, (3) positive and negative consequences of retirement, (4) the significance of cohort differences in the experience of being married, and (5) the overall significance of marriage to the quality of later life.

One persistent issue of concern is marital satisfaction over the life course in a dip and recovery pattern has been questioned on methodological grounds. Recent work (Spanier et al., 1975) points out the influence of the historical change in the institution of marriage and consequences of marital survivorship on the probability that couples will report satisfaction with their marriages at various ages and stages (Troll et al., 1979). The recent work does not seem to have resolved the confusion of findings on marital satisfaction, ranging from "marital disenchantment" (Keating and Cole, 1980; Pineo, 1968) to involvement in the postretirement marital relationship (Lowenthal et al., 1975). It may be that we have been examining this relationship too simplistically and need to look for mediating factors in determining marital satisfaction over the life course, as well as in later life.

A related issue is the change occurring in the rights and obligations of the marital relationship over time. Prior research had indicated changes in the division of labor and in the instrumental/affectional balance in the gender roles of husband and wife, especially following retirement of the husband (Keating and Cole, 1980). This growth of androgyny in the later stages of the marital relationship was viewed as granting increased power to women and resulting in changes in the boundaries of the rights and duties of each partner. Recent research on a sample of retired teachers and their wives in Canada (Keating and Cole, 1980) reported no change in role interchangeability or the division of labor after the husbands retired from their teaching positions. Further, the wives indicated some decrease in their personal freedom in structuring tasks and time with their husbands more evident at home.

Turning to other marital transitions, George (1980) summarizes the growing literature on widowhood and the consequences of the loss of

spousal status for the individual. She points out that most of the work done on this topic relates to a comparison of the statuses of marital partner versus widowed person, rather than the expectations and perceptions of the role of widow or widower. The majority of the studies take a social stress approach and examine the widowed population for negative consequences of loss of marital status (Morgan, 1976). Earlier research by Lopata (1973) focused specifically on the social-role nature of widowhood, finding in a sample of Chicago-area widowed women over age 50 that the role dimensions of widowhood are not well developed over the long term. Role expectations for widows focus most strongly in the time period immediately following loss of spouse. Much of the remaining literature, mostly focusing on women, emphasizes the negative consequences for the social situation and life satisfaction of persons who become widowed (George, 1980; Lopata, 1979; Morgan, 1976).

A related role transition, just beginning to receive greater attention in the literature, is that of remarriage (Treas and Van Hilst, 1976; George, 1980). Although the probabilities of remarriage, and apparently the expressed desire to remarry, decline in older age groups, remarriages have become sufficiently frequent to warrant study (Lopata, 1973; Treas and Van Hilst, 1976). Vinick (1978) studied 24 remarried elderly couples and reported that men remarried more rapidly than women, presumably because they had suffered more from being without a spouse. Vinick finds that the primary reason for remarriage was a desire for companionship, and that age-peers reacted more negatively toward the desire to remarry than did family members. Kin were hypothesized to have felt relief from responsibility at the remarriage of a partnerless parent. Finally, most of the respondents in Vinick's sample reported themselves to be satisfied or very satisfied with their new marriages (1978).

Grandparenthood

The role of grandparent is one that is available to most older people and, in fact, is likely to be one they have occupied since middle-age. Research on the role of grandparents had focused on the styles of grandparenting, perceptions by grandchildren, and contact between grandparents and grandchildren. Grandparenthood is not a uniform role but evidences variations based in ethnicity (Woehrer, 1978) and sex (Atchley, 1976; Hoffman, 1979).

The first major study by Neugarten and Weinstein (1964) outlined six styles of grandparenting, emphasizing companionate relations. More

recent research by Wood and Robertson (1976) developed four types of grandparenting, based on perceptions of male and female grandparents. This typology is based on the degree to which social norms as opposed to personal experience define the perceived role as grandparent. Respondents who based their relationships more on personal dimensions tended to be older than those for whom social norms were most important (Wood and Robertson, 1976). There is apparently wide diversity in ways of grandparenting, with black grandparents taking a more active surrogate parent role (Woehrer, 1978). As yet there is no consensus in the research as to the types of roles taken by grandparents with regard to grandchildren (see also Troll et al., 1979).

Summary: Kinship Roles

Overall, it appears that kinship roles, as primary involvements for the aging person, continue to be significant among their ties to the social world. It has often been emphasized that the ties of the elderly change dramatically, but that kinship ties are especially durable into old age. Although other roles may be lost, it is unlikely that an older person will be totally without kin (Shanas, 1979). Older people, then, retain ties to the family, arguing for increased relative importance of those roles in later life in lieu of other social positions (see Troll et al., 1979).

SECONDARY ROLES

While primary ties are certainly significant, secondary roles have also received considerable research attention. A study by Cutler (1979) reports that secondary role activity comprised the first dimension in a factor analysis of determinants of life satisfaction for respondents in his oldest age category (75–90 years) of the 1971 NORC sample. The so-called successful agers in the Duke panel are also reported to have high levels of involvement in secondary activities (Palmore, 1979). There is considerable interest in the secondary roles that continue into later life, those that are lost, and those that undergo some major transformations. In contrast to primary roles, the assumption surrounding secondary roles is that they are vulnerable in later life to lesser change. What we shall discuss now are recent findings on secondary roles, such as work, voluntary associations, political activity, and religion.

Work

Studies of the work role, its satisfactions, and its loss at retirement have always been central to gerontology (Atchley, 1976; Tuckman and Lorge, 1953). The work role has been considered to be of central importance to male identity in our culture, but has only recently been viewed as significant to the self-concept of women (Cohn, 1979; Jaslow, 1976).

Attitudes toward work in later life have been studied mainly in terms of (1) age differences and (2) relationship between work attitudes and attitudes toward retirement. Cohn (1979) examined the intrinsic and extrinsic satisfactions of work in a large, national sample of males over age 18. He reports that intrinsic work satisfaction is less important as an aspect of well-being among men in the preretirement years than it was for all the other age groups. Cohn suggests that there may be changes in the importance of the work role as an intrinsic source contributing to overall life satisfaction, but that there is no specific age-related change in satisfaction with work per se. He concludes that the work role can be terminated earlier than age 65 without decreasing the life satisfaction of men, but he does not explore the potential for cohort differences in attitude toward the work role.

In terms of attitudes toward work and retirement, Goudy and associates (1975) find only qualified support for an inverse relationship between attitudes toward work and retirement, depending on the measures used. Although positive work attitudes had been expected to be associated with dislike of retirement, results of their analysis showed a weak association at best. Glamser (1976) also found that the attitude toward retirement was not associated with commitment to work for a small sample of factory workers. The attitude toward retirement, Glamser concludes, is the function of a complex set of situational factors (1976; see also George, 1980; Pointrenaud et al., 1979).

A second important issue in the current literature is the growing significance of work roles and retirement as a transition in the lives of aging women. Lopata (1979) reports that the widows in her large, national sample ranked the role of worker among the lowest in terms of subjective importance. She reports that most of her respondents had not held jobs while their husbands were in good health, due to anticipated conflicts between work and family roles (Lopata, 1979). However, increasingly women hold long-term labor-force attachments and experience retirement. Campbell (1979) reports that women have different attitudes toward retirement than do males, often planning to work longer. Reviewing other studies on women's work, she points out

that women have often begun their careers later, may not be ready to quit working as early as males, and may make a significant economic contribution toward supporting a growing population over age 65.

While working is apparently a major role for a large number of older people, retirement is perhaps the most researched aspect of labor-force behavior. Atchley (1976) suggests that retirement has not been clearly defined by most researchers, leading to ambiguities in research. George (1980) points out that some of the confusion over the concept of retirement arises from the fact that it can be viewed as an event, a process, or a social role. She outlines in her review the stages of retirement as a process defined by Atchley (1976) and some of the debate regarding whether or not there is a true role associated with the social status of retirees (George, 1980). Atchley contends that there are rights and responsibilities associated with being in retired status, such as freedom of choice in how to spend one's time and financial support, but this is more tenuous than most roles, and the expectations for behavior are minimal (see Rosow, 1976).

By far the bulk of the research that has been done to date on retirement focuses on adaptation to retirement, once expected to be a devastating role loss for older workers. A study of males from the Duke longitudinal panel followed persons from pre- to postretirement status, finding no significant change in life satisfaction over a five-year span which included the event of retirement (George and Maddox, 1977). Two other studies, focusing on women and work, report that both currently working or having worked seem to contribute to enforcement of some types of well-being in old age for women. Older women who were working or had retired report greater life satisfaction and levels of social contact than women who had been housewives (Fox, 1977; Jaslow, 1976).

Numerous variables have been examined as conditioning the relationship between retirement and well-being. Kimmel et al. (1978) point out that voluntary retirement is associated with several other factors (i.e., good health and good retirement income) which also have been related to greater satisfaction in retirement, but the causal connections are unclear. George (1980) reviews studies that have explored numerous variables that mediate the overall positive relationship between retired status and morale. Having an adequate income, being in good physical health, and being married (for men) are consistently found to contribute to a relatively greater well-being in retirement (George, 1980). Most of the studies that have been done have come to the clear conclusion that retirement holds no necessary negative consequences for the well-being of aging individuals (George, 1980).

One more recent interest in the literature is the issue of working after retirement. In contrast to many other role transitions, retirement can be reversed, a reversal accomplished by relatively few retirees in a given year (Grad, 1977). Some workers, such as academicians, can continue to work after they retire in an unofficial capacity (Rowe, 1976), while other workers may return to paid, full- or part-time employment. A study of Swedish men and women found that economic considerations were not primary in return to work after retirement, but rather missing the work itself and the rewards it brings (Skoglund, 1979).

In sum, while the rules of retirement, ages at which it occurs, and other factors are subject to change, it appears that workers have accepted, and frequently look forward to, retirement as a stage of the life cycle. Few are disrupted severely by retirement, and more are selecting early retirement as an option (Atchley, 1976; George, 1980).

Voluntary Associations

Membership in clubs, organizations, and service groups has for a long time been considered a prime role available to the older person, whose other commitments to roles are often diminishing in number. This type of role is seen as a substitute for other losses in so-called compensatory theory (Clemente et al., 1975). The older population has been viewed by some as the prime category in which to find individuals with energy, time, and ideas to contribute to organizations interested in the bettering of society (Payne, 1977).

There has been considerable study recently on voluntary association membership and its anticipated benefits for the elderly. Most of the research deals with memberships in and attendance at formally organized groups, not simply community participation such as voting and social service in neighborhoods (Trela and Jackson, 1979). Voluntary associations are of many types and do not necessarily imply volunteer service.

Many of the organizations commonly chosen by older people are those common to persons regardless of age (Cutler, 1976a; Trela, 1976). Older people are generally found to have relatively high levels of participation in voluntary associations, but we do not know the extent to which these memberships and activities are newly acquired or have changed over the life cycle, except in the case of age-based groups, such as senior centers (Babchuk et al., 1979; Cutler, 1976a; Trela, 1976). Babchuk and associates (1979) developed a typology of the voluntary associations most commonly reported with the use of aided recall by older persons in their Midwest sample. The most com-

mon memberships were in church-related organizations, followed by fraternal and veteran/patriotic organizations. Groups specifically for the aged were the fourth most common type. Babchuk and associates also report sex differences in memberships, with women most often in church-related groups and men reporting more memberships in service and professional organizations. Surprisingly, this sample reported a higher ratio of attendance when individuals belonged to more rather than fewer groups, as well as more memberships and activity in upper socioeconomic categories (Babchuk et al., 1979).

Cutler (1976a) finds that a large proportion of older persons in the NORC samples from 1974 and 1975 reported belonging to "other" types of groups, which include age-related organizations. He speculates that we may be underrepresenting age-based organizations in our studies. Trela and Jackson (1979) report that activity in voluntary associations in their study of joiners and nonjoiners of a Senior Citizens center in the Midwest was mediated by family roles. Those very active in family roles were less likely to participate, and widows, with the fewest role-playing activities, were most likely to participate in voluntary associations or volunteer work. These authors conclude that capacity for role involvement for older people seems elastic, rather than fixed, and has potential to change (Trela and Jackson, 1979). A study of a large sample of older persons in an eastern city finds differences in organizational participation by race. Even when controls are instituted for sex, income, education, and health, black elderly seem to report even higher activity rates than their white counterparts (Clemente et al., 1975).

The second direction for research on voluntary association in later life has to do with the relationship between these activities and life satisfaction. Some studies have found a positive relationship between membership in or attendance at voluntary associations and life satisfaction (Graney, 1975; Payne, 1977). The value of voluntary associations for life satisfaction is far from clearly delimited in the research. Ward (1979) reports that active participation was not associated with psychological well-being. In his nonrepresentative sample of 300 persons over age 60, activity was associated with high socioeconomic status. Respondents were asked their reasons for participation, and the most commonly cited was contact with friends, followed by enjoyment, helping others, and creativity/learning. Ward suggests that there are different types of activities suited to varied needs, but that the aged have few activities from which to choose that are very substantial in terms of role content (1979).

Others have pointed out that the relationship between participation and life satisfaction is more complex. While many studies report

an association between participation and well-being and suggest a causal direction, Cutler (1976b) argues that the causal direction is undetermined. Participants are essentially self-selected, such that those who are most satisfied with their lives may more often choose to participate (Bull and Aucoin, 1975; Cutler, 1976b). In order to develop clear causal ordering, these studies need to examine more systematically both the types of persons and the types of voluntary organizations joined, rather than lumping "older people" and "voluntary associations" into categories without distinction (Bull and Aucoin, 1975; Cutler, 1976b). There is no specific treatment of role transitions in voluntary associations, since it is presumed that individuals continue their participation as long as health permits.

Religious Participant

Both religious sentiments and religious activity (i.e., church attendance) have been examined as important role involvements for older persons. The assumptions from prior research were that religious activity declined with age, essentially due to declining health, but that religious attitudes and salience increased as the individual approached death (Blazer and Palmore, 1976). Research has tended to examine subjective and objective aspects of religious role participation separately, but it is suggested by some that the separation may be an artificial one (Mindel and Vaughn, 1978).

Blazer and Palmore (1976) report a decrease in religious activities over time among longitudinal panel members at Duke University. Women in the panel remained more active than men, and the authors conclude that religious behavior seemed more closely related to adjustment than religious attitudes. Graney (1975) reports that changes in activity over a four-year time span (measured by attendance at religious services) had no significant influence on life satisfaction for a small sample of older women.

In terms of religious salience and subjective attitudes, such as religiosity, research findings are also available. Lopata (1979) reports that in her large sample of Midwest widows, 73 percent ranked role of member of religious group among the four least significant roles to their sense of self. Blazer and Palmore (1976) find that religious attitudes remained unchanged over time in the Duke longitudinal panel, rather than becoming more important with aging. Mindel and Vaughn (1978) suggest that we have been too simplistic in studying religiosity and that involvement must be measured by both subjective and objec-

tive measures. In their study of elderly residents of Missouri who were living with family members, they examined (1) attendance at church, (2) organizational involvement, and (3) nonorganizational religiosity. Their study seems to suggest significance for nonorganized aspects of religious behavior (praying, watching religious programming on television) in defining the self as a "religious person."

Finally, a study by Kivett (1979) examined religious motivation as a function of 10 independent variables. Kivett's major question is the intrinsic versus extrinsic nature of religious motivation, which she examined in a sample of 300 middle-aged (45–65 years) adults in a southern state. The independent variables she utilized explained a relatively small proportion of the variation (13 percent) in the type of religious motivation. She reports that the types of persons most likely to be intrinsically motivated are females; those with internal locus of control; and those with high idealization of self-concept (Kivett, 1979). This study, like that of Mindel and Vaughn (1978), examines religiosity in a much more complex manner, yet does not clearly outline the role(s) of middle-aged or older persons in the religious institutions of society or in terms of social behavior.

Critique and Synthesis: Empirical Studies

Before concluding the review of recent research on social roles in later life, it is crucial to outline some of the weaknesses, strengths, and significant directions being taken by this realm of research. Primary among the problems is the continuing issue of ambiguity of usage and looseness of role terminology.

The study of social role as it pertains to the elderly evidences many problems common to role studies in general. There is a long history of difficulty in utilizing role conceptualizations in both sociological and gerontological research (George, 1980; Komarovsky, 1973; Rosow, 1976). The major confusion arises from the fact that social role may be variously taken to mean a *position* (or status) within which social behavior occurs, the *expectations* or normative pre/proscriptions for behavior by incumbents of a social status, the actual behavior or *enactment*, or a negotiated consensus of reciprocal behaviors between social actors in an ongoing relationship. Depending on the definition expressed or implied, roles are viewed by those employing them as more or less fixed, more or less consensually defined in content and form, and more or less formally tied to social structure (Lutzky, 1979; Rosow, 1976). Given this confusion in conceptual parameters, it is

fortunate that some major works have attempted to systematize the role theoretical approach (see Biddle and Thomas, 1966; Sarbin and Allen, 1968). Confusion remains a serious problem in research applications in aging. This inconsistent usage means that studies which purportedly examine social roles of later life can actually focus on several, related issues. A so-called role analysis may be limited to occupancy rates or loss of a particular social position; the meaning, content, or satisfaction of behavior in a particular role; or the salience of roles to identity and self-concept. As is apparent, most of the attention given to social roles in later life focuses on the first of these issues, role occupancy.

A related issue characteristic of role studies of older individuals is the frequent appearance of a value bias. Early studies of social aging focused on role loss and the lack of meaningful attachment for older persons in society (Burgess, 1960). This perceived lack was hypothesized to lead to low social integration, anomie, and isolation, ultimately resulting in lowered quality of life. This lack of social roles for the elderly, viewed as a failing of modernized society, is still a theme that appears in contemporary work (Cowgill and Holmes, 1972; Rosow, 1976; Uhlenberg, 1979). Occupying social statuses and enacting content-rich roles are assumed to be inherently beneficial by integrating the older person in the ongoing society (Liang et al., 1980). Activity rather than inactivity, and engagement rather than disengagement, are still often implied as the universally desired states for aging individuals. These assumptions, whether implicit or explicit, continue to color the theoretical and empirical work on social roles in later life.

Beyond this assumed connection between participation in social roles and well-being, there is also a tendency to view only positive roles as the appropriate arena for study. While the literature certainly provides evidence that most of the older population is involved in and satisfied with a large number and type of social roles (George, 1980; Shanas, 1979), researchers have tended to overlook the role aspects of some of the less desirable statuses of later life. For example, until recently relatively little could be found regarding the role enactment of older persons as client, patient, or victim (Haug, 1979; Reed and Glamser, 1979). Rather, it seems that these more negative statuses are often viewed as consequences of lack of positive role attachments. There has been a certain tunnel vision, now dissipating, which limited the consideration of social roles to positive, rather than negatively perceived, social statuses.

A curious question is the means of selecting the roles and statuses for study by researchers in gerontology. The roles of later life are

undoubtedly quite diverse, yet we see essentially the same set of statuses and roles repeatedly examined in the literature. It is not clear to what extent these roles currently typify the involvements of people in later life or to what extent they reflect traditions in research or the limited perspective of researchers. One might hypothesize that the roles/statuses referred to and researched most frequently are those gerontologists view as normative for later life. There is some research attention given to the role of the older criminal, but there is more attention to the "role" of the victim (Reed and Glamser, 1979; Shichor and Kobrin, 1978). It may be that the listing of roles and statuses that are researched, and the frequency with which they receive attention, is itself a datum regarding social scientists' and practitioners' views of older people.

The limited set of roles that has been attributed to older people has, however, been expanding somewhat in recent research. Greater attention is being paid to the sick role (Myles, 1978), to the role of patient (Haug, 1979), and to older person as student. Bader (1978) discusses formal education as a developing opportunity for older persons and concludes that the greater availability of student roles to older persons indicates a change in attitudes toward the elderly, toward recognizing greater capability to learn and change, as well as changes in the age structure of society.

This attention to change is indicated, not only in the new roles that are being examined, but in the ways in which role-related research is approaching the problem. Role analyses are paying increasing attention to change, both in society and in the characteristics of the aging population. The treatment of social roles is reflecting increasing complexity. Analyses are not simply limited to whether or not a role is available and for its association with life satisfaction, but explore the interrelationships among roles. Studies are evaluating, for example, the interplay of wife and worker roles for women approaching and in retirement (Jaslow, 1976).

In recent studies roles are less often assumed to be the determinant of well-being or life satisfaction. In fact, researchers are more often delineating multiple possible causal sequences for the relationship between particular role attachments and life satisfaction (Bull and Aucoin, 1975; Cutler, 1976a; George, 1980; Goudy et al., 1975). Rather than assuming a causal direction between role participation and life satisfaction, the more current research is directed toward outlining models that might explicate the association commonly found between role participation and morale. Self-selection into many roles (or out of roles, such as in early retirement) may be more the consequence of

high life satisfaction and a large number of alternatives, rather than roles influencing morale. Larger numbers of variables which may condition or mediate relationships are also included in recent studies, adding to the overall picture of role enactment and its variation with the older population. Rather than just examining who is and is not in a status, research is moving toward a more complex, and more complete, view of role behavior in a total social context.

Part of examining this total social context is the growing interest in the ways larger macrosocietal changes influence the roles of later life. Tibbetts (1979) points to changes in the larger social structure as factors in the evolution of positive roles for older adults.

In a similar vein Cavan (1978) outlines the differences in social roles of the elderly in three types of societies. Societal values, organization of work, and the family have important input into the roles and prestige attached to the elderly in society.

Important among these societal changes are major demographic changes in the age structure of society and in the family. Dahlin (1980) outlines changes in family structure since 1900, pointing to changing norms and values of family living. He relates some of the changes in family roles, notably independent generational living arrangements, to changes in work roles and the larger economy. Dahlin points to the need to examine the interplay between various forces developing the structure of roles in society. Similarly, Achenbaum (1978) outlines changes in the place of the older person through the history of the United States. His analysis clearly points to changing forces of the economy and the political system, as well as the changing beliefs and values of the time, as significant factors in shaping the roles and opportunities made available to the elderly.

Another significant change is that in the roles available to women of all ages in society. Most significant among these changes is the growing labor-force participation of women, which influences their family roles in adulthood and their eventual characteristics as part of the older population. We have not yet seen the cohorts of women in old age who have spent a major proportion of their lives as workers, but women's work is already having a major impact. Treas (1977) suggests that women's labor-force participation makes them less available to fulfill traditional female roles as family kin-keepers. We are uncertain as to what influence this may already be having on the current older generation, whose daughters are career women.

Finally, among the newer trends in role analyses concerned with later life is a look to the "future elderly." Growing out of the examination of historical trends and the effects of macrosociological influences, there seems to be greater attention paid to the ways in which the cohorts

of older people in the decades to come might need an altered situation. Uhlenberg (1979) outlines the ways that women will be different from today's older women and the need to develop alternative roles for them to occupy which will utilize their skills and resources. He emphasizes the fact that the characteristics of the older population, as well as the nature of society, changes our views and expectations toward the older population to recognize the changes in their capabilities.

CONCLUSIONS

While this vast array of information, both theoretical and empirical, leaves one without a cohesive view of the status of social roles in later life, it is clear that we might make several conclusions.

First, it would appear certain that the study of social roles is still being vigorously pursued as a subfield in the study of aging. The volume of publications utilizing concepts or hypotheses arising from the role/status approach to the study of social life continues at very high levels. The strong tradition of concern with role aspects of aging thus appears to be continuing into the 1980s.

A second conclusion that might be drawn from the studies reviewed is that there is little in terms of novel developments in role theory as it is applied to aging. While there certainly has been refinement and sophistication of existing causal connections, there is little that might be characterized as dramatic or revolutionary in theoretical developments. Theory construction, or applications of hypotheses already in use in role-related research elsewhere, would appear as a priority for systematic growth in our understanding of the interplay of social roles in the lives of the elderly population.

A third conclusion arising from the material reviewed here is that there is surprisingly little connection between the theoretical and empirical literature. Many research studies, purportedly examining role issues in later life, make only a symbolic bow to theoretical issues, without the development of hypotheses or research questions that would build our base of knowledge. The development of our empirical knowledge would undoubtedly benefit greatly from some more concrete ties to theory and theory development.

Finally, and on a positive note, researchers and practitioners alike are beginning to more clearly recognize the diversity in role behavior among the current elderly population and the likelihood that role behaviors will change in future cohorts of the aged. This expansion of the

role horizons of the older population, at least in terms of the perspectives imposed upon its study by social researchers, suggests that a more diverse, and probably more accurate, picture of the social world and interaction of aging individuals will develop in future research.

REFERENCES

Achenbaum, Andrew W. *Old age in the new land: The American experience since 1790.* Baltimore and London: The Johns Hopkins University Press, 1978.

Anderson, M. The impact on the family relationships of the elderly of changes since Victorian times in governmental income-maintenance provision. In E. Shanas and M. B. Sussman (Eds.), *Family, bureaucracy, and the elderly.* Durham, N. C.: Duke University Press, 1977.

Atchley, R. C. *The sociology of retirement.* Cambridge, Mass.: Schenkman, 1976.

Atchley, Robert C., Miller, Sheila J., and Troll, Lillian, C. *Families in later life.* Belmont, Calif.: Wadsworth Publishing Co., Inc., 1979.

Babchuk, Nicholas, Peters, George R., Hoyt, Danny R., and Kaiser, Marvin A. The voluntary associations of the aged. *Journal of Gerontology,* 1979, *34*(4), 579–587.

Bader, Jeanne E. Formal educational opportunities for older adults. *International Journal of Aging and Human Development,* 1978, *8*(4), 339–344.

Bengtson, Vern L., and Black K. D. Intergenerational relations and continuity in socialization. In P. B. Baltes and K. W. Schaie (Eds.), *Life-span developmental psychology, personality and socialization.* New York: Academic Press, 1973.

Bengtson, Vern L., and DeTerre, Edythe. Aging and family relations. *Marriage and Family Review,* Spring 1980, *3*, 1.

Biddle, Bruce J., and Thomas, Edwin, J. *Role theory: Concepts and research.* New York: John Wiley and Sons, 1966.

Blazer, Dan, and Palmore, Erdman. Relgion and aging in a longitudinal panel. *Gerontologist,* 1976, *16*(1), 82–83.

Bull, C. Neil, and Aucoin, Jackie B. Voluntary association participation and life satisfaction: A replication note. *Journal of Gerontology,* 1975, *30*(1), 73–76.

Burgess, Ernest W. Roleless role of the aging. In *Aging in Western Culture.* Chicago: University of Chicago Press, 1960.

Campbell, Shirley. Delayed mandatory retirement and the working woman. *Gerontologist,* 1979, *19*, 257–263.

Cavan, Ruth S. Roles of the old in personal and impersonal societies. *Family Coordinator,* 1978, *27*(4), 315–320.

Clemente, Frank, Rexroad, Patricia A., and Hirsch, Carl. The participation of the black aged in voluntary associations. *Journal of Gerontology,* 1975, *30*(4), 469–472.

Cohn, Richard M. Age and the satisfactions from work. *Journal of Gerontology,* 1979, *34*(2), 264–272.

Cowgill, Donald O., and Holmes, Lewelyn. *Aging and modernization.* New York: Appleton-Century-Crofts, 1972.

Cutler, Neal E. Age variations in the dimensionality of life satisfaction. *Journal of Gerontology,* 1979, *34*(4), 573–578.

Cutler, Stephen J. Age profiles of membership in sixteen types of voluntary associations. *Journal of Gerontology,* 1976, *3*(4), 462–470.(a)

Cutler, Stephen J. Membership in different types of voluntary associations and psychological well-being. *Gerontologist,* 1976, *16*(4), 335–339.(b)

Dahlin, Michel. Perspectives on the family life of the elderly in 1900. *Gerontologist,* 1980, *20*(1), 99–107.

Fox, Judith H. Effects of retirement and former work life on women's adaptation to old age. *Journal of Gerontology,* 1977, *32*(2), 196–202.

George, Linda K. *Role transitions in later life.* Monterey, Calif.: Brooks/Cole Publishing Co., 1980.

George, Linda K., and Maddox, George L. Subjective adaptation to loss of the work role: A longitudinal study. *Journal of Gerontology,* 1977. *32*(4), 456–462.

Glamser, Francis D. Determinants of a positive attitude toward retirement. *Journal of Gerontology,* 1976, *31*(1), 104–107.

Glick, Paul C. Updating the life cycle of the family. *Journal of Marriage and Family,* 1977, *39,* 5–13.

Gordon, Chad. Role and value development across the life cycle. In J. W. Jackson (Ed.), *Sociological studies IV: Role.* London: Cambridge University Press, 1971.

Gordon, Chad. Development of evaluated role identities. *Annual Review of Sociology,* 1976, *2,* 405–433.

Goudy, Willis J., Powers, Edward, A., and Keith, Patricia. Work and retirement: A test of attitudinal relationships. *Journal of Gerontology,* 1975, *30*(2), 193–198.

Grad, Susan. New retirees and the stability of the retirement pensions. *Social Security Bulletin,* 1977, *40*(3), 3–12.

Graney, M. J. Happiness and social participation in aging. *Journal of Gerontology,* 1975, *30*(6), 701–706.

Haug, Marie. Doctor patient relationships and the older patient. *Journal of Gerontology,* 1979, *34*(6), 852–860.

Hess, Beth B., and Waring, Joan M. Changing patterns of aging and family bonds in later life. *The Family Coordinator,* October 1978, *27*(4), 303–314.

Hoffman, Edward. Young adults' relations with their grandparents: An exploratory study. *International Aging and Human Development,* 1979, *10*(3), 299–310.

House, J. S. Occupational stress and coronary heart disease: A review and theoretical integration. *Journal of Health and Social Behavior,* 1974, *15,* 12–27.

Jaslow, Philip. Employment, retirement and morale among older women. *Journal of Gerontology,* 1976, *31*(2), 212–218.

Keating, Norah C., and Cole, Priscilla. What do I do with him 24 hours a day? Changes in the housewife after retirement. *Gerontologist,* 1980. *20*(1), 84–89.

Kimmel, Douglas C., Price, Karl F., and Walker, James W. Retirement choice and retirement satisfaction. *Journal of Gerontology,* 1978, *33*(4), 575–585.

Kivett, Vira R. Religious motivation in middle age: Correlates and implications. *Journal of Gerontology*, 1979, *34*(1), 106–115.

Kobrin, F. E. The fall of household size and the rise of the primary individual in the United States. *Demography*, 1976, *13*, 127–138.

Komarovsky, Mirra. Presidential address: Some problems in role analysis. *American Sociological Review*, 1973, *38*, 646–662.

Liang, J., Kahana, E., and Doherty, E. Financial well-being among the aged: A further elaboration. *Journal of Gerontology*, 1980, *35*, 409–420.

Linton, R., *A study of man*. New York: Appleton-Century, 1936.

Lopata, Helena Znaniecki. *Widowhood in an American city*. Cambridge, Mass.: Schenkman, 1973.

Lopata, Helena Z. Women as widows. *Support systems*. New York: Elsevier, 1979.

Lowenthal, Marjorie F., Thurnher, Majda, Chiriboga, David, et al. *Four stages of life*. San Francisco: Jossey-Bass, 1975.

Lutzky, N. S. Attitudes toward old age and elderly persons. *Annual Review of Gerontology and Geriatrics*, 1979, *2*, 287–336.

Mindel, Charles H., and Vaughn, C. Edwin. A multidimensional approach to religiosity and disengagement. *Journal of Gerontology*, 1978, *33*(1), 103–108.

Morgan, L. A. A reexamination of widowhood and morale. *Journal of Gerontology*, 1976, *31*, 687–695.

Myles, John F. Institutionalization and sick role identification among the elderly. *American Sociological Review*, 1978, *43*(4), 508–520.

Neugarten, Bernice L., and Weinstein, Karol K. The changing American grandparent. *Journal of Marriage and the Family*, 1964, *26*, 199–204.

Palmore, Erdman. Predictors of successful aging. *Gerontologist*, 1979, *19*(5), 427–431.

Payne, Barbara P. The older volunteer: Social role continuity and development. *Gerontologist*, 1977, *17*(4), 355–361.

Pineo, Peter C. Disenchantment in the latter years of marriage. In Bernice L. Neugarten (Ed.), *Middle age and aging*. Chicago and London: The University of Chicago Press, 1968.

Pointrenaud, Jean, Vallery-Masson, Janine, Valleron, Alain, J., Demeestere, Michele, and Lion, Marie R. Factors related to attitude towards retirement among French preretired managers and top executives. *Journal of Gerontology*, 1979, *34*(5), 723–272.

Ragan, Pauline K. *Aging parents*. The Ethel Percy Andrus Gerontology Center, The University of Southern California Press, 1979.

Ragan, Pauline K., and Wales, Jeffrey, B. Age stratification and the life course. In James F. Birren and R. Bruce Sloane (Eds.), *Handbook of mental health and aging*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1980.

Reed, Monika, B., and Glamser, Francis D. Aging in a total institution: The case of older prisoners. *Gerontologist*, 1979, *19*(4), 354–360.

Riley, Matilda W. Age strata in social systems. In Robert Binstock and Ethel Shanas (Eds.), *Handbook of aging and the social sciences*. New York: Van Nostrand-Reinhold, 1976.

Rosow, Irving. Status and role change throughout the life span. In Robert Binstock and E. Shanas (Eds.), *Handbook of aging and the social sciences*. New York: Van Nostrand-Reinhold, 1976.

Rowe, Alan R. Retired academics and research activity. *Journal of Gerontology*, 1976, *31*(4), 456–461.

Sarbin, Theodore, R., Allen, Vernon L. Role theory. In Gardner Lindzey and Elliot Aronson (Eds.), *The handbook of social psychology*. Reading, Mass.: Addison-Wesley Publishing Co., 1968.

Seelbach, W. C. Correlates of aged parents' filial responsibility expectations and realizations. *Family Coordinator*, 1978, *27*(4), 341–350.

Shanas, Ethel. Social myth as hypothesis: The case of the family relations of old people. *The Gerontologist*, 1979, *19*(1), 3–9.

Shanas, Ethel, and Sussman, Marvin, B. *Family bureaucracy and the elderly*. Durham, N.C.: Duke University Press, 1977.

Shichor, David, and Kobrin, Solomon. Note: Criminal behavior among the elderly. *Gerontologist*, 1978, *18*(2), 213–218.

Skoglund, John. Work after retirement. *Aging and Work*, 1979, *2*(2), 103–111.

Spanier, Graham B., Lewis, Robert A., Coles, Charles L. Marital adjustment over the family life cycle: The issue of curvilinearity. *Journal of Marriage and the Family*, 1975, *37*, 263–275.

Tibbetts, Clark. Can we invalidate negative stereotypes of aging? *Gerontologist*, 1979, *19*(1), 10–20.

Treas, Judith. Family support systems for the aged: Some social and demographic considerations. *The Gerontologist*, 1977, *17* (6), 486–491.

Treas, J., and Van Hilst, A. Marriage and remarriage rates among older Americans. *Gerontologist*, 1976, *16*, 132–136.

Trela, James E. Social class and association membership: An analysis of age-graded and non-age graded voluntary participation. *Journal of Gerontology*, 1976, *3*(2), 198–203.

Trela, James E., and Jackson, David J. Family life and community participation in old age. *Research on Aging*, 1979, *1*(2), 233–251.

Troll, Lillian E., Miller, Shelia J., and Atchley, Robert C. *Families in later life*. Belmont, Calif.: Wadsworth Publishing Co., Inc., 1979.

Tuckman, Jacob, and Lorge, Irving. *Retirement and the industrial worker: Prospect and reality*. New York: Columbia University Teachers College, 1953.

Uhlenberg, Peter. Older women: The growing challenge to design constructive roles. *Gerontologist*, 1979, *19*(3), 236–241.

Vinick, Barbara H. Remarriage in old age. *The Family Coordinator*, October 1978, *27*(4), 359–363.

Ward, Russell A. The meaning of voluntary association participation to older people. *Journal of Gerontology*, 1979, *34*(3), 438–445.

Williams, R. H., and Wirths, C. G. *Lives through the years*. New York: Atherton, 1965.

Woehrer, Carol E. Cultural pluralism in American families: The influence of ethnicity on social aspects of aging. *The Family Coordinator*, October, 1978, *27*(4), 329–338.

Wood, Vivian, and Robertson, Joan, F. The significance of grandparenthood. In F. Gubrium Jaber (Ed.), *Time, roles, and self in old age*. New York: Human Service Press, 1976.

Time Course and Time Perspective in Later Life

ROBERT KASTENBAUM, PH.D.
DEPARTMENT OF COMMUNICATIONS
ARIZONA STATE UNIVERSITY
TEMPE, ARIZONA

Reality is *ordered* exactly to the degree in which it satisfies our thought. Order is therefore a certain agreement between the subject and object. It is the mind finding itself again in things [Bergson, 1911, p. 223].

These are not *my* hands! (Makes a face and laughs). My hands are soft. My hands are clear, not all tough and full of blotches. I want my real hands back—and all the rest of my body, too!" [M. L., aged 87].

Human aging involves a complex relationship with the fourth dimension. Time courses through the individual as the maturational program completes itself and then gives way to senescence. We create our own time frameworks as well, however, as individuals and as a society. These include at one extreme the enormous temporal arches constructed by cosmologists and archeologists and, at the other, the incredible precision uttered by the atomic clock. Between these extremes are found the bewildering array of sociocultural and developmental times. Essentially we mark time as a means of achieving "a certain agreement between the subject and object" (Bergson, 1911), and at the same time, time marks us.

Of most interest to us here is the aging person's own construction and reconstructions of time. There are two approaches toward understanding the older person's relationship to time. One emphasizes the context and correlates of time perspective. How does institutionalization influence time perspective? Do old people who spend much of

their time thinking about the past have low morale or life satisfaction? These are typical questions that treat the older person's orientation toward time as one more set of variables within the much larger set of variables that comprise gerontology. The other approach is by far the more difficult challenge to theory and research. Precisely what *is* time perspective? Precisely what are the processes at work? Questions of this nature require attention to matters philosophical as well as psychological, including our basic conceptions of person-in-the-world. Furthermore, both approaches must be examined with life-span developmental considerations in mind. Studying only the old person's time perspective, its context and correlates, would leave us with an incomplete and distorted picture—the obverse of many other lines of research that have yielded fragmentary portraits of human nature by concentrating on the young.

This review does not try to wrap the wild assortment of time perspective research and theory into a neat package. The aim instead is to identify, sort out, and comment on some of the major themes. Once we commit ourselves to understanding the meanings of time in later life we have surrendered the fantasy of quick, simple, and definitive conclusions. Few if any other topics take us into such intimate contact with the living complexities of human thought and feeling.

We begin with a brief consideration of attempts to study psychological time simply and objectively, move then to more complex approaches, and conclude with a life-span developmental view. While most topics included in *Annual Review of Gerontology and Geriatrics* have reasonably coherent histories that can be updated, time perspective is still seeking its shape. Attention is given, then, to earlier as well as more recent contributions.

TIME PERCEPTION: A BUTTERFLY IN THE LABORATORY

A Century of Disappointment

"Brass instrument psychology" selected time perception as one of its favorite themes in trumpeting the arrival of this new science. Early investigators such as Nichols (1890) recognized that time is an intimate facet of human personality, yet hoped to capture in the laboratory a butterfly that centuries of philosophers had found elusive. Ingenious

studies appeared in the literature for decades, but the butterfly remained at liberty, unbeguiled by the brass consort. When Frankenheuser (1959) reviewed this extensive literature, she came to the firm conclusion that confusion still reigned: each method of assessing the individual's "perception" of time carried its own assumptions, and, after all those years, it was still difficult to sort out "subjective" and "objective" aspects of performance. More discouraging yet, when a new study is laid atop the old ones, the whole stack topples over, leaving the researcher with no conclusion except the resolve to shift to some more promising line of work. Doob (1971), for example, attempted to apply a more contemporary perspective to the time perception literature and ended up complaining of the misery that awaits any scholar who would plunge into these murky depths.

I believe this century of disappointment can be traced to the premature assumption that time *is* perceived—or that what we do perceive is time. There has been no clear answer to the question: How do we perceive time? The analogy with other sensory modalities encouraged an optimistic attitude that simply has not been proved. No sensory receptor system for time has been identified comparable with vision, audition, or even equilibrium which is, like time, something of an inward sense. Moreover, there has not been a clear answer to the related question: What is it we perceive when we say we are perceiving time?

A more promising approach would be to regard time as a *construction*. This is by no means an original view; in very different ways, Hume (1748), Kant (1781), and Bergson (1911) conceived of time-ordering as something the human organism imposes on the world as experienced. It might be useful, however, to free ourselves from an assumption of our own times, namely, that constructs are cognitive and cognitive only. The "sense of time" might be more usefully approached as a *psychobiological construct*, an organismic achievement.

Constructed time involves both perceptual and cognitive functions and registers both internal and external reality. A developmental course can be hypothesized: first, perception of internal states is dominant in the construction of time sense; later the cognitive-symbolic level emerges and makes it possible to take more account of the external world. Psychoanalysts have observed that such a developmental pattern in the comprehension of time is closely related to the infant's transition from primary to secondary (reality principle) processes (e.g., Schneider, 1948). A more recent statement makes this position even

clearer: "Time, which is initially a sensory experience, can be thought of as an abstract thought when the symbolizing function is established and language becomes integrated into an automatic ego function, as a secondary process" (DuPont, 1974, p. 484). I think it questionable that the human organism *ever* has a purely sensory experience, but this caveat does not detract from the general notion of time sense originating largely in the perceptual-inner orbit and gradually becoming symbolic-external as well. The psychobiological context of time "perception" is altered by the developmental process, so it could be misleading to compare estimates of elapsed immediate time for individuals functioning at different developmental levels. An obvious implication of this approach is that our understanding of time in later life requires a life-span perspective.

Does Time Pass Differently for the Aged?

Despite the unproductive empirical outcome from traditional time perception research, some age-related observations deserve comment. Observers have been suggesting for a century that time passes differently for older people. Usually it is said that time passes faster (e.g., du Nouy, 1936; James, 1890; Janet, 1928; Fraisse, 1963). A popular explanation is that life is uneventful for old people. This explanation gained currency long before researchers began to study the phenomenology of old age and so makes an assumption rather than summarizes a data base. Furthermore, to the extent that this proposition is true we should expect to find the most direct correlation between "uneventfulness" and speed of subjective time passage, with chronological age as a relatively weak connector variable. There is an additional flaw. If a person of any age judges that few events have transpired, shouldn't this lead instead to a sense of time as slow and dragging? The key is the *relationship between inner and outer time.* Clock time moves faster than the old person recognizes (on this theory), because the experiencer registers relatively few events. However, the *felt quality* of the passing time may be "too slow" from the phenomenological standpoint while "at the same time," the hands of the clock are seen as moving "too fast." Old people (or others in certain situations) may judge that time is both too slow *and* too fast (as with the octogenarian who felt that "time is eating me up alive" while simultaneously lamenting that each day is empty, useless, and unbearably slow (Kastenbaum, 1966).

Research does not support any simple proposition about the speed of subjective time in old age. Kuhlen and Monge (1968) employed two methods to measure sense of time passage—neither of which involved direct estimation of passing time. Their two measures failed to correlate strongly with each other, and neither showed a relationship between subjective sense of time passage and chronological age. Neuringer et al. (1971) used Kuhlen and Monge's Time Opinion Survey with suicidal, geriatric, and "normal" patients. They found no difference in speed of time perception between the geriatric patients and younger patients with a variety of physical complaints (although the suicidal patients experienced time as passing more slowly then either of the other groups). But even the "no support" conclusion from this pair of studies does not warrant complete acceptance. The representativeness of the samples of old people is questionable, and neither study actually measured judgment of passing time. This might be just as well, however, because each specific time-estimation technique tends to go its own way in terms of results yielded. In the strict sense, there were no observations on time perception in these studies, and the findings are more appropriately considered in the realm of attitudes, cognitions, and constructions.

An approach with more theoretical coherence and appropriate methodology has recently been taken by Kline et al. (1980). Institutionalized elderly were compared with college students in their accuracy of estimating short time intervals as a function of three levels of audible background metronome rate. The old participants differed from the young in that their time judgments showed more influence from the metronome rate. The authors conclude that "These results are consistent with the notion of increased field-dependence among older persons and suggest their greater social conformity; and their inability to ignore irrelevant stimuli might also be explicable in the same theoretical terms" (Kline et al. 1980, p. 127). This particular study is flawed by the typical problem of utilizing an opportunistic sample of young adults who do not match well with the elders, but it does at least hint that cogent research may yet be possible in this area. Direct estimations of time in the immediate situation can provide a unique source of information. We must be well informed about the parameters of the situation, however, and have a clear idea about the indexing function of time estimation. Perhaps time *perception* should be abandoned as a variable per se, with focus instead on specific operational measures that do not assume a fixed relationship between a particular way of estimating time passage and the rest of the individual's phenomenological life.

TIME PERSPECTIVE

The Concept

The time-perspective concept was introduced in a masterful essay by Lawrence K. Frank (1939), who encompassed observations from theoretical physics, human development, and cross-cultural studies. Frank's synthesis built particularly upon the work of Kurt Lewin (1935, 1936), whose field theory strongly implied that temporality must be considered as a major set of dimensions in conceptualizing individual–environment interaction.

Taking his cue from theoretical physics, Frank suggested that we view each organism as its own unique "observing field." It follows that time has different rates, both experientially and objectively, according to the characteristics of the organism. Differences in these perspectives are to be found for societies as well as for individuals. Even within the same society, different social classes employ different conceptual organizations of time which have great influence on the individual from infancy through the entire life span. He further suggested that the *range* of time perspective increases from early childhood through much of adult life. There is more to the development of time perspective than the simple elongation of futurity, however, according to Frank. Past, present, and future points of reference continually interact. We see our future through the eyes of our past, and vice versa. The future is nothing other than "that name we give to the altered dimensions of the present" (1939, p. 299). Time perspective itself is responsive to time, change, and circumstance. We are continually shifting our conceptions of past, present, and future. Some of the most powerful dynamics within our time perspective field take place outside our awareness, as when the "forgotten" past influences our orientation toward past and future.

One of the many implications of the Frank/Lewin approach is that we should not concentrate our attention on a few more or less arbitrary points in the total life span. Disengagement theory (Cumming and Henry, 1961) and life review theory (Butler, 1963), for example, emphasize particular situations in which it is proposed that individuals markedly change their orientation toward time. Such approaches tend to overestimate the stability of time perspective at other phases of life and tell us little about the specific dynamics of "time perspectiving." Frank's contribution stands as a landmark for its literate and encompassing advocacy of the organism's own organization of experience and its specific suggestions regarding that type of organization that is now known as time perspective.

Nature and Dimensions of Time Perspective

Time-perspective research has most often dealt with the extension of thought into the future (or *protension*). The length of time in which thought is spun out beyond the present is the variable. Although a useful variable, protension should not be equated with the broader concept of time perspective. Other dimensions have been identified and operationalized and should be included whenever one is interested in the actual richness and complexity of time perspective rather than in a convenient variable that can be treated simplistically. These dimensions include past extension (or *retrotension*), density, (the number of phenomenological events per unit of time), coherence (degree of organization within the past–present–future matrix), and directionality (sense of perceived rate of movement toward the future). These dimensions have emerged in a series of research and review contributions over the years (e.g., Epley and Ricks, 1963; Kastenbaum, 1961, 1964; Wallace, 1956; Wallace and Rabin, 1960; Wohlford, 1964). Problems abound in the formulation, coding, and interpretation of time perspective variables, with a number of contributions devoted to some of the methodological issues (e.g., Rakowski, 1978, 1979, 1980, in press; Ruiz et al., 1967; von Wright and Kinnunen, 1976).

The importance of considering qualitative and thematic as well as formal dimensions of time perspective has been emphasized by some (e.g., Chiriboga, 1978; Kastenbaum, 1972; Neugarten, 1979). Unfortunately, qualitative analyses have often been neglected because of the time and expense involved. A person with a relatively short but very intense and eventful future extension, for example, could be classified as a low-future person, while another is considered a high-future person because of a long but pallid and sparse extension. Obviously, the most enriching research will capture the qualitative and thematic aspects of time perspective while also carefully analyzing the components' formal dimensions. A distinction has also been made between a cognitive and a personal set. By cognitive is meant the ability to use time as an ordering principle in general, as distinguished from the way one scans his/her own past and future. This theoretical distinction has yielded an empirical distinction with the aged, as will be seen below (Kastenbaum, 1963; Krajcir and Sundberg, 1979).

It is useful to distinguish between the dimensions and qualitative aspects of time perspective on the one hand, and the act of placing phenomena into perspective on the other. A person who "lives in the

past" (or in the future) may not be showing any perspective at all, that is, not relating one "place in time" to another. Kastenbaum (1965) has proposed that perspective-taking be carefully distinguished from *engrossment*. The engrossed organism (e.g., a kitten stalking its first bird) is operating in a unified way. All of the organism is oriented by and absorbed in a situation that is experienced as a totality. In perspective-taking, however, the individual has a differentiated or divided field of awareness which also has its physical correlates (e.g., a different type of postural and respiratory pattern). The engrossment/perspective difference can be seen clearly, for example, when administering psychological tests to people with brain damage. The individual whose condition is *improving* as a result of treatment may actually make more "errors" because he can now monitor his own performance and recognizes that he is, in fact, taking a test. "That's terrible, isn't it, that's terrible," he remarks as he erases and redraws a line (actions that technically are classified as errors but psychologically represent in this instance a heightened awareness of being in a situation).

The simplest form of perspective requires that one point of attention be seen in relationship to another. In the temporal realm this takes such forms as evaluating the immediate situation in terms of its possible future consequences, and evaluating the immediate situation in terms of both past and future. More elaborate still is a flexible shifting of perspective, for example, thinking of self in the past but scanning the immediate situation and the future to develop a judgment or context of meaning for the past—but subsequently planning for the future by enlisting observations from past and present. Taking the perspective in time perspective seriously, we would distinguish between the relatively simple act of thinking 10 years forward or backward, for example, and the more complex act of recruiting and integrating several time spheres within one conceptual framework. "Perspectiving," on this view, would be a relatively mature developmental process manifesting both flexibility and stability. Engrossment remains a vital activity, however. The person who cannot "lose" himself fully in a situation is deprived of "whole-hearted" (or "whole-minded") experiences and is at a disadvantage in coping with emergencies that require an intense, all-out effort. In one of the few empirical studies to explore this distinction, Costa and Kastenbaum (1967) found that centenarians tended to put most of their memories into perspective, but showed more engrossment in recollecting events of the remote past.

IN LATER LIFE

Three general questions will be asked of the available data: (1) What are the characteristics of time perspective and related variables in later life? (2) Are these characteristics attributable to "aging," or to other sources of variation and influence? (3) What are the implications for understanding life-span development and for possible interventions? Each of these general questions will be approached within the context of more specific substantive problems.

Does Future Extension Diminish with Advancing Age?

This is one of the most obvious questions. It assumes an isomorphic relationship between objective or chronological time and subjective or psychological time construction. This is a rather naive philosophical position that has been assaulted by some gerontologists (e.g., Hendricks and Hendricks, 1975, 1976), but nevertheless deserves an empirical answer.

Two early studies found differences that the authors believe should *not* be attributed to age per se. Fink (1957) concluded that institutionalization, rather than age, accounted for the tendency of the older men in his study to be more oriented toward past than future. Within both the older and younger samples, those individuals with more interests and activities had more extensive future perspectives. Feifel (1957) did not measure future perspective directly, but assumed that older people would underestimate objective time intervals because their futures (supposedly) included fewer events of interest. His elderly respondents did tend to underestimate objective time, but the relationship was shown to be influenced by another variable, positive versus negative future outlook. People with a positive sense of futurity tended to judge passing time more accurately, regardless of their age. Both studies suggested to their authors that the perceived *quality* of time was a more authentic predictor of future extension than was the respondent's chronological age.

Subsequent studies also have not come down decisively in support of the foreshortened futurity hypothesis as a function of age. Eson and Greenfield (1962) included adolescents as well as young and old adults. They found that all the respondents tended to think mostly about the near future and that chronological age differences did not separate them out with respect to other temporal variables. The elders in this

sample were no less "hopeful" about the future than were their younger colleagues. Schoenfield (1973) found that those elders who did have plans and expectations for the near future also had higher morale.

In contrast to the small sample studies already cited, Cameron (1972) obtained 3,839 respondents to his question, "What were you just thinking about?" The samples were drawn from several communities and a variety of situations, including "on the beach" and "in hospital." Cameron concluded that "thinking of the future occurs about twice as frequently as retrospective thinking in all adult age groups" (1972, p. 118). Nevertheless, future-oriented thinking was somewhat lower for the oldest group. This did not mean that the older respondents were engaging extensively in reminiscence; rather, in comparison with the younger respondents, they were more focused on the present. The Cameron study supports the view that there is some interdependence among sphere of time concern. In this instance, an age difference in future-oriented thinking is *not* associated with increased past-orientation. In his large-scale study of daydreams, Giambra (1977) detected an across-age preference for musing about practical aspects of the present and the near future. His older respondents were not markedly less interested in the future nor more caught up in the past. Spence (1968) found the the old-old tended not to do as much planning as the young-old, but chiefly because they desired a no-change future. The key variable appeared to be desire for change or stability rather than age per se.

The distinction between cognitive and personal futurity was borne out in a study of mentally alert geriatric patients who could project future outcomes and consequences that did not directly involve them, but had little to say about their own futures (Kastenbaum, 1963). Krajcir and Sundberg (1979) took a similar approach by distinguishing between future personal events and future societal events. In their sample of community-dwelling old adults, college students, and ninth graders there were no significant correlations between personal and societal future projections in any of the groups. As in the Kastenbaum study, the older respondents demonstrated shorter personal extensions into the future (their mean future extension being 1.5 years, by comparison with more than 4 years for the college students and 3.7 for the ninth graders). Despite the difference in future extension, the groups were similar in perceiving the future as relatively pleasant. Content analysis revealed numerous differences in the events anticipated, for example, death of self was frequently mentioned by the elderly but only occasionally by the younger samples. With respect to future soci-

etal events, there was again a mixture of similarities and differences. The age groups did not differ significantly in the length of future time encompassed, but both of the adult groups were more optimistic about future happenings in society than were the ninth graders. An additional analysis revealed that those old people who did look further ahead were less likely to be depressed.

Why Do Some Old People Show
Little Concern About the Future?

The welter of studies mentioned above make it inadvisable to conclude that advancing age necessarily leads to a loss of futurity. The results are more consistent with emphases on individual differences and in more complex types of change in temporal orientation. Another way to cut across this topic is to focus on future *concerns*. This is a component of total futurity that has been included in a number of investigations that were concerned with morale, adjustment, and attitudes and which did not encompass the larger range of time-perspective variables. Fortunately, a recent study by Kulys and Tobin (1980) helps bring some order to this field. Kulys and Tobin surveyed earlier studies by Shanas, Townsend, Wedderburn, Friis, Milhoj, and Stehouwer (1968), Gurin, Veroff, and Feld (1960), Heyman and Jeffers (1965), and James (1964). Common to all was the relatively high proportion of elderly respondents who did not express concerns about the future. The Gurin et al. study, although cross sectional, also suggested that the tendency toward low future concern increases with adult age.

In their own research, Kulys and Tobin tested two conflicting hypotheses that emerged from the previous studies: Low future concern is associated with (1) a strong sense of security and competence or (2) the operation of an avoidance strategy that blanks out future threat by blanking out the future. Using a sample of men and women with a mean age of 80 who were living in the community, these researchers carried out extensive interviews that included structured tasks as well as precoded and open-ended questions and interviewers' ratings. The pattern of findings tended to support the security hypothesis. Those with high future concern were relatively "more submissive, more hostile, more anxious, [and] have less mutual understanding with their responsible others" (Kulys and Tobin, 1980, p. 124). Those with low future concern seemed to feel in command of their present situations and to be secure in their interpersonal relationships. The Kulys and Tobin study is rich in data and represents a carefully differentiated

approach from conceptualization through operationalization and analysis. It perpetuates, however, rather than solves the sticky theoretical and semantic relationship between anxiety and apprehension about what is to come (see, e.g., Krauss and Ruiz, 1967). Attempts to measure either construct tend to imply the other; therefore obtained correlations may not be as edifying as they appear. Nevertheless, this is one of the more valuable studies available, and the following observations by its authors deserve attention:

> It is apparently more appropriate and functional for the very old not to be concerned with future crises—unless the crisis is immediate or imminent—but to concentrate on available gratifications by fostering the security of existing relationships. The uncertainty that a specific crisis will occur (event uncertainty) as well as the uncertainty of when that event will occur (time uncertainty) may make planning and preparation to deal with non-imminent future crises an irrelevant activity for the older person. Why plan and prepare for something that may not occur at all or even if it does occur may be so far in the future as to negate the advisability of preparing for it? [Kulys and Tobin, 1980, p. 124].

Distance from Death and Future Outlook

The hypothesis that the subjective future foreshortens as the probable distance from death diminishes is a familiar one in life-span development and gerontology. Awareness of finitude is a key concept for Butler (1963, 1981), Marshall (1975), Erikson (1968), and the disengagment theory of Cumming and Henry (1961). All these writers (and many others) suggest that with awareness of finitude, the individual begins to reflect on and reorganize his/her life. The perception of a foreshortened futurity then leads to retrospection that has the purpose of helping the person achieve a new and perhaps final integration of self. It is on this topic that gerontologists often come closest to an existential view.

Many writers appear to accept as fact the hypotheses that (1) age guarantees awareness of finitude and (2) the prospect of death invariably foreshortens the individual's sense of futurity. Acceptance of these hypotheses is at best premature, and to this writer seems simplistic as well. Clinical experience abounds with examples of terminally ill people of various ages and of old people in particular who have not automatically reduced their future perspective (e.g., Kastenbaum et al., 1981). The individual's personality and cognitive style remain influential, as do situational factors. Furthermore, there are many ways in

which the individual's entire configuration of time-oriented thoughts (past as well as future directed) can alter; foreshortening is only one dimension, and even this dimension needs to be studied at several levels of awareness. Moreover, chronological age is a poor and unreliable substitute for direct measures of the individual's experiential system, as Marshall (1975) well demonstrates.

In a set of particularly interesting clinical studies, Schulz (1976) and Schulz and Hanusa (1977) demonstrated that a simple modification of the interpersonal environment can lead to a stronger hold on futurity. The researchers made it possible for residents of geriatric institutions to predict and control the frequency and duration of visits by college undergraduates. This procedure, in effect, gave the future back to the old men and women. Both immediate and follow-up results indicated that given even a small degree of leverage and control, the aged participants became more involved in futurity and appeared to show other psychological and physical benefits as well. The studies by Schulz and his colleagues did not include specific dimensionalized analyses of time perspective, but did include scales whose item content assessed hopefulness and other aspects of future orientation. Their experimental findings are consistent with descriptive studies which suggest that the institutionalized old person's limited sense of futurity may be closely related to the attitude that one has little influence over what time brings forth, that is, the locus of control is not within one's self (Fawcett et al., 1976; Felton and Kahana, 1974). Chang (1977) has also found that the sense that one has the ability to control or at least influence daily life is perhaps the strongest contributor to morale (and the morale variable includes key items regarding futurity). The general implication of studies such as these is that the future outlook of old people, even in the institutional setting, should not be regarded as immutable. The future can become more relevant, eventful, and appealing, depending on the individual's specific relationship with his/her environment. This tends to weaken the position that there is a firm link between age, awareness of finitude, and constriction of personal futurity.

Despite the centrality of the death-foreshortens hypothesis, few studies have addressed themselves to its validity or its nuances. It is more common to treat chronological age as index or equivalent to a direct measure of the individual's sense of futurity and, as already noted, to assume that everybody reformulates their lives and does so at pretty much the same time. This view does not square with observations of individual differences in or out of the laboratory. Chappell (1975) found that most of the terminally ill elderly patients in her sample were quite aware that death was near; nevertheless, they dis-

played a variety of time perspectives. Some of her respondents re-
garded the future as "Not very important, I have nothing to look
forward to, I try not to think about the future. I've lived my life, I'm
tired." It was just as common, however, to hear that the future "is
important. I'll be passing away soon but I've still got things to do, or I
wouldn't still be here" (Chappell, 1975, p. 335). Both the nature and
the diversity of the time perspectives collected by Chappell are similar
to those reported by Weisman and Kastenbaum (1968) and Kasten-
baum and Weisman (1972) in their psychological autopsy series with an
independent set of terminally ill elders. It should be added that only a
minority of cases provide clear examples for full-fledged disengage-
ment or life review processes. Not all people appear to engage in the
type of thorough-going life review that theoreticians envision.

   Chellam (1964, 1977) contributed one of the few attempts at a
direct test of disengagement-theory postulates related to time and
death. She found that "self engagement" and "awareness of death"
were both common among the elderly people in Cleveland and To-
ronto samples, but found no clear evidence that self-engagement in-
creases progressively with age. Although she concluded that awareness
of death was "congruent" with self-engagement in old age, the rela-
tionship between these variables remained not entirely clear. Keith (in
press) appears to be the first to have studied a related phenomenon
that has often been observed but seldom reported, namely, that many
respondents do not quantify their future extension (or time-remaining-
until-death). Almost half of her small-town-dwelling elders did not
quantify the remaining portion of life. Age did not differentiate the
quantifiers and nonquantifiers within a sample that ranged from 72 to
99 (median age 79). Those who did specify the number of years they
thought they had remaining tended to have more future plans. Keith
interprets this finding as supporting the proposition that awareness of
death may promote organization of time (reorganization of time might
be the most appropriate concept). She further notes that "individuals
who specified years remaining had more favorable attitudes toward
death, supporting the hypothesis from dissonance theory that attitudes
toward events recognized as inevitable will be more positive." Keith
emphasizes that in her sample, planning for the future was not asso-
ciated with attitudes toward death. She concludes that "concern with
death then may constrain some perceptions of the future but not
others." This appears also to be a reasonable statement to summarize
present knowledge in this area in general, if we may add that the
influence and constraints of death awareness also vary from person to
person within any adult age group.

There is no question that distance from death is a relevant and significant variable in gerontology, as Lieberman and Coplan (1970) have pointed out, but chronological age and objective probable distance from death are of themselves empty variables and need to be enriched with real data.

The Uses of the Past

Gerontology has started to transcend the commonplace notion that "old people live in the past," as well as the value judgment that cultivating and utilizing the past is somehow improper or pathological. Paradoxically, there has never been any question about the importance of memory, yet the old person who does engage in remembrances runs the risk of being considered senile or at least out of step with society's temporal priorities. From the conceptual standpoint, systematic attention needs to be focused on the relationship between phenomena traditionally encapsulated within the domain of memory research and both the retrotensive and protensive functions of time perspective. These areas have yet to be brought into alignment. Such a task exceeds the scope of this chapter, but one might be alert to the mutual implications of memory and time-perspective phenomena.

McMahon and Rhudick (1967) helped to awaken gerontology to the adaptive functions that reminiscing can serve for the aged. Their study of Spanish-American War veterans found a positive relationship between frequency of reminiscence and ego strength and stability of the self-concept. Several subsequent studies also found that the tendency to reminisce was associated with various measures of adjustment and life satisfaction (Boylin et al., 1976; Havighurst and Glasser, 1972; Lewis, 1970). In his analysis of the conversations of elderly people, Coleman (1974) found that the most frequent type of reminiscence drew out material that was pleasurable to the speaker and supportive to his/her self-image, while another frequent type was informational, the speaker "teaching" the listeners. The relationship between reminiscence and adjustment was complex in Coleman's study, involving an interaction with type of reminiscence and sex differences. Lieberman and Falk (1971) obtained the life stories of both middle-aged and elderly people who, like most of the participants in the studies already cited, were residing in the community. While the middle-aged respondents tended to use past experiences to solve current problems, the elderly sample tended to use the past chiefly to derive personal satisfaction, a sort of warm glow from the embers.

It may be important to distinguish carefully between private and interpersonal reminiscence. As Romaniuk (1979) notes, "The private review of past events and experiences is generally considered to be an evaluative process involving large segments of one's past life and ultimately serving a positive adaptive function" (p. 2). The specific functions of interpersonal reminiscence have not been completely clarified, but one would expect that maintaining and enhancing social status and influencing the thoughts and actions of others might be factors of greater importance here than in private review. In Romaniuk's own study an attempt was made to differentiate various uses of reminscence among a population drawn from three private retirement communities. The respondents considered themselves to engage in more private than public reminiscence, with only about one-fifth of the sample using interpersonal exchange as their primary vehicle. Most of the respondents reported some degree of life review activity in the Butlerian sense of the term. A Self-Regard/Image Enhancement factor proved to account for the greatest number of reminiscences. The item within this factor that had the highest response percentage was reminiscence as a pleasurable form of self-stimulation. The two other factors obtained for uses of reminscence were Present Problem Solving and Existential/Self-Understanding. The Romaniuk study deserves follow-up and extension: clearly, there are multiple possible uses of the past and neither useful theory nor intervention is likely unless these differences are acknowledged.

Lo Gerfo (1981) has recently suggested that three basic types of reminscence be distinguished: informative, evaluative, and obsessive. It is the latter type that has given concern with the past much of its bad name. Distinguishing this more problematic type of reminiscence from the other kinds may help to explain some of the differences in research findings (not all of which have been covered in this review) and also guide interventions. Several types of intervention are described by Lo Gerfo, who also issues the useful reminder that an essentially valuable type of reminiscence "can become obsessive and dysfunctional" under the weight of guilt or despair. This useful paper unaccountably neglects the purely pleasurable aspects of reminscence that show up so clearly in the research literature.

It must be added here that as in other areas of time-perspective research, age per se does not invariably arise as the decisive variable. Fallot (1979), for example, found that people tended to rate themselves as in a more pleasant mood during reminiscence as compared with nonreminiscent contexts, but that age (within the middle-to-old-age range) was *not* a discriminating variable. "Talking about the

past . . . proved a relatively more positive experience than talking about the present and future. . . . The attribution of this positive aspect of remiscing to an age-specific process, however, finds no support in these data" (Fallot, 1979, pp. 396–397).

The relationship between uses of the past and of the future in old age remains to be clarified. We should not expect the relationship to be simple since, taken separately, both retrotension and protension are quite complex.

Kastenbaum (1972) identified five types of retrospective modalities (life review, validation, boundary-setting, perpetuation of the past, and replay), each of which has distinctive implications for the individual's relationship to the present situation and to futurity. The "replay" modality, for example, is seen as a strategy for loosening the temporal moorings of experience and substituting a kind of private ritual for the objective world of foreshortened futurity and impending death. Revere and Tobin (1981) have arrived at a rather similar conclusion, emphasizing the creation of poignant personal myths whose implications for futurity require further understanding.

THE "WHY" OF TIME PERSPECTIVE
IN LATER LIFE

The texture and functions of time perspective in later life are nearly as rich and varied as the people themselves. How the individual shapes the past and the future offers one of our most valuable sources of information about the meanings that life has accumulated.

It seems reasonably clear, however, that chronological age as such is only one variable among many. Some examples have been given in passing of the limitations of chronological age in accounting for the old person's orientation to time. There is also an abundant general literature in time perspective that reveals the operation of many psychological, sociological, health-related, and environmental/situational variables. Social class (LeShan, 1952), unemployment (Israeli, 1935), internal versus external control (Platt and Eisenman, 1968), achievement motivation (Gjesme, 1979), and dogmatism (Zurcher et al., 1967) are among some of the variables that have been found related to time perspective. The pioneering work of Nathan Israeli (1935, 1936) is especially relevant. By means of "future autobiographies" and other techniques, he found a wide variety of worlds projected ahead by both

normal and mentally ill populations. Perhaps most interesting to gerontologists are his descriptions of limited and barren futurities of the sort one might expect to find in the aged. These dysphoric futures, however, were expressed by young and middle-aged adults who had been experiencing a variety of disappointments, frustrations, and stresses. Teahan and Kastenbaum (1970) similarly found a striking parallel between the future perspectives of "hard-core unemployed" men and of depressed aged. As numerous studies have shown, the "no-future future" is but one type of orientation among older people and fails to represent adequately the variety of person and situation. The distinction between "old" and "old and sick" is also represented in constructions of temporal experience, as Levy (1978) has shown.

Systematic research and integrative theory are much needed from the life-span standpoint. We are not completely lacking comparisons with younger adults and children, but well-designed studies with compatible and converging methodology should be among the priorities in this area. While the same can be said for many other areas of research, there is a special reason for encouraging the life-span approach to temporal experience. Each individual is his/her own life-span theorist. In studying time perspectiving, we learn how people have been organizing their lives all along, without recourse to the life-span theory that we are just gradually formulating now. Before imposing general theory, then, it might be sensible to learn more about how the widest possible variety of people construct and reconstruct their own life-span psychologies.

REFERENCES

Bergson, M. *Creative evolution*. New York: Henry Holt and Company, 1911 (A. Mitchell, translator).

Boylin, W., Gordon, S. K., and Nehrke, M. E. Reminiscing and ego integrity in institutionalized males. *The Gerontologist*, 1976, *16*, 118–124.

Butler, R. N. The life review: An interpretation of reminiscence in the aged. *Psychiatry*, 1963, *26*, 65–76.

Butler, R. N. The life review: An unrecognized bonanza. *International Journal of Aging & Human Development*, 1981, *12*, 35–39.

Cameron, P. The generation gap: Time orientation. *The Gerontologist*, 1972, *12*, 117–119.

Chang, B. L. The relationship of generalized expectancies and situational control of daily activities to morale of the institutionalized aged. Presented to The Gerontological Society, San Francisco, 1977.

Chappell, N. L. Awareness of death in the disengagement theory: A conceptualization and an empirical investigation. *Omega*, 1975, *6*, 325–344.

Chellam, G. The disengagement theory: Awareness of death and self-engage-ment. Doctoral Dissertation, Case Western Reserve University, 1964.

Chellam, G. Awareness of death and self-engagement in later life: The en-gagement continuum. *International Journal of Aging and Human Develop-ment*, 1977, *8*, 111–178.

Chiriboga, D. A. A life course perspective. *Journal of Gerontology*, 1978, *33*, 388–393.

Coleman, P. G. Measuring reminiscence characteristics from conversation as adaptive features of old age. *International Journal of Aging & Human Development*, 1974, *5*, 281–294.

Costa, P., and Kastenbaum, R. Some aspects of memories and ambitions in centenarians. *Journal of Genetic Psychology*, 1967, *110*, 3–16.

Cumming, R., and Henry, W. E. *Growing old*. New York: Wiley, 1961 (re-printed: New York: Arno Press, 1980).

Doob, L. *Patterning of time*. New Haven: Yale University Press, 1971.

du Nouy, L. *Biological time*. New London: Methuen, 1936.

DuPont, M. A. A provisional contribution to the psychoanalytical study of time. *International Journal of Psychoanalysis*, 1974, *55*, 483–484.

Epley, D., and Ricks, D. F. Foresight and hindsight in the TAT. *Journal of Genetic Psychology*, 1963, *27*, 51–59.

Erikson, E. H. *Identity: Youth and crisis*. New York: W. W. Norton, 1968.

Eson, M. E., and Greenfield, N. Life space: Its content and temporal dimen-sions. *Journal of Genetic Psychology*, 1962, *100*, 113–120.

Fallott, R. D. The impact on mood of verbal reminiscing in later adulthood. *International Journal of Aging & Human Development*, 1979, *10*, 385–400.

Fawcett, G., Stonner, D., and Zepelin, H. Locus of control perceived, con-straint, and morale among institutionalized aged. Presented to The Ge-rontological Society, New York, 1976.

Feifel, H. Judgment of time in younger and older persons. *Journal of Geron-tology*, 1957, *12*, 71–74.

Felton, B., and Kahana, E. Adjustment and situationally-bound locus of con-trol among institutionalized aged. *Journal of Gerontology*, 1974, *29*, 295–301.

Fink, H. H. The relationship of time perspective to age, institutionalization, and activity. *Journal of Gerontology*, 1957, *12*, 414–417.

Fraisse, P. *The psychology of time*. New York: Harper & Row, 1963.

Frank, L. K. Time perspectives. *Journal of Social Philosophy*, 1939, *4*, 293–312.

Frankenheuser, M. *Estimation of time: An experimental study*. Stockholm: Almguist & Witzell, 1959.

Giambra, L. M. Adult daydreaming across the life-span: A replication, further analyses, and tentative norms based upon retrospective reports. *Interna-tional Journal of Aging & Human Development*, 1977, *8*, 197–228.

Gjesme, T. Future time orientation as a function of achievement motives, ability, delay of gratification, and sex. *Journal of Psychology*, 1979, *101*, 173–188.

Gurin, G., Veroff, J., and Feld, S. *Americans view their mental health: A nationwide interview study*. New York: Basic Books, 1960.

Havighurst, R. J., and Glasser, A. An exploratory study of reminiscence. *Journal of Gerontology*, 1972, *27*, 245–253.

Hendricks, C. D., and Hendricks, J. Historical development of the multiplicity of times and implications for the analysis of aging. *The Human Context*, 1975, *7*, 117–129.

Hendricks, C. D., and Hendricks, J. Concepts of time and temporal construction among the aged, with implications for research. In J. F. Gubrium (Ed.), *Time, roles, and self in old age*. New York: Human Sciences Press, 1976, pp. 13–49.

Heyman, D., and Jeffers, F. Observations on the extent of concern and planning by the aged, for possible chronic illness. *Journal of the American Geriatric Society*, 1965, *13*, 152–159.

Hume, D. *An enquiry concerning the human understanding*. (1748).

Israeli, N. *Outlook upon the future of British unemployed, mental patients, and others*. New York: Science Press, 1935.

Israeli, N. *Abnormal personality and time*. New York: Science Press, 1936.

James, R. I. *Edmonton senior residents' survey report*. Edmonton, Alberta: Edmonton Welfare Council, 1964.

James, W. *The principles of psychology*. New York: Holt, 1890.

Janet, P. *L'evolution de la memoire et de la notion de temps*. Paris: Chahine, 1928.

Kant, I. *Critique of pure reason*. (1781).

Kastenbaum, R. The dimensions of future time perspective, an experimental analysis. *Journal of General Psychology*, 1961, *65*, 213–218.

Kastenbaum, R. Cognitive and personal futurity in later life. *Journal of Individual Psychology*, 1963, *19*, 216–222.

Kastenbaum, R. The structure and function of time perspective. *Journal of Psychological Researches* (India), 1964, *8*, 1–11.

Kastenbaum, R. Engrossment and perspective in later life. In R. Kastenbaum (Ed.), *Contributions to the psychobiology of aging*. New York: Springer Publishing Co., 1965, pp. 3–18.

Kastenbaum, R. As the clock runs out. *Mental Hygiene*, 1966, *50*, 332–336.

Kastenbaum, R. Time, death and ritual in old age. In J. T. Fraser and N. Lawrence (Eds.), *The study of time. II*. New York: Springer-Verlag, 1972, pp. 20–38.

Kastenbaum, R., and Weisman, A. D. The psychological autopsy as a research procedure in gerontology. In D. P. Kent, R. Kastenbaum, and S. Sherwood (Eds.), *Research, planning, and action for the elderly*. New York: Behavioral Publications, Inc., 1972, pp. 210–217.

Kastenbaum, R., Barber, T. X., Wilson, C., Ryder, B. C., and Hathaway, C. B. *Old, sick, and helpless: Where therapy begins*. Cambridge: Ballinger Press: 1981.

Keith, P. M. Perceptions of time remaining and distance from death. *Omega*, in press.

Kline, D. W., Holleran, L., and Orme-Rogers, C. The estimation of short time intervals as a function of age and metronome pacing. *International Journal of Aging & Human Development*, 1980, *11*, 127–134.

Krajcir, S. F., and Sundberg, N. D. Future time perspectives in old age, adulthood, and youth. Presented to American Psychological Association, New York, 1979.

Krauss, H. H., and Ruiz, R. A. Anxiety and temporal perspective. *Journal of Clincial Psychology*, 1967, *23*, 340–341.

100 BEHAVIORAL AND SOCIAL SCIENCES

Kuhlen, R. G., and Monge, R. H. Correlates of estimated rate of time passage in the adult years. *Journal of Gerontology*, 1968, *23*, 427–433.

Kulys, R., and Tobin, S. S. Interpreting the lack of future concerns among the elderly. *International Journal of Aging & Human Development*, 1980, *11*, 111–126.

LeShan, L. L. Time orientation and social class. *Journal of Abnormal & Social Psychology*, 1952, *47*, 589–592.

Levy, S. M. Temporal experience in the aged: Body integrity and the social milieu. *International Journal of Aging & Human Development*, 1978, *9*, 313–344.

Lewin, K. *Dynamic psychology*. New York: McGraw-Hill, 1935.

Lewin, K. *Principles of topological psychology*. New York: McGraw-Hill, 1936.

Lewis, C. N. Reminiscing and self-concept in old age. *Journal of Gerontology*, 1970, *26*, 240–243.

Lieberman, M. A., and Coplan, A. S. Distance from death as a variable in the study of aging. *Developmental Psychology*, 1970, *2*, 71–84.

Lieberman, M. A., and Falk, J. M. The remembered past as a source of data for research on the lifecycle. *Human Development*, 1971, *14*, 132–141.

Lo Gerfo, M. Three ways to reminiscence in theory and practice. *International Journal of Aging & Human Development*, 1981, *12*, 39–48.

Marshall, W. Age and awareness of finitude in developmental gerontology. *Omega*, 1975, *6*, 113–129.

McMahon, A. W., and Rhudick, P. J. Reminiscing in the aged: An adaptational response. In S. Levin and R. Kahana (Eds.), *Psychodynamic studies on aging*. New York: International Universities Press, 1967, pp. 64–78.

Neugarten, B. L. Time, age and the life cycle. *American Journal of Psychiatry*, 1979, *136*, 887–893.

Neuringer, C., Levenson, M., and Kaplan, J. M. Phenomenological time flow in suicidal, geriatric and normal individuals. *Omega*, 1971, *2*, 247–252.

Nichols, H. The psychology of time. *American Journal of Psychology*, 1890, *3*, 453–529.

Platt, J. J., and Eisenman, R. Internal–external control of reinforcement, time perspective, adjustment, and anxiety. *Journal of General Psychology*, 1968, *79*, 121–128.

Rakowski, W. Reporting and coding expected life-events as concerns in time perspective research. Presented to The Gerontological Society, Dallas, 1978.

Rakowski, W. Future time perspective in later adulthood: Review and research directions. *Experimental Aging Research*, 1979, *5*, 43–88.

Rakowski, W. Comparability and short-term reliability of personal future extension among older adults. Presented to The Gerontological Society, San Diego, 1980.

Rakowski, W. Methodological considerations for research on late life future temporal perspective. *International Journal of Aging & Human Development*, in press.

Revere, V., and Tobin, S. S. Myth and reality: The older person's relationship to his past. *International Journal of Aging & Human Development*, 1981, *12*, 15–26.

Romaniuk, M. The function of reminiscence for older adults. Presented to American Psychological Association, New York, 1979.

Ruiz, R. A., Reivich, R. S., and Krauss, H. H. Tests of temporal perspective: Do they measure the same construct? *Psychological Reports*, 1967, *21*, 849–852.

Schneider, D. E. Time-space and the growth of the sense of reality: A contribution to the psychophysiology of the dream. *Psychoanalytic Review*, 1948, *35*, 278–291.

Schoenfeld, D. Future commitments and successful aging: I. The random sample. *Journal of Gerontology*, 1973, *28*, 189–196.

Schulz, R. The effects of control and predictability on the psychological and physical well-being of the institutionalized aged. *Journal of Personality & Social Psychology*, 1976, *33*, 563–573.

Schulz, R., and Hanusa, B. H. Long-term effects of control and predictability enhancing interventions: Findings and ethical issues. Presented to The Gerontological Society, San Francisco, 1977.

Shanas, E., Townsend, P., Wedderburn, D., Friis, H., Milhoj, P., and Stehouwer, M. *Older people in three industrial societies*. New York: Atherton Press, 1968.

Spence, D. L. The role of futurity in aging adaptation. *Gerontologist*, 1968, *8*, 180–183.

Teahan, J., and Kastenbaum, R. Subjective life expectancy and future time perspective as predictors of job success in the "hard-core unemployed." *Omega*, 1970, *1*, 189–200.

von Wright, J., and Kinnunen, R. On the scaling of future time. *Perceptual and Motor Skills*, 1976, *43*, 1235–1241.

Wallace, M. Future time perspective in schizophrenia. *Journal of Abnormal & Social Psychology*, 1956, *52*, 240–245.

Wallace, M., and Rabin, A. I. Temporal experience. *Psychological Bulletin*, 1960, *57*, 213–236.

Weisman, A. D., and Kastenbaum, R. *The psychological autopsy: A study of the terminal phase of life*. New York: Behavioral Publications, Inc., 1968.

Wohlford, P. An investigation into some determinants of extension of future time. Dissertation, Duke University, 1964.

Zurcher, L. A., Willis, J. E., Ikard, F. F., and Dohme, J. A. Dogmatism, future orientation, and perception of time. *Journal of Social Psychology*, 1967, *73*, 205–209.

Social-Psychological Correlates of Longevity

Prof. Dr. Ursula M. Lehr
Psychology Institute
University of Bonn
Bonn, West Germany

LONGEVITY: A SIGN OF OUR TIME?

For ages man has dealt with the problems of whether and how human life might be prolonged. Lueth (1965) provides a historical overview which reaches back to the stone age, introduced by a quotation from C. H. Schultz (1842): "The idea of the rejuvenation of human life is as old as science, if not as old as the human race itself" (p. 5). "Rejuvenation" is used here to denote regeneration and revitalization as well as prolongation of life. Otsuka (1979) points out historical aspects in the efforts of oriental medicine to expand the length of life, and in his historical overview Gruman (1966) describes the multitude of hypotheses and ideas regarding prolongevity (life prolongation) that date back primarily to the beginning of the nineteenth century: "a concept like prolongevity reflects almost equally the influence of philosophy, religion, science and medicine" (p. 3). Of course, longevity and prolongevity must not be used as synonyms. The concept of longevity is used when the age an individual has reached substantially surpasses his or her average life expectancy; prolongevity is "defined as the significant extension of the length of life by human action" (Gruman 1966, p. 3). All efforts, however, to bring about a prolongation of life should be based upon a knowledge of the factors of longevity—just as, con-

versely, the factors of longevity can be inferred within certain limitations from successful efforts to bring about prolongevity. But the point here is not only to add years to life but to add life to years; not only to prolong the length of human life, but rather to secure "an extension of the healthy and productive period of life" (Fries, 1980).

Since time immemorial suggestions on how to attain old age, while maintaining physical and psychological well-being, have incorporated not only medical but psychological and sociological aspects as well: Physical activity and adequate nutrition were already stressed by Hippocrates (460–377 B.C.) and Galen of Pergamon (120–199 A.D.). Moreover, Plato (427–347 B.C.) and Cicero (106–43 B.C.) emphasized the necessity of intellectual activity and mental training, and Cicero mentioned the importance of social aspects. Finally, in his book called *Macrobiosis, or The Art of Prolonging Human Life,* Hufeland (1796) underscored the multidimensionality of the determinants of a long life, naming, as already mentioned, intellectual activity and sensorial stimulation. None of these assertions, however, was proved by empirical research. Obviously, suggestions of the above kind found only limited acceptance or were ineffective, for the highly rated longevity was but rarely encountered.

The Increase in Average Life Expectancy and Changes in Demography

In ancient Greece during the time of Pericles, life expectancy averaged 20 years; in the middle of the nineteenth century life expectancy in the Western world averaged about 35 years. Current life expectancy is 70.4 years in highly developed countries and 49.6 years in the less developed nations. By the year 2000 average life expectancy is expected to increase by 2.8 years in the more developed countries to 73.2 years, but in the less developed countries by as much as 15.7 years to an average of 65.3 years.

These average figures are problematic, however, because they reflect infant and child mortality rates. And yet these statistics show, not only that there is an increase of the average life expectancy today, but that there is also a high probability that many individuals will reach a very old age. The proportion of people over age 65 is increasing rapidly. This group amounted to only 5 percent of the German population a century ago, but is now at 15 percent, surpassed only by the German Democratic Republic with 16 percent above age 65 (see Table 5-1).

Although the total population of the more developed countries is expected to increase between 1970 and 2000 by 33 percent, the proportion of those over 60 years of age will increase by 58 percent. In the

Table 5-1
Population by Age

| Country | Year | Percentage of the population of Age . . . to Under Age . . . | | | | |
		under 15	15–30	30–45	45–65	65 and over
Europe						
Austria	1978	22	22	19	21	15
Belgium	1978	21	24	19	23	14
Bulgaria	1978	22	22	20	24	11
Czechoslovakia	1978	24	24	19	21	12
Denmark	1978	22	22	21	22	14
Federal Rep. of Germany (West Germany)	1978	19	22	21	22	15
Finland	1978	21	25	21	21	12
France	1979	22	24	19	21	14
German Democr. Rep. (East Germany)	1978	20	24	20	20	16
Greece	1978	23	21	20	23	13
Hungary	1977	21	23	20	23	13
Iceland	1978	28	28	17	18	10
Ireland	1976	31	24	15	19	11
Italy	1978	23	22	20	22	13
Luxembourg	1977	20	23	21	23	13
Malta	1978	24	28	20	19	9
Netherlands	1977	24	25	20	20	11
Norway	1978	23	23	18	22	14
Poland	1976	24	28	18	20	10
Portugal	1978	28	24	18	20	10
Rumania	1978	26	23	19	21	10
Spain	1976	27	23˙	19	21	10
Sweden	1978	20	21	20	23	16
Switzerland	1978	20	23	21	22	14
Turkey	1975	40	27	16	12	5
United Kingdom	1978	22	22	19	23	14
USSR	1974	36	15	28	16	5
Yugoslavia	1975	26	26	21	19	9
Africa						
Algeria	1977	48	25	13	10	4
Ethiopia	1977	43	27	17	11	3
Libya	1976	49	22	15	10	4
Morocco	1978	46	27	15	10	3
Mauritius	1977	36	32	15	13	4
Tunisia	1976	44	26	15	12	4
Zaire	1979	45	26	16	11	3

Table 5–1 (continued)

Country	Year	Percentage of the population of Age . . . to Under Age . . .				
		under 15	15–30	30–45	45–65	65 and over
Americas						
Argentina	1978	29	25	19	20	8
Bolivia	1976	42	27	15	12	4
Brazil	1977	41	28	16	12	3
Canada	1978	24	28	19	19	9
Chile	1978	34	28	18	14	5
Colombia	1979	41	30	15	11	3
Haiti	1977	41	27	15	12	4
Honduras	1977	48	26	14	10	3
Mexico	1979	46	27	14	9	3
Nicaragua	1977	48	27	13	9	3
Panama	1977	43	26	15	12	4
United States	1978	23	27	18	20	11
Venezuela	1977	43	29	14	11	3
Asia						
China (Taiwan)	1978	33	32	16	15	4
Cyprus	1978	25	29	19	17	10
India	1977	41	27	17	12	3
Indonesia	1971	44	24	19	11	3
Iran	1976	45	25	15	12	4
Iraq	1979	48	27	12	10	3
Israel	1977	33	27	16	16	8
Japan	1979	24	22	24	21	9
Jordan	1975	47	25	15	9	3
South Korea	1975	39	28	18	12	3
Kuwait	1976	44	27	19	8	2
Pakistan	1977	45	22	16	13	4
Philippines	1978	42	29	15	11	3
Singapore	1979	28	34	19	14	5
Sri Lanka (Ceylon)	1976	39	28	16	13	4
Syria	1977	49	23	14	10	4
Thailand	1977	43	28	15	11	3
Yemen, Democr. People's Rep.	1977	49	22	15	10	4
Australia and Oceania						
Australia	1977	27	26	19	20	9
Fiji Islands	1976	41	30	16	10	3
New Zealand	1978	28	26	18	18	10
Papua-New Guinea	1976	44	25	15	12	4

From: *World Population Prospects Beyond the Year 2000.* (Population Studies No. 49). New York: United Nations, 1971.

less developed countries over the same time span the prospects are a 98 percent increase in total population and an increase of 158 percent for the proportion of people 60 years and older.

In 1970, 154 million people over 60 years of age were living in the more developed countries, compared to 137 million in the less developed countries. The expected figures for the year 2000 are: 231 million people over 60 in the more developed countries, but 354 million in the less developed countries, which is an increase of 65 percent (Beattie, 1975). Demographic changes are attracting increasing scientific interest (cf. Beaudet and Coberly, 1981; Christian and Baker, 1979; Conrad, 1980; Fujii, 1980; and Myers, 1978).

The "graying world," to use Hauser's (1976) expression, which is thus emerging constitutes a direct challenge to scientists to discuss the question of longevity combined with a state of psychophysiological well-being. What can be done to assure the quality of life in old age?

Recent Scientific Discussions
Concerning "Longevity"

At the International Congress of Gerontology held in Tokyo in 1978, the topic "Survivor—Non-survivor" was discussed in several symposia and interdisciplinary sessions. Dalakishvicy, Chichinadze et al. (1978) reported results of their study of 150 individuals in Georgia (USSR) aged 100 years or older and suggested that "besides biological, psychosocial factors should be observed" (p. 58). Anderson and Cowan (1978) reported on their 17-year follow-up study on the theme "Survival of Healthy Older People" in Glasgow, Scotland (p. 58). In his presentation on "Organizational Hierarchical Aspects of Longevity," Reiff (1978) stated that "prevention of biological, psychological and sociologic atrophy of chronologically based mandatory retirement, re-education of older persons, and attitudinal changes may play major roles in bringing about a lengthening of the healthy human life span to well over a century" (p. 60). O'Brien's (1978, pp. 173–174) longitudinal study of the influence of social and economic factors on longevity showed that only "a set of life-style patterns," but no single factor, could be directly related to longevity.

Several biological factors were discussed: "Physiological and Molecular Factors in Life Span Differences" (Sacher et al., 1978); "Evaluation of Longevity and DNA Repair Processes in Mammals" (Hart and Hall, 1979); "Growth Components, Aging and Longevity" (Lints, 1978); and "Immune Regulation and Longevity" (Williams, Yunis et al., 1978). The work by Andres dealt with clinical geriatrics: "Lack of

Effect of Mild and Moderate Obesity on Longevity" (1978); "Physical Fitness and Life Expectancy" was the topic of Ogawa and Nakajima (1978); Hatano and his co-workers (1979) spoke on "Risk Factors for Mortality of the Elderly as Observed in Japanese Old People's Homes." Busse (1979) contributed a report on longevity based on the findings of the Duke longitudinal study.

The problem of longevity was also one of the central topics of the 32nd Annual Meeting of the Gerontological Society, held in Washington in December 1979. Based on the results of their longitudinal study, Steuer, LaRue, and Jarvik (1979) discussed aspects of *critical loss*, the decline of certain functional abilities during the final years prior to death. Critical loss previously established in the earlier evaluation of their longitudinal study, however, could not be demonstrated where death occurred after age 80. The sample of these by now very old people decreased to 22 persons; at the final follow-up, however, there were only 10 survivors and 12 nonsurvivors whose data could be compared from first to last measurement point.

Jean et al. (1979) also presented a "Late Life Decline Model." Faulkner, Heisel, and Ross (1979) analyzed the circumstances and conditions to be found shortly prior to death in a group of 67 nonsurvivors who died between 1972 (year of first measurement) and 1979, the year of the last measurement of the longitudinal study, which included 82 survivors. Length of hospitalization, time spent bedridden, and causes of death were noted. Group differences between survivors and nonsurvivors were found for self-concept, life satisfaction, and social interaction.

Bartone and Lieberman (1979) studied the "psychological correlates of impending death" and discussed the decline of specific abilities described in the literature as supposedly beginning five years prior to death. Their sample consisted of 386 individuals between the ages of 40 and 80, of whom 41 (over the age range from 45 to 79 years) had died within five years. Comparison of matched pairs resulted in the finding that the "Death-Near" group had subjectively perceived poorer health status, engaged in fewer activities, showed more psychiatric symptoms, reported a larger number of "stressful life events," and more frequently reported death themes in their early childhood recollections than did the "Death-Far" group.

Scott and Collins (1979) investigated the correlation between experienced stress situations and longevity. Mayer (1979) presented a "biocultural theory" and tried to show "how selection for longevity could have effected a positive feedback loop between inclusive fitness and social support networks" (p. 114f).

The topic of longevity was also discussed in several papers at the

33rd Annual Scientific Meeting of the Gerontological Society of America (San Diego, November 1980). One symposium concentrated on "macrolongevity" (Freeman, 1980) , and within its context Gruman and Freeman (1980) discussed historical and possible future aspects. Mazess reported on "Supposed Longevity in Southern Ecuador" (1980), while Brown (1980) presented genetic determinants of longevity, and Masters (1980) discussed the influence of proteins. Results of experimental biological studies concerning the role of DNA replication in influencing the life span were also reported at this 1980 meeting by Brash and Wani; Courtney and Getz; Hall, Bergmann, and Walford. In addition, Loeb reported on "Fidelity and Infidelity of DNA-Replication," and special aspects of the influence of DNA structures on longevity were further discussed by Lipetz, Smith-Sonneborn, and Stephens, as well as by Friedovich. Another interesting contribution based on the data of the Duke longitudinal study (Woodbury and Monton) analyzed risk factors: "There are significant differences in the risk factors and risk factor changes between the elderly and the middle-aged study population" (1980, p. 231). Results of the Framingham study, based upon a population that was approximately 30 years younger, could not be confirmed. The latter report was one of the few contributions which dealt with the psychological and social correlates of longevity, while the overall discussion concentrated on biological aspects.

The problem of longevity received major attention at the 12th International Congress of Gerontology in Hamburg in July 1981. The interdependence of physiological, biological, ecological, and social-psychological factors of longevity were demonstrated by a number of reports on centenarians from Japan (Matsuzaki et al., 1981; Oikawa et al., 1981; Sakugawa and Suzuki, 1981; Suzuki et al., 1981), from Ecuador (Mazess, 1981; Nagahori, 1981), from Pakistan (Nagahori, 1981), from the Caribbean (Schwartz and Snyder, 1981), and from the Federal Republic of Germany (Franke and Schramm, 1981) as well as by studies on over-90-year-olds from Scotland (Conacher and Sclare, 1981), the USSR (Korkushko, 1981; Mankovsky and Mints, 1981), and China (Krkang et al., 1981; Yushen et al., 1981). Familiar influences on longevity were discussed in reports on studies from Canada (Philippe, 1981) warning against excessive attention to genetic factors and pointing to the importance of comparable living and environmental circumstances.

Correlations between physical and intellectual activity, which in turn are strongly influenced by subjectively perceived health status, were shown in the results of studies by Zonneveld (1981), Lehr, Schmitz-Scherzer, and Thomae (1981), and by Lehr (1981). Finally

Jarvik (1981) discussed the possibility of predicting longevity based on findings from various longitudinal studies.

Despite the dominance of medical and biological research on problems of longevity, there is no doubt that an intensification of interdisciplinary approaches will be required in view of the causation or correlates of longevity, as well as the practical consequences resulting from increased life expectancy (cf. Beaudet and Coberly, 1981; Bynum, 1979) upon almost every aspect of life. Inevitably, these consequences will bring about changes, not only for the health care system, but also for the labor market, for the economy, for retirement and pension policy, for family relations, and, last but not least, for the social welfare system—consequences which were discussed as early as 1976 in the conference on "Extending the Human Life Span: Social Policy and Social Ethics" (Neugarten and Havighurst, 1977).

Longevity: An Interdisciplinary Problem

In his address to the plenum of the 11th International Congress of Gerontology in Tokyo in 1978 on "Progress and Trends in Psychological Research in Gerontology," J. E. Birren pointed out that "both bio-psychological and social psychological research is moving toward the study of the health changes over the adult years. Longevity and specific diseases are being studied as the outcomes of behavior characteristics" (1978, p. 7).

The number of interdisciplinary studies on "survivorship," "longevity," and "life expectancy" has increased considerably during the last few years. The publication of the two volumes of *Predicting Longevity* by Rose and Bell (1971), which analyzed the data of the "Normative Aging Study of Boston Veterans," and the *Prediction of Life Span* by Palmore and Jeffers (1971), who based their analysis on data of the Duke study, has stimulated an increased interest in these topics among various scientific disciplines.

Most publications, including the studies of Shang Wang and Busse (1974), Pfeiffer (1974), and Palmore (1974), which report analyses of data from the Duke study, as well as the study by Libow (1974), which based its analysis upon data from the Bethesda study (Birren et al., 1963; Butler, 1967), and the studies by Dalakishvicy, Chichinadze et al. (1978), Anderson and Cowan (1978), Reiff (1978), O'Brien (1978), and P. J. Mayer (1979), differentiate carefully between "physiological predictors," "psychological predictors," and "social predictors" of longevity, or survival in old age. In this connection, Rose and Bell (1971)

first developed a very simple model which gave primary importance to the social factors, which, in turn, are co-determined by genetic factors (see Figure 5-1).

Several studies—including the Bonn Longitudinal Study on Aging (BLSA) (Lehr, 1975; Lehr and Schmitz-Scherzer, 1976; Thomae, 1976a,b)—have made important contributions to a more differentiated view of this basic model.

Although various studies differ in their identification of the principal determinants of longevity, there is agreement that longevity involves the joint effect of differentially weighted factors as well as their complex interaction. As a consequence, sophisticated approaches are required for the collection and analysis of research data, raising doubts about the results of earlier (unscientific) approaches to the study of centenarians' life styles.

We now know that research on longevity has to be based upon interdisciplinary approaches within which biomedical aspects are of great significance, but which nevertheless can not afford to ignore the psychological, social, and ecological aspects. Longevity, or well-being in old age, is by no means merely a function of intracellular processes and thus cannot be explained by referring to the so-called Hayflick phenomenon (1965, 1976, 1977, 1980). Modifications and revisions have been contributed by Medvedev (1974, 1975, 1976), Strehler (1971, 1976), Hart and Setlow (1974, 1976), and Orgel (1973) (see also Platt, 1976; Sacher, 1980). Without claiming any degree of exhaustiveness, we should also mention contributions by Kent (1980), Daly, Davis, and Baker (1979), Goodrick (1979), and Shinohara (1977, 1978, 1981) in their studies of immune reaction in the aged.

Figure 5-1. Interrelationship among social, physical, and genetic influences on longevity (Rose and Bell, *Predicting Longevity,* 1971). Copyright 1971 by Heath Lexington Books. Reprinted with permission.

Although modern biologists maintain that potential life span which is preprogrammed in the cell at conception is not significantly altered by environmental factors, such factors do determine whether the potential life span is reached at all and under what conditions—other than physiological factors—longevity can go hand in hand with high quality of life (cf. Butler, 1967; Franke, 1979; Lehr and Schmitz-Scherzer, 1976; Ries, 1980).

RESEARCH ON THE DETERMINANTS OF LONGEVITY: PROTOSCIENTIFIC APPROACHES

For a long period of time the main subject of medical research was the question of how man could reach the longest possible life span while maintaining a state of healthy well-being. Streib and Orbach (1967) refer to the Smith Papyrus rolls, more than 4,000 years old, which not only consider the question of prolongevity but also discuss the possibilities of rejuvenation. Since then, numerous theories have been developed which attempted to explain various reasons for physical aging and some of which raised hopes of discovery of interventions that might delay the aging process.

M. Schmid (1973) has analyzed the medical-historical aspects of a number of these theories of aging. He concluded,

> What is remarkable about the 20th century theories is that efforts to explain aging concentrate on the micro level of the living organism. This is reminiscent of the development of modern physics in atomic physics, where the greatest insights are discovered in the smallest objects. Are there discoveries, possibilities and problems in biology that are analogous to those of atomic physics? The future prospects of purely biological genetics and gerontology, whose initial approaches are to be admired, require a comprehensive holistic view of man, which is able to incorporate research findings for the good of the individual as well as of the human community [p. 4].

It is important "to understand the aging person in his totality," an outcome to be achieved only through the cooperation of different disciplines within the field of gerontology. However, long before medical historians even postulated such an integrative approach, one could find a rapid expansion of literature without scientific foundation on the topic of prolongation of life, prevention of the aging processes, or even the reversibility of age changes (cf. Felstein, 1973; Gruman, 1966; Lueth, 1965).

Recommendations made in various publications either were based for the most part on analyses of previously published biographies of famous persons or were derived from simple interviews of very old people. In many instances individuals were interviewed on their ninetieth or hundredth birthday on how they managed to live so long. Their responses, which go beyond stereotypical responses such as "a natural way of life" or "healthy life style," yield no uniform clues. With regard to eating and drinking habits, praise of vegetarian food is directly contradicted by others advocating eating large portions of meat; abstinence from alcohol is opposed by those who favor regular consumption of "spirits." When it comes to sexual activity, suggestions range from lifelong moderation or even abstinence to frequent sexual activities continuing into old age. Some of the centenarians saw the reason for their advanced age in a quiet life style, free of stressful events; others attributed their longevity to an exciting and dynamic life course, requiring confrontation of many problem situation. Some praised intensive activity and hard work, while others recommended leisure as leading to longevity.

ANALYSES OF VITAL STATISTICAL
AND DEMOGRAPHIC SURVEYS

Another approach to establishing the determinants of longevity originated in the analysis of demographic and statistical material (cf. Rose and Bell, 1971).

One example can be found in the use of mortality statistics for corroborating the significance of genetic factors for longevity: from the evident correlation between the ages reached by grandparents and parents, a so-called Total Immediate Ancestral Longevity Index was derived by summing across the six ages (Korenchevsky, 1961; Pearl and Pearl, 1934). Zonneveld and Polman (1957) also tried to show the relationship between documented longevity of parents and life expectancy of their offspring. Pears (1945), too, found strong evidence in mortality statistics for an "intergenerational concordance in longevity"; he was, however, one of the first to stress the significance of favorable environmental conditions. Other important contributions underlining this tendency were provided by several life insurance studies (Dublin and Marks, 1951; Dublin et al., 1949). Nevertheless, such correlations must be interpreted with caution.

Based on epidemiological studies, Cohen (1964) asked the critical

question of whether longevity in certain families was primarily determined by genetics or whether commonly experienced environmental factors are to be implicated. Environmental influences of this kind are also discussed by Cherry and Forbes (1975), who analyzed mortality statistics for the province of Ontario, Canada, for the years 1964 to 1968. These authors state corresponding differences in various environmental parameters, such as trace metal levels, type of drinking water, and cigarette consumption. Gourlay (1978) also stresses the necessity of reexamining environmental variables in their effects on genetic factors.

The problems of analyzing mortality statistics and the great difficulties of deriving valid conclusions from them have been repeatedly pointed out starting with Beeton and Pearson in 1899 and 1901/02, Bell (1918), and Wilson and Doering (1926). Yuan (1931) tried to improve the inferential potential of statistics by being the first to introduce the use of "life tables" which take into account secular trends by establishing separate norms for various age cohorts. Rose and Bell summarize these findings and state: "Although these genealogical studies showed that 'parental longevity' was predictive of offspring longevity, there were problems of inaccuracy and incompleteness of data in addition to the confounding social environment factors" (Rose and Bell, 1971, p. 24).

Abbott, Murphy, Bolling, and Abbey (1974) demonstrated that the additive genetic component of variance is less than 10 percent of the total phenotypic variance. Philippe (1978) analyzed data for the French Canadian population and came to the conclusion "that heritability of survival is nearly zero." Observed variability in survival is interpreted here as the effect of environmental differences acting upon age-dependent genes (1978, p. 121; see also Philippe, 1976).

Abbott et al. (1978) analyzed data of nonagenarians and centenarians, originally collected by Pearl and Pearl (1934), and data of 7,103 progeny of whom 1,766 had one parent over 90 years of age. These authors concluded

> that the genetic component operates not through nonspecific genes for longevity, but through an absence of deleterious genes leading to premature death. . . . Parents who died at age 81 or over had offspring who lived on the average some five to seven years longer than offspring of parents who died at 60 years old or younger. This difference was generally found regardless of similarities or differences in occupation, in place of birth, residence or death . . . [p. 119f].

Statistics have also been called upon to help explain the question of whether maternal or paternal life span is decisive for a high life

expectancy; the results are contradictory but tend to suggest maternal life span to be the more important factor (Cohen, 1964; Jalavisto 1951).

Stronger relationships were demonstrated by analyses of statistical data between maternal age at birth and life expectancy, which lowered by higher maternal age. Paternal age at conception or birth does not seem to have any predictive value. Statistics can also yield evidence regarding the influence of birth order on longevity: first- and second-born children generally have a higher life expectancy than later-born children. Wyshak (1978) analyzed data for 10,000 completed families and compared the life span of twins, siblings, and their parents. For twins, he found a shorter life expectancy than for their siblings; although positive correlations between the life expectancy of parents and their offspring were shown, here too the influence of environmental factors is quite evident. (See also Kallmann and Jarvik, 1959, whose twin studies supported the importance of genetic factors in longevity, since MZ twin pairs had smaller within-pair differences in life span than did the DZ twins.) Vital statistics also document racial differences in mortality (see Rose and Bell, 1971) which are often attributed to the influence of genetic factors (see The Increase in Average Life Expectancy, above). Here, too, major significance must be assigned to environmental influences, socioeconomic factors, and life style.

The vital statistics for industrialized countries show higher life expectancy for women than for men, albeit a recent trend hints toward a slight leveling off. Rose and Bell (1971) point to the great variety of hypotheses used to explain the reasons for sex differences in longevity, ranging from biological or perinatal factors (Clark, 1964; Dublin et al., 1949) to occupational stress factors (Bogue, 1959) which unfavorably affect the life expectancy of men (see also Hildemann, 1978; Payne and Whittington, 1976). In this context, one should note Thomlinson's (1965) interesting finding that in less developed countries women have a lower life expectancy than men. It can be assumed that this is due to higher day-to-day stress levels for women in these countries, as well as to their greater number of pregnancies and other sociocultural influences. Schaefer (1978) sees the higher life expectancy for women as being determined by "physiological factors and—as their consequences—psychological and social determinants: higher life expectancy of women is probably a result of their lower levels of aggression and stress" (p. 59).

Analyses of demographic data also show a correlation between family status and longevity (Beard, 1962; Berkson, 1962). In the United States, greatest life expectancy is reached by married persons, followed by singles. Widowed individuals have a lower life expectancy,

and divorced persons are particularly disadvantaged when it comes to longevity. The latter finding is especially true for women, but is not as clear for men. Rose and Bell (1971) attributed this difference to a social component, namely the greater acceptance of divorced men in society. Recent studies, however, suggest that this interpretation may require correction (Abbott et al., 1978; Fooken, 1980a,b).

Fox, Buensen, and Kinlen (1979) also found a clearly higher mortality rate for persons married to considerably older or younger spouses. In this context the authors emphasize certain characteristics of those persons who enter into *marriages with large age differences* (some males look for "young nurses," while some younger women look for supportive older partners), but such unidimensional explanations do seem problematic. Finally, Niemi (1979) demonstrated the effect of loneliness upon mortality after retirement.

Matter (1979b) found a relationship between specific biographical factors and longevity in male Kansas pioneers. He analyzed demographic data for three longevity groups: those who died before 62 years, those who died between 62 and 84, and those whose age at death was 85 years and older. Relevant biographical data which correlated with longevity were age at time of marriage (those who lived longest married earlier and were married longer; those who died young married at a later average age) and number of sons and daughters (long-lived settlers had more sons than daughters). However, it remains to be determined whether findings are generalizable or whether they apply only to this specific sample.

Similar questions in regard to generalizability also apply to Matter's study (1979a) on longevity of high school graduates, which found relationships between longevity and biographical, demographic, and motivational data and which discussed predictors of early death and of specific causes of death. On the one hand, there are very problematic general statements such as: individuals dying of cancer had significantly more female children while individuals dying of heart attacks tended to have more male children. On the other hand, one must question the limited data base and, more generally, must question the validity of autobiographical information obtained by means of mailed questionnaires.

The analysis of demographic data also revealed the significance of social factors for longevity. As early as 1934, Whitney called attention to the fact that the mortality rate of unskilled workers was almost double that of skilled and white-collar workers of the same age. Based on these and similar findings, Rose and Bell (1971) maintain that one can see a connection here between social status, better education, better professional occupation, higher income, better nutrition, and

housing situation with the consequence of lower susceptibility to illness and better health care (see also Hammond, 1976; Kitagawa and Hauser, 1973; Matter, 1979).

Moreover, statistical data indicate that college graduates reach a higher average age when compared to their birth cohort. Terman and Oden (1959) also pointed out that the mortality rate of their "gifted children" was lower than their comparable age group—findings which apparently identify intelligence as a determinant of longevity. Correspondingly, Rose and Bell (1971) emphasize the finding that individuals named in *Who's Who in America* reached a higher age than the average of their birth cohort—scientists named in *Who's Who* attained the highest life expectancy and journalists the lowest.

Analyses of census data repeatedly point to certain interrelationships between *specific occupations*, morbidity, causes of death, and life expectancy. However, the comparability of occupational mortality is problematic (Olsen and Sabroe, 1979). Interrelationships of this kind (e.g., frequency of lung cancer death rates; the interaction of smoking with job environment, as with asbestos workers) have also been analyzed by Fox and Adelstein (1978) to determine the extent to which mortality of an occupational group reflects the work environment and how much it reflects life style. The results of this study and of other investigations (Doll and Peto, 1976; Eitner, 1976; Eitner et al., 1971a,b) emphasize the significance of environmental circumstances which are often, but not necessarily, specific to a certain occupation.

Fisher (1978), who used demographic data to demonstrate the relationships between longevity and socioeconomic status in Australia, states, however, that "the negative correlation between socioeconomic status and mortality becomes stronger with increasing age" (1978, p. 45). The life expectancy of unskilled workers is undoubtedly lower (Eitner et al., 1971a,b) which is due in great part to biographical factors which, as hypothesized by Fisher (1978), become effective only late in life.

In this context Bunn (1979) presents an interesting analysis of disease and mortality statistics: decrease in life expectancy due to coronary diseases correlates with *periods of unemployment or economic recession*. There are "links between unemployment, national stress, and heart disease. Ischemic heart disease mortality and national stress were found to follow the business cycle" (p. 780).

Since certain population groups—unskilled workers, for example—are more strongly affected by unemployment and its consequences during their working years, the impact of socioeconomic fac-

tors would be expected to increase in the middle years of life. The apparent contradiction of a stronger impact of socioeconomic status on longevity in middle or advanced age can probably be explained in part by taking into account possible historical period-related variables.

Statistical data from several insurance companies also show correlations between longevity and body weight. Dublin and Marks (1951) were able to demonstrate that obesity shortens life. Graulich (1977) reports on the current state of obesity in the Federal Republic of Germany as documented in the medical records of insurance companies. Diehl (1978) provides a good review of the state of research on the "risk factor obesity" and discusses its causes and consequences. Moehr (1976, 1977) emphasizes the biological and social factors of individual eating habits and generally confirms the multidimensional antecedents of such eating and smoking behavior previously demonstrated by Howell and Loeb (1969; cf. also Caster, 1976; Gerritsen, 1976; Hawthorne and Fry, 1978; Hazzard, 1976; Lehr, 1972; Ostfeld, 1976; Rockstein and Sussman, 1976a,b; Ross, 1977; Shank, 1976). Holtmeier (1968; 1972, p. 10), analyzing data from several life insurance companies, impressively demonstrated that more than every third death in the Federal Republic of Germany is in some way connected with a nutritional disease, that life expectancies are decreasing by the same percentage rate as excessive weight is increasing (see also Andres, 1980), and that for over-40-year-olds a 30 percent excess weight problem increases mortality by 50 percent, whereas a state of 10 percent underweight yields the highest life expectancy.

These findings strongly confirm Max Buerger's (1957) dictum: "Your stomach is your death" and Shakespeare's warning "Leave gormandizing; know the grave doth gape for thee thrice wider than for other men" (*Henry IV*, Part II, v.5, 58f).

THE STUDY OF CENTENARIANS AS A MODEL
FOR INVESTIGATING CORRELATES OF LONGEVITY

Another methodological approach to research on the determinants of longevity is represented by scientifically targeted studies of persons who have reached a very old age. Investigations of this kind have been undertaken in various industrialized countries as well as in less developed countries: For example, Franke (1972, 1973, 1977, 1978, 1979), Franke et al. (1973), Franke and Schmitt (1971), and Franke and

Schramm (1981) in the Federal Republic of Germany; Henschen (1974) in Sweden; Haranghy et al. (1965) in Hungary; Oikawa et al. (1981), Suzuki et al. (1981), Matsuzaki et al. (1981), and Sakugawa and Suzuki (1981) in Japan; Lambrev (1951) and Stojnev (1981) in Bulgaria; Nagahori (1981) in Pakistan and Ecuador; and Chebotarev (1969), Mankovsky and Mints (1981), and Korkushko (1981) in the USSR. In addition to medical and clinical data, many of these studies included analyses of the family doctor's records and ecological data such as education, occupation, life satisfaction, life crises, and eating and drinking habits. Categorized information was obtained also by interviews of the older persons, their family members, and of friends and acquaintances.

Franke et al. (1973) summarized the findings obtained from such studies: middle altitude environments (3,000 to 4,500 feet above sea level) seem to correlate with longevity; moreover, certain occupations seem to favor the attainment of a high age—occupations such as farmer, gardener, fisherman, soldier, that is, outdoor pursuits requiring physical effort (Felstein, 1973). Of course, occupational satisfaction also plays a large role (Felstein, 1973; Palmore, 1970). The latter relationship, however, was not as clearly demonstrable in West German studies; there too, however, most of the 217 centenarians had to perform "hard work" in the intellectual or physical area until late in their lives, "be it as teacher, college instructor, craftsman, farmer or housewife" (Franke et al., 1973, p. 72).

The group of very old people also showed a lesser degree of emotional tensions, but by no means an exemption from life crises. With regard to eating habits, high life expectancy seems to correlate primarily with intake of low-caloric, protein-rich, and low-fat foods. Smoking and drinking habits of centenarians by no means show the expected abstinence.

Moderation but consistency was also characteristic for sexual behavior. Beyond these matters, genetic factors must obviously be considered and in particular the favorable concurrence of endogeneous and exogeneous factors. The hereditary disposition, however, especially the maternal genetic influence, seems to be the "condition sine qua non" (Franke, 1977, 1978). Franke (1979) assesses the proportion of genetic factors to be about 65 percent as against 35 percent for the exogeneous factors; his calculation, however, cannot be reproduced unequivocably. Nevertheless, Franke et al. (1973) found that of the centenarians studied, 31.5 percent could be classified as "vigorous and robust," 49 percent as displaying "limited life styles," and 19.5 percent of the group as "permanently bed-ridden."

Beller and Palmore (1974) analyzed data of 50 nonagenarians liv-

ing in the southeastern provinces of Turkey. A comparison with a younger control group of 110 Turks showed that longevity is associated with blood types P2 and Le(a-b-), which show greater resistance to infectious, neoplastic, or degenerative diseases. Longevity was also associated with good health (94 percent still had their vision, 96 percent could still hear, and only 22 percent had ever visited a physician during their lifetime). It is very interesting that only one-third of the longevous Turks were women; in this area, the mortality of women is higher than that of men. Longevous people were judged to be normal in weight and height and were "moderate eaters" (simple diets with little meat). Most of them did not smoke, but there were no differences in drinking habits. Vigorous physical activity contributed to longevity (Palmore, 1969c, 1971, 1978); three-fourths of the men claimed to have continued sexual activity until at least 90 years of age. The high frequency of sexual activity among the longevous Turks supports the theory that sexual activity is generally healthy and contributes to longevity (Beller and Palmore, 1974, p. 375).

A high degree of social activity and good cognitive abilities (which were also found in a study on American centenarians, see Beard, 1968) supports the theory that continued involvement and social activity contributes to satisfaction and to longevity, as well as "a positive view of life" (Beller and Palmore, 1974).

Numerous studies of centenarians have been reported from Japan (Matsuzaki et al., 1978). An investigation of 120 women and 24 men by a 20-member medical team showed that 73.6 percent of the centenarians had never consulted a physician prior to age 60; on the basis of this result and similar findings it may be claimed that "centenarians are persons who have congenitally strong constitutions, naturally high resistance to infectious diseases and natural defence mechanisms against cancer and circulatory diseases which afflict those of middle and advanced age" (Matsuzaki et al., 1978, p. 151).

Longevous persons are of normal weight (no overweight, no underweight), most of them had long-living parents and siblings: "persons living to over 100 usually came from families with a history of longevity" (Matsuzaki et al., p. 151). Dietary habits, such as taking good quality protein (fish, eggs), avoiding taking too much salt to prevent hypertension, and taking care to avoid hyperlipemia are vital; physical activity, mental activity, and also mental functioning are further correlates of longevity (see also Aoi et al., 1978).

Suzuki et al. (1981) reports on very thorough medical studies of 50 centenarians in Okinawa. "In physical examinations almost normal data have been documented biochemically, hematologically and electrophysiologically" (p. 84) (see also Oikawa et al., 1981).

Medvedev (1974) pointed out that in geographically specific areas there is a statistically higher proportion of centenarians; there are geographical centers of exceptional longevity: for instance, the Caucasus mountain area and the Georgian area in the USSR. However, the investigation of the geographical distribution of "super longevity" casts some doubts on the existence of special climatic influences. In Yakutia and the Altay Plain areas the climate is extremely cold, dry, and continental, whereas another region of exceptional longevity in Ecuador has a tropical climate. Moreover, the living conditions in these regions are very complex and different: restricted consumption of calories in Ecuador and Hunza, very high standards of nutrition in the Georgian and Caucasian areas, where consumption of wine is very high, probably higher than in France (Medvedev, 1974). This viewpoint is contradicted by Kyucharyants (1974), who points to the low caloric value of the Caucasian diet.

Medvedev emphasizes the doubtfulness of information about centenarians because there was no birth registration at all at the time of the claimed birth. Referring to Berdyshev (1968), he points out that in the mountains of South Altay very old people have the highest authority in the social group: the older the person, the more respect and honor he or she receives. Such traditions create the stimulus to exaggerate age, especially when no birth documents exist (see also Sachuk, 1970).

Nagahori (1981), who conducted sociological surveys and physical examinations on centenarians in Ecuador, in Georgia, and in the Caucasus, also questions the authenticity of the ages of the "centenarians." Mazess and Forman (1979) discuss the problem of overstatement of ages on the basis of their finding that the Vilcabamba population in Ecuador shows a systematic age exaggeration. These authors claim that "none of the 23 investigated cases of living or recently deceased 'centenarians' had survived over 100 years" (Mazess and Forman, 1979, p. 97). The reasons for such age exaggeration were unclear; the tendency has been worsened by recent scientific and tourist incursions.

While extreme longevity in these countries remains questionable, there is some support for a high proportion of elderly individuals (age 60 and over) "who remain physically active and who seem to maintain cardiovascular and musculoskeletal health" (Mazess and Forman, 1979, p. 98).

The investigations cited above are studies of "real" centenarians for whom exact date of birth was officially documented. For a number of other reports on centenarians, however, caution as to their authen-

ticity is appropriate (Mazess and Forman, 1979; Medvedev, 1974; Nagahori, 1981). Because of these problems, it may be better to refer in such cases to longevous persons rather than to centenarians.

THE LONGITUDINAL APPROACH
TO LONGEVITY RESEARCH

Different Types of
So-called Longitudinal Studies

The term *longitudinal studies* encompasses a variety of different types of repeated measurement studies. Differences emerge in regard to: the length of time between measurements, ranging from several months up to 10, 20, 30, or more years; the number of measurement points, which range from only 2 to more than 10; the breadth of the data under study, ranging from a few physiological, sociological, or psychological variables up to comprehensive studies operating with a large variety of medical, sociological, and psychological variable sets, as for example in the Bethesda Study (cf. Birren et al., 1963; Butler, 1967), the Duke Study (cf. Palmore, 1970, 1974a; Pfeiffer, 1969, 1974), and the Bonn Longitudinal Study on Aging (cf. Thomae, 1976). Data-collection methods employed range from comparative analyses of demographic data and comparison of information gathered through mailed question-naires to large data sets obtained by thorough examinations, tests, and interviews held in assessment sessions of several days' duration.

The above-mentioned differences among longitudinal studies—number and spacing of measurement points, range of variables under study, and assessment instrumentation—are inversely related, of course, to the size of the sample of subjects under study: the more intensive, basic, comprehensive, and longer-lasting the study, the fewer the number of subjects.

All these different types of longitudinal studies, however, contribute to research on longevity insofar as they are based on multiple data gathered from those individuals, the "survivors," who have reached an old age and the corresponding data of the "nonsurvivors," or those individuals who died during the course of the study. Social-psychological and psychological correlates of longevity could be attained by means of detailed longitudinal studies, whereby the "input data" of persons who participated in all of the subsequent measurement points ("survivors") could be compared with the "input data" of persons who died after a certain measurement point ("nonsurvivors").

The Problem of Experimental
Mortality ("Dropouts")

This line of research on the determinants of longevity was originally motivated by one of the major methodological problems and challenges faced by every longitudinal study: the problem of analyzing as accurately as possible the attrition of the original sample which usually occurs within the duration of the study and of examining the comparability of the attrited sample with the original sample. On the basis of the comparison of medical, sociological, and psychological data obtained at the first measurement point of the study, attempts have been made to precisely determine the characteristics of the "dropouts," only a portion of whom were claimed by death.

Streib (1966) reviewed the "participants and 'dropouts' in the longitudinal study" and analyzed 25 "longitudinal studies" (some of which were follow-up studies) conducted in the United States with adult subjects to determine the "characteristics of the dropouts." A common finding of the analyzed studies was that more persons of lower socioeconomic status belonged to the dropout group than persons with higher socioeconomic status (Belson, 1960; Benn, et al., 1956; Berelson et al., 1954). Correspondingly, more persons with less school education belonged to the dropout group than did those with a higher level of education (Berelson et al., 1954; Reeder, 1960).

The subjects' interest in the problems and questions under study has been identified as a strong incentive for continuing participation over the years, but generalizable conclusions seem difficult, at least for those dropouts not due to death.

In their follow-up study on voting behavior, for example, Berelson et al. (1954) found that the politically interested, better informed, and more heavily involved individuals participated, whereas dropouts were highly conspicuous among those classified as indifferent toward politics.

Similar findings were demonstrated in a five-year follow-up study on the situation of chronically sick persons and their families: those families which were not affected by chronic illness, and thus could be regarded as less motivated concerning the problem under study, were found to refuse more often further participation in the follow-up studies (Downes, 1952).

The thorough analysis of the dropouts in the Kansas City study (Cumming and Henry, 1961) indicated that persons who had only a few social contacts and who perceived themselves as isolated tended to refuse participation at subsequent measurement points; in addition, the nonparticipants also included extremely active persons who claimed that they were too busy to participate.

Analyses concerning the question of whether there are significant differences in refusal tendency due to sex and age have not yielded any generalizable answers. What seems to be decisive here is the individually perceived relevance of the specific question under study (Lowe and McCormick, 1955; Streib, 1966).

Streib himself (1966) analyzed the data of the Cornell Retirement Study, which was based only on mailed questionnaires and included 3,797 men and women of 64 years of age who were still actively employed in the labor force. Eighteen months after the initial data collection, the second questionnaire was mailed, which was responded to by 75 percent of the original sample. The third questionnaire followed after another two years and was answered by 65 percent of the original sample; however, the reasons for dropout (death, refusal, or other impediment for participation) could not be evaluated. A comparison of the dropouts with the original sample showed that women were more likely to continue participation; working-class subjects, those with lower income and less education, belonged significantly more often to the group of dropouts. Moreover, refusal to participate further was more evident for persons who expressed negative attitudes toward retirement and who expressed greater occupational involvement at first measurement. Persons who had a more positive future perspective and a more favorable subjective perception of their health status were represented more frequently among the participants.

In the present context, however, we are more interested in those who dropped out due to death. Here, Riegel (1969) and Riegel and Riegel (1972) could show that the willingness of an individual to continue participating is an important predictor of his or her survival chances (Riegel, 1969, p. 455). Riegel used material from a gerontological study he had initiated in 1956/57 in northern Germany and attempted to collect new data from the same 380 subjects five years later (in 1961/62). At that time, the sample was reduced to 202 subjects: 62 persons had died in the interim, and 116 refused further participation (cf. Riegel et al., 1967). During the second follow-up study, five years later, it was found that 160 subjects of the original sample of 380 had died; that is, 41.9 percent of the 116 persons who had refused to participate, but only 24.7 percent of the 202 participants in this first follow-up measurement. Riegel (1969) concluded from these findings that persons who refuse to participate in follow-up studies have a lower chance of survival. A comparison of first measurement data for those who died prior to first follow-up with the group who participated in both first and second follow-up studies demonstrated that longevity correlates with higher verbal scores in the Hamburg-Wechsler intelligence test (the German standardization

of the WAIS) as well as with a more differentiated range of interests and lower rigidity and dogmatism scores. Characteristics in common for the group that had died before the first measurement point were: lower intelligence scores, especially in the verbal part; narrower range of interests; and lower activity scores. In addition, the subjects in this group had lower income and were found more often to be descendants of larger families than the "longevous group." Moreover, the degree of physical activity and perceived health status (based upon the initial measurement) were found to be reliable predictors of longevity (Riegel, 1969).

Schmitz-Scherzer (1975) analyzed data from the Bonn Longitudinal Study on Aging in regard to the dropouts who did not participate at the fifth measurement point. Already at the first measurement point the dropouts were characterized by significantly lower auditory capacity, greater frequency of physician's visits, lower reaction time, higher stress reactivity as measured by the Mierke test, and lower ratings on the adjustment scale. These individuals, however, were prevented from participation in the survey for a variety of reasons as well as family obligations. The relevance of the above findings therefore is limited in their contribution to survivor research. Differences in subjects' motivation with regard to their participation in the Hamburg study (Riegel, 1969) and the Bonn Longitudinal Study on Aging (cf. Thomae et al., 1973) must also be considered.

Comparison of First Measurement Data
of Survivors and Nonsurvivors
in Longitudinal Studies

The large-scale gerontological longitudinal studies in the United States which were initiated in the late 1950s have by now been subjected to a first analysis in regard to a comparison between "survivors" and "nonsurvivors." This aspect of the data of the repeatedly emphasized Bethesda Study was analyzed by Granick and Birren (1969), Granick and Patterson (1971), and Youmans and Yarrow (1969). Libow reported the results of these analyses in 1974. At the second measurement, after five years, 8 persons of the original sample of 47 men (Group I included 27 men with "excellent health status"; Group II was composed of 20 men with "moderate health status") had died; at the third measurement point, 11 years after the study's origin, 24 men had died, while 5 could not participate for other reasons. The comparative longevity analysis was therefore based on the first measurement comparing the 18 survivors with the

24 nonsurvivors. In addition to a number of differences for certain biological and physiological correlates, the comparison showed the survivors to have a higher IQ on both verbal and performance tests; they also had higher scores on adjustment to or coping with the everyday problems of elderly people, and they showed faster reaction times in psychomotor response.

Moreover, even at the start of the study, the everyday behavior of the survivors was characterized by higher complexity and variability, that is, they were more active over a wider range of interests. By contrast, the nonsurvivors complained at the inception of the study about an increasing impoverishment of their environment, of monotony and boredom in their everyday life ("environmental tasks").

Another prominent longitudinal study, the Normative Aging Study, applied "thousands of measures" to study several thousand persons of middle and older age from the VA outpatient clinic in Boston. Here, too, the goal was "to investigate a broad spectrum of aging processes in initially healthy individuals (Bell et al., 1966). On the basis of this material, Rose and Bell produced a scientific monograph entitled *Predicting Longevity* (1971) based on age at death. A number of medical, biological, sociological, and psychological variables for 500 individuals who died during 1965 in Boston and who participated in the longitudinal study were compared with corresponding data for survivors. "Seventy variables were analyzed by zero-order correlation, multiple regression, linear discriminant analysis, factor analysis, nonlinear discriminant analysis and nonlinear clustering" (Rose and Bell, 1971, p. 214).

In the realm of personality, variables like "not worrying, conserving energy," "not trusting others," "not getting aggravated easily," "not living dangerously" were found to be associated with longevity. The authors discuss the dependence of their results upon the methodology used. For example, within each age group different variables were found to correlate with longevity, precluding aggregation of data across different age groups. In addition, there was a call for a "control for secular trends," since it can be assumed that epochal events differentially burden or affect the behavior of an individual depending upon the age at which the individual is confronted with such events. Therefore, any comparison has to consider "the effect of secular change." In any event the authors summarize their results as follows:

> The findings suggest that physical predictors are more important than social predictors to account for advanced longevity while the contrary is true for moderate longevity. Although social variables were more vulnerable to secularity than physical variables . . . , there was some evidence of

their being more important than physical variables [Rose and Bell, 1971, p. 215].

Other studies attribute major significance to health status (Harel, 1979; Kleban, 1978; Mueller et al., 1975; Richardson, 1973). However, in the Mueller study, the original sample was drawn from a psychogeriatric population, with only marginal inclusion of psychological and social variables. Greatest caution is therefore required in the interpretation of the latter findings.

An attempt to summarize the results of the different studies despite all variations in detail indicates almost unanimous agreement that at the initial measurement points of longitudinal studies survivors show higher activity, higher complexity and variability in everyday life activities, a more extended future time perspective, a more positive mood, and a greater involvement in social contacts. In addition, longevity seems to correlate with better education, "respected" occupational roles and greater engagement in occupational activities, higher socioeconomic status, and, at least for the male samples, higher intelligence. The latter correlation of longevity with intelligence was not found in studies of female samples by Britton and Britton (1969). In this instance, social status (measured by the husband's education and profession) does not correlate as directly to intelligence among women as it does among men, and such status seems to be more decisive for women.

An initial analysis of the data of the Bonn Longitudinal Study on Aging (BLSA) (cf. Lehr, 1975, 1979; Lehr and Schmitz-Scherzer, 1974, 1976; Rudinger and Schmitz-Scherzer, 1976; Thomae, 1976a,b), comparing survivors and nonsurvivors over a period of seven to eight years, yielded a number of marked differences evident as early as at the first measurement in 1965. Particular emphasis should be given to "subjective health status" as perceived by the individual. This variable showed highly significant differences between the two groups, while "objective health status" (as rated by a physician) did not have any predictive value in this relatively healthy sample. Better subjective health was found to correlate positively with activity, which obviously contributed to longevity (see also Costa and McCrae, 1979, who obtained similar findings in the six- and twelve-year longitudinal analyses of 1,024 male participants of the Baltimore longitudinal study of aging). In addition to higher intelligence, particularly on verbal abilities, survivors in 1965 showed a higher level of mental and physical activity, a more positive mood, better adjustment, and a stronger feeling of being needed.

Zonneveld (1981) reports some findings from a study of nationwide random samples of 3,149 persons 65 years and older in the Netherlands who were investigated in three follow-up studies after 5, 8, and 11 years. The data base included health interviews (including many questions about psychological and social factors) and health examination surveys by general practitioners. Here, objective health status (rated by the family physician) correlated more highly with longevity than did subjective health status. Interest in reading newspapers showed a positive correlation with longevity, but interest in listening to the radio did not. Feelings of loneliness were negatively correlated with longevity, but nonoptimal contact with the subjects' children seemed not to be very important.

At the fourth measurement point, 108 persons were examined, 11 years subsequent to the beginning of the study. The results of a memory test showed cross sectionally as well as longitudinally a steady decrease of scores. Memory deterioration was significantly greater for the shorter lived subjects. Almost none of the physical characteristics (hemoglobin content, pulse rate, systolic and diastolic blood pressure, weight, and height) correlated as much with longevity as did this component of psychic functioning (Zonneveld, 1981). Another longitudinal study of 476 male residents of an old-age home in Amsterdam mentioned by Zonneveld (1981) found that old men who died 2 ½ years after their first examination had significantly lower scores on the memory test than did those who survived at least 11 years.

Another analysis of biological and psychological predictors of survival in a psychogeriatric population was conducted by Mueller, Grad, and Engelsmann (1975). Out of 206 subjects in the original sample, 180 could be reexamined in a five-year follow-up. No significant differences between survivors and nonsurvivors were found on sex, educational level, social status, or biomedical correlates such as hearing deficits and visual impairment. However, survivors were five years younger on average. Differences were found also on EEG-variables and in plasma cortisol level as well as in the nurses' ratings and on some of the psychological tests. But these predictors of survival were found in a psychogeriatric population, so that generalization to the whole population of aged is inappropriate.

In a follow-up study of noninstitutionalized residents of a retirement community in Florida (Wilson and Webber, 1976) begun in 1959, 2,544 persons 65 years of age and older were interviewed. Nine years later, in 1968, only 826 persons could be reinterviewed; 835 persons had died in the meantime, and the rest, one-third of the original sample, could not be located. A comparison of characteristics of the

survivors and nonsurvivors revealed that the deceased subgroup was older and had higher proportions residing in single-person units, mobile homes, and hotels. The reported daily activities of the three groups differed significantly: the reinterviewed persons had been the most active at the first measurement point in 1959, the "lost group" had been slightly less active, and the nonsurvivor group had had the lowest activity score in 1959.

There were no significant differences in education, occupation, or social status among the three groups. The deceased individuals had reported in 1959 higher rates of heart disease, high blood pressure, diabetes, prostate troubles, and asthma; there were statistically significant differences between the reinterviewed and the deceased groups on 10 of the 22 reported health items. Objective data of health status, rated by a physician, were not collected.

Longevity Index (LI) and Longevity Quotient (LQ)

Longitudinal research based solely upon the comparison of initial measurement data of survivors and nonsurvivors often neglects the difference in chronological age of the two subgroups at the initiation of the study, a difference frequently amounting to some 10 to 20 years. The frequently used global statement that nonsurvivors were older on the average does not satisfy entirely. The differentiation between "short-term survivors" and "long-term survivors" also seems insufficient considering that, for example, "long-term survivors" may die at a younger age than "short-term survivors," who may have entered the longitudinal study at a more advanced age. Palmore (1971) attempted to remedy this problem by introducing the terms *longevity index* (LI) and *longevity quotient* (LQ) in his analyses of the Duke study data (Palmore 1969a,b, 1970, 1974; Palmore and Jeffers, 1971).

The longevity index represents the total number of years from the initial examination to death. For living subjects, the index is the number of years from initial examination to the sixth examination plus the expected number of years remaining at the time of the sixth examination based on the actuarial life expectancy table. The longevity quotient is the ratio between the longevity index and the actuarial life expectancy at the time of the initial examination. A longevity quotient greater than unity means that the individual lived longer than expected; a longevity quotient less than unity implies that the subject did not live out his life expectancy.

Groups of "long-lived" and "short-lived" subjects were compared on the basis of the LI and LQ specification of life expectancy for each birth cohort. Individuals in the Duke study with an LQ below one differed considerably from those with an LQ greater than one on a number of biological, psychological, and social variables. For example, there were significant differences in health behavior and health maintenance practices with greater significance placed upon locomotor activities. In their interpretation of correlations between auditory and visual capacity with longevity, Anderson and Palmore (1974) with good reason emphasize that good vision facilitates social contacts (participation in group activities); moreover, it favorably influences emotional security and perceived social status. Visual difficulties, on the other hand, reduce leisure-time activities and social interactions and can thus also have an adverse effect on one's self-concept.

In his comparison of long-lived and short-lived persons, respectively long-term and short-term survivors, from the Duke sample, Pfeiffer (1969, 1971, 1974) studied four carefully selected subsamples of the Duke longitudinal study: 17 long-lived women, 17 short-lived women, 20 long-lived men, 20 short-lived men. He found a LI of 19.30 years and an LQ of 1.32 years among long-lived women; for short-lived women the LI was 5.5 years and the LQ 0.44 years. Long-lived men showed an LI of 17.22 years and an LQ of 1.56; short-lived men had an LI of 2.42 years and an LQ of 0.24. The group of the long-term survivors or longevous persons was characterized by high intelligence, better financial status, well-maintained health, and intact marriages. The comparative analyses were run only within the same-sex groups because of the strong evidence that sex is a major determinant of life expectancy. For example, the women in the long-lived group and the short-lived group showed very similar subjective ratings of their personal health status: there was no significant difference in regard to the feeling of leading a restricted life or in regard to the reported number of days spent bedridden or to the renunciation of certain activities. The ratings of the women, however, were in general more negative than those for the men (cf. also Lehr et al., 1973). By contrast, highly significant differences for subjective health status were found between the male groups of long-lived and short-lived. The same tendency was evident in regard to subjective perception of their personal financial situation, where women showed no differences while for men considerable differences were found between "survivors" and "nonsurvivors."

After thus having identified a number of variables which seem to differentiate between survivors and nonsurvivors with an LQ greater

than 1 and an LQ less than 1, an attempt was made to determine the exact contribution to the total variance by each of these variables. For the female sample, 35 percent of the total variance was explained by intelligence, subjectively perceived change of health status, family status, evaluation of physiological functions, and change in their financial situation. For the men, 52 percent of the total variance was explained by financial status, subjectively perceived change of health status, evaluation of physiological functions, change of family situation, and family status. A number of other factors also correlated significantly with longevity, but did not make a significant independent contribution to the total variance. The studies by Pfeiffer (1974) and Palmore (1974) also suggest that there is no single factor which determines longevity, but that there is a constellation of biological, psychological, and social factors which differentiate between men and women.

Although cardiovascular disease is by far the greatest killer among both men and women in this age group, it is still surprising that the variable "work satisfaction," rather than perceived health, is the second-most important predictor. This finding suggests that maintaining a satisfying and meaningful social role may contribute to longevity by providing physical exercise, intellectual stimulation, gratifying and supportive social relationships, and general motivation to take care of one's self and extend one's life. The final significant predictor of longevity in the total group was the happiness rating made by the social worker, indicating that the individual's overall mental attitude may have a significant psychosomatic effect on longevity (cf. also the cognitive theory of aging developed by Thomae 1969, 1971).

In short, the findings of the comparative analyses of the Duke study data suggest the conclusion that the most important ways to increase longevity are: maintain a useful and satisfying role in society, maintain a positive attitude toward life, maintain good physical functioning, and avoid smoking cigarettes (Palmore, 1974).

Longevity and Terminal Decline or Terminal Drop

Some of the well-known longitudinal studies that investigated determinants of longevity also raised the question of whether there is specific change or typical decline in physiological, psychological, or social functioning shortly before death (Botwinick et al., 1978; Jean et al., 1979; Steuer et al., 1979).

Wilkie and Eisdorfer (1972, 1973, 1974), for example, analyzed data from the Duke study to see whether terminal changes in intelli-

gence appear shortly before death. As discussed by Granick and Pat-
terson (1971) in a review of the cognitive aspects of longevity, health
status and various social and demographic factors appeared to be pre-
dominant predictors of longevity, although there was strong evidence
to indicate that cognitive functioning may also be a good psychological
predictor of survival. In fact, there is evidence that a marked decrease
in intellectual performance occurs one to five years prior to death
(Berkowitz and Green, 1965; Goldfarb, 1969; Jarvik and Blum, 1971).
Observed differences are less apparent in the initial scores than in the
pattern of change over time. A "critical loss" can be interpreted as a
signal of impending death.

In contrast to Berkowitz and Green's (1965) and Lieberman's
(1965) findings, however, our results suggest that psychological
changes do not always increase with increasing nearness of death. Fur-
ther, the findings do suggest that some but not all individuals experi-
ence a marked intellectual loss before death. Interestingly, survivors
and nonsurvivors in the low IQ group (IQ below 85) showed no differ-
ences, while in the middle IQ group (IQ 85–115) survivors had signifi-
cantly higher scores in the verbal part, but not in the performance
part. Finally, the high IQ group (IQ over 116) showed the most signifi-
cant intellectual decline for nonsurvivors on verbal and particularly on
the performance scores.

Palmore and Cleveland (1976) criticize previous studies on termi-
nal drop or decline for several conceptual and methodological weak-
nesses: these studies require a differentiation between the term *termi-
nal decline* as a linear decline prior to death and *terminal drop* as an
accelerating drop before death. Such a terminal drop can be tested
adequately only in longitudinal analyses because scores of the same
individuals from at least three consecutive measurement points are
needed to be able to identify any accelerating decline. An additional
criticism given is the fact that until now terminal changes have been
studied exclusively with regard to intellectual functioning. They sug-
gest the need for including psychological and physical variables.

These authors analyzed the data of 148 participants in the first
longitudinal investigation of the Duke study who had died before De-
cember 1974. The study began in 1955 with 271 persons, 60 to 90 years
of age, with nine measurement points for the survivors between 1955
and 1974. Two types of multiple regression analysis were used: the
cross-sectional analysis showed the additional terminal declines in in-
tellectual functioning after age differences were controlled; the longitu-
dinal analysis showed that there were no substantial terminal drops
after age declines in hearing, vision, and leisure activities and terminal
declines in intelligence (primarily in the ninth decade of life) were

controlled. But most of the attitude and satisfaction measures and the personal adjustment rating showed no aging declines, terminal declines, or terminal drops. That no terminal drops could be found may be attributed to the fact that the measurement points were not very close to death; in addition, it should be noted that some very sick persons refused participation in the examination.

A critical loss, a decline on certain tests (digit symbol, similarities, digit span, and block design), shows a very high correlation with distance from death (Blum et al., 1973; Botwinick, 1977; Wang and Busse, 1974). Woodbury and Manton (1980) analyzed data from the Duke longitudinal study and found that among psychological items only the WAIS performance scale contributed independently to the prediction of mortality.

Cognitive functioning and length of survival were also investigated by Kay et al. (1977). Of 177 people 65 years of age and older living at home given the WAIS, 26 subjects died after 2 years, 82 died after 7 years, and 95 survived. A high mortality rate was found among the low scorers; there seemed to be a critical level of performance below which chances of dying increased progressively. Correlations between decreasing intellectual functioning and distance from death were extremely significant in social classes I and III (higher and middle social classes), but not significant in (lower) social classes IV and V.

In addition, increasingly negative self-concept, decreasing life satisfaction, and decreasing social interaction scores were found for persons close to death in a group of black, urban, and poor participants of a longitudinal study (Faulkner et al., 1979). This sample also showed deterioration of subjective health status and decrease in activity.

In summary, it must be stated that carefully controlled and wide-ranging longitudinal studies, which pay as much attention to biological, physiological, and medical aspects of human development as they do to the social and psychological aspects, but which, in addition, take into account historical, biographical, and ecological data, can contribute to an understanding of the determinants of longevity and identify variables which may presage impending death. The fact that these predictors vary for men more than for women has been mentioned above; whether these sex differences are relevant only with regard to the "aged of yesterday and today," whether they are cohort-specific or generalizable across cohorts, remains to be discovered by future research. If practical implications are to be derived, careful study of the correlates of longevity as well as of psychological and physical well-being in old age for differing populations will be required by means of interdisciplinary longitudinal studies.

SUMMARY AND CONCLUSIONS:
THE MULTIDIMENSIONAL DETERMINANTS
OF LONGEVITY

As this review has made apparent, the many findings on longevity corre-lates point to one major conclusion: no single variable can indepen-dently explain longevity. As influential as genetic and physical factors may be, they do not suffice as exclusive determinants of longevity.

The results of recent international longevity research point to a number of interesting relationships. And yet, considering the present state of research, it still seems premature to derive theories or even relationships which may be related to long life expectancy. And what must receive primary consideration is the fact that a series of factors that can possibly influence increased life expectancy interact with each other and seem to be part of a complicated reciprocal causal network.

A possible model of these interacting influences upon longevity is provided in Figure 5-2.

Genetic, physical, and biological factors can be regarded as having a *direct* influence upon longevity (1 on Figure 5-2) and also upon the personality development (2) of an individual (intelligence, activity, morale, adaptation, self-esteem, etc.). Personality development, more-over, is determined by socialization processes: Child-rearing methods, teachers, significant others, and the social environment in general de-termine the experience and behavior of an individual; historical factors also play a role in this process (3). In addition, ecological determinants such as physical environment and climatic conditions have an impact on personality development (4). A number of studies have determined *direct* connections between personality and longevity (5). Correlations between ecological factors and longevity (6), are frequently referred to in studies of centenarians (see The Study of Centenarians, p. 117). Personality variables, on the other hand, have an impact on education and occupational training, on occupational activities, and on socioeco-nomic status (7). Correlations between social status and longevity (8) have been determined primarily from vital statistics and demographic analyses (see Analyses of Vital Statistics, above) and have been further corroborated by follow-up and longitudinal studies finding increased life expectancy for persons with high socioeconomic status (SES).

Social status (9) and personality (10) as well as ecological factors (11) influence nutritional habits. Moreover, a *direct* correlation be-tween nutrition and longevity (12) is claimed to exist, especially by studies on "macro-longevity" among centenarians (see The Study of

Figure 5-2. Correlates of psychological and physical well-being and longevity.

Centenarians, p. 117). However, many problems remain to be addressed, since most of the conclusions about human nutritional requirements have unfortunately been extrapolated from experimental work with lower mammals, especially the albino rat. Undernourishment and overnourishment as well as chronic malnutrition are important factors in sharply limiting survival; obesity has been correlated with high mortality rates. The effects of aging on spontaneous activity may contribute to overnutrition and further accelerate aging. Increased activity may retard aging; in any case, there seems to be an experimentally demonstrated correlation between nutrition and activity. In addition, the role of nutrition for diabetes in relation to age and nutritional aspects of stroke and atherosclerosis ought to be mentioned. It is clear that the longevity of the atherosclerotic, the diabetic, and the stroke patient is reduced. Smoking and use of alcohol must also be mentioned, because when indulged in excessively, they considerably raise mortality rates.

Genetic and biological factors (13), personality (14), ecological variables (15), and socioeconomic status (16) have been found to influence physical activities and sports, preventive medical care, and hygiene. Correlations of the latter variables with longevity (17) have also been demonstrated.

Our model by no means includes all variables that may possibly influence longevity. It is merely meant to stimulate further empirical studies which will critically reexamine the relationships described in this review and to provide encouragement for future modification, elaboration, and differentiation.

REFERENCES

Abbott, M. H., Murphy, E. A., Bolling, D. R., and Abbey, H. The familial component in longevity: a study of offspring of nonagenarians. *John Hopkins Medical Journal*, 1974, *134*, 1–16.

Abbott, M. H., Abbey, H., Bolling, D. R., and Murphy, E. A. The familial component in longevity—a study of offspring of nonagenarians. *American Journal of Medical Genetics*, 1978, *2*, 105–120.

Anderson, B., and Palmore, F. Longitudinal evaluation of ocular function. In E. Palmore (Ed.), *Normal aging II*. Durham: Duke University Press, 1974, pp. 24–32.

Anderson, F., and Cowan, N. R. Survival of healthy older people. In *Proceedings, XIth International Congress of Gerontology* (Vol. 2). Tokyo: SCIMED Publications Inc., 1978, p. 58.

Andres, R. Lack of effect of mild and moderate obesity on longevity in middle-aged and elderly people. In *Proceedings, XIth International Congress of Gerontology* (Vol. 1). Tokyo: SCIMED Publications Inc., 1978 p. 74.

Andres, R. Influence of obesity on longevity in the aged. In C. Borek, C. M.

Fenoglio, and D. W. Kind (Eds.), *Aging, cancer and cell membranes.* New York: Thieme, Stratton Inc., 1980, pp. 238–246.

Aoi, K., Maeda, D., Inoue, K., Matsumura, T., Hasegawa, K., and Fukutake, T. A survey of centenarians (the social and psychological team). In S. Nasu (Ed.), *Aging in Japan.* Tokyo: SCIMED Publications Inc., 1978, pp. 187–198.

Bartone, P., and Lieberman, M. Psychological correlates of impending death. *Gerontologist,* 1979, *19/5,* part II, 41.

Beard, B. Longevity and the never married. In C. Tibbitts and W. Donahue (Eds.), *Social and psychological aspects of aging.* New York: Columbia University Press, 1962, pp. 36–50.

Beard, B. Some characteristics of recent memory of centenarians. *Journal of Gerontology,* 1968, *23,* 23–30.

Beattie, W. M. Aging in the year 2000—Discussion. *Gerontologist,* 1975, *15,* 39–40.

Beaudet, F., and Coberly, S. Alternative assumptions of longevity in the 21st century: demographic and social consequences. Proceedings of the Twelfth International Congress of Gerontology, Hamburg, 1981.

Beeton, M., and Pearson, K. Data for the problem of evolution in man—a first study of the inheritance of longevity and the selective death-rate in man. In *Proceedings, Royal Society.* London, 1965, 1899, pp. 290–305.

Beeton, M., and Pearson, K. On the inheritance of the duration of life. *Biometrica,* 1901/02, *1,* 50–89.

Bell, A. G. *The duration of life and conditions associated with longevity. A study of the Hyde genealogy.* Washington: Judd & Detweiler Inc., 1918.

Bell, B., Rose, B. L., and Damon, A. The Veterans Administration longitudinal study of healthy aging. *Gerontologist,* 1966, *6,* 179–183.

Beller, S., and Palmore, E. Longevity in Turkey. *Gerontologist,* 1974, *14,* 373–376.

Belson, W. Volunteer bias in test-room groups. *Public Opinion Quarterly* 1960, *24,* 115–126.

Benn, W., Gray, A. P., and Pear, R. H. *How people vote.* New York: Grove, 1956.

Berdyshev, G. D. *Ecologic and genetic factors of ageing and longevity.* Leningrad: Nauka Publ. House, 1968.

Berelson, B. R., Lazarsfeld, P. F. and McPhee, W. N. *Voting.* Chicago: University of Chicago Press, 1954.

Berkowitz, B., and Green, R. E. Changes in intellect with age. V. Differential changes as functions of time interval and original score. *Journal of Genetic Psychology,* 1965, *107,* 179–192.

Berkson, J. Mortality and marital status: reflections on the deviation of etiology from statistics. *American Journal of Public Health,* 1962, *52,* 1318–1326.

Birren, J. E. Progress and trends in psychological research in gerontology. In *Proceedings, XIth International Congress of Gerontology,* Tokyo: SCIMED Publications Inc., 1978, p. 7.

Birren, J. E., Butler, R. N., Greenhouse, W., Sokoloff, L., and Yarrow, M. R. *Human aging a biological and behavioral study.* Bethesda: National Institute of Mental Health, 1963.

Blum, J. E., Clark, E. T., and Jarvik, L. F. The New York State Psychiatric Institute study of aging twins. In L. F. Jarvic, C. Eisdorfer, and J. E. Blum (Eds.), *Intellectual functioning in adults.* New York: Springer, 1973.

Bogue, D. *The population of the United States.* Glencoe: Free Press, 1959.

Botwinick, J. Intellectual abilities. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand, 1977, pp. 580–605.

Botwinick, J., West, R., and Storandt, M. Predicting death from behavioral test performance. *Journal of Gerontology,* 1978, *33,* 755–762.

Brash, D., and Wani, A. DNA damage due to spontaneous lability or nucleophilic agents. *Gerontologist,* 1980, *20,* 27.

Britton, J. H., and Britton, J. O. Survival of older adults and their personality and adjustment. In *Proceedings VIIIth International Congress of Gerontology* (Vol. 2). Washington, D.C.: International Association of Gerontology, 1969, p. 62.

Brown, W. The genetics of aging. *Gerontologist,* 1980, *20,* 38.

Buerger, M. *Altern und Krankheit* (3rd ed.). Stuttgart: Thieme, 1957.

Bunn, A. R. Ischemic heart disease mortality and the business cycle in Australia. *American Journal of Public Health,* 1979, *69,* 772–781.

Busse, E. W. The Duke Study: the EEG in senescence and senility. In H. Orimo et al. (Eds.), *Recent advances in gerontology.* Amsterdam: Excerpta Medica, 1979, pp. 528–532.

Butler, R. N. Aspects of survival and adaptation in human aging. *American Journal of Psychiatry,* 1967, *123,* 1123–1242.

Bynum, G. D. The impact of longevity therapy and increased life span on population projections and policy planning. In J. D. Montgomery, H. D. Laswell, and J. S. Migdal (Eds.), *Patterns of policy: comparative and longitudinal studies of population events.* New Brunswick, N.Y.: Transaction Books, 1979, pp. 275–293.

Caster, W. O. The role of nutrition in human aging. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, longevity and aging.* New York: Academic Press, 1976, pp. 29–45.

Chebotarev, D. F. Longevity and aging processes. In *Proceeding, VIIIth International Congress of Gerontology* (Vol. 5). Washington, D.C.: International Association of Gerontology, 1969, p. 382.

Cherry, W. H., and Forbes, W. F. Studies of mortality and morbidity data. *Journal of Gerontology,* 1975, *30,* 185–192.

Christian, R. R., and Baker, G. T. The influence of postreproductive cohorts in the selection for increased longevity. *Gerontologist,* 1979, *19,* 56.

Cicero: *Cato major de senectute* (edited by J. Meyer). Zürich: Füssli, 1948.

Clark, A. M. Genetic factors associated with aging. In B. L. Strehler (Ed.), *Advances in gerontological research.* New York: Academic Press, 1964, pp. 207–255.

Cohen, B. H. Family patterns of mortality and life span. *Quarterly Review of Biology,* 1964, *39,* 130–181.

Conacher, W. D. H., and Sclare, G. Clinical features and causes of death in 80 Scottish nonagenarians. Proceedings of the Twelfth Congress of Gerontology, Hamburg, 1981.

Conrad, C. Steigende Lebenserwartung und Gesellschaft—Bericht über ein interdisziplinäres Colloquium an der Ecole des Hautes Etudes en Sciences Sociales, Paris, Oktober 1979. *Medizin, Mensch und Gesellschaft,* 1980, *5,* 128–131.

Costa, P. T., and McCrae, R. R. Self-assessment of health as a function of age and neuroticism. *Gerontologist,* 1979, *19,* 58.

Courtney, M., and Getz, M. Viral induced modification of DNA-replication. *Gerontologist,* 1980, *20,* 28.

Cumming, H., and Henry, W. E. *Growing old: the process of disengagement.* New York: Basic Books, 1961.

Dalakishvicy, S. M., Chichinadze, N. K., et al. The results of the complex scientific research of 150 inhabitants of more than 100 years old in Georgia. *Proceedings XIth International Congress of Gerontology* (Vol. 2). Tokyo: SCIMED Publications Inc., 1978, p. 58.

Daly, R. N., Davis, F. A., and Baker, G. T. Effect of mutations of loci affecting DNA repair on longevity in drosophila melanogaster. *Gerontologist,* 1979, *19,* 60.

Diehl, J. M. *Ernährungspsychologie.* Frankfurt: Fachbuchhandlung fuer Psychologie, 1978.

Doll, R., and Peto, R. Mortality in relation to smoking. 20 years observations on male British doctors. *British Medical Journal,* 1976, *2,* 1525–1536.

Downes, J. The longitudinal study of families as a method of research. *Milbanz Mens. Ed. Quart. Bull.,* 1952, *30,* 101–118.

Dublin, L. I., Lotka, A. J., and Spiegelman, M. *Length of life.* New York: Ronald Press, 1949.

Dublin, L. I., and Marks, H. H. Overweight shortens life. *Statistical Bulletin of the Metropolitan Life Insurance Company,* 1951, p. 32.

Eitner, S. Die Vorbereitung auf das Alter als Problem der Gestaltung der Arbeits- und Lebensbedingungen. *Zeitschrift fuer Alternsforschung,* 1976, *31,* 215–240.

Eitner, S., Ruehland, W., and Siggelkow, H. *Praktische Gerohygiene.* Dresden: Steinkopff, 1975.

Eitner, S., Troeger, A., and Masius, E. Schwerarbeit und Alter im mehrdimensionalen Aspekt. *Zeitschrift fuer Alternsforschung,* 1971, *25,* 139–150.(a)

Eitner, S., Troeger, A., and Wilke, G. Gerohygienische Probleme in der Stomatologie. *Zeitschrift fuer Alternsforschung,* 1971, *25,* 115–128.(b)

Faulkner, A. L., Heisel, M. A., and Ross, R. 67 passed—conditions prior to death in a group of black elderly. *Gerontologist,* 1979, *19/5,* part II, 71.

Felstein, I. *Living to be a hundred.* Newton Abbot: David and Charles, 1973.

Fisher, S. Relationship of mortality to socioeconomic status and some other factors in Sidney in 1971. *Journal of Epidemiology and Community Health,* 1978, *32,* 41–46.

Fooken, I. *Frauen im Alter.* Frankfurt: Lang, 1980.(a)

Fooken, I. Biographische Faktoren des Alterserlebens lediger und langjährig verwitweter Frauen. *Zeitschrift fuer Gerontologie,* 1980, 13, 475–490.(b)

Fox, A. J., and Adelstein, A. M. Occupational mortality: work or way of life? *Journal of Epidemiology and Community Health,* 1978, *32,* 73–78.

Fox, A. J., Buensen, L., and Kinlen, L. Mortality and age-differences in marriage. *Journal of Biosocial Sciences,* 1979, *11,* 117–131.

Franke, H. Polypathie und Multimorbilitaet bei Langlebigen und Hundertjaehrigen. *Aerztliche Praxis,* 1972, *24,* 1373.

Franke, H. Das Wesen der Polypathie bei 100 jaehrigen. Ber. Symp. dt. Gesellschaft fuer Gerontology, Neurnberg. In R. Schubert and A. Stoermer (Eds.), *Schwerpunkte in der Geriatrie.* Muenchen: Banaschewski, 1973.

Franke, H. Gesundheitszustand und klinische Beobachtungen bei den Hundertjaehrigen der Bundesrepublik Deutschland. *Schweizer Rundschau fuer Medizin*, 1977, *66*, 1149–1157.

Franke, H. Kriterien der Langlebigkeit mit entsprechenden klinischen Beobachtungen bei 356 Ueberhundertjaehrigen der Bundesrepublik Deutschland. *Internist*, 1978, *19*, 399–404.

Franke, H. Theorien der Langlebigkeit. *Aktuelle Gerontologie*, 1979, *9*, 167–177.

Franke, H., and Schmitt, I. *Hundertjaehrige*. Wuerzburg: Verlag der Fraenkischen Gesellschaftsdruckerei, 1971.

Franke, H., and Schramm, A. Clinical findings in 575 German centenarians of documented age. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Franke, H., Bracharz, H., and Gall, L. Fruehere Lebensweisen von 100 jaehrigen und Aelteren. Ber. Symp. Deutsche Gesellschaft fuer Gerontologie, Nuernberg. In R. Schubert and A. Stoermer (Eds.), *Schwerpunkte in der Geriatrie*. Muenchen: Banaschewski, 1973. p. 69–77.

Freeman, J. Macrolongevity: the Methusalah legend. *Gerontologist*, 1980, *20*, 38, 247.

Friedovich, E. Metabolism and scarvaging. *Gerontologist*, 1980, *20*, 28.

Fries, J. F. Aging, natural death and the compression of morbidity. *The New England Journal of Medicine*, 1980, *303*, 130–135.

Fujii, S. M. Minority group elderly: demographic characteristics and implications for public policy. *Annual Review of Gerontology and Geriatrics*, 1980, *1*, 261–284.

Gerritsen, G. C. The role of nutrition for diabetes in relation to age. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, longevity and aging*. New York: Academic Press, 1976, pp. 229–252.

Goldfarb, A. Predicting mortality in the institutionalized aged. *Archives of General Psychiatry*, 1969, *21*, 172–176.

Goodrick, Ch. L. The experimental prolongation of the lifespan: exercise and periodic fasting. *Gerontologist*, 1979, *19*, 80.

Gourlay, N. Heredity vs. environment: the effects of genetic variation with age. *British Journal of Educational Psychology*, 1978, *48*, 1–21.

Granick, S., and Birren, J. E. Cognitive functioning of survivors versus nonsurvivors: 12 years follow-up of healthy aged. *Proceedings, VIIIth International Congress of Gerontology* (Vol. 2). Washington, D.C.: International Association of Gerontology, 1969, p. 67.

Granick, S., and Patterson, R. D. *Human aging II. An eleven year follow-up biomedical and behavioral study*. Washington, D.C.: U.S. Government Printing Office, DHEW Publication, No. (HSM) 71-9037, 1971.

Graulich, J. Zum Stande der Uebergewichtigkeit in der Bundesrepublik aus der Sicht der Versicherungsmedizin. *Ernaehrungs-Umschau*, 1977, *24*, 11–16.

Gruman, G. A history of ideas about the prolongation of life—the evolution of prolongevity hypotheses to 1800. *Transactions of the American Philosophical Society*, Philadelphia, 1966.

Gruman, G., and Freeman, J. Historical and perspective aspects of macrolongevity. *Gerontologist*, 1980, *20*, 38.

Hall, K. Y., Bergmann, K. L., and Walford, R. L. A relationship between

Holtmeier, H. J. *Diaet bei Uebergewicht und gesunde Ernaehrung* (5th ed.). Stuttgart: Thieme, 1972.

Howell, S. C., and Loeb, M. B. Nutrition and aging. *Gerontologist*, 1969, *9*, 1–122.

Hufeland, C. W. *Makrobiotik oder die Kunst, das menschliche Leben zu verlaengern* (10th ed.). Stuttgart: Hippokrates Verlag, 1958 (originally, 1796).

Jalavisto, E. Inheritance of longevity according to Finnish and Swedish genealogies. *Ann. Med. Internal. Fenniae*, 1951, *40*, 163–274.

Jarvik, L. F. Predictors of health in old age: findings from a longitudinal study in the USA. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Jarvik, L. F., and Blum, J. E. Cognitive decline as predictors of mortality in twin pairs. In E. Palmore and F. Jeffers (Eds.), *Prediction to life span*. Lexington: Lexington Books, 1971, pp. 199–212.

Jarvik, L. F., and Falek, A. Intellectual stability and survival in the aged. *Journal of Gerontology*, 1963, *18*, 173–176.

Jean, E., Stewart, B., and Beaudet-Walters, M. Testing a late life decline model using cluster analysis. *Gerontologist*, 1979, *19/5*, part II, 95.

Kallman, F. L., and Jarvik, L. F. Individual differences in constitution and genetic background. In J. E. Birren (Ed.), *Handbook of aging and the individual*. Chicago: University of Chicago Press, 1959, pp. 216–263.

Kay, D. W. K., Britton, P. G., Bergman, K., and Forster, E. M. Cognitive function and length of survival in elderly subjects living at home. *Australian and New Zealand Journal of Psychiatry*, 1977, *11*, 113–117.

Kent, S. The evaluation of longevity. *Geriatrics*, 1980, *35*, 98–104.

Kitagawa, E. M., and Hauser, P. M. *Differential mortality in the United States: A study in socioeconomic epidemiology*. Cambridge, Mass.: Harvard University Press, 1973.

Kleban, M. H. Medical variables which predict survival vs. non-survival in healthy aged. *Gerontologist*, 1978, *18*, 89.

Korenchevsky, V. *Physiological and pathological aging*. New York: Hafner, 1961.

Korkushko, O. W. Peculiarities of functional state of cardiovascular system in longevous people. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Krkang, Z., Yusken, Z., et al. A survey of 125 aged people of ninety or over in Hubei. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Kyucharyants, V. Will the human life-span reach one hundred? *Gerontologist*, 1974, *14*, 377–380.

Lambrev, J. Untersuchung der Langlebigkeit in Bulgarien. Godisnikina medicinskij facultet. *Plovdivski Univ. Paisi Chilendazski Plovdiv* (Vol. 5), 1951, p. 102.

Lehr, U. Alter und Ernaehrung—psychologische Aspekte. In V. Boehlau (Ed.), *Alter und Ernaehrung*. Stuttgart: Schattauer Verlag, 1972.

Lehr, U. Psychologie der Langlebigkeit. In V. Boehlau (Ed.), *Alter und Langlebigkeit*. Stuttgart: Schattauer Verlag, 1975.

Lehr, U. *Psychologie des Alterns* (4 ed.) Heidelberg: Quelle and Meyer, 1979.

Lehr, U. Longevity—findings from the Bonn longitudinal Study of Aging

(BLSA). Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Lehr, U., and Schmitz-Scherzer, R. Psychosoziale Korrelate der Langlebigkeit. *Actuelle Gerontologie,* 1974, *4,* 261–268.

Lehr, U., and Schmitz-Scherzer, R. Survivors and non-survivors—two fundamental patterns of aging. In H. Thomae (Ed.), *Patterns of aging.* Basel: Karger, 1976, pp. 137–146.

Lehr, U., Schmitz-Scherzer, R., and Thomae, H. Psychologischer Befund, subjektiver Gesundheitszustand, internistischer Befund. In R. Schubert and A. Stoermer (Eds.), *Multimorbiditaet.* Muenchen: Banaschewski, 1973, pp. 94–101.

Lehr, U., Schmitz-Scherzer, R., and Thomae, H. Objective vs. perceived health in longitudinal perspective—findings from the BLSA. Proceedings of the Twelfth International Congress of Gerontology, Hamburg, 1981.

Libow, L. S. Interaction of medical, biologic, and behavioral factors on aging, adaptation, and survival: an 11 year longitudinal study. *Geriatrics,* 1974, *29,* 75–88.

Lieberman, M. A. Psychological correlates of impending death: some preliminary observations. *Journal of Gerontology,* 1965, *20,* 181–190.

Lints, F. A. Growth components, ageing and longevity. *Proceedings, XIth International Congress of Gerontology* (Vol. 1). Tokyo: SCIMED Publications Inc., 1978, p. 10.

Lipetz, P., Smith-Sonneborn, J., and Stephens, R. Control of aging and development and higher order DNA structure. *Gerontologist,* 1980, *20,* 28.

Loeb, L. Fidelity and infidelity of DNA-replication. *Gerontologist,* 1980, *20,* 28.

Lowe, F. E., and McCormick, T. C. Some survey sampling biases. *Public Opinion Quarterly,* 1955, *19,* 303–315.

Lueth, P. *Geschichte der Geriatrie.* Stuttgart: Enke, 1965.

Mankovsky, N. B., and Mints, A. Y. Neurological aspects of physiological old age in subjects aged 90 and over. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Masters, P. M. Racemization in aging proteins. *Gerontologist,* 1980, *20,* 247.

Matsuzaki, T., Hayami, K., and Shigiya, R. A survey of centenarians (the medical team). In S. Nasu (Ed.), *Aging in Japan.* Tokyo: SCIMED Publications Inc., 1978, pp. 143–186.

Matsuzaki, T., Shibata, H., et al. Aging of an urban and a rural population in Japan and its accelerating factors. Presented at the Twelfth International Congress of Gerontology. Hamburg, 1981.

Matter, D. E. Longevity of high school graduates (1907–1967) from biographical, demographic and motivational data. *Psychological Reports,* 1979, *45,* 175–185.(a)

Matter, D. E. Biographical factors associated with longevity in male Kansas pioneers. *Psychological Reports,* 1979, *45,* 843–852.(b)

Mayer, P. J. The evolution of human longevity: toward a biocultural theory. *Gerontologist,* 1979, *19/5,* Part II, p. 115.

Mazess, R. B., and Forman, G. H. Longevity and age exaggeration in Vilcabamba, Ecuador. *Journal of Gerontology,* 1979, *34,* 94–98.

Mazess, R. Supposed longevity in southern Ecuador. *Gerontologist,* 1980, *20,* 38.

Mazess, R. Longevous people in Ecuador: myth and reality. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Medvedev, Z. A. Caucasus and Altay longevity: a biological or social problem? *Gerontologist*, 1974, *14*, 381–387.

Medvedev, Z. A. Aging and longevity—new approaches and new perspectives. *Gerontologist*, 1975, *15*, 196–201.

Medvedev, Z. A. Error theories of ageing. In D. Platt (Ed.), *Alternstheorien*. Stuttgart: Schattauer Verlag, 1976, pp. 37–46.

Moehr, M. Epidemiologische Untersuchungen ueber die Adipositas und deren Risikofaktoren. *Deutsches Gesundheitswesen*, 1976, *31*, 529–535.

Moehr, M. Adipositas in Abhaengigkeit von biologischen und sozialen Faktoren. *Deutsches Gesundheitswesen*, 1977, *32*, 374–376.

Mueller, H. F., Grad, B., and Engelsmann, F. Biological and psychological predictors of survival in psychogeriatric population. *Journal of Gerontology*, 1975, *30*, 47–52.

Myers, G. C. Cross-national trends in mortality rates among the elderly. *Gerontologist*, 1978, *18*, 441–448.

Nagahori, H. Survey and examination on the so-called centenarians in regions of extreme long-living of the world—Vilcabamba Ecuador, Georgia Caucasus USSR and Hunza Pakistan. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Nagahori, H. Authenticity of the ages of centenarians in Hunza. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Neugarten, B. L., and Havighurst, R. J. (Eds.). *Extending the human life span: social policy and social ethics.* Chicago: Committee on Human Development, 1977.

Niemi, T. Effect of loneliness on mortality after retirement. *Scandinavian Journal of Social Medicine*, 1979, *7*, 63–65.

O'Brien, J. E. A longitudinal analysis of maintenance and decline among low income urban elderly. *Proceedings, XIth International Congress of Gerontology* (Vol. 2). Tokyo: SCIMED Publications Inc., 1978, pp. 173–174.

Ogawa, S., and Nakajima, H. Physical fitness and life expectancy of Sumo wrestlers. *Proceedings, XIth International Congress of Gerontology* (Vol. 1). Tokyo: SCIMED Publications Inc., 1978, p. 136.

Oikawa, T., Hata, Y., Ishii, T., et al. Centenarians as a model for studying longevity and the aging process in man. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Olsen, J., and Sabroe, S. Researching occupational mortality: the problem of comparison. *Scandinavian Journal of Social Medicine*, 1979, *7*, 1–6.

Orgel, L. E. Ageing of clones of mammalian cells. *Nature*, 1973, *243*, 441–445.

Ostfeld, A. M. Nutritional aspects of stroke particularly in the elderly. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, longevity and aging.* New York: Academic Press, 1976, pp. 197–227.

Otsuka, Y. Historial considerations on juvenesce and longevity in oriental medicine. In H. Orimo, K. Shimada, M. Iriki, and D. Maeda (Eds.), *Recent advances in gerontology.* Amsterdam: Excerpta Medica, 1979, pp. 657–658.

Palmore, E. Sociological aspects of aging. In E. W. Busse and E. Pfeiffer (Eds.), *Behavior and adaptation in later life.* Boston: Little, Brown, 1969, pp. 33–69.(a)

Palmore, E. Predicting longevity: a follow-up controlling for age. *Gerontologist*, 1969, *9*, 247–253.(b)
Palmore, E. Physical, mental and social factors in predicting longevity. *Gerontologist*, 1969, *9*, 103–108.(c)
Palmore, E. *Normal aging*. Durham: Duke University Press, 1970.
Palmore, E. Variables related to needs among the aged poor. *Journal of Gerontology*, 1971, *26*, 524–531.
Palmore, E. (Ed.), *Normal aging II*. Durham, N.C.: Duke University Press, 1974. (a)
Palmore, E. Predicting longevity: a new method. In E. Palmore (Ed.), *Normal aging II*. Durham: Duke University Press, 1974, pp. 281–290. (b)
Palmore, E. Predictors of successful aging. *Gerontologist*, 1978, *18*, 110.
Palmore, E., and Cleveland, W. Aging, terminal decline and terminal drop. *Journal of Gerontology*, 1976, *31*, 76–81.
Palmore, E., and Jeffers, F. *Prediction of life span*. Lexington: Lexington Books, 1971.
Payne, B., and Whittington, F. Older women: an examination of popular stereotypes and research evidence. *Social Problems*, 1976, *23*, 488–504.
Pearl, R., and Pearl, R. D. The ancestry of the long-lived. Baltimore: Johns Hopkins University Press, 1934.
Pears, S. Length of life of parents of offspring in a rural community. *Milbank Memorial Fund Quarterly*, 1945, *23*, 180–196.
Pfeiffer, E. Short-term vs. long-term survival in old age: physical, psychological and social correlates in two polar groups. *Proceedings, VIIIth International Congress of Gerontology* (Vol. 2). Washington, D.C.: International Association of Gerontology, 1969, p. 48.
Pfeiffer, E. Physical, psychological, and social correlates of survival in old age. In E. Palmore and F. C. Jeffers (Eds.), *Prediction of life span*. Lexington: Lexington Books, 1971, pp. 237–247.
Pfeiffer, E. Survival in old age. In E. Palmore (Ed.), *Normal aging II*. Durham, N.C.: Duke University Press, 1974, pp. 269–280.
Philippe, P. Genetics of longevity. *Excerpta Medica International Congress*, 1976, Series No. 397, pp. 192–193.
Philippe, P. Familial correlations of longevity: an isolate-based study. *American Journal of Medical Genetics*, 1978, *2*, 121–129.
Philippe, P. Familial basis of longevity and related diseases. Proceedings of the Twelfth International Congress of Gerontology. Hamburg 1981.
Plato. *Politeia*. In v. E. Loewenthal (Ed.) Berlin: Lambert Schneider Verlag, 1957.
Platt, D. *Biologie des Alterns*. Heidelberg: Quelle and Meyer, 1976.
Reeder, L. G. Mailed questionnaires in longitudinal health studies. *Journal of Health (and) Human Behavior*, 1960, *1*, 123–129.
Reiff, T. R. Organizational hierarchal aspects of longevity. *Proceedings, XIth International Congress of Gerontology* (Vol. 2). Tokyo: SCIMED Publications Inc., 1978, p. 60.
Richardson, A. Social and medical correlates of survival among octogenarians. *Journal of Gerontology*, 1973, *28*, 207–215.
Riegel, K. F. Research designs in the study of aging and the prediction of retest-resistence and death. *Proceedings, VIIIth International Congress of Gerontology* (Vol. 2). Washington: International Gerontological Society, 1969, pp. 455–457.

Riegel, K. F., and Riegel, R. M. Development, drop and death. *Developmental Psychology,* 1972, *6,* 306–319.

Riegel, K. F., Riegel, R. M., and Meyer, G. Sociopsychological factors of aging: a cohort-sequential analysis. *Human Development,* 1967, *10,* 27–56.

Ries, W. Risikofaktoren des Alterns aus klinischer Sicht. *Sitzungsberichte der saechsischen Akademie der Wissenschaften zu Leipzig,* Vol. 114. Berlin: Akademie-Verlag, 1980.

Rockstein, M., and Sussman, M. L. (Eds.) *Nutrition, longevity and aging.* Proc. Symposium, February 1976, Miami, Florida. New York: Academic Press, 1976.(a)

Rockstein, M., and Sussman, M. L. Food for thought. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, longevity and aging.* New York: Academic Press, 1976, pp. 1–7.(b)

Rose, C., and Bell, B. *Predicting longevity.* Lexington: Heath Lexington Books, 1971.

Ross, M. H. Dietary behavior and longevity. *Nutrition Reviews,* 1977, *35,* 257.

Rudinger, G., and Schmitz-Scherzer, R. Sample and methods. In H. Thomae (Ed.), *Patterns of aging.* Basel: Karger, 1976, pp. 12–19.

Sacher, G. A. Theory in gerontology. *Annual Review of Gerontology and Geriatrics,* 1980, *1,* 3–25.

Sacher, G. A., Brash, D. E., and Hart, R. W. Physiological and molecular factors in lifespan differences within and between rodent species. *Proceedings, XIth International Congress of Gerontology* (Vol. 1). Tokyo: SCIMED Publications Inc., 1978, p. 9.

Sachuk, N. N. Population longevity study: sources and indices. *Journal of Gerontology,* 1970, *25,* 262–264.

Sachuk, N. N. Socio-hygienic problems of long-living. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Sakugawa, H., and Suzuki, M. The electroencephalographic findings of centenarians in Okinawa. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Schaefer, H. Die Frau im Alter als Problem der Sozialmedizin. *Zeitschrift fuer Gerontologie,* 1978, *11,* 54–60.

Schmid, M. Wesen und Aufgabe der Gerontologie in medizinge-schichtlicher Sicht. *Bericht Symposion der Deutschen Gesellschaft für Gerontologie,* Nuernberg 1973. Muenchen: Banaschewski 1973.

Schmitz-Scherzer, R. *Probleme der psychischen Entwicklung im Alter.* Habilitation Bonn 1975.

Schultz, C. H. *Ueber die Verjuengung des menschlichen Lebens und die Mittel und Wege zu ihrer Kultur.* Berlin: Aug. Hirschwald Verlag, 1842.

Schwartz, A. N., and Snyder, C. L. Physiological, psychological and social aspects of longevity among Caribbean centenarians. *Abstr. XII Intern. Congr. Gerontology,* Hamburg, 1981.

Scott, J., and Collins, K. Effects of stress on elderly residents of a home for the aged and predictors of nonsurvival. *Gerontologist,* 1979, *19/5,* Part II, p. 143.

Shang Wang, H., and Busse, E. W. Brain impairment and longevity. In E. Palmore (Ed.), *Normal aging.* Durham, N.C.: Duke University Press, 1974, pp. 263–268.

Shank, R. E. Nutritional characteristics of the elderly—an overview. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, longevity and aging.* New York: Academic Press, 1976, pp. 9–28.

Shinohara, T. Senescence and nutrition. *Medi-Sania,* 1977, *1/4,* 22–32.

Shinohara, T. Aging and autoimmunity. *Acta gerontologica Japonica,* 1978, *61,* 83–88, 99–102.

Shinohara, T. Effects of some immune parameters on the survival rate and causes of death. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Steuer, J., LaRue, A., and Jarvik, L. "Critical loss" in the 8th and 9th decades: A longitudinal view. *Gerontologist,* 1979, *19/5,* Part 2, p. 150.

Stojnev, G. Clinico-physiological characteristics of long-lived persons in Bulgaria. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Strehler, B. L. Genetic and cellular aspects of life span prediction. In E. Palmore (Ed.), *Prediction of life span.* Toronto: Heath Lexington Books, 1971, pp. 33–49.

Strehler, B. L. Elements of a unified theory of aging—integration of alternative models. In D. Platt (Ed.), *Alternstheorien.* Stuttgart: Schattauer Verlag, 1976, pp. 5–36.

Streib, G. F. Participants and drop outs in a longitudinal study. *Journal of Gerontology,* 1966, *21,* 200–209.

Streib, G. F., and Orbach, H. L. Aging. In P. Lazarsfeld et al. (Eds.), *The use of sociology.* New York: Basic Books, 1967, pp. 612–640.

Suzuki, M., Sakugawa, H., Furumi, K., et al. Medical and sociological research upon centenarians in Okinawa. Proceedings of the Twelfth International Congress of Gerontology. Hamburg, 1981.

Terman, L. M., and Oden, M. H. *The gifted group at mid-life.* Stanford: Stanford University Press, 1959.

Thomae, H. Theory of aging and cognitive theory of personality. *Proceedings, VIIIth International Congress of Gerontology* (Vol. 1). Washington, D.C.: International Association of Gerontology, 1969, p. 7.

Thomae, H. Die Bedeutung einer kognitiven Persoenlichkeits-theorie fuer die Theorie des Alterns. *Zeitschrift fuer Gerontologie,* 1971, *4,* 8–18.

Thomae, H. (Ed.) *Patterns of aging—findings from the Bonn Longitudinal Study on Aging.* Basel: Karger 1976.(a)

Thomae, H. Background and aims of the Bonn Longitudinal Study on Aging. In H. Thomae (Ed.), *Patterns of aging.* Basel: Karger, 1976, pp. 8–11.(b)

Thomae, H., Angleitner, A., Grombach, H., and Schmitz-Scherzer, R. Determinanten und Varianten des Alternsprozesses. Ein Bericht ueber die Bonner gerontologische Laengsschnittstudie. *Aktuelle Gerontologie,* 1973, *3,* 359–377.

Wang, H. S., and Busse, E. W. Brain impairment and longevity. In E. Palmore (Ed.), *Normal aging II.* Durham, N.C.: Duke University Press, 1974, pp. 263–268.

Whitney, J. S. *Death rates of occupation based on data on the U.S. Census Bureau 1930.* New York: National Tuberculosis Association, 1934.

Wilkie, F. L., and Eisdorfer, C. Terminal changes in intelligence. *Gerontologist,* 1972, *12,* 67–72.

Wilkie, F. L., and Eisdorfer, C. Systemic disease and behavioral correlates. In L. F. Jarvik, C. Eisdorfer, and J. E. Blum (Eds.), *Intellectual functioning in adults: psychological and biological influences.* New York: Springer 1973, pp. 83–94.

Wilkie, F. L., and Eisdorfer, C. Terminal changes in intelligence. In E. Palmore (Ed.), *Normal aging II*. Durham: Duke University Press, 1974, pp. 103–115.

Williams, R. M., Yunis, E. J., et al. Immune regulation and longevity. *Proc. XIth Intern. Congr. Gerontology* (Vol. 1), Tokyo, 1978, p. 20.

Wilson, E. B., and Doering, C. R. The elder pierces. *Proceedings of the National Academy of Science* (U.S.A.), 1926, *12*, 424–432.

Wilson, A. J. E., and Webber, I. L. Attrition in a longitudinal study of an aged population. *Experimental Aging Research*, 1976, *2*, 367–387.

Woodbury, M. A., and Manton, K. G. The physiological correlates of disease development and mortality in the Duke Longitudinal Study of the Aged. *Gerontologist*, 1980, *20*, 231.

World population prospects beyond the year 2000. (Population Studies No. 49). New York: United States, 1971.

Wyshak, G. Fertility and longevity in twins, sibs and parents of twins. *Social Biology*, 1978, *25*, 315–330.

Youmans, E. G., and Yarrow, M. R. Twelve year follow-up study of healthy older men: social psychological data. *Proceedings, VIIIth International Congress of Gerontol.*, Washington, D.C.: International Association of Gerontology, 1969, p. 84.

Yuan, I. Ch. Life tables for a southern Chinese family from 1365–1849. *Humanbiology*, 1931, *3*, 157–179.

Yushen, Z., Weishan, L., and Shengchang, T., et al. A survey of aged people of ninety or over in Guangzi Zhvang Autonomous Region. Proceedings of the Twelfth International Congress of Gerontology, Hamburg, 1981.

Zonneveld, R. J. vann. Some possible psychosocial factors in aging and longevity. Proceedings of the Twelfth International Congress of Gerontology, Hamburg, 1981.

Zonneveld, R. J. van, and Polman, A. Hereditary factors in longevity. *Acta Genet. Statist. Med.*, 1957, *7*, 160–162.

CHAPTER 6
Personality and Aging

JOEL SHANAN, PH.D.
DEPARTMENT OF PSYCHOLOGY
HEBREW UNIVERSITY AND
DEPARTMENT OF PSYCHIATRY
HADASSAH-HEBREW UNIVERSITY HOSPITAL
JERUSALEM, ISRAEL

JORDAN JACOBOWITZ, M.A.
DEPARTMENT OF PSYCHIATRY
HADASSAH-HEBREW UNIVERSITY HOSPITAL
JERUSALEM, ISRAEL

THE SCOPE OF THE CHAPTER

This article reviews the empirical research in the field of personality and aging during the middle and later years. Theoretical and specula- tive contributions emanating from clinical work will be considered mainly to assess their potential heuristic value. Most of the material for the present survey is from publications that appeared between 1975 and 1980 in articles, books, and dissertations, including some of the European literature. These dates were selected to minimize possible overlap with major reviews specifically dealing with personality and aging (e.g., Thomae, 1980), which generally were based on literature published prior to 1976.

The material presented here represents a selection of what appears to be a rising wave of interest in personality development during the later years. Even if the amount is relatively small compared to other

148

aspects of adult development (for example, in the review of life span developmental psychology by Baltes, Reese, and Lipsitt, 1980, only 16 lines are devoted to adult personality development), it certainly deserves attention beyond its specific contribution to the psychology of aging.

A review of personality research in aging cannot be undertaken without placing the topic within the context of recent developments in general personality research and theory. While preparing this review it became evident that surprisingly little overlap exists between journals dealing with personality in general and those dealing specifically with aging. Gerontology journals accounted for some 65 percent of the articles reviewed on personality and aging. Only 10 percent of the articles appeared in journals devoted to the general topic of human development, with an additional 15 percent appearing in journals devoted to general psychology. The remaining articles were found in journals relating to psychopathology. This segregation of personality and aging from the general literature on personality was paralleled on the content level by infrequent attempts to relate personality findings among older populations to models of personality or to personality theory. Few attempts were found to tie personality development of middle and late years to personality theory of earlier developmental periods, although there are some notable exceptions (Folkman and Lazarus, 1980; Lazarus 1980; Lazarus and Golden, in press; Lehr, 1980; Olbrich and Thomae, 1978; Peskin and Livson, 1980; Shanan, 1976; Shanan and Weihl, 1976; Thomae, 1978). Marked too, was the tendency to turn toward social psychology or sociology rather than to personality theory for frameworks to guide and interpret research findings. For example, attribution theory, role theory, cognitive dissonance models, theories of attitude change, general theories of person–environment fit or ecological effects on personality were the most cited theoretical foci.

Recent Trends in Personality Research

The neglect of personality theory in guiding research endeavors in adult development is less surprising when one inspects the role of personality theory in the general field of psychology. The personality literature of the past decade (e.g., Blass, 1977; Helson and Mitchell, 1978; Hoffman, 1977; Jackson and Paunonen, 1980) suggests much uncertainty and confusion in attempts to forge theoretical guidelines for research. While emphasis on validating broad theories directed

personality research strategy in the 1940s and 1950s, work during the '60s and early '70s took an atomistic and at times nihilistic stance. Disputing the scientific utility and the heuristic value of broad and abstract theories and constructs, personologists sought behavioral phenomena that lent themselves to relatively easy definition and measurement. Theories based on hypothetical principles of personality organization, structure, and dynamics were abandoned. The trend toward observing easily isolated bits of behavior led many to relegate "personality" to the realm of science fiction. Intra-individual and across-situation fluctuations in specific behaviors, separated from underlying principles of organization, were interpreted to mean that "situation" was a better proposition for scientific inquiry than a metapsychological inner world. Others were willing to compromise on some mid-interactionist point of view, seeing internal characteristics reacting to external situations. Scientific precision was sought, but in Jackson and Paunonen's (1980) words, "chaotic diversity" was found.

Of course it is convenient to deal with behavior that can be conceptualized in terms of relatively isolated units lending themselves to what resembles superficially precise measurements. In contrast, personality as a construct attempts to encompass the unique organization of individual behavior in its different manifestations in varying situations and over time. During the past five years the more holistic position has been in a process of slow revitalization, apparently in response to the frustrating compartmental nature of the past decades' research efforts. While little change, if any, can be noted in research practice, calls for exploring central issues of personality and integrating them into comprehensive wholes are on the rise. For example, Hoffman concluded, "Perhaps it is time for the cognitive and affective parts of the person, long separated for purposes of analysis and research, to be put back together again" (1977, p. 317). In their 1978 review, Helson and Mitchell point to a renewed interest in idiographic and psychodynamic approaches. Similarly, Sundberg et al., while assessing the state of competency research, concluded, "The hard-headed technological approach of behaviorism is now in the process of being moderated by the two major forces: the information processing cognitive orientation and humanistic experiential approach" (1978, p. 208). A growing appreciation of the roles that theory and constructs such as "structure" can play in personality research is revealed in a number of recently published books (e.g., Goldstein and Blackman, 1978; de Rivera, 1976). These recent calls for greater flexibility and comprehensiveness of approach in investigating personality are highly relevant to personality and aging.

In summary, this area seems to have been plagued by two major problems: (1) the neglect of the field by gerontologists interested in personality and the absence of personologists interested in life-span implications of personality theory; and (2) the generally disorganized and theory-impoverished field of general personality research. We can only generalize to this field what Baltes, Reese, and Lipsitt have stated for the whole of adult developmental psychology: "The study of adult development and aging, however, does not only suggest implementation of a life-span developmental approach, it also stretches its conceptual and methodological boundaries" (1980, p. 97).

STABILITY AND CHANGE OF PERSONALITY THROUGHOUT THE ADULT YEARS

One of the greatest stumbling blocks in reaching consensus on an integrated theory of personality and its development through the life span has been the controversy concerning consistency of behavior over time. This controversy stems from two sources: divergent theoretical orientations and inconsistent empirical findings. Of course, these two sources are related to one another, with proponents of diverse orientations citing empirical evidence supporting their views. Different outlooks generate differences in research samples, methods of investigation, research design, and means of statistical analysis. Despite the centrality of the stability–change issue for research in personality, less than 15 percent of the reviewed studies directly examined it. A major reason for this neglect is no doubt the difficulty of conducting longitudinal research.

Some research strategies for studying stability and change of personality through the adult years have sought *global* rules of personality organization and change while others have emphasized *differential* or completely *idiographic* rules (Emmerich, 1968).

Today, few if any researchers of adult personality (Gribbin et al., 1980; Havighurst, 1975; Schaie and Parham, 1976; Thomae, 1980) accept the proposition of a universal unidirectional pattern of development during the aging process as hypothesized, for example, in "disengagement theory" (Cumming and Henry, 1961) or in the earlier theoretical formulations of Jung (1933) and Erikson (1950). Some researchers, however, endeavor to establish general principles of personality organization and development. Costa and McCrae (1976, 1978,

1980), for example, offer evidence for the usefulness of trait theory in demonstrating structural consistency across age groups ranging from 25 to 82 years for two central personality dimensions (Anxiety–Adjustment and Intraversion–Extraversion). Stability over time for Anxiety and Extraversion scores in a nine-year longitudinal study was also demonstrated. Although they suggest that other characteristics of personality may change, such as openness to experience, locus of control, or various unconscious or intrapsychic processes, they see greater usefulness in models that stress trait stability over time. For example, when Costa and McCrae (1978) examined empirically the ideas of midlife crises promulgated by Levinson (1978) and Gould (1972), not only was there no self-report evidence for a general crisis at midlife, but the crises were equally prevalent across the adult life span and their presence was highly correlated with Eysenck's Neuroticism scale (Eysenck and Eysenck, 1964). Furthermore, those few experiencing a midlife crisis tended to have scores on personality tests 10 years earlier indicating high "neuroticism." The suggestion was made that reporting a midlife crisis represents a form of *stability* of personality, one of the manifestations of a neurotic trait. Supporting the view of trait stability over time is the work of Siegler, George, and Okun (1979), who reported stability in personality scores for 331 men and women, aged 54 to 70 years, on the Cattell 16 Personality Factor Test across an eight-year span. They found stable sex differences but few cohort differences. Angleitner (1976) reported stability of rigidity scores for older German people across a seven-year longitudinal period. Noberini and Neugarten (1975) reported fairly high consistency for 56 women across a 10-year period for life satisfaction and coping scores. Other writers have reported stability of personality during the middle and later years, but only within specific cohorts, emphasizing personality differences among different cohorts (Schaie and Parham, 1976, 1977).

The most recent findings of Schaie and his group, however, suggest complexity of life style and associated ability patterns to be more characteristic of individuals than of cohorts (Gribbin et al., 1980). In the Baltimore longitudinal study, Douglas and Arenberg (1978) carried out cross-sequential analyses on 336 men tested twice over a seven-year span with the Guilford-Zimmerman Temperament Survey (GZTS); they found cohort differences for some of the variables and age changes on other variables. In a cross-sectional study, Giambra (1977) found age differences among 170 males aged 24 to 91 for "Neurotic Anxious Absorption in Daydreaming" but no other differences in the Imaginal Processes Inventory and GZTS. A number of fairly recent cross-sectional studies reported that despite expectations to the contrary, no differ-

ences were found in self-concept between older and younger popula-
tions (Crandall, 1975; Egan, 1977; Murphy, 1977). In general, these
studies indicate that personality is quite stable during the adult years,
although quantitative and possibly qualitative differences in structure
may characterize different cohorts.

In contrast to the above studies, there are approaches to the topic of
developmental processes which either concentrate on intracohort differ-
ential patterns of development or ignore cohort differences. These
studies usually deal with typologies. On mid-early adulthood, perhaps
Block (1971, 1981) best illustrates this approach. By factor analyzing
Q-sort items from two different longitudinally studied populations, he
was able to identify five types of men and six types of women; he
followed them to their early 30s and mid-40s, respectively. Not only
were general patterns of development different for many of the types,
but the consistency in personality variables varied from one type to the
other. Livson (1976) also used Q-sort items to identify two types of
personality organization in women, the "traditionalists" and the "inde-
pendents." She found different developmental paths for the two types
from adolescence to age 50 as well as more inconsistency in personality
growth among the independents. Similarly, Keith (1979), in a longitudi-
nal study on aged men and women in small towns, found differences in
continuity of life style among those characterized as "negativists" or
"passivists" and those as "positivists" or "activists." Higgins (1978)
examined 49 middle-aged women and identified congruent (positively
corresponding self and social identity), diffuse (conflictual self and so-
cial identity), and moderate (moderately congruent with positive self-
image) types. On a series of variables relating to adaptive potential and
life satisfaction, there were longitudinal differences among the three
types. The moderate type showed the most change (in the direction of
greater congruency) while the other two groups maintained high (con-
gruent type) and low (diffuse type) levels of adaptation and satisfaction.
These relatively recent studies generally confirm the more classical
studies on adult personality typologies (Havighurst, 1968; Maas and
Kuypers, 1974; Neugarten et al., 1964; Reichard et al., 1962). All of
them stress the differential nature of consistency and change across
different types of personality organization.

A third group of researchers have approached the question of
stability and change from either the individualized clinical viewpoint or
a social-cognitive interactionist approach (Mischel, 1968). Lehr (1976),
for example, concluded on the basis of biographical studies that pat-
terns of adult development are related neither to biological change, to
role change, nor to the change from one decade of life to the other.

She sees as much more important very personal experiences that often lead to reorganization. She confirmed this position (Lehr, 1980), after reviewing the data of the Bonn Longitudinal Study of Aging from 1965 to 1977. Olbrich (1979) found a person–situation interaction effect on stability of social role behavior in older people. In what he called "central" roles—as in intrafamilial social interactions—considerable consistency was found over time for the whole sample. For "peripheral" roles—such as citizen, club member, or friend—much more change was found in dropouts from the study than in participants. Consistency and change appeared to be a function of social and psychological factors. Elder (1979) examined the effects of a historical period, the Great Depression in the United States, on the developmental patterns of cohorts of adolescents. He found complex relationships among the stressful life event, family structure and sex of subjects. He concluded that "the impact of historical change on lives varies according to what people bring to the new situation; their resources, interpretations and relationships pattern modes of adaptation and options" (p. 156). Thomae (1980) felt that there was sufficient evidence from research on adult personality to conclude that personality functioning and change were the result of a complex interaction among age, sex, social condition, health, and various psychological factors. Considering this point, he raised doubts as to the usefulness of the "trait" approach to investigating and understanding adult personality development. He also saw the possibility of a shift from trait to what he called "process-centered" approaches. The result would be a science of personality where "the theory could end up with an ideographic concept of the uniqueness of personality like that of G. W. Allport (1937) and with a conceptualization of behavior as idiosyncratic in terms of person, situation and the specific meaning of this situation" (p. 293).

To these three divergent modes of personality study, a fourth should be added. Peskin and Livson (1980) suggested an "adult-centered" orientation to understanding personality and continuity and change throughout the life span. Their approach is based on two major premises. The first is that one must distinguish between genotypic and phenotypic levels of personality (Livson, 1973). Basic traits may be submerged for periods of time, disappearing from the surface, to reappear at some future time. Traits may also be transformed from one means of expression to another. Hence, differences in overt behavior patterns from one time to the next cannot be taken as evidence that personality has changed in the sense that major personality trends have disappeared from the person. The second premise is that periods of

adult development differ in the demands placed upon the individuals; individuals in turn draw upon their past experiences, that is, their "genotype" trait reservoir, to cope with changing demands. Through transformation or accommodation of genotypic traits to changing demands and maturational processes, new traits can emerge. Peskin and Livson (1980) cite correlational data from their longitudinal analysis of men and women tested at various times from preadolescence to age 50 that point to changing relationships of prior developmental periods to subsequent ones. For example, one trait in early adolescence may be correlated with a given trait at age 30, uncorrelated with the same trait at age 40, but again correlated with it at age 50. This approach combines conceptually both continuity and change factors simultaneously for a given individual as well as accounts for varying types of development (different genotypic pools of traits) across the life span. Many additional factors will need to be identified in order to understand stability and change in life-span personality development (Moss and Sussmann, 1980).

Developmental Stages

Relevant to the question of stability and change is the question of transitional periods, phases, or stages in the development process. The approach to this question is, of course, contingent on the basic premises concerning the nature of personality and personality development. One can discern a number of directions in the work devoted to this area (although most of the work is impressionistic, clinical, or theoretical in nature). First, in line with earlier theoreticians, particularly Erikson (1950) or Buehler (1959), regular age-sequential phases in adult development, which primarily reflect inner needs, have been postulated (Levinson, 1978). Estes and Wilensky (1978) proposed an adult developmental pattern of morale, with various phases; the phases are primarily determined by the interaction of family cycle, economic considerations, and individual's expectations. As Neugarten (1979) pointed out, some of these theories have a "staircase" quality, as though one jumps from one phase to another. Particularly the work on midlife crises (Brim, 1976; Gould, 1972) gives the impression that phases suddenly emerge. While accepting midlife as a period calling for change in life patterns, Neugarten and Datan (1974) see events during the life span as part of ongoing development in the social matrix. They see many events as expected and "rehearsed." Transition in these instances seems often smooth-flowing. Shanan (1977, 1982) sees movement through the life

span as an interaction between man as an agent of change and a set of changing environmental constellations, both factors contributing to changing patterns and qualities of transitions across historical periods. People's phenomenological descriptions of successive states or stages should thus be considered when building theories of behavioral change (Shanan and Kedar, 1980). And as previously mentioned, stability theories of personality (Costa and McCrae, 1980) tend to view phases as more or less stressful periods to which a given personality reacts in a characteristic, basically stable manner.

Although Neugarten (1977) found personality research in aging and adult development to be in a state of disarray, we can nevertheless discern many encouraging trends of the past five years. In fact, the research gerontologists seem to be coping better and more ingeniously with the major issues of personality than their nongerontologist colleagues. First, we can observe an increasing diversity and openness to different theoretical orientations in the research on adult development. For example, trait theory, differential psychology reflected in typological approaches to personality and development, and clinical, holistic orientations have become almost anathema for modern general personality research. Yet they are gaining ascendance in aging research, as in the work of Costa and McCrae (1980) in trait theory; Block (1981) and his colleagues in California on typologies; Vaillant (1977) using intensive interviewing and psychodynamic formulations of ego development to follow the course of development in his now middle-aged Harvard graduate subjects; and Livson's (1973) "adult-centered" approach.

An active willingness to confront the debilitating attacks on personality theory by social interactionist and atomistic approaches is emerging. This type of research constructively tackles many of the numerous problems of both developmental and personality research. Change of attitude toward the place of personality in development has not inhibited others from investigating the finer complexities of person–environment transactions. Ironically, it may very well be the relative isolation of gerontologists from their personologist colleagues that has led them to take a more optimistic and respecting attitude toward personality. The greater "conceptual and methodological boundaries" of the life-span approach as noted by Baltes, Reese, and Lipsitt (1980) may also have contributed to this situation.

STRESS, COPING, AND
THE PROCESS OF ADJUSTMENT

Many of the earlier studies of coping strategies and the general process of adjustment to aging focused on life satisfaction and its social and biological correlates, such as income and health. Life satisfaction is an aspect of the person–environment transaction that lies at the core of the adjustment process. Life satisfaction is influenced by adjustment as much as it influences the course of development. One instance of this mutual relationship can be found in Palmore's longitudinal study (1979). The best predictors of "successful aging" (defined as physical survival to age 75) were initial measures of health and happiness, which together predicted 74 percent of the variance. Thus, life satisfaction or any measure of adjustment can serve both as a dependent variable representative of past and contemporaneous processes of adjustment and as a predictor of itself at some future time. Furthermore, determinants of life satisfaction or adaptation at different times or across different situations or for different types of people are likely to differ. Lieberman (1975), for example, suggested that personality traits associated with adjustment differ for older and younger people.

Viewing adjustment as a dynamic process across time intervals necessitates a shift in both theoretical perspectives and empirical aims. Rather than determining the correlates of life satisfaction at a given time for a given population, the task becomes that of investigating the vicissitudes of adjustment over time. Changes in research paradigms reflecting this latter orientation are evident in a number of major works in life-span psychology (Hultsch and Plemons, 1979; Lieberman, 1975; Palmore et al., 1979; and Vaillant, 1977).

Many have taken it for granted that aging is particularly stressful. Events such as retirement, widowhood, health decrements, and the "empty nest" (Lowenthal and Chiriboga, 1972) are age-linked because of their greater liklihood of occurring the second half of the life span. "Life event" stress models (Holmes and Rahe, 1967) and their applications to medical illness (Eisdorfer and Wilkie, 1977; Holmes and Masuda, 1974), psychiatric vulnerability (Caplan, 1981), and life-span developmental psychology (Chiriboga and Cutler, 1980; Hultsch and Plemons, 1979; and Lieberman, 1975) have reinforced the impression that aging leads to greater physical and psychological vulnerability with consequent decrements in adjustment. With the exceptions of Erikson (1950) and Jung (1933), psychoanalytic theory, with its emphasis on intrapsychic loss (loss of ego strength or lessened drive-energy), sup-

ported this decrement model (Freud, 1959; Zinberg and Kaufman, 1978). To some extent, disengagement theory (Cumming and Henry, 1961) originated as a response to this age-related decrement model. While accepting the view of an age-linked shrinking of life space, disengagement theory postulated a self-chosen trend of withdrawal and self-reorganization to take out the sting of external losses.

Recent empirical findings and theoretical speculations have questioned whether stress and decrement models of aging are sufficiently encompassing, helpful, or even appropriate in investigating the normal course of development during the life span. If fact, if recent trends are any indication of future developments, it appears that the stress-decrement model of adjustment and aging will follow the path of the decrement model of intellectual development that Schaie and his colleagues have questioned (Schaie, 1979).

Stressful Events in Later Life

Do older people actually experience more stress than younger people? Can decrements in adjustment, if they exist, be connected with increased stress during the aging process? Lowenthal, Thurner, and Chiriboga (1975) found that there were more signs of emotional distress among young newlyweds than in two older populations (average ages of 50 and 60). They found no age differences in the distribution of stress types across four age groups. Stuart (1978) compared older adults from Leisure World (a retirement community in California) with university students. He reported that the old people were significantly more satisfied than the young people. The data from the second Duke longitudinal study (Palmore et al., 1979) revealed a relatively low incidence of stressful events in an adult sample of 375 people aged 45 to 70 at first time of measurement. After an eight-year interval, 80 percent had not retired, 80 percent of the subjects' spouses had not retired, 75 percent had had no major illness, 94 percent had not experienced widowhood, and 85 percent had not experienced a last child leaving home. It is hard to know whether this is characteristic of the second half of life, since no comparable life event data are available for equivalent younger samples. Can one assume that stressful life events such as marriage, birth of first child, divorce, change of job, mental health crisis, or psychiatric hospitalization are similarly distributed over the life span? Our own data in Jerusalem show that the majority of people over the age of 55 who were hospitalized for psychiatric problems had either been hospitalized at least once during their 30s or

40s or had suffered previous psychological problems requiring psychiatric intervention (Livne, 1981).

From a theoretical point of view, Neugarten's (1979) concept of on-time and off-time events in the life span is relevant here. Older people may anticipate and integrate some events within a positive social and self configuration. Are the same life events that are stressful for younger people—even medical problems and widowhood—as stressful to the aged? Whatever the case, it has not been established conclusively that the majority of older experience objectively or subjectively more stress than the majority of younger people.

Coping with Stress

Even if there is no increase in stress level during the second half of the life span, it is possible that older people have more difficulty in coping with stressful or even everyday events. From an operational point of view, this question may be posed thus: Is there evidence (1) that adjustment level declines over time and (2) that older people manifest poorer ability to cope with stress as compared to younger people?

The study by Palmore et al. (1979) sheds some light on the first question. Surprisingly, although major illnesses had negative effects on later health, they had few long-term effects on psychological adaptation. Yet it should be noted, as Siegler (1980) pointed out, that those people who reported a particular stressful life event had relatively poor psychological resources *before* the event occurred. Psychological resources were defined in the study by joint criteria of intelligence and adaptive capacity as measured by the Cattell 16 PF Factor QII (Cattell and Eber, 1966). Although it is difficult to make a causal statement regarding the link between psychological resources and stress, this finding underlines the circular relationship of elements in the adjustment process noted above. Not only do life events influence adjustment, but adjustment may also influence life events. A second finding was that the effects of retirement on overall adjustment level were generally negative but small. The negative effects of other life events on life satisfaction and other indices of adjustment were insignificant. In fact, contrary to expectations, the empty nest situation resulted in positive changes in satisfaction. Across all stressful events, long-term negative reactions occurred primarily among people having relatively poor social and psychological resources. The researchers concluded that at least for their "normal," middle-class sample, "it appears that many of these potentially stressful events have less serious long term

outcomes than a crisis orientation would suggest; and those with good physical, psychological and social resources have even less to fear from these fearful events" (Palmore et al., 1979, p. 850).

Similarly, Chiriboga (1981) could not link decrements in adjustment longitudinally to difficult transition periods. He questioned the utility of antecedent stress models (Hultsch and Plemons, 1979). Noberini and Neugarten (1975) found that there was no connection between stressful life events and life satisfaction over a period of 10 years for 56 women, although losing a spouse was associated with a drop in coping ability. These studies support some of the earlier findings of the longitudinal study of Maas and Kuypers (1974), who did not find evidence of personality change during or after major transitions (e.g., widowhood and retirement).

There is, therefore, no clear evidence, at least for normal older people with adequate social and psychological resources, that there is any decrement in adjustment (as measured by self-report techniques) when faced with on-time stressful life events. Nor can one conclude that the second half of the life span is in general more stressful than the first half.

With regard to the question of age differences or age changes in ability to cope with stress, empirical findings suggest that on the social-behavioral level, measured by interview or self-report techniques, there is little evidence for age-related decrease in coping ability; on a deeper intrapsychic level, as extrapolated from projective tests, there is growing evidence for a change in coping style.

Coping Style

In an institutional setting for old people, Lieberman (1975) found that the most adaptive coping style was characterized by aggressiveness, irritability, demandingness, and narcissism. Moreover, maintenance of personal identity as well as the presence of introspective tendencies was also associated with more favorable adaptation to relocation. These findings suggest that those who succeed in psychologically integrating experience over time and across situations and maintain a sense of continuity of self fare well even in very stressful situations.

Stuart (1978) examined the adjustment patterns of young (college age) and old females in California via self-report questionnaires and objective tests. He concluded that stressful life events were significant in the etiology of illness. But he attributed similar importance to psy-

chological defense mechanisms used to "cope" with these stressful life events encountered.

Vaillant (1977) developed a hierarchial model of defense mechanisms, ranging from immature to mature. He applied this model to a sample of Harvard graduates and found a general trend toward the increased use of the mature defense mechanisms from the early 20s to the early 50s. He concluded that stress in itself was not related to adjustment across a number of life areas; rather, the kinds of defense mechanisms employed were the prime correlates of psychosocial adjustment. Those maintaining or developing more mature defense mechanisms fared better in midlife than those who did not.

A host of studies have consistently shown that older people with an internal locus of control manifest overall higher adjustment levels than those with external locus of control (Hamrick, 1976; Varna Garis, 1977, Kivett, 1976; Driver, 1975; Baker, 1976). Similarly, higher levels of adjustment in institutions for the aged have been associated with better impulse control (Kahana and Kahana, 1975) and self-actualization tendencies (Landau and Maoz, 1978). Thomae (1980) concluded that internal locus of control was related to more successful coping patterns in both younger and older groups and that there was little evidence for age difference in this personality characteristic. Costa and McCrae (1980), on the basis of theirs and others' studies, concluded that individual coping capacities remain quite stable throughout the adult period. Savage et al. (1977) similarly found no age difference in "neuroticism" scores on the MMPI over the 70 to 90 year age range.

The pioneer work of Gutmann (1964) and Rosen and Neugarten (1960) with the Thematic Apperception Test and Ames et al. (1954) with Rorschach responses suggested an age-related constriction of ego strength and active strategies of problem solving. The review article of Kahana (1978) on projective tests in general confirmed this view. Schiff (1977) reported that Draw-a-Person test performance of elderly persons significantly differed from a younger comparison group. Gutmann's (1980) more recent work stresses the importance of culture and individual personality structure for the development of specific adjustment patterns and psychopathology.

If in fact coping as measured by projective tests is age related, what is the meaning of this apparent discrepancy between self-report and interview techniques on the one hand and projective tests on the other? The above studies and our own work in Israel suggest that it is the relationship among different levels of experience and consciousness (Leary, 1957), that is, personality structure, that undergoes change

with the aging process. The constriction noted on projective tests may reflect drawing upon internal coping reserves to bolster social functioning and to maintain self-image, perhaps in response to lower physical energy levels.

Research in Personality and Coping in Israel

One of the early cross-sectional studies on aging (Shanan and Sharon, 1965) illustrates this change of coping strategy. Sixty-two healthy males between the ages of 34 and 62, of relatively high educational backgrounds, were administered a series of cognitive and personality tests, including the TAT. Findings indicated that the older adults had lower achievement motivation, a lessened need for interaction with the outer world, and lowered morale as revealed in growing pessimism on the TAT. On the other hand, no age differences were found in extent of risk-taking behavior, expressed emotion, or indices of cognitive performance. This pattern of findings suggested that in spite of decline in certain aspects of ego strength, a change in psychological structure permitted the maintenance of adequate social functioning. The authors suggested that people over 40 may sense certain biological changes, which in turn are reflected in a consciously unacknowledged lowering of morale and in a tendency to see oneself as more passive and less likely to succeed. These changes may occur in spite of the absence of any objective reason to doubt one's ability.

Subsequent work focused on the role of coping from a structural point of view. The definition of coping used served as a conceptual framework from which test measures of active coping have been developed. Coping includes (1) field articulation, the individual's readiness to perceive sources of potential threat or challenge, (2) the readiness to tolerate perceived complexity or conflict, in a way that maintains (3) optimal balance between the demands of reality and the self as reflected in positive self-esteem. Accordingly, reliable measures of coping behavior and its parameters were derived from the Shanan Sentence Completion Technique (SSCT) as well as from other techniques of personality assessment. The validity and reliability of the SSCT have been reported in a number of studies of development from adolescence to adulthood (Shanan, 1976). It has been shown to differentiate consistently between adult psychiatric, psychosomatic, and normal populations (Hess, 1978; Shanan, 1968, 1973, 1976; Shanan and Galnour, 1979; Shanan and Jacobowitz, 1979; Shanan et al., 1965).

In 1967, 152 Jewish Jerusalemites participated in the first large-

scale cross-sectional study on psychological aging in Israel (Shanan, 1968, 1969, 1975a). The participants were divided into three age co-horts, aged 46 to 55, 56 to 65, and 66 to 75 years. Each cohort was equally divided into subjects of Western (mostly European) and East-ern (Afro-Asian) origin. Men and women and people with less (6 to 10 years) and more (11 or more years) education were equally repre-sented. All subjects were clinically healthy individuals, living in the community and actively engaged in full-time or part-time work, even if after formal retirement. The subjects were interviewed and adminis-tered a battery of psychological tests: the TAT (Murray, 1938) and the Shanan Sentence Completion Technique.

In 1972, a second cross-sectional study of an additional 116 subjects ranging in age from 45 to 65 was undertaken (Shanan, 1975b). The distribution of subjects in terms of education, sex, and geographic origin was identical to those of the 1967 study, as were the instruments used to test the subjects. In addition, data were gathered on psychological aging across the same age range of 45 to 65 from about 200 people from so-called development towns[1] and close to 200 members of kibbutzim[2] to asses the impact of ecological setting on aging. Data from both cross-sectional studies revealed that the direction and amount of change in coping patterns across the ages were similar to those reported in the 1965 study: few overall age differences in global measures of coping and in general level of energy but an increase in readiness to perceive intra-psychic complexity. In other words, it appeared that maintenance of adequate coping levels across age groups was associated with a struc-tural change in style of coping as age increased.

The 1967 and 1972 samples differed in coping patterns as revealed in the relationships between SSCT and TAT coping scores. The 1972 groups showed a greater readiness than did the 1967 group to cope actively on an overt level (SSCT), while responses to the TAT, which are under less conscious control, showed the opposite trend. More-over, overt self-perception was more positive in 1972 than in 1967 but time perception and the less-obvious indicators of morale were more negatively toned. These effects occurred differentially among sub-groups and were more clear-cut in people of European origin, in the

---

[1]Townships planned and built as urban centers of rural development, after the establish-ment of the State of Israel. They are populated mostly by poorly educated people of Mideastern background.

[2]Collective settlements started by small groups of Jewish pioneers since the beginning of this century to promote agricultural development in the then arid areas. They are popu-lated mostly by people of European background.

better educated, and in the younger (46 to 55) group. A hypothesis was advanced that those differences between the populations may have reflected effects of the prevailing political atmosphere during the five-year period from 1967 to 1972, that is, reactions to the Six-Day War in 1967 and the latent tensions of "tired heroes" five years later (Shanan and Sagiv, 1974). These findings suggested that exploring the relationship between the overt and the covert aspects of coping can shed light on different developmental patterns of intrapsychic structure (Shanan, 1975). The data from the combined cross-sectional studies reflected differences in ego structure between the high and low education groups. Intelligence, coping, and certain self-evaluation variables (derived from the interview) were more highly correlated with one another among the older higher educated than among the older lower educated. The greater cohesiveness of structure among the more highly educated was suggested to reflect a greater "integrity" as opposed to "diffusion" of ego identity. Yuval (1980) examined the coping styles of men and women in the combined cross-sectional data. She reported that across all age groups men coped more actively with difficulties and showed a more positive self-image, although level of education affected the extent of the differences. In fact, sex differences practically disappeared among the more highly educated.

The importance of differences in structure of coping patterns among different subcultural groups was further reinforced by another finding for the same cohorts matched for background characteristics. Structural differences across ecological settings appeared even when cohorts, cultural background, and time of measurement were constant. For example, people of Mideastern background living in development towns showed higher global coping on the SSCT but lower overall intelligence scores than the people of identical background living in urban centers (Shanan, 1978). While there were no differences in intelligence between Westerners living on the kibbutz and in the city, those living on the kibbutz had lower coping scores than those in the city.

In 1975 the 1967 population was retested, as was the 1972 population in 1980. These data are in the process of being analyzed by the sequential methods developed by Schaie (1977). Early results show that for the longitudinal age range as a whole (45 to 75), coping scores on the SSCT tended to drop over time, although the decrease was substantially larger in the 1972 than in the 1967 population, suggesting either a cohort or a time-of-measurement effect on coping patterns over time. It should also be recalled that the 1972 population had a larger gap between overt and covert coping scores. Possibly the relatively steep drop on the overt coping scores of the 1972 population

may be related to different patterns of ego structure between the two populations. The TAT longitudinal data tended to show more decline than the SCCT in spite of the fact that story length and amount of content did not decrease over time. The main decrease was on morale and the readiness to cope actively. In spite of such change in group means, intragroup stability as reflected in time 1–time 2 correlations was reasonably high (mean r's were around .40).

Other Personality Variables

Life satisfaction, essentially an attitudinal variable, has attracted perennial attention from gerontologists. It has, as Thomae (1980) pointed out, been used as a general indicator of the outcome of the adjustment process. Perhaps to examine and refute stereotyped conceptions that older people suffer from widespread defects in flexibility, resiliency, intellectual abilities, mental health, and so on, life satisfaction has been given much more emphasis in the field of gerontology than in general personality research. Furthermore, concern with life satisfaction and its related constructs of morale and adjustment (Lohmann, 1977) has been perpetuated by the relative ease with which it can be measured.

The research on life satisfaction of the past five years seems in general to have confirmed the work of prior years. Thomae (1980) summarized recent work in this area: despite the "somewhat unsatisfactory results obtained thus far . . . the repeated appearance of income and perceived health in most of the studies indicated that they may be major factors influencing morale" (p. 289).

The topics reviewed thus far account for the largest part of the published literature. Excluding psychopathology and a growing literature on sexual functioning of the aged, the remaining literature on personality during the aging process is sparsely distributed among sundry topics, such as social development (Kahana, 1981), attitudes held by or toward the aged (e.g., Herzog, 1976; Schweibert, 1978; Westphal, 1977), the impact of various activities such as sports or music (Altman, 1978; Trowbridge, 1979), and motivation for learning (Dillon, 1977; King, 1977). There are surprisingly few studies on motivation or motivational structures, the nature of emotional life (except for "happiness" and "sadness"), the quality and diversity of interpersonal relationships, or moral development. The virtual absence of these topics together with the emphasis on adjustment processes is indicative of the strong tendency to perceive the aged as a risk population. This

propensity persists despite the fact that the majority of studies demonstrate that the majority of the older population is quite healthy and in general copes quite well with the normal stresses of life. Perhaps during the next decade more attention will be paid to the normal everyday expression of personality during the aging process as well as the ways people handle "daily hassles" (Lazarus, 1980).

METHODOLOGICAL ISSUES

Despite the progress in personality research, one cannot help noting the casual way in which many studies of personality and aging are designed and results are generalized and interpreted. While personologists struggle with basic questions of reliability and validity of personality assessment instruments and techniques (Fiske, 1974), many studies in personality and the aging process take for granted that measures of life satisfaction, coping, personality questionnaires, and interview ratings are accurate, reliable, and revealing. There have been some admirable defenses of personality concepts and assessment techniques (Block, 1977; Livson, 1973). However, one cannot ignore complacently some justified criticisms. This section will review some methodological issues that sooner or later will have to be resolved before the researcher can rest assured that his or her data are reliably meaningful.

Sampling Procedures and the Problem of Attrition

Most studies in personality deemphasize problems of selective sampling and dropout. Yet considering the importance of the individual's history and socioeconomic background for the understanding of personality, one should be careful to specify the historical, environmental, and contextual characteristics of the sample, as well as the conditions of assessment. Many studies, particularly long-term longitudinal studies, encounter monetary, manpower, or other practical constraints that lead to the restriction of subject sampling to certain locales or groups of people.

Refusals or dropouts may occur at initial or later periods of the study because of time, money, change in address, ill health, or death. One may wonder, for example, whether much of the stability of personality findings is produced because "unstable" people may be more

inclined to refuse to participate or to drop out over time. General levels of adaptation, that is, may be exaggeratedly high (e.g., the population of Vaillant, 1977) or low (e.g., the institutionalized population of Lieberman, 1975). Studies in Jerusalem (Shanan, 1978) and elsewhere (e.g., Palmore et al., 1979) found that dropouts tend to have lower psychological and social resources than participants.

Unconfounding Developmental Correlates

With a few exceptions (e.g., Elder, 1979; Gribbin et al., 1980; Schaie and Parham, 1976), most studies in personality during the adult years have not applied the desirable quasi-experimental developmental designs (Schaie, 1977). These designs seem particularly relevant for studying developmental transition, phase-oriented theories, responses to life events, effects of social change on developmental patterns, and differential patterns of stability and change.

One should note, however, that the choice of optimal age ranges to build cohorts (1, 2, 5, or more years?) is not a clear issue. How does one select particular historical events that are relevant for personality development? Do historical periods have the same psychological impact on different background groups? For example, one might ask, was the impact of the World War II period psychologically the same for Jews and Germans? Cohort analysis may reveal no more than the cover of the book until some of these questions are further clarified.

An additional problem is that, in the area of personality, quasi-experimental designs may require further elaboration. For example, as Block (1971), Maas and Kuypers (1974), and others have demonstrated, within the same cohort of a single longitudinal study, different groups or types of personality organization evince divergent patterns of development. Lumping people together obscures these diverse patterns; studying only certain types precludes generalization to others even within the same cohort. Much work is necessary to identify relatively homogeneous personality organizations or types within single cohorts. The generality of these types across cohorts must be established and the interactions among units of organization, environmental factors, and patterns of development observed within the context of age. Means must be found to classify different psychological organizations by reliable and meaningful methods, to stipulate population characteristics, and to avoid selective sampling. Such improvements will help unconfound the effects of age from those due to environmental vicissitudes on developmental processes.

Conceptions of Stability and Change

Oversimplified ways of testing stability or change over time are often adopted, such as simply comparing scores or ratings of two age groups, or of the same group at two or more periods of time. Stability is frequently measured by testing differences among group means or the correlation between time 1–time 2 measures. The two main problems of measuring developmental change are (1) the conceptualization of stability and change, and (2) technical difficulties in measurement (Overton and Reese, 1981).

Defining Change

In order to specify the paths and processes of change, one must first define categories of change. Such categories may include, for example, continua in any one or more of these categories: (1) relatively slow rate of change ("stable") versus quick rate of change ("change"); (2) no change in direction ("stable") to change in same direction ("stable pattern") to change in different direction ("change"); and (3) "stable" rates or unidirectional patterns of change that remain "stable" over time versus those who change over time (for example, early versus late bloomers). Thus a person may be a changer in rate but a nonchanger in direction. The solutions offered are also important for the analysis of the continuity–discontinuity issue (Lehr, 1978). The criteria employed to define change affect not only what the researcher concludes from his study but also what he selects to observe while planning his study.

A second problem in specifying categories of change stems from the fact that many behavioral phenomena change their social-psychological meanings as development proceeds or context changes. As an example, Haan (1977) delineated four categories of "change" based upon two factors, absolute (compared to one's own previous level) and relative (in comparison to others) change: (1) sameness—both absolute and relative levels of functioning remain the same; (2) continuity—absolute level changes but for all individuals in the same direction; (3) discontinuity—changes occur in either absolute or relative levels but return to previous absolute or relative level of functioning at a later period of development; and (4) change—a person's absolute and relative functioning changes permanently over time. The distinction between absolute and relative change is particularly relevant for variables whose meaning and consequences change as context changes. For ex-

ample, infantile behavior for a two-year-old may be quite adaptive and successful in the context of the home but totally maladaptive four years later in the context of school. In such cases, there is stability in absolute level of functioning but change in relative level (since most other two-year-olds will no longer exhibit that behavior four years later). Thus, paradoxically, it is possible for a person to be a stable coper across time or situations by continually changing behavior or to be an unstable coper by not changing behavior.

Measuring Change

After defining what to observe, the next task is to measure it. Differences between pre- and postobservation scores may be due to (1) real change in the characteristic being studied; (2) change in factors affecting performance but not in the characteristic itself, such as motivation, testing or observatory conditions, or learning effects from first testing period (Fiske, 1974); or (3) unreliability of testing instruments. Some of these factors may be relatively controlled by maintaining consistency in tester and testing conditions, by testing matched samples not included in first testing at retest period (posttest-only group) and by using instruments with high reliability. Nevertheless, meeting these conditions in longitudinal studies is particularly difficult. Over relatively long periods of time the research staff is subject to turnover, and it is difficult to assure tester and scorer similarity. Moreover, there is always the temptation to improve or introduce new tests and techniques on the basis of prior experience. Whatever the case, it should be emphasized that problems of unreliability favor finding changes in scores over time, at least on an individual basis. Consequently, longitudinal studies may tend to exaggerate the degree of instability of behavioral indices over time.

   Another problem of measurement stems from the fact that most personality tests are not intervally scaled; therefore, differences in test-retest scores reflect only relative directional changes. How much in absolute terms a person changes is difficult to determine. Hence, comparisons among or within individuals are problematic. Changes of equal numerical value among subjects with different initial scores may be incomparable; it might be easier, for example, to move from low to medium scores than from medium to high scores. Many tests may not pick up performance beyond a certain level ("ceiling effect"); high scores may undergo real change without any evident signs of it. A similar floor effect, the test's inability to discriminate below a certain

level, also puts constraints on measuring change over time. It is beyond the scope of the present paper to review the theoretical and statistical attempts to overcome the problems of measuring change (see Cronbach and Furby, 1970; Harris, 1963; Linn and Slinde, 1977; Rudinger and Lautermann, 1975); however, thus far there have been no generally accepted solutions (Aschenback, 1978).

As a final point it should be stressed that the technical and conceptual problems of personality research are inextricably bound. As previously mentioned, objectively measured change in functioning cannot be dissociated from the problem of intrasubjective (self-perceived) and intersubjective (relative or normative) evaluation of meaning. For instance, a statistically significant decrement in a particular intellectual function may have little or no impact on a person's performance at his or her place of work. Even if absolute measures of psychological traits were obtainable, comparison among groups of people from different life contexts or with diverse psychological organizations may lack meaning. Change in level of aggression, for example, may signify wideranging reorganization in one personality while in another it may mean change isolated from more central patterns or processes of functioning.

Summing up this section, it can be stated that studies examining developmental processes should provide some framework for conceptualizing and defining change. It seems wise to consider objective, intersubjective, and intrasubjective dimensions in conceptualizing change. Each dimension may change quantitatively, qualitatively, or in its degree of consistency over time. Technical problems of measurement affect each conceptualized dimension of change. Finally, the practical or social-psychological meaning of change should be considered within the context of environment and individual organization.

CONCLUDING REMARKS

This review of the past half-decade of psychological research on personality development during the second half of life concludes on an optimistic note. There is renewed interest in the field and growing sophistication in both the reanalysis of data collected long ago and even more so in studies designed recently. Many of the new studies contribute to basic theoretical and/or methodological issues.

There is growing awareness that the conceptual analysis of theoretical propositions about aging must be integrated within an assump-

tional framework that is valid for earlier phases of development and for personality as a whole. The life-span developmental approach that has produced progress in the realm of intellectual development is now coming of age in research on personality development.

The conceptualization of coping with and adapting to change as a process rather than as an outcome has contributed greatly to progress in this area. This process view revealed the complexity of issues involved in research on adaptation in later life. It was also instrumental in reviving interest in theories of personality and personality development in which man is assumed to play an active part, rather than being conceptualized as a respondent.

Methodological problems of measuring stability and change have made it clear that only sound logical analysis of the conceptual framework can integrate data gathering, data analysis, and the subject matter they are are supposed to clarify. It is in this realm where creative thought and technical advance are probably most needed.

REFERENCES

Allport, G. W. *Personality: A psychological interpretation.* New York: Harper, 1937.

Altman, K. P. The effect of a music participation program on self-concept and extraversion of senior citizens in a day treatment facility. *Dissertation Abstracts International,* 1978.

Ames, L. B., Learned, J., Métraux, R. W., and Walker, R. N. *Rorschach responses in old age.* New York: Harper, 1954.

Angleitner, A. Changes in personality observed in questionnaire data from the Riegel Questionnaire on rigidity, dogmaticism, and attitude toward life. In H. Thomae (Ed.), *Patterns of aging.* Basel-New York: Karger, 1976.

Aschenbach, T. M. *Research in developmental psychology: Concepts, strategies, methods.* New York: Free Press, 1978.

Baker, E. K. Relationship of retirement and satisfaction with life events to locus of control. *Dissertation Abstracts International,* 1976, *37* (9-B), 4748.

Baltes, P. B., Reese, H. W., and Lipsitt, L. P. Life span developmental psychology. *Annual Review of Psychology,* 1980, *31,* 65–110.

Blass, R. *Personality variables in social behavior.* New York: John Wiley and Sons, 1977.

Block, J. *Lives through time.* Berkeley, Calif.: Bancroft Books, 1971.

Block, J. Recognizing the coherence of personality. In D. Magnusson and N. S. Endler (Eds.), *Personality at the crossroads.* Hillside, N.J.: Laurence Erlbaum, 1977, pp. 37–64.

Block, J. Some enduring and consequential structures of personality. In A. I. Rabin (Ed.), *Further explorations in personality.* New York: John Wiley and Sons, 1981.

Brim, O. G. Jr. Theories of male midlife crisis. *Counseling Psychologist,* 1976, *6,* 2–9.

Buehler, C. *Der Menschliche Lebenslauf als Psychologisches Problem.* Gottingen: Hogrefe, 1959.

Caplan, G. Mastery of stress. *American Journal of Psychiatry,* 1981.

Cattell, R. B., and Eber, H. W. *The Sixteen Personality Factor Questionnaire Test.* Champaign, Ill.: Institute for Personality and Ability Testing, 1966.

Chiriboga, D. A. Consistency in adult personality: the influence of social stress. Presented at 12th International Conference of Gerontology, Hamburg, 1981.

Chiriboga, D. A., and Cutler, L. Stress and adaptation: life-span perspective. In L. W. Poon (Ed.), *Aging in the 1980's.* Washington, D.C.: American Psychological Association, 1980, 347–362.

Costa, P. T. Jr., and McCrae, R. R. Age differences in personality structure: a cluster analytic approach. *Journal of Gerontology,* 1976, *31,* 564–570.

Costa, P. T. Jr., and McCrae, R. R. Objective personality assessment. In M. Storandt, I. C. Siegler, and M. F. Elias (Eds.), *The clinical psychology of aging.* New York: Plenum, 1978.

Costa, P. T. Jr., and McCrae, R. R. Still stable after all these years: personality as a key to some issues in adulthood and old age. In P. B. Baltes and O. G. Brim, Jr. (Eds.), *Life span development and behavior* (Vol. 3). New York: Academic Press, 1980.

Crandall, R. C. An exploratory study of the self concept of male members of selected senior centers in southeastern Michigan. *Dissertation Abstracts International,* 1975, *36* (3-A), 1824.

Cronbach, C. J., and Furby, C. How should we measure change—or should we? *Psychological Bulletin,* 1970, *39,* 670–690.

Cumming, E., and Henry, W. E. *Growing old: The process of disengagement.* New York: Basic Books, 1961.

de Rivera, J. *Field theory as human science.* New York: Gardner Press, 1976.

Dillon, J. Learning aspiration of older adults. *Dissertation Abstracts International,* 1977, *39,* (2-A), 606.

Douglas, K. D., and Arenberg, D. Age differences in cohort differences and cultural change in the Guilford-Zimmerman Temperament Survey. *Journal of Gerontology,* 1978, *33,* 732–747.

Driver, J. D. Personality differences in the elderly as a function of type and length of residence. *Dissertation Abstracts International,* 1975, *36* (3-A), 1860–1861.

Egan, M. J. A study of the effect of educational level, age, and sex and the values and self concepts of adult students and alumni of an adult baccalaureate degree program. *Dissertation Abstracts International,* 1977, *37* (11-A), 7034–7035.

Eisdorfer, C., and Wilkies, F. Stress, disease, aging and behavior. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977.

Elder, G. H. Historical change in life patterns and personality. In P. B. Baltes and O. G. Brim (Eds.), *Life span development and behavior* (Vol. 2). New York: Academic Press, 1979.

Emmerich, W. Personality development and concepts of structure. *Child Development,* 1968, *39,* 671–690.

Erikson, E. H. *Childhood and society.* New York: Norton, 1950.

Estes, R. J., and Wilensky, H. L. Life cycle squeeze and the morale curve. *Social Problems,* 1978, *25,* 277–292.

Eysenck, H. J., and Eysenck, S. B. G. *Manual of the Eysenck Personality Inventory.* London University Press, 1964.

Fiske, D. W. The limits for the conventional science of personality. *Journal of Personality,* 1974, *42,* 1–11.

Folkman, S., and Lazarus, R. S. An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior,* 1980, *21,* 219–239.

Freud, S. *Analysis terminable and interminable, collected papers* (Vol. 5). New York: Basic Books, 1959, pp. 316–357.

Giambra, L. M. A factor analytic study of daydreaming, imaginal process and temperament: a replication on an adult male life span sample. *Journal of Gerontology,* 1977, *32,* 675–680.

Goldstein, K. M., and Blackman, S. *Cognitive style.* New York: John Wiley and Sons, 1978.

Gould, R. L. The phases of adult life: a study in developmental psychology. *American Journal of Psychiatry,* 1972, *29,* 521–531.

Gribbin, K., Schaie, K. W., and Parham, I. A. Complexity of lifestyle and maintenance of intellectual abilities. *Journal of Social Issues,* 1980, *36,* 47–61.

Gutmann, D. C. An exploration of ego configurations in middle and late life. In B. L. Neugarten (Ed.), *Personality in middle and late life.* New York: Atherton, 1964.

Gutmann, D. Observations on culture and mental health in later life. In J. Birren and B. Sloane (Eds.), *Handbook of mental health and aging.* Englewood Cliffs, N.J.: Prentice-Hall, 1980.

Haan, N. *Coping and defending: Processes of self-environment organizations.* New York: Academic Press, 1977.

Hamrick, N. D. Learned helplessness and internal-external locus of control in the elderly. *Dissertation Abstracts International,* 1976, *37* (11), 5812-B, 107.

Harris, C. W. (Ed.). *Problems in measuring change.* Madison: University of Wisconsin Press, 1963.

Havighurst, R. J. Personality and patterns of aging. *Gerontologist,* 1968, *8,* 20–23.

Havighurst, R. J. Life style transitions related to personality after age fifty. Presented at the International Society for Study of Behavioral Development Symposium, Kibbutz Kiryat Anavim, Israel, 1975.

Helson, R., and Mitchell, V. Personality. *Annual Review of Psychology,* 1978, *29,* 555–586.

Herzog, A. R. Effects of age, information reception, and source credibility on attitude change. *Dissertation Abstracts International,* 1976, *37* (B), 5397.

Hess, N. The Shanan Sentence Completion Technique: comparison between psychiatric patients and the psychologically healthy (in Hebrew). Unpublished M. A. Thesis, Hebrew University, Jerusalem, 1978.

Higgins, D. H. Self-concept and its relation to everyday stress in middle-aged women: a longitudinal study. *Dissertation Abstracts International,* 1978, *38* (9-B), 4539.

Hoffman, M. L. Personality and social development. *Annual Review of Psychology*, 1977, *28*, 295–322.

Holmes, T., and Masuda, M. Life change and illness susceptibility. In B. S. Dohrenwend and B. P. Dohrenwend (Eds.), *Stressful life events*. New York: John Wiley and Sons, 1974.

Holmes, T., and Rahe, R. The social readjustment scale. *Journal of Psychosomatic Research*, 1967, *11*, 213–218.

Hultsch, D. F., and Plemons, J. K. Life events and life span development. In P. B. Baltes and O. G. Brim (Eds.), *Life span development and behavior* (Vol. 2). New York: Academic Press, 1979.

Jackson, D. N., and Paunonen, S. V. Personality structure and assessment. *Annual Review of Psychology*, 1980, *31*, 503–552.

Jung, C. G. *Modern man in search of soul*. New York: Harcourt, 1933.

Kahana, B. The use of projective techniques in personality assessment of the aged. In M. Storandt, I. C. Siegler, and M. F. Elias (Eds.), *The clinical psychology of aging*. New York: Plenum Press, 1978.

Kahana, B. Social development in adulthood aging. In B. Wolman (Ed.), *Handbook of developmental psychology*. Englewood Cliffs, N.J.: Prentice Hall, 1981.

Kahana, B., and Kahana, E. The relationship of impulse control to cognition and adjustment among institutionalized aged women. *Journal of Gerontology*, 1975, *30*, 679–687.

Keith, P. M. Life change perceptions of life and death among older men and women. *Journal of Gerontology*, 1979, *34*, 870–878.

King, D. M. Factors affecting the motive to avoid success: age, sex role orientation, and type of cue. *Dissertation Abstracts International*, 1977, *38* (5-B), 2429.

Kivett, V. A. Physical, psychological and social predictors of locus of control among middle aged adults. *Dissertation Abstracts International*, 1976, *37* (5-B), 2481.

Landau, E., and Maoz, B. Creativity and self-actualization in the aging personality. *American Journal of Psychotherapy*, 1978, *32*, 117–127.

Lazarus, R. S. The stress and coping paradigm. In C. Eisdorfer, D. Cohen, A. Kleinman, and P. Maxim (Eds.), *Theoretical basis for psychopathology*. New York: Spectrum, 1980.

Lazarus, R. S., and Golden, G. The function of denial in stress, coping and aging. In *The biology and behavior of the elderly* (Vol. 3). Washington, D.C.: National Research Council Assembly of Behavioral and Social Science, Committee on Aging, in press.

Leary, T. *Interpersonal diagnosis of personality: A functional theory and methodology for personality evaluation*. New York: Ronald Press, 1957.

Lehr, U. Zur Frage der Gliederung des menschlichen Lebenslaufs. *Aktuel Gerontologie*, 1976, *6*, 337–345.

Lehr, U. Kontinuität und Diskontinuität im Lebenslauf. In L. Rosenmayr (Hg), *Die Menschlichen Lebensalter—Kontinuität und Krisen*. München–Zurich: Piper und Co., 1978.

Lehr, U. Die Bedeutung der Lebenslaufpsychologie für die Gerontologie. *Aktuel Gerontologie*, 1980, *10*, 257–269.

Levinson, D. J. *The seasons of a man's life*. New York: Knopf, 1978.

Lieberman, M. A. Adaptive processes in late life. In N. Datan and L. H. Ginsberg (Eds.), *Life span developmental psychology: Normative life crises.* New York: Academic Press, 1975.

Linn, R. L., and Slinde, J. A. The determination of significance of change between pre and post testing. *Review of Educational Testing,* 1977, *47,* 121–150.

Livne, N. Patient careers of elderly psychiatric patients (in Hebrew). Unpublished M. A. thesis, Hebrew University, Jerusalem, 1981.

Livson, F. B. Patterns of personality development in middle aged women: a longitudinal study. *International Journal of Aging and Human Development* 1976, *7,* 107–115.

Livson, N. Developmental dimensions of personality: a life span formulation. In P. B. Baltes and K. W. Schaie (Eds.), *Life span developmental psychology: Personality and and socialization.* New York: Academic Press, 1973.

Lohmann, N. Correlates of life satisfaction, morale and adjustment measures. *Journal of Gerontology,* 1977, *32,* 73–75.

Lowenthal, M. F., and Chiriboga, D. Transition to empty nest: crisis, challenge or relief? *Archives of General Psychiatry,* 1972, *26,* 8–14.

Lowenthal, M. F., Thurner, M., and Chiriboga, D. *Four stages of life.* San Francisco: Jossey-Bass, 1975.

Maas, H. J., and Kuypers, J. A. *From thirty to seventy.* San Francisco: Jossey-Bass, 1974.

Mischel, W. *Personality and assessment.* New York: John Wiley and Sons, 1968.

Moss, H. A., and Sussmann, E. J. Longitudinal study of personality development. In O. G. Brim and J. Kagan (Eds.), *Constancy and change in human development.* Cambridge: Harvard University Press, 1980.

Murphy, D. M. Sex-role identity in the aged. *Dissertation Abstracts International* 1977, *37* (12-B), 6376.

Murray, H. A. *Explorations in personality.* New York: Oxford University Press, 1938.

Neugarten, B. L. Personality and aging. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977.

Neugarten, B. L. Time, age and the life cycle. *American Journal of Psychiatry,* 1979, *136,* 887–894.

Neugarten, B. L., and Datan, N. The middle years. In S. Arieti (Ed.), *American handbook of psychiatry* (Vol. 1, 2nd ed.). New York: Basic Books, 1974.

Neugarten, B. L., Crotty, W. J., and Tobin, S. S. Personality types in an aged population. In B. L. Neugarten et al. (Eds.), *Personality in middle and late life.* New York: Atherton Press, 1964.

Noberini, M., and Neugarten, B. L. A follow-up study of adaptation in middle-aged women. Presented at annual meeting of the Gerontological Society, Louisville, Kentucky, October 1975.

Olbrich, E. Antecedents and correlates of continuity and discontinuity in social role behavior of aged people: interpretation of stability and change. Presented at the Fifth Biennial Conference of the International Society for the Study of Behavioral Development, Lund, Sweden, 1979.

Olbrich, E., and Thomae, H. Empirical findings to a cognitive theory of aging. *International Journal of Behavioral Development*, 1978, *1*, 67–82.

Overton, W. F., and Reese, H. W. Conceptual prerequisites for an understanding of stability-change and continuity-discontinuity. *International Journal of Behavioral Development*, 1981, *4*, 99–123.

Palmore, E. Predictors of successful aging. *Gerontologist*, 1979, *19*, 427–431.

Palmore, E., Cleveland, W. P., Nowlin, J. B., Ramm, D., and Siegler, I. C. Stress and adaptation in late life. *Journal of Gerontology*, 1979, *34*, 841–851.

Peskin, H., and Livson, N. Uses of past in adult psychological health. In D. H. Eichorn, P. Mussen, J. Clausen, N. Haan, and M. Honzik (Eds.), *Present and past in middle life*. New York: Academic Press, 1980.

Reichard, S., Livson, F., and Peterson, P. G. *Aging and personality*. New York: John Wiley and Sons, 1962.

Rosen, J. L., and Neugarten, B. L. Ego functions in the middle and late years: a thematic apperception study. *Journal of Gerontology*, 1960, *15*, 62–67.

Rudinger, G., and Lautermann, E. D. Probleme du Veränderungs—messung in individuaellen und gruppentypischen Entwicklungsverlaufen, Berichte Psychologisches Institut, Bonn Universitaet, 1978.

Savage, R. D., Gaber, L. B., Bolten, N., and Cooper, A. *Personality and adjustment in the aged*. New York: Academic Press, 1977.

Schaie, K. W. Quasi-experimental research designs in the psychology of aging. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging*. New York: Van Nostrand Reinhold, 1977.

Schaie, K. W. The primary mental abilities in adulthood: an exploration in the development of psychometric intelligence. In P. B. Baltes and O. G. Brim Jr. (Eds.), *Life span development and behavior*. New York: Academic Press, 1979.

Schaie, K. W., and Parham, I. A. Stability of adult personality traits. Facts or fable? *Journal of Personality and Social Psychology*, 1976, *34*, 146–158.

Schaie, K. W., and Parham, I. A. Cohort-sequential analysis of adult intellectual development. *Developmental Psychology*, 1977, *13*, 649–653.

Schiff, N. P. A study of the differences in the Draw-a-Person tests of normal elderly females and normal adult females. *Dissertation Abstracts International*, 1977, *37* (10), 5374, B.

Schweibert, D. C. Unfavorable stereotyping of the aged as a function of death anxiety, sex, perception of elderly relatives and a death anxiety-repression interaction. *Dissertation Abstracts International*, 1978, *39* (6-B), 3007.

Shanan, J. *Psychological changes during the middle years* (in Hebrew). Jerusalem: Gon and Grafica, 1968.

Shanan, J. A crosscultural study of active coping behavior during and after the middle years. *Proceedings, 8th International Congress of Gerontology* (Vol. 2). Washington, D.C.: International Association of Gerontology, 1969, p. 79.

Shanan, J. Sentence completion in the prediction of complex tasks. *Proceedings, 12th International Congress of Applied Psychology*. Bruxelles: Editest, 1973.

Shanan, J. Auseinandersetzungsbereitschaft und ihr Verhältnis an Kognitiven und Persönlichkeitsfaktoren in den mittleren Lebensjahren. In U. Lehr und F. Weinert (Hgb.), *Entwicklung und Persönlichkeit*. Stuttgart: Kohlhammer, 1975, 147–158. (a)

Shanan, J. Zeitgeschichtliche Faktoren als Determinanten von Auseinander-setzungsbereitschaft und Moral während der mittleren Lebensjahre. *Zeitschrift für Gerontologie*, 1975, *8*, 87–95. (b)

Shanan, J. Levels and patterns of social engagement and disengagement from adolescence to middle adulthood. In K. F. Riegel and J. A. Meacham (Eds.), *The developing individual in a changing world* (Vol. 2). *Social and environmental issues*. The Hague: Mouton and Co., 1976.

Shanan, J. The Jerusalem study of midadulthood and aging (JESMA). *Israel Journal of Gerontology*, 1978, *2*, 37–49.

Shanan, J. Transitional phases of human development in transient society. In J. E. Birren, J. M. Munnichs, and H. Thomae (Eds.), *Aging: A challenge to science and policy*. Proceedings of the World Conference on Aging (Institute de la Vie, Vichy, 1977), Behavioral Sciences Section, Oxford (UK): Oxford University Press, 1982.

Shanan, J., and Galnour, D. Coping style and need structure as determinants of mental health in an Israeli student population. *Proceedings, 8th World Congress, International Union of School and University Health and Medicine*. Jerusalem, 1979.

Shanan, J., and Jacobowitz, J. The role of student selection in the prevention of suicide and psychiatric disorders in medical school. *Proceedings 8th World Congress, International Union of School and University Health and Medicine*. Jerusalem, 1979.

Shanan, J., and Kedar, H. S. Phenomenological structuring of the adult life span as a function of age and sex. *International Journal of Aging and Human Development*, 1980, *10*, 343–357.

Shanan, J., and Sagiv, R. Historical change as a factor in the study of development during mid-adulthood (in Hebrew). *The Israel Journal of Gerontology*, 1974, *1*, 18–28.

Shanan, J., and Sharon, M. Personality and cognitive functioning of Israeli males during the middle years. *Human Development*, 1965, *8*, 2–15.

Shanan, J., and Weihl, H. Forced and autonomous detachment, their relationships to coping style and independence in late adulthood. In J. M. A. Munnichs and W. J. A. Van den Heuvel (Eds.), *Dependency or interdependency in old age*. The Hague: Martinus Nishoff, 1976.

Shanan, J., Brzezinski, A., Sulman, F., and Sharon, M. Psychological adjustment and cordicosteriod excretion in the prediction of transient amenorrhea. *Behavioral Science*, 1965, *10*, 461–465.

Siegler, I. C. The psychology of adult development and aging. In E. W. Busse and D. G. Blazer (Eds.), *Handbook of geriatric psychiatry*. New York: Van Nostrand Reinhold, 1980.

Siegler, I. C., George, L. K., and Okun, M. A. Cross-sequential analysis of adult personality. *Developmental Psychology*, 1979, *15*, 350–351.

Stuart, D. M. The relationship between stressful life events, age, personality and illness. *Dissertation Abstracts International*, 1978, *38* (8-B), 3950.

Sundberg, N. D., Snowden, L. R., and Reynolds, W. M. Toward assessment of personal competence and incompetence in life situations. *Annual Review of Psychology*, 1978, *29*, 179–222.

Thomae, H. Zur Problematik des Entwicklungsbegriffs in mittleren und höheren Erwachsenetalter. In R. Oerter (Hg.), *Entwicklung als lebenslanger Prozess*. Hamburg: Hottmann and Campe, 1978.

Thomae, H. Personality and adjustment to aging. In J. E. Birren and B. Sloane (Eds.), *Handbook on mental health and aging*. Englewood Cliffs, N.J.: Prentice-Hall, 1980.

Trowbridge, B. M. Effects of a selected exercise program on the attitudes of elderly men toward exercise and physical activity. *Dissertation Abstracts International*, 1979, *39* (7-A), 4127–4128.

Vaillant, G. *Adaptation to live*. Boston: Little, Brown and Co., 1977.

Varna Garis, A. M. An empirical investigation of an existential theory as it applies to the elderly: the will to life. *Dissertation Abstracts International*, 1977, *38* (4-B), 1911–1912.

Westphal, C. R. A comparison of attitude change in senior citizen and college age subjects. *Dissertation Abstracts International*, 1977, *39* (3-B), 1552.

Yuval, Y. Coping styles among middle aged men and women—their relationships to socioeconomic background (in Hebrew). Unpublished M. A. thesis, Hebrew University, Jerusalem, 1980.

Zinberg, N. E., and Kaufman, I. (Ed.), *Normal psychology of the aging process*. New York: International University Press, 1978.

Health and Clinical Practices

This page intentionally left blank

Aspects of Infection in the Elderly

RICHARD W. BESDINE, M.D.
HEBREW REHABILITATION CENTER FOR AGED
BETH ISRAEL HOSPITAL;
DIVISION ON AGING
HARVARD MEDICAL SCHOOL
BOSTON, MASSACHUSETTS

RICHARD M. ROSE, M.D.
DIVISION OF PULMONARY MEDICINE
NEW ENGLAND DEACONESS HOSPITAL
BOSTON, MASSACHUSETTS

INTRODUCTION

One of the last clinical subspecialties in medicine offering its practitioners the satisfaction of truly curative treatment has been infectious disease. Since Snow's management of the Broad Street pump cholera epidemic, Pasteur's development of vaccinia vaccination to prevent smallpox, and Erlich's discovery of arsenical compound No. 606 and its effect on syphilis, epidemiologic, preventive, and antimicrobial treatments for infection have become routine effective measures in medicine. But in the last decades of the twentieth century, even infectious disease, like most of medical practice, has become a specialty in which dramatic cures are few and continuing treatment of chronic disease or management of infection in patients with underlying chronic illness is the rule. As the disease burden of the infected patient population has changed, the patients also have become older. The demographic shift in our population toward old age, combined with the death-delaying treatments for malignant and other lethal chronic diseases, have produced a sharp increase in the mean age of infected hospitalized pa-

tients (Kreger et al., 1980; Gladstone and Recco, 1976). Infections are more lethal as patients age. Nosocomial infections, whether in a teaching or community hospital, occur more often and kill more often when patients are elderly (Gross et al., 1980). After the second decade of life, pneumonia mortality rates double every 10 years, and by age 70 the mortality risk for pneumonia is 20 times greater than in the general population. Bacteremia of any cause is more common and more deadly in patients of advanced age (Kreger et al., 1980). Thus there are compelling reasons for reviewing aspects of infectious disease especially relevant to the aged population.

It might have been predicted upon theoretical considerations that infections would be less troublesome in elderly individuals as newer and better antimicrobial drugs became available. Pneumonias, the single most common infectious cause of death, are both treatable with antibiotics and, in certain instances, preventable with vaccines. Even if treatment and vaccination for infections are excluded, it might be expected that a lifetime's experience with the array of agents infecting humans would bestow special immune-mediated protection on aged individuals. Nonetheless, the available data indicate special vulnerability among the elderly to infectious morbidity and mortality. Accordingly, it is important that aspects of infection pertinent to the elderly be presented and discussed in a forum such as this *Annual Review*. Considering the high prevalence of malignant disease among young and middle-aged patients, elderly survivors with infection might well deserve more therapeutic optimism than the young. This chapter considers host defenses, selected antimicrobials, epidemiology, certain infections, and immunization as each shows special features related to older infected patients. No attempt is made to present a comprehensive view of infectious disease, and for information unrelated to the focus of aging the reader is referred to general reference material.

HOST DEFENSES AGAINST INFECTION

In spite of the importance of infections in the elderly (Gardner, 1980), there is surprisingly little information about specific alterations in host defense responsible for this phenomemon. In general, host defenses against infection appear to be normal or only mildly deranged when healthy older persons are studied. However, in the presence of chronic illness or malnutrition, these defects are likely to be exaggerated.

Nonspecific factors in host defense such as granulocyte killing in vitro, as well as the complement system, exhibit no apparent age-related decline in function (Phair et al., 1978a). Quantitative assessment of the circulating B lymphocyte (Diaz-Jouanen et al., 1975) and T lymphocyte (Hellgren et al., 1978) pools shows no significant difference between healthy old and young people. Although levels of circulating immuno-globulins G and A in the elderly have been found to be increased in two longitudinal studies (Buckley et al., 1974; Hellgren et al., 1973), in a cross-sectional analysis of immunoglobulin concentration, an age-related fall in both IgM and IgG was found (Buckley and Dorsey, 1970). When only healthy old people are studied, serum IgM levels declined after a peak in the third decade of life, and IgG and IgA appeared to undergo no age-related change (Phair et al., 1978a). A similar pattern of midlife decline has been found for other naturally occurring antibodies, such as salmonella flagellar antigen (Rowley, 1970), and isohemagglutinins (Somers and Kuhms, 1972). The importance of these changes in naturally occurring antibody is unclear. There is greater variability in immunoglobulin concentration among older individuals than among their younger counterparts. This variability could be related to age-related diseases such as rheumatoid arthritis or malignancy, or to impaired nutritional status, rather than the result of the aging process per se.

Immune function in healthy older individuals is characterized by only subtle differences from that of normal young people. The humoral reponse to exogenous antigen, as measured by hemagglutination inhibition titers in response to influenza vaccine, is lower in the elderly compared to younger vacinees. However, the number of individuals achieving protective levels of antibody is similar in both age groups (Cate et al., 1977; Douglas et al., 1977).

In vitro evaluation of cellular immunity in the elderly has consistently demonstrated diminished lymphocyte blastogenic response to lectins, as well as allogeneic lymphocytes in mixed culture (Hellgren et al., 1978; Weksler and Hutteroth, 1974). Stimulation of lymphocytes from elderly donors is characterized by diminished numbers of mitogen-responsive cells and decreased proliferative capacity of those cells which respond (Inkles et al., 1977). The relation of these observations to susceptibility to infection is unclear. Defects in T-lymphocyte function have been thought to explain the impaired cutaneous delayed hypersensitivity in the elderly (Grossman et al., 1975), particularly sensitivity to tuberculin (Gianni and Sloan, 1957). Whether these findings reflect generalized anergy consequent to intercurrent disease or chronic debilitation or are related to a primary immune deficit is unclear from the populations studied. It should be emphasized that the

majority of older individuals with active tuberculosis will have cutaneous reactivity to tuberculin (Holden et al., 1971). Moreover, retesting of nonreactors will frequently elicit a positive response. What needs clarification is the role of age-related alterations in cellular immunity to the development of tuberculosis and other infections. In one study which addressed this issue prospectively, no correlation was apparent between in vitro assessement of antimicrobial defenses in older persons and risk of pneumonia (Phair et al., 1978b).

Local defenses at the organ system level also are affected by the aging process. The aging respiratory system, for example, is characterized by loss of compliance due to alterations in the configuration and stiffness of the chest wall associated with loss of lung elastic recoil. This could impair the effectivenes of cough, which requires the generation of high airflow rates, as a means of clearing central airways of particulate matter and mucus. Other pulmonary reflexes like the aspiration reflex have not been evaluated in healthy old people, although it is well established that aspiration is a common occurrence in elderly individuals with swallowing disorders, altered consciousness, and abnormalities of the upper airway (Zavala, 1977). Defenses of the lower respiratory tract, such as mucociliary clearance and pulmonary macrophages, have not been extensively studied in the elderly. During one study, tracheal mucus velocity was found to be diminished in nonsmoking elderly individuals compared to younger nonsmoking controls (Goodman et al., 1978). This might be a reflection of age-related alterations in mucus, cilia, or both.

In the normal elderly person the magnitude of abnormalities in systemic and local antimicrobial defenses may be insufficient to increase the risk of severe infection. Yet as the severity of underlying disease increases in an older person, it is reasonable to expect a proportionate fall in host resistance. In the elderly, as in any age group, it is the debilitated, bedridden, malnourished individuals who are most likely to become infected. Under these circumstances, alterations in host defense not only enhance susceptibility to infection, but also make infections more difficult to treat and prevent. In a chronically ill elderly individual with pneumococcal pneumonia, for instance, ineffective cough and diminished humoral immune response may lead to lethal disease in spite of the extraordinary sensitivity of the pneumococcus to penicillin. In addition, age-related defects in immune response accentuated by chronic illness may prohibit the development of protection after polyvalent pneumococcal vaccine (Broome et al., 1980), even though the overwhelming majority of healthy older individuals develop a two-fold or greater rise in anitbody titer to most of the vaccine serotypes (Bentley et al., 1974).

ANTIBIOTICS

Many good textbooks and reviews present principles and specifics of antibiotic usage. The present review is limited to principles of antimicrobial prescribing and consideration of a few specific drugs that pose special problems for the elderly.

General Principles

One of several recent excellent reviews of age-related changes influencing pharmacokinetics and pharmacodynamics was published in the previous volume of this *Annual Review* (Plein and Plein, 1981), and readers are encouraged to consult it for comprehensive information. Predictable, normal age-related changes in human body composition and physiology exert profound influence on absorption, distribution, metabolism, excretion, and the effects of many drugs, including antibiotics. Most of the observed changes collaborate to make higher levels of drug the rule in elderly patients receiving standard doses. Thus, toxic effects are more likely, and in general drug doses should be reduced for aged individuals. Adverse reactions of all sorts are more common in older patients and surveillance must be astute.

Several specific phenomena deserve mention regarding antimicrobial use. The predictable slowing of gastrointestinal motility facilitates more complete absorption and produces higher blood levels of drugs generally incompletely absorbed, such as some penicillins or tetracyclines, and allows important absorption of drugs usually not absorbed at all when given orally, such as aminoglycosides and vancomycin. The decline in serum albumin, the most important protein binding drugs in the circulation, allows more of a given drug in the serum to exist in the unbound and active form. This phenomenon is especially important for agents which are highly bound to protein, such as methicillin and cefazolin. Though a diminished volume of distribution might be expected for most drugs because of the decline in lean body mass and total body water with age, volume of distribution is a concept rather than a physical space, and increase rather than decrease explains the prolonged half-life of several agents (Plein and Plein, 1981). Although hepatic metabolism in general is said to decline with age, and in fact acetylation may slow, little evidence has been collected showing enhanced drug toxicity due to slower metabolism.

The single most important age-related change influencing drug dosage is the decline in renal function in the absence of detectable

disease. Renal blood flow, glomerular filtration rate and, of necessity, creatinine clearance (C_{cr}) all diminish during the adult life span by 30 to 50 percent (Rowe et al., 1976). Accordingly, doses of all drugs, especially those excreted in the active form by the kidney, must be reduced commensurate with the diminution in the C_{cr}. Both the blood urea nitrogen (BUN) and the serum creatinine (SC) do not change with age and thus overestimate true renal function. BUN, derived from ingested protein, can be maintained at normal levels throughout life because of diminished protein intake resulting from decline in lean body mass with age. SC, derived from muscle breakdown, does not rise because striated muscle mass, along with protein intake, declines in parallel with C_{cr}. The reduced capacity of the kidney to clear drugs and their metabolites must be anticipated in prescribing specific antimicrobial agents and doses for elderly individuals. When renal function is further impaired by disease and BUN or SC is elevated above the normal range, sharp reductions in dosage and restriction of toxic drugs are imperative since kidney capacity will be much diminished. Guidelines for antimicrobial use in the face of renal failure are available and should be consulted (Appell and Neu, 1977; Bennett et al., 1977). Agents which are filtered but not secreted, such as aminoglycosides and amantadine, and thus are handled exactly like creatinine, should have doses reduced commensurate with the decline in C_{cr}. When drugs from this category are nephrotoxic, such as the aminoglycosides, special care is required in their use. Dose reductions can be based on predictions from gerontologic studies quantitating renal function decline; these studies reveal approximately 10 percent loss of C_{cr} per decade over age 40 years. Alternatively, C_{cr} can be measured directly and specific dose reductions can be made for each individual patient. Agents which are filtered and secreted, such as penicillins and cephalosporins, are generally cleared quickly as long as urine volume is maintained at reasonable levels. Only when urine volume declines or C_{cr} is markedly impaired by disease ($C_{cr} < 20$ ml/min) are major reductions in dosage necessary.

Although the common use of antimicrobials has generated abundant advisory literature, a brief summary of sound principles governing their administration is warranted. Regardless of the patient's age, no currently effective antimicrobial should be excluded from potential use. When a seriously ill person is thought to have an infection, all available clinical materials should be cultured and, when appropriate, Gram stained, including blood, cerebrospinal fluid, pus, ascites, aspirates, and sputum. When the clinical situation is urgent and the 24- to 48-hour delay while awaiting culture data is inadvisable, an agent or

combination is chosen based upon Gram stain appearance of relevant specimens and the epidemiology, clinical characteristics, and location of the infection. Unless there is a strong suspicion of an infecting organism, agents broadly effective against the group or groups of microbes likely infecting should be initially selected. Once culture and sensitivity data become available, treatment should be changed to the narrowest-spectrum, least-toxic agent effective against identified pathogens. Although high-dose broad-spectrum antimicrobial treatment predisposes to superinfection and although elderly patients are especially vulnerable to respiratory and other nosocomial infections, clinicians must be careful not to undertreat infection in elderly patients since inadequate dose or too brief duration of antimicrobial treatment has been shown to be an additional risk factor for treatment failure and death for elderly infected patients (Habetz-Gabr et al., 1973).

Individual Drugs

Cephalosporins became available first as an alternative to penicillins, with the added advantage of greater efficacy against some gram-negative bacteria and comprehensive resistance to staphylococcal beta-lactamases (penicillinase), making them apparently useful in patients allergic to penicillin especially when staphylococcal or suspectible gram-negative infection was present. But cross allergenicity with penicillins, limited effectiveness against gram-negatives, and the intense venous irritation of cephalothin reduced its utility. Oral cephalexin added little to the effectiveness of oral penicillinase-resistant penicillins such as cloxacillin and dicloxacillin. Second-generation drugs, such as cefoxitin and cefamandole, added to the antimicrobial armamentarium by offering minor additional anaerobic and gram-negative coverage, respectively, and, in the case of cefazolin, by sharply reducing the chemical inflammatory effect on veins. Cefazolin was sufficiently inert that it could be given intramuscularly, a major advantage for elderly patients with fragile veins in which indwelling lines were difficult to maintain. The newest, third-generation cephalosporins, such as cefotaxime, offer broader efficacy against gram-negative bacteria and, particularly important, effectiveness against *Pseudomonas aeruginosa.* For the first time, there is the possibility of avoiding the nephrotoxic aminoglycosides in choosing treatment for pseudomonas infections in the elderly. How useful and enduring the benefit of the third-generation cephalosporins turns out to be cannot currently be assessed, but cautious optimism seems justified.

Penicillins are a mainstay of treatment for a broad array of infections. As a group they have the highest therapeutic to toxic ratio of all antibiotics, and serum levels must reach astronomical concentrations for central nervous system irritability to occur. In young patients, penicillins have a serum half-life of 30 to 60 minutes, and the drugs, if used intravenously, must be given no less often than every 4 hours. Older patients, though rarely requiring major dose adjustments unless afflicted with severe renal failure, can be given penicillins less often in recognition of a modest prolongation of the half-life. Allergic reactions, though common and occurring in 10 percent of patients receiving a penicillin, are usually confined to skin; and the ampicillin rash, by far the most frequent, is questionably related to more serious reactions with it or other penicillins. One special potential hazard for elderly patients is presented by the disodium penicillins, especially carbenicillin and, to a lesser degree, ticarcillin. These drugs are the most effective penicillins against gram-negative bacteria, including certain strains of pseudomonas. Because of their chemical configuration, they are cleared from the blood by the kidney extremely rapidly, so that in order to maintain effective serum levels, large doses must be administered frequently. Carbenicillin must be given in doses of 20–30 gm daily, in aliquots as often as every 2 or 3 hours. In addition to problems of venous access and large volumes of intravenous fluid administration, the 5 mEq/gm sodium load of cabenicillin challenges the elderly recipient with the same quantity of sodium as is contained in one liter of normal saline. In patients with compensated or borderline congestive heart failure, worsening or new failure can be provoked. Clinicians must be sensitive to this complication, especially in view of the high prevalence of heart disease in old age.

Tetracyclines are among the oldest of the modern antimicrobials. Special considerations when using them, as is common, to treat bronchitis or urinary infection, are necessary. First, all tetracyclines except doxycycline have an antianabolic effect which, in the presence of mild or moderate renal failure, can provoke sharp elevations of BUN and SC. Second, all but doxycycline are nephrotoxic as well. Doxycycline is largely metabolized in the liver and therefore does not concentrate in the kidney. Third, tetracyclines are incompletely absorbed and chelate with numerous cations in the gastrointestinal tract, including calcium, magnesium salts, aluminum hydroxide, sodium bicarbonate, and iron preparations. Usually of only marginal importance, this chelation can be clincally important when calcium absorption is critical, such as in metabolic bone disease, or when iron deficiency anemia, already a problem because of diminished iron absorption by the aged gut, is

exacerbated by binding to tetracycline. Chelation of iron or calcium with tetracycline also hinders absorption of the antibiotic. The tetracyclines penetrate into the body tissues and fluids extremely well and are one of few antimicrobials which penetrate the prostate gland in therapeutic levels. The high prevalence of chronic prostatitis in elderly men makes the tetracyclines frequently useful agents to treat them. Use of demeclocycline to interfere with secretion and tubular effects of antidiuretic hormone in patients with water intoxication is an incidental use of one of the tetracyclines.

Aminoglycoside antibiotics have been discussed already regarding the special care required in using them because of their tendency to accumulate in elderly patients in view of the age-related decline in renal function. These agents are potent against most gram-negative bacteria and are used parenterally in hospital settings when serious or life-threatening gram-negative infections are suspected. Gram-negative infections with or without bacteremia, increasingly common with age, usually originate in the lung, urinary tract, or intestine in the elderly. The aminoglycosides are nephrotoxic when serum concentrations rise above therapeutic levels, and these drugs incapacitate the renal tubules, leading to further inability to clear the agent. Differential toxicity for the kidney has been suggested. One study verified a significant advantage of tobramycin over gentamicin (Smith et al., 1980), but differences were small. Extreme caution must be exercised when using any of the aminoglycosides. These drugs are ototoxic as well as nephrotoxic, but there are important differences among the agents concerning toxicity for the eighth cranial nerve. Streptomycin, gentamicin, and tobramycin damage the vestibular portion of the eighth nerve first and are thus more likely to produce imbalance and gait disturbance as the initial sign of toxicity. In a critically ill bedfast patient, detection of the vestibular damage may be delayed unless carefully sought. Once damage has occurred, little recovery generally takes place. The group including kanamycin and amikacin produce hearing loss initially, though if continued drugs from either group eventually affect both parts of the nerve. In the patient with impaired conciousness, monitoring either variety of eighth nerve toxicity is difficult, and even more careful attention must be given to serum levels. Elderly patients receiving an aminoglycoside should initially have peak and nadir levels measured, with daily determinations thereafter, especially if renal function and fluid balance are not stable. There appears to be exacerbation of aminoglycoside toxicity in patients receiving concurrent furosemide, and given the prevalence of congestive heart failure in the elderly, special care must be given in monitoring these patients as well. Recent

data show enhanced nephrotoxicity from antibiotic combinations of cephalosporin and aminoglycoside compared with regimens not including a cephalosporin especially in the elderly (Wade et al., 1981); but differences were small and optimal practice recommendations previously outlined still apply to antibiotic selection.

Isoniazid (INH) is the mainstay of antituberculous chemotherapy, and effective therapeutic regimens without it are difficult to design. Additionally, INH is the only drug to have been shown to prevent reactivation of spontaneously arrested tuberculosis (TB) in individuals who have evidence of infection but who have never been treated (Ferebee, 1969). Accordingly, INH chemoprophylaxis is recommended in a number of clinical situations with a known increased risk for reactivation TB. Such situations include recent skin test conversion, household contact with a known infectious case, previously active TB inadequately treated, or a positive skin test with evidence of inactive tuberculous pulmonary disease (Comstock and Edwards, 1975). Also considered for chemoprophylaxis are patients with inactive TB (or positive skin tests) with additional risk factors including steroid or antimetabolite therapy, hematologic malignancy, metastatic solid tumors, or achlorhydria, each representing an increased risk for TB reactivation. Because the major reservoir of inactive TB in developed countries is in the aged population, older individuals most often are candidates for INH chemoprophylaxis. But studies emerging during the decade of the 1970s revealed an age-related increasing risk for INH hepatitis, and increasing severity and lethality of the hepatitis as well (Kopanoff et al., 1978). Though it is speculated that decline in hepatic acetylation of INH with age may be responsible, definitive data do not exist. Whatever the mechanism, the increasing rate, severity, and mortality of INH hepatitis in the elderly argue vehemently for extreme conservatism in prescribing one year of INH chemoprophylaxis for an asymptomatic aged individual with a statistical risk for reactivating dormant TB. Most of the high-risk situations for reactivation are constant annual risks, and elderly persons with limited life expectancy have a much shorter duration of risk and, in certain situations, a lower cummulative risk compared with young persons having the same risk factors. It appears advisable, then, in elderly individuals with a known risk for reactivation TB, a high risk for INH hepatitis, and a limited life span, to carefully monitor their tuberculous status using chest X-ray and clinical examination frequently rather than risk severe or lethal hepatitis.

Amantadine, an antiviral drug licensed for the prevention and treatment of type A influenza infections, was first shown to prevent

penetration by type A_2 virus into mammalian cells in the 1960s. Subsequent studies have shown amantadine to prevent other type A influenzal infections and to shorten and ameliorate symptomatic influenzal disease. Pulmonary function abnormalities return to normal significantly faster in patients treated with amantadine shortly after onset of illness. Continuous administration of amantadine during influenza A epidemics protects as many as 70 percent of susceptibles, a protection rate that equals specific vaccination. Although influenza has a very low mortality rate in the modern era for healthy young individuals, the chronically ill, the frail, and the elderly bear a disproportionate burden of serious influenzal morbidity and mortality. The persuasive arguments in favor of widespread influenza vaccination of high-risk persons, especially the elderly, are equally valid for using prophylactic amantadine when confronted with epidemic type A disease and an unimmunized or inadequately immunized vulnerable population. Yet current usage of amantadine is largely in the treatment of Parkinson's disease, for which it is quite effective.

Why, in view of apparently good reasons for its use, is prophylactic amantadine rarely used in America during influenza outbreaks? Four reasons which might explain the infrequent use of amantadine prophylaxis emerge. First, prophylactic drugs generate negative psychological bias. The only successful outcome is no illness. There is no dramatic reinforcement for patient or physician. Second, initially licensed only for use during type A_2 epidemics, amantadine is still not well understood by most practitioners. Third, there is a theoretical concern that development of amantadine resistance, a common in vitro event, might become a clinical problem with wide prophylactic amantadine use. To date, resistant strains have not emerged as clinical problems during trials of amantadine prophylaxis. The fourth and most worrisome objection for the use of amantadine is that toxic side effects obliterate the benefit accruing from influenza protection. However, data from thousands of individuals receiving the 200 mg/day prophylactic dose, as well as the vast experience in Parkinsonism patients, suggest that toxicity is not a major problem (NIH Consensus Development Conference, 1980). Most side effects are manifested in the central nervous system, including drowsiness, lethargy, nervousness, lightheadedness, difficulty in concentration, and mild intellectual blunting. Anticholinergic effects also occur. Between 5 and 10 percent of subjects taking amantadine experience a side effect, but only a small minority of these are sufficiently troubled to stop treatment. Although there are anecdotal reports of more severe and frequent side effects in

the elderly, careful study has not verified exaggerated toxicity in the aged (Petterson et al., 1980). Thus it appears that the reasons behind the infrequent use of amantadine prophylaxis are rooted in bias, misinformation, and inadequate education. Amantadine prophylaxis of epidemic influenza A disease, especially in high-risk elderly individuals without firm vaccine protection, is currently an underutilized and worthwhile clinical option. Additionally, when the onset of respiratory illness, in a setting of epidemic influenza A disease, is severe in vulnerable frail individuals, therapeutic amantadine offers benefit and should be used.

EPIDEMIOLOGY OF INFECTION IN THE ELDERLY

In the process of growing old the individual has an opportunity to develop immunity to a wide variety of infectious agents. If exposure to a specific pathogen results in lifelong immunity, it can be predicted that the risk of infection with that particular organism will decline with age. This is true for measles and probably accounts for the rarity of mycoplasma infections in the elderly (Foy et al., 1979). Another explanation for the age-related decline in attack rates for mycoplasma disease is the limited contact many older individuals have with the reservoir of infection, children and teenagers.

Although age may have benefits for some infectious agents, in many instances the risk of developing infections increases with age. Age-specific attack rates for both bacteremia (Myerowitz et al., 1971) and lethal pneumonia increase with age. This appears to be a consequence of age-related defects in host defense magnified by chronic underlying illness.

The attack rate for specific pathogens may also increase with age, as classically exemplified by tuberculosis (see below). Both prevalence of positive tuberculin reactors (Reichman, 1978) and the incidence of active cases of tuberculosis (Powell and Farer, 1980) increases with age. Not only are the elderly the largest reservoir of late tuberculous infection, but they are also more likely to have depressed immunity and develop reactivation tuberculosis than individuals of younger age groups. An analogous situation exists for varicella-zoster virus infection. Chicken pox occurs early in life and thereafter virus resides in dorsal root ganglia. Dormant virus may then reactivate in the presence of altered cellular immunity and produce shingles (Meyers, 1977).

SELECTED INFECTIONS

Several infections with special features or great importance in the elderly will be discussed as examples of the particular relevance of some infections in old age. Urinary tract infection, appendicitis, bacterial pneumonia, tuberculosis, and bacterial endocarditis have been chosen to illustrate different features and special problems of infections in the elderly. No attempt is made to be comprehensive within these selected topics, and the reader is referred to general sources for complete discussions.

Urinary Tract Infection

Asymptomatic Bacteriuria. The urinary tract is the most common site for bacterial infection in elderly individuals, both in the community and in the hospital. But classic concepts of infection and pathology do not always apply to bacteria in the urine, particularly in old age. Asymptomatic bacteriuria (ASB) is defined as greater than 10^5 of the same bacterial species per milliliter of urine on two consecutive aseptically collected urine cultures in an individual without fever or symptoms referable to the urinary tract. ASB is frequent among older individuals, rising in prevalence from 3 percent in middle age to over 20 per cent after age 70 years, and approaching 30 percent among institutionalized elderly (Akhtar et al., 1972; Brocklehurst et al., 1977). Women are at greater risk than men. Diabetes, dementia, cerebrovascular disease, and decreased physical activity are important risk factors in noninstitutionalized older people. Age-related factors of possible importance in the establishment of ASB include poor hygiene, decreased immune competence, and minor accumulation of residual urine, promoting stasis and allowing bacterial growth. Lack of long-term studies on the natural history of ASB in the elderly makes management uncertain. The bulk of present evidence suggests that ASB rarely leads to serious acute illness or loss of renal function, but one study of elderly institutionalized Greeks raises questions about the long-range impact of ASB in old age (Dontas et al., 1981). A 10-year prospective study revealed bacteriuria as a statistically significant marker of early mortality compared with an appropriate control group that did not differ in age, sex, blood pressure, smoking habits, hematocrit, or cholesterol levels. But these data do not imply that ASB should necessarily be treated in the elderly. For such a conclusion to

be valid, the mortality risk in the bacteriuric group would have to be reduced by treatment, and no such data exist. One may speculate that the bacteriuria is merely a marker rather than a cause of the increased mortality and that a fundamental abnormality underlies them both, such as diminished immune competence (Roberts-Thomson et al., 1974). Currently, in view of the increased risk of adverse drug reactions in the elderly, withholding antibiotics seems best. One exception to this principle occurs in the hospitalized elderly. Nosocomial gram-negative bacteremia, a highly lethal disorder, originates most often in the urinary tract. Given these data, treatment of bacteriuria in sick hospitalized old people seems warranted (Gladstone and Friedman, 1971). ASB alone is not an indication for anatomical evaluation of the urinary tract.

Cystitis. Acute symptomatic lower urinary tract infection is managed routinely in elderly patients much as in the young. Factors demanding special consideration include impaired renal function, a prior history of infection, renal stones, anatomic abnormalities, or a bladder catheter. Presentation of cystitis in the elderly, as in young adults, includes the usual symptoms of urgency, frequency, pain, and burning on urination; but in addition, incontinence assumes increasing importance as an indicator of cystitis with advancing age. Routine treatment is accomplished with two weeks of an oral antibiotic effective against the organism cultured from the urine before treatment. A post-treatment culture documents bacterial eradication. Recurrence of infection after treatment is frequent and usually represents reinfection with a new organism rather than relapse or failure to eradicate the original organism. When reinfection occurs, a second two-week course of antibiotic treatment should be given, while relapse requires a six-week course. When infection recurs after the second course of antibiotics, whether as reinfection or as relapse, studies should be undertaken seeking underlying pathology such as stones, anatomic or functional abnormalities, or loculated infection. In men, the most common cause of recurrent urinary infection is prostatic infections, and these infections, not surprisingly, are usually prompt relapses (Smith et al., 1979). These recurrent infections, especially when originating in the prostate, are more often cured by prolonged antibiotic treatment (8–12 weeks) than by repeated short (10-day) courses of therapy. Smith and colleagues (1979) chose trimethoprim/sulfamethoxazole for all recurrences regardless of bacteriology after specific initial treatment had failed.

One reason that chronic prostatic infection is such a frequent reservoir for acute urinary tract flares is the relative impermeability of the

prostate to most antibiotics used to treat cystitis. Of antibiotics effective against common urinary tract pathogens, only certain tetracyclines, a few sulfonamides, and trimethoprim reach therapeutic concentrations in prostate with usual oral doses (Meares, 1973; Stamey et al., 1970). Trimethoprim is, in fact, concentrated in prostatic fluid and, from several points of view, is usually a wise choice in the treatment of suspected prostatitis as the source of repeated urinary infections. In women, recurrences are usually reinfections related to poor vulvar hygiene, and chronic suppresive therapy is indicated. When renal function is normal, a single nightly dose of trimethoprim/sulfamethoxazole or nitrofurantoin is justified and often effective.

Management of bacteriuria and infection in the presence of permanent transurethral bladder catheterization does not follow the same guidelines described above (Stamm, 1975). These patients uniformly have chronic bacteriuria and pyuria, but neither one nor both in the absence of invasive infection should provoke antibiotic treatment. When urine becomes so thickened by bacteria, leukocytes, or other consequences of infection that catheter drainage is impeded, several daily irrigations (1/8 to 1/4 percent acetic acid in sterile water) may reduce the sludge and enhance drainage. Catheters should be changed every few weeks as accretions interfere with drainage. Monthly culture of the catheter urine provides information useful in selecting an antibiotic if and when invasive infection develops. When invasive infection does appear in the catheterized patient, it must be determined that the catheter is patent, draining freely, and not crusted with accretions serving as a nidus for continuing infection. Antibiotic treatment, initially directed by surveillance urine culture data and updated by any subsequent new sensitivity information from a culture collected just before beginning treatment, is intended to eradicate any bacteremia and reduce the burden of infection in the urine. Return of infection after antibiotics are stopped is virtually certain, and treatment should continue only long enough to eradicate signs and symptoms of infection, unless blood cultures were positive. Blood must always be cultured before starting treatment in these patients as a practical matter, since bacteremia demands continuation of antibiotic treatment for 7 to 10 days, while nonbacteremic infection generally requires only a few days of therapy to satisfy the above criteria.

Renal function must always be considered in addition to bacteriology when choosing an antibiotic regimen, especially when the infection is in the urinary tract. Nitrofurantoin is cleared very rapidly from the blood, so that appreciable serum levels do not occur in patients with normal renal function. Its efficacy, in fact, depends upon rapid clear-

ance and accumulation of high concentrations in the urine itself, where it acts as an antiseptic. In patients with renal failure, it accumulates in the blood, is ineffective for urinary infections, and produces a toxic peripheral neuropathy.

Tetracyclines, with the exception of doxycycline, should not be used in azotemic patients (see above). Trimethoprim/sulfamethoxazole should be reduced in elderly patients to half the usual recommended dose (2 regular-strength tablets daily) when mild to moderate renal disease (creatinine = 2.0–5.0 mg/dl) is superimposed upon normal kidney aging; and should not be used at all when renal impairment is severe (creatinine > 5.0 mg/dl). Aminoglycosides and renal function are discussed above.

Pyelonephritis. Acute pyelonephritis, characterized by bacteriuria, pyuria, fever, and flank pain or renal tenderness is life threatening in elderly patients; and bacteremia is common. Diagnosis may be more difficult than in younger patients because (1) bacteriuria is nonspecific, occurring as ASB in many elders without acute pyelonephritis; and (2) fever and urinary tract signs and symptoms may be less prominent than in young adults. Initial antibiotic therapy should be chosen to maximally protect the bloodstream of the patient. Since pyelonephritis is often bacteremic, these patients are at immediate risk for septic shock and death. Regardless of how well the patient looks, pyelonephritis always should be treated with parenteral antibiotics. The Gram stain of the urine, if unequivocally showing a single abundant bacterial morphology, can help direct antibiotic choice. Gram-positive cocci almost always represent enterococci, for which intravenous ampicillin, in divided doses of 8 to 12 gm/day, should be given. When gram-positive cocci represent *Staphylococcus aureus*, one of two very uncommon situations is present. Either the patient has disseminated staphylococcal sepsis with renal abscesses, or chronic perinephric abscess is present and seeding the urine with bacteria. Though it is true that approximately 5 percent of cystitis is caused by *Staphylococcus epidermitis*, which is also a gram-positive coccus, this organism rarely if ever causes pyelonephritis. When *S. aureus* is the gram-positive coccus in urine, it announces itself through the characteristics of the two illnesses with which it is associated, and appropriate treatment is undertaken for the cause. When, as is most common, gram-negative rods are seen on urine Gram stain, an agent broadly effective against such organisms is begun; most often one of the aminoglycosides known to be effective against the gram-negative flora of the particular local setting, such as gentamicin, tobramicin, or amakacin, is chosen. As soon as sensitivities are available, a less toxic agent should replace the aminoglycoside if possible. Under no circum-

stances should culture and sensitivity data be ignored and an initial potentially toxic regimen continued because "the patient is doing well and we don't want to change what is working."

When appropriate antibiotics are given in adequate doses, urine is generally sterile within 24 hours; fever and flank pain may persist for several days, however, and should not provoke concerns about adequacy of antibiotic treatment. If bacteria are sensitive to the antibiotic being used and the patient is no better three days into treatment or continues to be sick and febrile beyond five days, loculated infection or an additional source of fever should be considered. Intravenous pyelography (IVP), a procedure performed far too frequently in view of its increased risk of renal failure due to dehydration from contrast dye in elderly patients with pyelonephritis, should rarely be undertaken during acute illness. Treatment failure is more frequently secondary to incorrect or inadequate antibiotic therapy than to obstruction.

Chronic renal infection is an important and often overlooked cause of the "failure to thrive" syndrome in the elderly. Perinephric abcess may develop, especially in the presence of renal stones, and lead to insidious weight loss, weakness, altered mental state, and, only sometimes, fever. Diagnosis is usually made by distorted renal architecture on IVP and immobility of the kidney with respiration on fluoroscopy. Antibiotics may be ineffective, and treatment of choice is often surgery.

Appendicitis

Appendicitis (AP) is probably a mechanical and vascular surgical disease, usually complicated by infection. It has a reputation for being occult in the elderly and presenting a different face to the well-intentioned clinician caring for the patient. Sadly, abundant reliable data do not exist, making firm conclusions concerning AP in older individuals elusive. But there is some helpful information allowing generalizations useful in evaluating aged patients with suspected AP. The lifetime risk of AP in the general population is 1 in 15. Incidence falls off in older individuals, probably in part because many susceptibles have already experienced disease and surgical cure by maturity. For women over 50 years of age, the cumulative risk is 1 in 35, while in older men it is 1 in 50.

In spite of a falling incidence with age, mortality and morbidity skyrocket. Many series report mortality rates in the elderly 5- or even 10-fold greater than in younger individuals; one series reports a mor-

tality of 20 percent (Albano et al., 1975). Complication rates are even more disproportionately common in older patients, averaging 40 to 60 percent from series to series. Most cases include infection, usually of the surgical wound, but occasionally bacteremia and sepsis, among the complications. The high mortality, however, is usually not related to direct surgical or infectious complications of AP, but rather to associated or underlying cardiorespiratory complications such as pneumonia, pulmonary embolus, congestive heart failure, or myocardial infarction.

Much speculation in the literature concerning the explanation for increased morbidity and mortality of AP in the elderly passes for fact. It is said that AP in old age manifests peculiar or atypical or more subtle features compared with AP in younger patients, and for this reason the disease is allowed to progress further before detection and proper treatment. Relevant data analyzing the presentation of AP in the elderly reveal that signs, symptoms, and history of AP in elderly individuals are indistinguishable from those in younger patients. But some important differences do emerge that affect detection, complications, and survival of older victims of AP.

General principles of disease in old age tell us that elderly patients have a higher prevalence of diseases, such as depression or causes of a dementia syndrome, which interfere with reporting of other illnesses. Numerous other phenomena making late presentation of disease likely have been shown to cluster in aged individuals (Besdine, 1980). Thus, elderly AP patients are more likely to give imprecise histories and present for treatment later in the course of illness. Additionally, since prevalence of disease rises sharply with age beyond 70, truly elderly patients with AP are more likely to have serious associated illnesses which increase complications and mortality.

Two specific observations about AP in an aged population are useful in approaching the elderly patient. First, appendiceal perforation and peritonitis occur substantially sooner in older individuals than in younger ones. A five-fold increase of rupture rates has been observed in older AP patients, approaching 50 percent or even higher in some instances (Owens and Hamit, 1978; Peltokallio and Jauhiainen, 1970). The pathophysiology of early perforation of the aged appendix includes narrowing of the lumen; thinning of the wall, primarily the muscularis; and, probably most important, attenuation of the blood supply. Whatever the full explanation, early perforation is a major factor underlying the grave outlook in elderly AP patients. The second important conclusion from the study of elderly AP patients is that the admitting diagnosis is more often erroneous, not because the presenta-

tion is any different, but because the findings are attributed to some other common cause of acute abdomen in the elderly. These common diseases include right-sided diverticulitis, cholecystitis or cholangitis, right colon carcinoma, ovarian tumors, or bowel obstruction. The same clinical presentation, which in the elderly provokes a non-AP diagnosis, if occurring in a younger person would usually lead to immediate identification of acute AP.

The relatively few documented clinical differences between old and young AP patients, combined with general tendencies to inadequate histories, late presentation, and multiple pathology, account in part for the increased morbidity and mortality in elderly individuals with AP. A higher degree of suspicion would lead to earlier diagnosis and less surgical delay in these patients, and probably better survival and fewer complications.

Bacterial Pneumonia

Epidemiology. Bacterial pneumonia has a long and prominent history among the infections causing sickness and death among adults. In 1900, pneumonia was a leading cause of death in the United States, producing in excess of 200 deaths per 100,000 population annually. In the intervening three-quarters of a century, pneumonia has slipped to fifth, and rather than killing both healthy and debilitated individuals as it did in 1900, current fatalities from pneumonia are generally confined to the frail and sick, who are usually old. Although mortality from pneumonia has fallen steadily over the past 50 years, with an accelerated drop since the introduction of sulfonamides and penicillin in the 1930s and 1940s, pneumonia deaths have leveled off at 25 to 30 per 100,000 annually and changed little since the 1950s. The only infection among the 10 leading causes of death in America, pneumonia accounts for 10 percent of all medical admissions to acute hospitals. Some estimate as many as 500,000 annual cases with nearly 65,000 deaths at a cost in care and lost work time of $500,000,000 (Austrian, 1974). Pneumonia mortality in the very old, those 75 years of age and older, is 10-fold greater than in the general population.

Presentation. The importance of pneumonia for aged individuals resides in several factors. First, breaches of systemic and local lung defenses against infection accumulate with age (see above) due both to normal age-related changes and to the impact of diseases that are common with advancing age. Second, clinical features of pneumonia in old age militate against a favorable outcome. Many diseases present

with atypical or unique features in old age (Besdine, 1980); and when pneumonia is not promptly recognized, late initiation of antibiotic and other treatment contributes to an increased morbidity and mortality.

Although quantitative differences between pneumonia presentations in young and old persons have not been adequately studied and defined, it is certain that some elderly individuals do not demonstrate the typical findings of bacterial pneumonia such as fever, elevated white blood count, cough, sputum production, or pleuritic chest pain. Instead, elderly pneumonia victims are likely to manifest general systemic effects of sepsis and hypoxia, especially in the central nervous system, by showing cognitive loss, or in the cardiovascular system by developing new or worsening congestive heart failure. One study found only 40 percent of adult patients with pneumonia by X-ray to have evidence of consolidation on physical examination; and poorest correlation was associated with advancing age (Osmer and Cole, 1966). Retrospective analysis of pneumonia deaths in old age revealed a 20 percent error rate in diagnosis (Rossman et al., 1974). Subtle decline in function, often aptly labeled "failure to thrive," may be the only early herald of pneumonia in an elderly person. Because physical examination correlates poorly with radiologic evidence of pneumonia, especially in the elderly, prompt chest X-ray is an essential part of screening for the vaguely ill older person.

Pathophysiology. Bacterial pneumonia develops by one of three pathophysiologic mechanisms. First, organisms can reach alveoli via infected inspired air, such as occurs when droplet nuclei containing tubercle bacilli are inhaled or respiratory equipment contaminated with gram-negative aerobic bacteria generate infectious aerosols (Pierce et al., 1966). Second, bacteria can reach the lungs via the bloodstream, as in hematogenous spread of pseudomonas to involve small and medium-sized arterial vessels of the lung via their vasa vasorum (Fetzer et al., 1967) or in septic embolization to the lung from right-sided bacterial endocarditis or from venous sources. Third, and most common, bacteria-laden secretions are aspirated subclinically from the oropharynx into the lung. The majority of bacterial pneumonias, including pneumococcal, which is the most prevalent, develop in this way. Given the frequency of micro-aspiration in healthy adults and its increasing incidence with advancing age, and given the ubiquity of pathogenic organisms able to cause pneumonia, the rarity of pulmonary infection actually appears surprising. The explanation resides in the oropharynx, where pathogens must first gain access and proliferate before they can be aspirated and cause disease. The normal oropharyngeal flora have been shown to prevent growth and inhibit acquisi-

tion of many pathogens. Alpha streptococci kill staphylococci, pseudo-monas, *Escherichia coli*, and numerous other gram-negative potential pathogens (Sprunt and Redman, 1968). These normal flora are rela-tively hardy even in the presence of broadly effective systemic antibiotic therapy; but when they are eradicated, colonization with an array of pathogens is the rule (Crowe et al., 1973). One bacterial group illustrat-ing the relation between pharyngeal colonization and pneumonia with special relevance to the elderly is aerobic gram-negative bacteria. Cur-rently accounting for nearly two-thirds of nosocomial pneumonias, en-teric gram-negative aerobic bacteria (EGNAB) are nevertheless rarely found in the throats of healthy adults; the 2 percent of young control subjects who harbor them do so only transiently (Pierce and Sanford, 1974). But chronically or seriously ill patients rapidly are oropharyn-geally colonized with EGNAB. The sickest patients in acute hospitals have the highest colonization rates, approaching three-quarters or higher; and colonization is a precursor of EGNAB pneumonia in 90 percent of cases (Johanson et al., 1972). Colonization is by contamina-tion with the patient's own gastrointestinal flora, presumably by the fecal–oral route.

Although previous antibiotic therapy is commonly associated with nosocomial EGNAB pneumonia, neither colonization nor pneumonia is statistically correlated with antibiotic administration, inhalation ther-apy, or duration of hospitalization, but it is closely related to severity of illness. In the elderly, who bear the brunt of nosocomial pneumonia morbidity and mortality, severe illness is not necessary for EGNAB colonization. Colonization rises with progressive dependency: from 19 percent of apartment-dwelling elderly, a high figure for community-dwelling normals; to 40 percent of nursing home residents; and up to 60 percent of those on the acute unit of a chronic disease hospital (Valenti et al., 1978b). Correlates of colonization in this study were incontinence, immobility, impairment in activities of daily living, de-teriorating or preterminal condition, and debility from malignant, car-diac, and respiratory disease. Immobility and respiratory disease were the most important contributors to colonization. The mechanism of flora alteration is not clear, but attachment of EGNAB to oropharyn-geal epithelium is somehow facilitated by aging and disease. Defects in salivary volume and chemistry, in oral hygiene, and in epithelium itself have been suggested for further study. Prevention of colonization and thus EGNAB pneumonia may reside in better understanding of nor-mal pharyngeal defenses and their defects.

Etiologic Diagnosis: Bacteriology. Fifty years ago when successful serum therapy for pneumococcal pneumonia demanded precise identi-

fication of the infecting serotype, induced sputum, blood culture, and even direct percutaneous lung puncture were employed in sampling pulmonary infections (Heffron, 1939). Regardless of the age of the patient, life depended upon accurate diagnosis of the infecting sero-type. Late in the twentieth century, broad-spectrum antibiotics and patient debility have produced a clinical reticence for etiologic diagno-sis of pneumonia. In recent series of nosocomial (Graybell et al., 1973) and ambulatory (Sullivan et al., 1972) pneumonia, less than two-thirds of cases had a specific bacteriologic diagnosis; and in one series the blood was a more common source of respiratory pathogen identifica-tion than the sputum (Brewin et al., 1974). When specific bacteria are not identified in pneumonia or any other infection, patients are treated with broad-spectrum agents based upon how sick they are and how they respond to treatment. Such empiric therapy is especially danger-ous in elderly patients for several reasons: (1) Elderly patients are more susceptible to adverse drug reactions, and empiric therapy usu-ally results in higher doses of more toxic drugs for longer treatment courses. (2) Elderly patients are more likely to have gram-negative infections, so that oto- and nephrotoxic aminoglycosides are more likely to be chosen. (3) Elderly patients are more likely to suffer ill effects of superinfection and prolonged hospitalization, both more likely with empiric treatment. Accordingly, it is especially advisable to pursue bacteriologic diagnosis of pneumonia in aged individuals.

Accurate diagnosis depends upon adequate culture of a reliable sample of infected sputum; again, special problems are encountered in the elderly. Aged pneumonia victims are particularly prone to dehy-dration and severe debility, due to both multiple associated illnesses and physiologic changes of aging, making sputum collection more diffi-cult. Additionally, pneumonia is more likely to produce mental status alteration in old patients and make them less cooperative. In patients of any age, sputum reliability is usually inversely proportional to the difficulty in obtaining it; but there is always the concern that in passing from the lung to the culture plate sputum will be contaminated by oropharyngeal bacteria and yield false data about etiology of the pneu-monia (Barrett-Connor, 1971). Since the bronchoscope also passes through the oropharynx on its way to the lung, specimens from this source may be as suspect as expectorated sputum (Jordan et al., 1976). One way to improve diagnostic accuracy in sputum bacteriology is the Gram stain. Prompt examination of an optimally collected fresh spu-tum can yield immediate morphologic data about pneumonia provided proper caution is used in interpreting the smear. Areas with the high-est concentration of polymorphonuclear leukocytes should be scanned

for a predominant bacterial species. If squamous epithelial cells are seen, the specimen has, by definition, been contaminated by oropharyngeal secretions and is likely to provide misleading data. If there are fewer than 10 epithelial cells (Murray and Washington, 1975), and more than 25 inflammatory cells (Van Scoy, 1977), per low-power field (100-fold magnification), it is very likely that Gram stain and culture data will reliably reflect parenchymal lung infection. When the Gram stain can be trusted, it provides data allowing substantial narrowing of the coverage required for initial antibiotic treatment. When gram-positive cocci are seen, the Quellung, or capsular swelling reaction, allows immediate identification of pneumococci and use of low-dose penicillin, an extremely safe antibiotic regimen (Merrill et al., 1973).

When expectorated sputum is unavailable or shows microscopic evidence of oropharyngeal contamination making the specimen unreliable for immediate Gram stain or later culture and sensitivity data, an invasive diagnostic procedure described in the 1950s—transtracheal aspiration (TTA)—is useful in obtaining sputum suitable for evaluation (Pecora, 1959). It has been amply demonstrated that TTA is a safe method for obtaining material which reliably samples lung bacteriology without risking oropharyngeal contamination (Bartlett, 1977; Pecora, 1963; Ries et al., 1974). TTA is especially likely to be necessary for elderly patients who often are unable to produce sputum and for whom the risk of empiric antibiotic treatment is substantially increased. When the risks of toxic empiric therapy, of unusual infection, or of severe illness make accurate bacteriologic diagnosis vital in an elderly pneumonia patient, TTA is the procedure of choice, with a record of safety and reliability even in the elderly (Valenti et al., 1978a).

TTA should be performed using the classic technique (Pecora, 1959), but with a disposable 14-gauge intracatheter rather than a reusable needle and separate catheter. In many settings, TTA is underutilized because of exaggerated reports of risk, lack of individual experience with the procedure, or both. A clinician familiar with the procedure experiences an approximately 10 percent complication rate, usually consisting of localized subcutaneous emphysema at the puncture site or mild self-limited hemoptysis. Serious and even fatal complications can occur if TTA is performed on patients with any of the following contraindications: (1) bleeding disorder, making extensive hemoptysis likely; (2) preexisting hemoptysis which could become severe; (3) severe hypoxia, predisposing to cardiac arrhythmias or respiratory arrest; (4) inability or unwillingness to cooperate; or (5) severe paroxysms of coughing predisposing to major mediastinal emphysema (Spencer and Beaty, 1972; Unger and Moser, 1973). These contraindi-

cations are only relative if correctable for the procedure. In the absence of contraindications, serious complications are extremely rare. Those reported include puncture-site infection, problems relating to operator inexperience, and, in one case, an anatomically aberrant cricothyroid artery which was lacerated and bled uncontrollably (Schillaci et al., 1976). The clinical situations in which TTA should be strongly considered are pneumonias in which (1) the patient is unable to produce sputum; (2) infection with an organism of the oropharyngeal flora (anaerobes, alpha streptococci, yeasts, etc.) is suspected (Bartlett et al., 1973); (3) prior antibiotic treatment or prolonged hospital stay prohibits accurate prediction of bacteriology; and (4) adequate antibiotic coverage would require aminoglycoside use in a patient with pre-existing renal failure or eighth cranial nerve damage. TTA is not a routine diagnostic test, but in appropriate settings performed by an experienced person, it provides reliable specimens for immediate Gram stain and Quellung reactions and later culture and sensitivity tests which yield data invaluable in selecting treatment for otherwise perplexing pneumonias.

   Clinical Setting. The clinical setting of a pneumonia, including local epidemiology and the rate of development, can give valuable circumstantial information about likely etiology of an individual case. The season of the year and endemic respiratory disease in the community can often narrow the clinician's focus on possible etiology. The predictable timing and severity of each year's winter episode of influenza (see below) suggest the cause of much community-acquired illness. The vaccination status of each patient must be ascertained, since influenza vaccine reduces disease risk substantially; and pneumococcal vaccine diminishes the risk of the most common bacterial pneumonia. Awareness of any special environmental exposure to respiratory illness is also helpful, such as the nursing-home resident whose roommate has been found to have active tuberculosis or whose entire institution is suffering an outbreak of meningococcal pneumonia.

   The tempo of a developing pneumonia can also guide the clinician. Viral respiratory illness is a common antecedent of bacterial pneumonia, probably largely related to the negative impact of viral infection on host defenses of the lung (Loosli, 1973). When elderly individuals in the community develop minor respiratory symptoms, usually confined to the upper airway without serious systemic effects, the clinician should be alerted. After a few days of cold symptoms, a sharp exacerbation of illness, with new or exaggerated fever, cough, purulent sputum production, and malaise, signals the onset of bacterial pneumonia. Although "prophylactic" antibiotics are commonly used in clinical

practice for the early viral phase of such illnesses, especially in frail, elderly, high-risk patients, such practice may increase the risk of acquiring a relatively resistant organism as the later bacterial pneumonia and does not reduce the chance of pneumonia overall (Louria and Brayton, 1963; Tillotson and Finland, 1969; Weinstein et al., 1954). In patients at high risk for complications and death from pneumonia, culture of the throat to determine bacterial species likely to cause any pneumonia that later develops will arm the clinician with specific antibiotic sensitivity data to allow the most precise and safe therapeutic agent to be used if and when pneumonia develops. When pneumonia develops in ambulatory individuals with the double peaks of symptoms, pneumococcal infection is most common, accounting for one-half to two-thirds of all cases, followed by enteric gram-negative aerobes and *Staphylococcus aureus,* each accounting for 5 to 10 percent of cases (Sullivan et al., 1972). When pneumonia begins abruptly without prodrome and progresses quickly, influenzal pneumonia, hematogenous necrotizing pneumonia, or *Legionella pneumophila* infection should be considered. Primary anaerobic pneumonia is emerging as another possible entity in the ambulatory patient, especially if aspiration is suspected, though these patients usually have a more indolent course (Bartlett and Finegold, 1974).

Specific Pneumonias. PNEUMOCOCCUS (STREPTOCOCCUS PNEUMONIAE). Though pneumococcal pneumonia is more common than all other bacterial pneumonias combined, accounting for one-half to two-thirds of all cases, and is therefore relevant to patients of all ages, certain special features are of particular importance in the elderly. Complications and death from this common but usually curable pneumonia cluster in aged patients. Though overall mortality is less than 10 percent and bacteremic infection is fatal in 15 to 20 percent of cases, age greater than 50 years doubles the mortality. Pneumococcal bacteremia, detected one-quarter to one-third of the time, does not increase with age (Austrian, 1975).

Delayed radiographic resolution, classically thought to correlate with malignant bronchial obstruction, was found in no case to signal lung cancer; but age greater than 50 years was a powerful correlate of persisting consolidation (Jay et al., 1975). All patients younger than age 50 had resolution by 6 weeks, and half were free of consolidation in 2 weeks. Less than half the group over age 50, however, showed resolution by 6 weeks, and 14 weeks elapsed before all of patients over 50 cleared their chest radiographs. Of the risk factors for increased mortality identified in a classic study of bacteremic pneumococcal pneumonia, all five were found to cluster in the elderly (Austrian and

Gold, 1964). The situations associated with greater mortality were: (1) age greater than 50 or less than five years, with a sharply increased mortality in patients beyond age 60; (2) late initiation of treatment; (3) septic complications of any kind; (4) complicating medical disease; and (5) infection with pneumococcal serotype III. Risk factors 2 and 4 are more common in elderly individuals (Besdine, 1980). Austrian has found septic complications more often in old patients (1975). Two-thirds of the type III infections occurred in patients over age 50. The landmark observations of Austrian and Gold (1964) detected a remarkable phenomenon concerning mortality in bacteremic pneumococcal pneumonia. They retrospectively compared survival rates in the first three weeks of illness for bacteremic pneumonia patients treated only symptomatically, treated with type-specific antipneumococcal serum, or treated with penicillin. Their data document the equally dramatic impact on survival of the availability first of type-specific serum therapy in the late 1920s, and later of penicillin in the 1940s. But the startling observation was that in the first five days of illness, regardless of treatment modality, the mortality rates were the same and that only after five days was there noticeable survival benefit in the serum and penicillin groups compared with patients receiving no specific treatment. In the penicillin group, 60 percent of the total mortality occurred in the first five days; this early mortality seemed unavoidable, regardless of how promptly treatment was initiated. It appears, then, that there are patients with bacteremic pneumococcal pneumonia who will inevitably die of the disease in spite of optimal therapy.

ENTERIC GRAM-NEGATIVE AEROBIC BACTERIA (EGNAB). EGNAB pneumonia, rarely occurring in ambulatory individuals, is usually a nosocomial infection and is more lethal than any community-acquired respiratory infection. The National Nosocomial Infections Study identified pneumonia in 0.6 percent of medical/surgical hospitalizations, as the second most common nosocomial infection, accounting for 20 percent of all hospital-acquired infections (Sanford and Pierce, 1979). Risks for nosocomial pneumonia are: (1) treatment with hypnotics or immunosuppressives; (2) need for assisted respiration; (3) surgery done under general anesthesia; and (4) grave illness (Graybell et al., 1973). Because most or all of the risks associated with nosocomial pneumonia are more common in elderly individuals, these pneumonias will also cluster in the very old. Nearly two-thirds of nosocomial pneumonias are caused by EGNAB, and the mortality is 50 percent (Sanford and Pierce, 1972). As might be predicted, elderly individuals bear the brunt of EGNAB pneumonia and its mortality (Sullivan et al., 1972).

INFLUENZA. Though a viral illness, influenza is a common lower respiratory infection and a particular hazard to elderly individuals. As a lower respiratory infection, in contrast with many viruses afflicting epithelium of the airway only as far as the larynx, influenza damages the entire respiratory epithelium and leaves it denuded and vulnerable to secondary bacterial infection (Douglas, 1975). Tracheobronchitis is the usual initial presentation. Pneumonia in the setting of influenza follows one of three clinical-pathologic patterns. Rarest of all is a rapidly progressive and lethal explosive illness with bacterial, usually staphylococcal, pneumonia present at the onset of severe influenzal disease. Also uncommon but very dangerous is progressive influenzal pneumonia in which viral infection advances beyond bronchioles into the alveoli and produces a hemorrhagic pneumonia. Progressive influenza pneumonia usually occurs in individuals with preexisting cardiorespiratory disease. The most common pneumonia of influenza follows the classic diphasic pattern in which the initial febrile influenzal disease, as it begins to abate, is superseded by a more hectic newly febrile phase in which bacterial superinfection occurs. Although *Staphylococcus aureus* is a well-known dread and devastating secondary infection following influenza, *Streptococcus pneumoniae* is most common (Louria et al., 1959). The special virulence of influenza and its complications for the elderly is well known. Type A infection is most common in the modern era, and the A viruses produce the most severe illness and highest complication rates.

LEGIONELLA PNEUMOPHILA. First identified as the cause of perplexing epidemic pneumonia among guests at a Philadelphia hotel, Legionnaire's disease has been increasingly recognized as a cause of sporadic pneumonia in community-dwelling individuals. Legionnaire's victims are older on average than other bacterial pneumonia patients. The onset is typically abrupt and severe, without prodromal illness, and is often characterized by the headache of encephalopathy. Hepatic injury, with elevation of serum transaminases, is common; the urine sediment is often abnormal as well (Helms et al., 1979). Diagnosis is still relatively difficult, but clinical laboratory methods of culture on special media, direct immunofluorescence, and serologic detection are available (Edelstein et al., 1980). Rarely, the small gram-negative rods can be seen in clinical specimens. Although the organism is sensitive in vitro to a variety of antibiotics, optimum clinical outcome appears to follow treatment with erythromycin.

ASPIRATION PNEUMONIA. Though aspiration of small amounts of oropharyngeal secretions commonly occurs in healthy individuals and is the mechanism generating most bacterial pneumonias (Huxley et al.,

1978), massive aspiration is a less frequently documented event. Unfortunately, all aspirations tend to be lumped together in clinical studies, though there are major clinical differences dependent largely upon the aspirated material. The aspiration of undigested food generally produces a multifocal granulomatous pneumonia analogous to confluent foreign-body reactions (Wynne and Modell, 1977) or acute obstruction of a bronchus or even the trachea. The aspiration of gastric acid, or Mendelson's syndrome, is analogous to a chemical burn of the lung and has a high immediate and late mortality. Although aspiration is not primarily an infectious disease, the injured lung is ripe for secondary infection by whatever flora inhabit the upper airway (Bynum and Pierce, 1976). Aspiration of bland liquid is far less catastrophic or ominous (Murray, 1979). The last of the aspiration syndromes, inhalation of a large bolus of bacteria-laden oropharyngeal secretions, is most common and has classically been associated with anaerobic pneumonia or lung abscess (Bartlett et al., 1973). Patients classically manifest a subacute course, with foul sputum, fever, infiltrate in a dependent lung segment, and systemic signs of chronic disease. Reliable bacteriologic diagnosis can be made only on unexpectorated sputum obtained via TTA or from abscess or empyema fluid (Bartlett et al., 1973). Risk factors for any aspiration include periodontal disease, sedating drugs, neurologic disease, impaired gag reflex, immobility, general anesthesia, nasogastric intubation, and advanced age (Huxley et al., 1978). Classic aspiration lung abscess or pneumonia has penicillin-sensitive mixed anaerobic mouth flora and is often found in patients with periodontal disease, which increases oropharyngeal bacteria 100- to 1,000-fold. But some studies have shown that oropharyngeal aspiration pneumonia is not reliably best treated with penicillin (Bartlett and Finegold, 1974; Lorber and Swenson, 1974). Rather, the bacteriology of the pneumonia depends upon where the patient resided at the time of aspiration. Community-dwelling individuals have the characteristic chronic pneumonia or abscess produced by mouth anaerobes; but in the hospital, aspirations are associated with necrotizing pneumonia due to EGNAB or penicillin-resistant anaerobes commonly found in the oropharynxes of hospitalized patients. Treatment clearly hinges upon the epidemiologic circumstances of illness and upon accurate bacteriologic diagnosis.

Management. Regardless of etiology, certain principles of care apply to pneumonia patients. These principles require special attention when the patient is elderly. In addition to administration of a safe and effective antibiotic, chosen and given in accordance with guidelines outlined earlier, the general management of pneumonia victims is all

too often neglected in the modern chemotherapeutic era. Adequate fluid intake is crucial, not only for the general health of the patient, but also to allow adequate hydration of pulmonary secretions. Younger patients, with greater lean body mass and total body water, can tolerate a day or two of dehydration associated with the onset of pneumonia, whereas the elderly patient, in addition to being at greater risk for acute tubular necrosis from volume depletion, will also clear sputum less well if at all when dehydrated. Varieties of chest physical therapy are prescribed for patients with pneumonia. Gravity, enhanced by vibration and percussion, can accelerate clearance of infected pulmonary secretions, but elderly patients usually experience fatigue and even exhaustion from the vigorous pounding and shaking of well-intentioned respiratory therapy, and the net effect may well be a reduction in their ability to clear inspissated secretions. Adequate humidification of inspired air, along with cough and deep-breathing coaching from a patient therapist, usually provides optimal assistance in raising purulent viscous sputum. When these manuevers, along with whatever parenteral hydration is appropriate, are unsuccessful, gentle mechanical suctioning of tracheal secretions should be performed, not according to an arbitrary schedule, but rather whenever auscultation or respiratory embarrassment indicate reaccumulation. Increasing the oxygen content of inspired air is helpful for hypoxemic elderly pneumonia patients, but the risk of ablating the hypoxic drive to respiration must be considered even when using small amounts of added oxygen.

Chronic lung disease with hypercapnia is a common condition in elderly individuals, and these patients are especially prone to pneumonia. For them, hypoxia may well be the only stimulus for continued adequate spontaneous ventilation; additional oxygen may produce hypoventilation or even apnea. Thus, extreme care must be taken in administering oxygen to elderly pneumonia patients, especially when there is a history of chronic lung disease. Blood gases can, of course, provide the definitive information for making the correct clinical decision. Antipyretic drugs such as aspirin and acetominophen are commonly given to reduce fever in patients with pneumonia and may reduce metabolic stress in elderly patients with borderline cardiac function. But the fever chart can be valuable in verifying the response to antibiotics or in heralding the onset of a complication. Accordingly, antipyretics should be used only when patient comfort or cardiac function are truly compromised by fever and demand treatment. Though less common in the antibiotic era, when large consolidations are permitted to develop less often, pleurisy, when it does occur, interferes sharply with ventilation and clearance of secretions. Pleuritic pain lim-

its respiratory excursion of the chest, producing alveolar hypoventilation and nonhomogenous lung expansion. Additionally, cough is enfeebled or suppressed so that secretions become progressively thicker and interfere further with ventilation. When such a cycle of pain, diminished aeration, and thickened secretions begins, it is difficult to reverse. The work of breathing increases, and in frail elderly patients respiratory failure is easily provoked. Early relief of pleuritic pain is essential, using splinting, topical heat or cold, intercostal nerve block, or even narcotic analgesics. All are less dangerous than the initiation by pain of cyclical inadequate ventilation and cough.

Tuberculosis (TB)

Epidemiology. TB is largely a disease of the elderly in the United States and other Western industrialized countries. The age-specific and overall incidence of TB has declined for all American states since the early 1950s, but the decline among aged persons has not been as rapid, producing a rise in the proportion of cases in the elderly. In 1953, 13.8 percent of new TB occurred in people 65 years of age and older; but by 1979, there was a doubling of new cases in the elderly to 28.6 percent (Powell and Farer, 1980).

Tuberculous infection is defined as the asymptomatic state produced by successful encounter with live tubercle bacilli, marked by a positive skin test and perhaps an abnormal chest X-ray, but negative smears and cultures of all specimens. Tuberculous disease, or TB, is the result of invasion and continued proliferation of tubercle bacilli in one or more organ systems. Bacteriologic tests detect these organisms.

Only a small proportion of the population infected ever develops disease and becomes symptomatic, between 5 and 15 percent. The risk of active disease is greatest in the year or two immediately following infection but persists for life (Styblo, 1980). Because there has been a steady decline of new TB, currently old individuals, born and growing up when exposure to active cases was more likely, are more likely to have been infected and, retaining their lifelong if diminishing risk, are more likely as a group to be the reservoir from whom new reactivation cases arise. These observations are validated by studies of skin test positivity, which has been shown to increase with age regardless of socioeconomic status, geography, or ethnicity (Reichman and O'Day, 1978). Active disease rates increase with age, though the risk of reactivation for a single individual dwindles throughout life in the absence of

specific new risk factors for reactivation, such as malignant disease or immunosuppressive therapy (Comstock and Edwards, 1975).

A crucial observation, given the epidemiology of TB, is that since there is a lifelong potential for reactivation, TB can survive and be perpetuated in a population for years, decades, and even generations with no new infections occurring, only to erupt in disease with widespread contagion from a rare individual who has reactivated after many quiescent years. Because of the continuing risk, the concept of disease prevention in those with evidence of infection was developed; chemoprophylaxis with one year of isoniozid (INH) was shown to reduce the risk of reactivation by 60 to 90 percent (Ferebee, 1969). Furthermore, the risk reduction persisted for 20 years. Sadly, there is evidence that older individuals, the group most likely to be the reservoir of infection, have an unacceptable risk for INH hepatitis (see above), so that chemoprophylaxis is denied to individuals who would benefit most and whose treatment would benefit society most (Comstock and Edwards, 1975). Current recommendations for chemoprophylaxis are influenced by the risks to older individuals and suggest one year of INH in the following situations (after active disease has been ruled out):

1. Household or other intimate contacts of contagious TB cases.
2. Positive skin test and chest X-ray evidence of inactive disease.
3. Recent conversion of the skin test from negative to positive.
4. Individuals younger than 35 years of age with positive skin tests.
5. Individuals with positive skin tests and associated disease which is known to increase the risk of reactivation TB, such as silicosis (American Thoracic Society, 1974).

Skin Testing. A reaction of 10 mm or more of induration 48 hours after intradermal injection of 5 tuberculin units of Tween-stabilized PPD is evidence of tuberculous infection. Detection of active disease depends upon bacteriologic and other diagnostic methods.

Recently some doubt has been cast upon the reliability and specificity of tuberculin skin tests, especially in the elderly. Although cross reactivity with other mycobacteria has been demonstrated, a 10 mm or greater reaction in the United States is virtually diagnostic of *Mycobacterium tuberculosis* infection. It is true that elderly individuals, infected early in life and then living many decades without skin testing or reactivation of disease, may demonstrate shrinkage of skin reactivity to less than 10 or even 5 mm of induration and thus be interpreted as

negative to PPD (Thompson et al., 1979). Confusion can be avoided in these cases by following the first skin test by a second one a week later. If the second test is now positive, it is intepreted as a booster phenomenon indicating recall of previous sensitivity rather than new conversion of skin test reactivity. The third skin testing problem raised is lack of diagnostic accuracy in patients with active TB. Excluding those with recent acquisition of rapidly progressive disease, whose skin test reactivity has not yet converted (conversion takes six to eight weeks following initial infection), there is documentation of negative skin tests, in patients with long-standing active disease, at rates as high as 20 or 30 percent (Rooney et al., 1976). When carefully studied, however, negative reactions were found to cluster in the sickest patients. After two weeks of good nutrition and general care, the great majority of negative reactors developed (likely regained) positive skin tests. This loss of skin reactivity in the face of severe disease may be analogous to situations demonstrated in experimental animals whereby the in vitro lymphocyte reactivity is unaffected but the ability to manifest a positive skin test is ablated by several debilitating manipulations (Zweiman et al., 1966).

Clinical Problems. In the latter part of the twentieth century, TB presents a clinical face substantially different from that of several decades ago. The declining rates in all age groups has combined with the rising mean age of patients with active disease to make clinical stereotypes of the tuberculous patient increasingly rare. A greater percentage of each year's cases are extrapulmonary (Farer et al., 1979), and these cases cluster even more heavily in the elderly. The clinical picture of milliary TB has changed dramatically from the classical picture in children and young adults to a cryptic wasting disease of the elderly, usually presenting with headache, malaise, weight loss, and hematologic and hepatic abnormalities, but without fever or a positive skin test (Munt, 1971; Sahn and Neff, 1974). Disease in these patients is often mistaken for disseminated cancer as in the case of Eleanor Roosevelt; and diagnosis is often made only postmortem. Even pulmonary TB is less well recognized today than in the past; roentgenographic presentations other than standard upper lobe reactivation infiltrates are often misdiagnosed.

Care of TB patients has been shifted to the general hospital by the closing of TB sanatoria (Khan et al., 1977). Several studies report hospital personnel being exposed to and infected by unrecognized, unsuspected active open pulmonary tuberculosis (Grieco and Chmel, 1974; MacGregor, 1975). Detailed examination of misdiagnosis of elderly TB patients in general hospitals revealed (1) distraction of the

physician by the presence of a second more acute condition and (2) ignoring of chest roentgenogram abnormalities as chronic, and thus omitting sputum smear and culture (Cole et al., 1974). Routine surveillance and sputum examination was carried out for aged patients regardless of clinical presentation or symptoms if chest roentgenogram was consistent with pulmonary TB, active or not. In nine months 6 out of 81 patients were discovered to have active disease (Cole et al., 1974)! Cumulative evidence demands more careful attention to the possibility of active pulmonary tuberculosis in elderly patients in acute hospital or community settings.

One well-documented report of a nursing home outbreak of TB infection and disease among residents and staff deserves special mention because of its direct relevance to the elderly (Stead, 1981). A single gregarious resident of a clean, well-administered nursing home was fully mobile with a diagnosis of lung cancer for more than a year until TB was suspected by an alert public health nurse who noted a large number of skin test conversions among employees. Thirty percent (49) of 161 skin-test-negative residents converted, 17 percent (8) developed progressive primary TB, and 1 patient died; 15 percent of 138 negative staff converted, and 1 person developed active disease. All converters, residents, and staff were given prophylactic isoniazid (INH); of the 39 residents, only three showed minor hepatic toxicity which rapidly cleared when INH was stopped. Besides emphasizing the need to beware of TB in institutional settings housing elderly individuals, the entity of progressive primary TB is recalled. Further, INH hepatitis was, in the 39 patients who received the drug, much less of a problem than predicted. In addition to being alert to the possibility of TB outbreaks in nursing homes and perhaps being less fearful of INH hepatitis (though numbers are small), several useful principles can be generated:

1. All elderly individuals should have tuberculin skin tests upon admission to a long-term care institution, with repeated testing in one week if negative (Thompson et al., 1979), and annual testing thereafter if still negative.
2. Skin-test-positive elderly nursing-home residents should have periodic chest roentgenograms.
3. The same recommendations 1 and 2 above apply to employees of these institutions.
4. Though there is the highest prevalence of tuberculin skin test reactivity among the elderly, more than half are likely to be negative and thus vulnerable to primary infection, disease, and progressive illness.

Treatment. Principles of TB treatment are well established regardless of the patient's age (Glassroth et al., 1980). Current studies show that a two-drug regimen of INH and rifampin is at least as effective and fast in converting sputum as any three-drug regimen ever used. INH hepatitis hazard for the elderly has already been discussed. Aminoglycosides, effective second-line antituberculous agents, have special risks for the aged kidney and eighth cranial nerve (see above). Scrupulous attention to overall health and associated diseases in elderly TB patients may become more important to survival than the antituberculous regimen itself during treatment.

Bacterial Endocarditis

Recent series of infective endocarditis (IE) in adults include a greater proportion of cases in the over-60 age group than studies done in the pre-antibiotic era. In a review of IE published in 1955, only 18 percent of cases were over 60 years of age (Anderson, 1955), while in recent series, the proportion of cases in this group ranges from 30 to 55 percent (Lerner and Weinstein, 1966; Von Reyn et al., 1981; Weinstein and Rubin, 1973). Rather than indicating a change in the nature of IE, these statistics more likely reflect increasing life expectancy, which places more older people at risk for IE than in years previous.

IE has a higher fatality in the elderly than in those of younger age groups. In a recent series of 123 cases of IE, 12 of the 16 deaths occurred in those over 60 years of age (Von Reyn et al., 1981). In this series the increased age-related mortality appeared to be the result of the severity of underlying cardiovascular systemic disease as well as the virulence of the infecting organism.

Other studies have emphasized the impact of delayed recognition of IE on survival. In one retrospective series, the pre-mortem diagnosis of IE was made in only 40 percent of elderly individuals (Thell et al., 1975). Although the absence of fever and heart murmur in older patients with IE has been stressed in the past, in a recent series 93 percent of elderly individuals with IE were found to have fever and 68 percent had a murmur (Thell et al., 1975). Since many older individuals have systolic murmurs indicative of aortic or mitral valve sclerosis, the diagnosis of IE may be neglected if there is no change in the preexisting murmur. In fact, an unchanged murmur may be the most common cardiac finding in IE (Von Reyn et al., 1981), particularly early in the course of infection. It should also be noted that no difference in the bacteriology of IE between the young and the old has been found to account for the age-related differences in mortality (Ries, 1976).

IMMUNIZATION

Although the magnitude of the antibody response to immunogens declines statistically significantly with age, the decline is only quantitative and small. Thus, vaccination of elderly individuals against preventable infections should be pursued, especially when the diseases are common or especially dangerous. Given the sharply increased incidence of many infections in the elderly and the tendency to late presentation for treatment of established disease, any preventive measures such as vaccination should be vigorously encouraged. Annual office visits or hospitalizations for unrelated illnesses present an opportunity to vaccinate aged individuals which should not be neglected. Though certain illness, such as malignant blood disease and immunologic disorders, which are more common with advancing age, add to the decline in antibody production seen in immunologically normal elderly, the great majority of older individuals, including frail elders with chronic diseases, can be expected to produce adequately protective levels of antibody when appropriately vaccinated (Gladstone and Recco, 1976). Influenza, pneumococcus, and tetanus vaccination are discussed in detail as examples of important immunization in the elderly.

Influenza

Annual immunization against influenza is advised by he USPHS Committee on Immunization Practices for elderly and chronic-disease burdened individuals because of the documented increase in influenzal morbidity and mortality in such persons. Each year vaccine components are selected based on influenzal antigens prevalent in the Southern Hemisphere's winter, which occurs during late spring and summer in North America. Prevalent strains usually vary from year to year in a process called antigenic drift, and major changes occur about once a decade and are called antigenic shift (Langmuir and Schoenbaum, 1976).

Vaccines are always inactivated and can contain antigens from one or several virus strains, depending on epidemiologic surveillance. In recent years, the dominant pathogens have been variants of influenza A_2 originating from the Hong Kong strain of 1968 with a major variation in the Victoria strain of 1975. Additionally, an occasional B strain has been included in vaccine. Each year there is a rush through the summer to produce enough egg-grown virus for the 10 to 15 million doses to be administered in the following fall and winter. Rarely does

demand for vaccine exceed the supply. The more common problem is getting recipients and health professionals to remember and follow through with vaccination, especially in relatively healthy persons. Though vaccine is most urgently recommended for the very old and those with heart or lung disease, for whom the impact of influenza is likely to be devastating, other individuals advised to get annual vaccination are healthy elderly greater than 60 years of age, those of any age with chronic disease, and key personnel in health and public services whose absence during an influenza outbreak would be a burden to the community.

Influenza vaccination elicits protective antibody, which appears after one week and peaks in two to four weeks. Most elderly subjects produce adequate antibody, and titers usually rise four-fold above baseline. More important than antibody titer, illness protection is as good in elderly as in young subjects (Howells et al., 1975). Antibodies are produced to a variety of antigens, but those directed against the surface hemagglutinin and neuraminidase correlate best with disease protection. Protection is conferred on 70 percent of vaccinees, though this figure varies widely from population to population. A general trend is noted whereby the sickest vacinees get the least protection, though inadequate antibody production has generally been noted only in the presence of diseases known to affect immune mechanisms or of severe debility including protein malnutrition. Protection lasts at most a year, and repeated immunization with different antigens provokes the peculiar phenomenon of original antigenic sin. Francis and co-workers noted that influenza-experienced subjects, when vaccinated with related but different strains, made antibody primarily reactive with the original infecting strain but also cross reactive with the new one (Francis et al., 1953). The clinical significance of this interesting reaction has not been defined. Although a lifetime of repeated influenzal infection confers better immunity than artificial vaccination and might be expected to provide some enduring immunity, none has been observed; aged individuals are at least as vulnerable to most influenzal strains as are the young. An exception occasionally occurs when a new strain appears, closely related to one prevalent decades previously. In such circumstances virulence and attack rates are greater in young patients (Langmuir and Schoenbaum, 1976).

Annual vaccination is valuable for elderly individuals, especially those most likely to suffer serious complications from influenza. Any health provider contact for an elderly individual, from first availability of vaccine throughout the winter, should be used as a chance to vacci-

nate. Adverse reactions to vaccine are, for the most part, limited to local soreness or a day or two of fever and malaise. Complaints of "getting the flu" from vaccination usually represent influenzal infection during an outbreak concurrent with immunization. An exception to the usual blandness of vaccine was the report of increased numbers of postvaccination Guillain-Barré syndrome associated with the 1976 "Swine flu" program (Schoeberger et al., 1979).

Pneumococcus

Pneumococcal infections continue to be a major problem in the latter part of the twentieth century. Theoretical arguments can be made for the development and use of a vaccine designed to prevent pneumococcal infection (Austrian, 1974).

1. Given the outstanding safety and general efficacy of penicillin in treating pneumococcal infections, it is unlikely that a better antibiotic will emerge.
2. In spite of widespread penicillin use, 500,000 cases of pneumococcal pneumonia annually with a greater than 10 percent mortality and $500,000,000 cost make prevention highly desirable.
3. Although the overall mortality of pneumococcal pneumonia is only 10 percent, selected groups are at much higher risk in spite of appropriate therapy:
   a. Bacteremic disease has an overall mortality of more than 20 percent.
   b. Age greater than 50 years has a 40 percent or more mortality with bacteremic infection.
   c. Bacteremic type III infection has a 55 percent mortality.
   d. Serious associated medical illness doubles the mortality (diabetes, congestive heart failure, renal failure, stroke, blood dyscrasia, cirrhosis, or malignancy).
   e. Patients who are splenectomized (trauma or disease) or have impaired splenic function have a markedly increased mortality and risk of pneumococcal infection.
4. Regardless of therapy, certain patients are doomed to die in the first five days of illness—5 to 7 percent of all bacteremic cases, but 60 percent of the deaths in the treated group.
5. Pneumococcal otitis media afflicts 20 percent of American children by age two; and among poor children entering school, 35 percent have hearing loss due to previous otitis media.

6. Pneumococcal meningitis is the second most common bacterial meningitis, afflicting 48,000 people annually with a 40 percent mortality.

In the early twentieth century, experimental immunity to type-specific pneumococcal polysaccarides was produced in laboratory animals and antibody was detected in humans recovering from infection (Dochez and Avery, 1917). In 1911, South African gold miners were found to be protected against fatal pneumococcal pneumonia by whole pneumococcal cell vaccines (Wright et al., 1914). In the 1940s, a commercial vaccine was marketed and shown to be effective in preventing pneumonia in young healthy subjects (MacLeod et al., 1945) and in elderly nursing-home residents (Kaufman, 1947). But immunization was never widespread, and the dramatic appearance of cheap, effective penicillin treatment for pneumococcal infections reduced vaccine use further. By the early 1950s, vaccine had been withdrawn from the market. During the subsequent two decades, persuasive evidence was collected, largely by Robert Austrian's perseverence (1975, 1977; Austrian and Gold, 1964), documenting age-related increases in death and complications from pneumococcal pneumonia as well as an apparent irreducible early mortality in spite of prompt initiation of antibiotic treatment, again largely in elderly patients (see above). Additional theoretical impetus for vaccine development came from multiple reports of penicillin-resistant pneumococci in various worldwide settings, though clinical problems due to resistant pneumococci are only case report rarities in the Western Hemisphere (Jacobs et al., 1977). Pneumococcal vaccine, containing the 14 most common serotypes producing bacteremia in North America, is commercially available and produces a rise in protective antibody in young and old recipients with a variety of chronic diseases. Advanced debility and illnesses affecting humoral immunity interfere with antibody production and thus reduce or ablate vaccine efficacy. Unfortunately, because humoral immunity is a major natural defense against pneumococcal infection, some of the individuals most in need of vaccine protection will not respond to immunization. One such case is the postsplenectomy patient with hematologic malignancy who is doubly vulnerable to pneumococcal infection because of both splenectomy and disease (Siber et al., 1978). Pneumococcal vaccination is currently being suggested (there are no formal recommendations by the USPHS advisory Committee on Immunization Practices, only guidelines for use) for closed populations of elderly individuals such as in nursing homes, for frail chronically ill elderly, for splenectomized individuals, and in circumstances of epidemic spread

(Center for Disease Control, 1978). Vaccination confers protective immunity for at least three to five years, and adverse reactions are generally limited to local inflammation and soreness. Though aged individuals do produce adequate levels of protective type-specific antibody, most studies of the immune response and virtually all current studies of clinical efficacy have been performed in young subjects; and it cannot be stated with confidence that vaccine truly protects elderly individuals from pneumococcal infection with vaccine serotypes. It has been shown that vaccine serotypes are common in bacteremic and nonbacteremic pneumococcal infections in the elderly (Valenti et al., 1978b). There has been no documentation to date of the theoretical concern that vaccine use will merely result in substitution of another group of infecting serotypes for the ones in the vaccine. As vaccine use becomes widespread, documentation of prior immunization becomes important in the acutely ill pneumonia patient, since pneumococcal infection, the most common bacterial pneumonia, becomes less likely in vaccinees.

Tetanus

Tetanus is a rare and dread disease, well known in antiquity, which currently follows classic epidemiologic models of infectious diseases, showing exaggerated mortality and severity at the extremes of life. Like tuberculosis and bacterial pneumonia, tetanus incidence declined sharply during the first half of the twentieth century. Active tetanus immunity is conferred by a toxoid which provokes antibody that is cross reactive with the exotoxin. Lethality of disease is due strictly to production of the neurotoxin tetanospasm by spores which have entered a wound, germinated, and proliferated under anaerobic conditions. Although the reasons are still poorly understood, it is well established that tetanus survivors acquire no protective immunity to subsequent risk; such patients require the same primary immunization sequence as any unvaccinated individual (Turner et al., 1958).

The epidemiology of tetanus has changed sharply during the twentieth century. In 1900, incidence and mortality rates for tetanus were similar for all age groups, but in the past 50 years both have fallen more rapidly for the young and middle aged than for the newborn and elderly. Thus, even though the risk for tetanus has fallen for all Americans, the risk of acquiring and dying of tetanus remains closer to levels of a half century ago for the very young and the old. Age-specific mortality rates show sharp differences. From 1920 to 1965, the fall in mortality for those under age 30 was 50-fold; but for those 70 years

and older the decline was only 5-fold (LaForce et al., 1969). Because incidence and mortality curves have declined in parallel during the entire century, overall case fatality ratios have remained the same, at roughly 65 percent. Tetanus decline began at the turn of the century, implicating environmental factors of less exposure to spores and better local wound care along with immunization as causes for the decline. Because both environmental measures and immunization have partici- pated in lowering tetanus rates and because overall rates have contin- ued to decline during the 1960s and 1970s when vaccination programs have not improved, it is generally agreed that in the mid and late twentieth century, environmental factors have been as important as vaccination in reducing tetanus rates (Fraser, 1972). Among adults, tetanus mortality and incidence have stopped falling since the 1950s, suggesting that a portion of the adult population remains unimmunized and thus respresents a lifelong reservoir of susceptibles.

Analysis of tetanus cases in the United States shows an overall case mortality ratio, in the mid-1960s, of 68 percent, but the ratio was greater than three-quarters for neonates and the elderly. When neona- tal cases were omitted from analysis, case fatality rates were 55 percent for those less than 50 years of age and 76 percent for those over 50 (LaForce et al., 1969). An earlier series of patients over 12 years of age, collected from 1940 to 1955, showed a doubling of the case fatality ratio for patients over 50 years of age compared with those under 50 (Garcia-Palmieri and Ramirez, 1957). Although historically it is well documented that incubation time is inversely proportional to the fatal- ity ratio (Patel and Mahta, 1963), recent series have not verified the phenomenon because it appears to be valid only in patients younger than age 50. Moreover, the mean age of non-neonatal cases has ad- vanced progressively in America since the 1940s and obscured the phenomenon. In recent series, the relation of mortality to incubation time still holds for cases under age 50 (LaForce et al., 1969).

All data presented confirm that in spite of its rarity, tetanus is a special hazard for the old, and the aged are the very group with the lowest immunization rates. It has repeatedly been shown that the vast majority of cases, regardless of age, have no or inadequate vaccination histories (LaForce et al., 1969). Serum levels of antitoxin tend to be low in those groups with the highest attack rates. In middle-aged women and the aged of both sexes, antitoxin levels are significantly less than those of middle-aged men and often are below the minimum protective level of 0.01 units/ml (Millian et al., 1967). These danger- ously low levels of antitoxin are universely attributed to neglect of immunization of women and the elderly because of their general ab-

sence from military service. Current recommendations urge primary immunization of all individuals without a definite history of prior immunization and boosters every 10 years or immediately following a tetanus-prone wound if no booster has been given in the previous year. Immunization of the debilitated elderly is especially important since 4 percent of adult tetanus cases currently originate from diabetic ulcers or pressure sores. Excessive immunization is to be avoided because of adverse toxoid reactions due to hyperimmunity and the risk of amyloid or vasculitis secondary to excess antigenic stimulation (Edsall et al., 1967).

REFERENCES

Akhtar, A. J. et al. Urinary tract infection in the elderly: a population study. *Age and Aging*, 1972, *1*, 48–54.
Albano, W. A., Zielinski, C. M., Organ, C. H. Is appendicitis in the aged really different? *Geriatrics*, 1975, *30*, 81–88.
American Thoracic Society, Medical Section of the American Lung Association. Preventive therapy of tuberculous infection. *Am. Rev. Resp. Dis.*, 1974, *110*, 371–378.
Anderson, H. J., Staffurth, J. S. Subacute bacterial endocarditis in the elderly. *Lancet*, 1955, *2*, 1055.
Appell, G. B., Neu, H. C. The nephrotoxicity of antimicrobial agents. *N. Engl. J. Med.*, 1977, *296*, 663–670, 722–728, 784–787.
Austrian, R. Pneumococcal infection. *Prev. Med.*, 1974, *3*, 443–445.
Austrian, R. Random gleanings from a life with the pneumococcus. *J. Infect. Dis.*, 1975, *131*, 474–484.
Austrian, R. Prevention of pneumococcal infection by immunization with capsular polysaccharides of Streptococcus pneumoniae: current status of polyvalent vaccines. *J. Infect. Dis.*, 1977, *136* (suppl.), S38–S42.
Austrian, R., Gold, J. Pneumococcal bacteremia with especial reference to bacteremic pneumococcal pneumonia. *Ann. Intern. Med.*, 1964, *60*, 759–776.
Barrett-Connor, E. The nonvalue of sputum culture in the diagnosis of pneumococcal pneumonia. *Am. Rev. Resp. Dis.*, 1971, *103*, 845–848.
Bartlett, J. Diagnostic accuracy of transtracheal aspiration bacteriologic studies. *Am. Rev. Resp. Dis.*, 1977, *115*, 777–782.
Bartlett, J. G., Finegold, S. M. Anaerobic infections of the lung and pleural space. *Am. Rev. Resp. Dis.*, 1974, *110*, 56–77.
Bartlett, J. G., Rosenblatt, J. E., Finegold, S. M. Percutaneous transtracheal aspiration in the diagnosis of anaerobic pulmonary infection. *Ann. Intern. med.*, 1973, *79*, 535–540.
Bennett, W. M., et al. Guidelines for drug therapy in renal failure. *Ann. Intern. Med.*, 1977, *86*, 754–783.
Bentley, D. W., Simon, S. E., Douglas, R. G., et al. Responses to pneumo-

coccal vaccines in healthy elderly volunteers. Abstract presented at Fourteenth Interscience Conference of Antimicrobial Agents and Chemotherapy, San Francisco, California, p. 187, 1974.

Besdine, R. W. Geriatric medicine: an overview. *Annu. Rev. Gerontol. Geriatr.*, 1980, *1*, 135–153.

Brewin, A., et al. High dose penicillin therapy and pneumococcal pneumonia. 1974, *230*, 409–413.

Brocklehurst, J. C., et al. Bacteriuria in geriatric hospital patients. *Age and Aging*, 1977, *6*, 240–245.

Broome, C. V., Facklam, R. R., Fraser, D. W. Pneumococcal disease after pneumococcal vaccination: an alternative method to estimate the efficacy of pneumococcal vaccine. *N. Engl. J. Med.*, 1980, *303*, 549–552.

Buckley, C. E., Buckley, E. G., Dorsey, F. C. Longitudinal changes in serum immunoglobulin levels in older humans. *Fed. Proc.*, 1974, *33*, 2036–2039.

Buckley, C. E., Dorsey, F. C. The effect of aging on human serum immunoglobulin concentrations. *J. Immunol.*, 1970, *105*, 964–972.

Bynum, L. J., Pierce, A. K. Pulmonary aspiration of gastric contents. *Am. Rev. Resp. Dis.*, 1976, *114*, 1129–1136.

Cate, T. R., Kasel, J. A., Couch, R. B., et al. Clinical trials of bivalent influenza A/New Jersey/76–A Victoria/75 vaccines in the elderly. *J. Infect. Dis.*, 1977, *136*, S518–S525.

Center for Disease Control. *Morb. Mort. Weekly Rep.*, 1978, *27*, 25–31.

Cole, R. B., Balmer, J. P., Wilson, T. S. Surveillance of elderly hospital patients for pulmonary tuberculosis. *Brit. Med. J.*, 1974, *1*, 104–106.

Comstock, G. W., Edwards, P. O. The competing risks of tuberculosis and hepatitis for adult tuberculin reactors. *Am. Rev. Resp. Dis.*, 1975, *111*, 573–577.

Crowe, C. C., et al. Bacterial interference II: role of the normal throat flora in prevention of colonization dry group A streptococcus. *J. Infect. Dis.*, 1973, *128*, 527–532.

Diaz-Jouanen, E., Strickland, R. G., Williams, R. C. Studies of human lymphocytes in the newborn and the aged. *Am. J. Med.*, 1975, *58*, 620–628.

Dochez, A. R., Avery, O. T. The elaboration of specific soluble substance of pneumococcus during growth. *J. Exp. Med.*, 1917, *26*, 477–493.

Dontas, A. S., et al. Bacteriuria and survival in old age. *N. Engl. J. Med.*, 1981, *304*, 939–943.

Douglas, R. G. Jr. Influenza in man. In E. D. Kilbourne (Ed.), *The influenza viruses and influenza*. New York: Academic Press, 1975, pp. 395–447.

Douglas, R. G., Bentley, D. W., Brandris, M. W. Responses of elderly and chronically ill subjects to bivalent influenza A/New Jersey/8/76 (Hsw/N1)–A/Victoria/3/75 (H3N2) Vaccines. *J. Infect. Dis.*, 1977, *136*, S526–S532.

Edelstein, P. H., Meyer, R. D., Finegold, S. M. Laboratory diagnosis of Legionnaire's disease. *Am. Rev. Resp. Dis.*, 1980, *121*, 317–327.

Edsall, G., et al. Excessive use of tetanus toxoid boosters. *JAMA*, 1967, *202*, 17–19.

Farer, L. S., Lowell, A. M., Meador, M. P. Extrapulmonary tuberculosis in the United States. *Am. J. Epidemiol.*, 1979, *109*, 205–217.

Ferebee, S. H. Controlled chemoprophylaxis trials in tuberculosis: a general review. *Adv. Tuberc. Res.*, 1969, *17*, 28–106.

Fetzer, A. E., Werner, A., Hagstrom, J. W. C. Pathologic features of pseudomonal pneumonia. *Am. Rev. Resp. Dis.*,1967, *96*, 1121–1130.

Foy, H. M., Kenny, G. E., Cooney, M. K., Allen, I. D. Long-term epidemiology of infections with *mycoplasma pneumoniae. J. Infect. Dis.*, 1979, *139*, 681–687.

Francis, T. Jr., Davenport, R. M., Hennessy, A. V. Serologic recapitulation of human infection with different strains of influenza virus. *Trans. Assoc. Am. Physicians*, 1953, *61*, 231.

Fraser, D. W. Tetanus in the United States, 1900–1969: analysis by cohorts. *Am. J. Epidemiol.*, 1972, *96*, 306–312.

Garcia-Palmieri, M. R., Ramirez, R. Generalized tetanus: analysis of 202 cases. *Ann. Intern. Med.*, 1957, *47*, 721–730.

Gardner, I. D. The effect of age on susceptibility to infection. *Rev. Infect. Dis.*, 1980, *2*, 801–810.

Gianni, D., Sloan, R. S. A tuberculin survey of 1285 adults with special reference to the elderly. *Lancet*, 1957, *1*, 525–527.

Gladstone, J. L., Friedman, S. A. Bacteriuria in the aged: a study of its prevalence and predisposing lesions in a chronically ill population. *J. Urol.*, 1971, *106*, 745–749.

Gladstone, J. L., Recco, R. Host factors and infectious disease in the elderly. *Med. Clin. North. Am.*, 1976, *60*, 1125–1240.

Glassroth, J., Robbins, A. G., Snider, D. E. Jr. Tuberculosis in the 1980's. *N. Engl. J. Med.*, 1980, *302*, 1441–1450.

Goodman, R. M., Yergin, B. M., Landa, J. F., Golinvaux, M. H., Sackner, M. A. Relationship of smoking history and pulmonary function tests to tracheal mucous velocity in non-smokers, young smokers, ex-smokers, and patients with mucous chronic bronchitis. *Am. Rev. Resp. Dis.*, 1978, *117*, 205–214.

Graybell, J. R., et al. Nosocomial pneumonia: a continuing major problem. *Am. Rev. Resp. Dis.*, 1973, *108*, 1130–1140.

Grieco, M. H., Chmel, H. Acute disseminated tuberculosis as a diagnostic problem: a clinical study based on twenty-eight cures. *Am. Rev. Resp. Dis.*, 1974, *109*, 554–560.

Gross, P. A., et al. Deaths from nonsocomial infections: experience in a university hospital and a community hospital. *Am. J. Med.*, 1980, *68*, 219–227.

Grossman, J., Baum, J., Gluckman, J., et al. The effect of aging and acute illness on delayed hypersensitivity. *J. Allergy Clin. Immunol.*, 1975, *55*, 268–275.

Habetz-Gabr, E., January, L. E., Smith, I. M. Bacterial endocarditis: the need for early diagnosis. *Geriatrics*, 1973, *28*, 164–170.

Heffron, R. *Pneumonia; with special reference to pneumococcus lobar pneumonia.* New York: The Commonwealth Fund, 1939.

Hellgren, H. M., Buckley, C. E., Gilgerstein, V. A., et al. Lymphocyte phytohemagglutinin responsiveness, immunoglobulins, and autoantibodies in aging humans. *J. Immunol.*, 1973, *111*, 1101–1107.

Hellgren, H. M., Kersey, J. H., Dubey, D. P., et al. Lymphocyte subsets and integrated immune function in aging humans. *Clin. Immunol. Immunopathol.*, 1978, *10*, 65–78.

Helms, C. M., Viner, J. P., Sturm, R. H., Renner, E. D., Johnson, W. Comparative features of pneumococcal, mycoplasmal and Legionnaire's disease pneumonias. *Ann. Intern. Med.*, 1979, *110*, 56–77.

Holden, M., Dubin, M. R., Diamond, P. H. Frequency of negative intermediate strength tuberculin sensitivity in patients with active tuberculosis. *N. Engl. J. Med.*, 1971, *285*, 1506–1508.

Howells, C. H. L., et al. Influenza vaccination and mortality from bronchopneumonia in the elderly. *Lancet*, 1975, *1*, 381–383.

Huxley, E. J., et al. Pharyngeal aspiration in normal adults and patients with depressed consciousness. *Am. J. Med.*, 1978, *64*, 564–568.

Inkles, B., Innes, J. B., Kuntz, M. D., et al. Immunological studies of aging. III. Cytokinetic basis for the impaired response of lymphocytes from aged humans to plant lectins. *J. Exp. Med.*, 1977, *145*, 1176–1187.

Jacobs, M. R., et al. Emergence of multiply resistant pneumococci. *N. Engl. J. Med.*, 1977, *299*, 735–740.

Jay, S. J., Johanson, W. G., Pierce, A. K. The radiographic resolution of streptococcus pneumoniae pneumonia. *N. Engl. J. Med.*, 1975, *293*, 798–801.

Johanson, W. G., et al. Nosocomial respiratory infections with gram-negative bacilli: the significance of colonization of the respiratory tract. *Ann. Intern. Med.*, 1972, *77*, 701–706.

Jordan, G. W., Wong, G. S., Hoeprich, P. D. Bacteriology of the lower respiratory tract as determined by fiberoptic bronchoscopy and transtracheal aspiration. *J. Infect. Dis.*, 1976, *133*, 428–432.

Kaufman, P. Pneumonia in old age. *Arch. Intern. Med.*, 1947, *79*, 518–531.

Khan, M. A., et al. Clinical and roentgenographic spectrum of pulmonary tuberculosis in the adult. *Am. J. Med.*, 1977, *62*, 31–38.

Kopanoff, D. E., Snider, D. E. Jr., Caras, G. J. Isoniazid-related hepatitis: a U. S. Public Health Service cooperative surveillance study. *Am. Rev. Resp. Dis.*, 1978, *117*, 991–1001.

Kreger, B. E., et al. Gram-negative bacteremia. III. Reassessment of etiology, epidemiology, and ecology in 612 patients. *Am. J. Med.*, 1980, *68*, 332–343.

LaForce, F. M., Young, L. S., Bennett, J. V. Tetanus in the United States (1965–1966): epidemiologic and clinical features. *N. Engl. J. Med.*, 1969, *280*, 569–574.

Langmuir, A. D., Schoenbaum, S. C. The epidemiology of influenza. *Hosp. Prac.*, 1976, *11*, 49–56.

Lerner, P. I., Weinstein, L. Infective endocarditis in the antibiotic era. *N. Engl. J. Med.*, 1966, *274*, 119, 259, 323, 388.

Loosli, C. G. Influenza and the interaction of viruses and bacteria in respiratory infections. *Medicine*, 1973, *52*, 369–384.

Lorber, B., Swenson, R. M. Bacteriology of aspiration pneumonia: a prospective study of community and hospital acquired cases. *Ann. Intern. Med.*, 1974, *81*, 329–331.

Louria, D. B., Brayton, R. G. The efficacy of penicillin regimens with observations on the frequency of superinfection. *JAMA*, 1963, *186*, 113–117.

Louria, D. B., et al. Studies on influenza in the pandemic of 1957–58. II. Pulmonary complications of influenza. *J. Clin. Invest.*, 1959, *38*, 213–265.

MacGregor, R. R. A year's experience with tuberculosis in a private urban

teaching hospital in the post-sanitorium era. *Am. J. Med.*, 1975, *58*, 221–228.

MacLeod, C. M., et al. Prevention of pneumococcal pneumonia by immunization with specific capsular polysaccharides. *J. Exp. Med.*, 1945, *82*, 445–465.

Meares, E. M. Observations on activity of trimethiprim-sulfamethoxazole in the prostate. *J. Infect. Dis.*, 1973, *128* (suppl.), S679–S685.

Merrill, C. W., et al. Rapid indentification of pneumococci: gram stain vs. the Quellung reaction. *N. Engl. J. Med.*, 1973, *288*, 510–512.

Meyers, M. G. Varicella and herpes zoster: comparisons in the old and young. *Geriatrics*, 1977, *32*, 77–79.

Millian, S. J., et al. A serologic survey of tetanus and diphtheria immunity in New York City. *Arch. Environ. Health.*, 1967, *15*, 776–781.

Munt, P. W. Miliary tuberculosis in the chemotherapy era: with a clinical review in 69 American adults. *Medicine*, 1971, *51*, 139–155.

Murray, H. W. Antimicrobial therapy in pulmonary aspiration (editorial). *Am. J. Med.*, 1979, *66*, 188–190.

Murray, P. R., Washington, J. A. Microscopic and bacteriologic analysis of expectorated sputum. *Mayo Clin. Proc.*, 1975, *50*, 339–344.

Myerowitz, R. L., Medeiros, A. A., O'Brien, T. F. Recent experience with bacillemia due to gram negative organisms. *J. Infect. Dis.*, 1971, *124*, 230–246.

National Institutes of Health Consensus Development Conference. Amantadine: does it have a role in the prevention and treatment of influenza? *Ann. Intern. Med.*, 1980, *92* (part I), 256–258.

Osmer, J. C., Cole, B. K. The stethescope and roentgenogram in acute pneumonia. *South Med. J.*, 1966, *59*, 75–83.

Owens, B. J., Hamit, H. F. Appendicitis in the elderly. *Ann. Surg.*, 1978, *187*, 392–396.

Patel, J. C., Mehta, B. C. Tetanus: study of 2007 cases. *Indian J. M. Sc.*, 1963, *17*, 791–811.

Pecora, D. V. Method of securing uncontaminated tracheal secretions for bacterial examination. *J. Thorac. Surg.*, 1959, *37*, 653–654.

Pecora, D. V. A comparison of transtracheal aspiration with other methods of determining the bacterial flora of the lower respiratory tract. *N. Engl. J. Med.*, 1963, *269*, 664–666.

Peltokallio, P., Jauhiainen, K. Acute appendicitis in the aged patient. *Arch Surg.*, 1970, *100*, 140–143.

Petterson, R. F., et al. Evaluation of amantadine in the prophylaxis of influenza A (HLUL) virus infection: a controlled field trial among young adults and high-risk patients. *J. Infect. Dis.*, 1980, *142*, 377–383.

Phair, J. P., Kauffman, C. A., Bjornson, A. Investigation of host defense mechanisms in the aged as determinants of nosocomial colonization and pneumonia. *J. Reticuloendothel. Soc.*, 1978, *23*, 397–405. (a)

Phair, J. P., et al. Host defenses in the aged: evaluation of components of the inflammatory and immune response. *J. Infect. Dis.*, 1978, *138*, 67–73. (b)

Pierce, A. K., et al. An analysis of factors predisposing to gram-negative bacillary necrotizing pneumonia. *Am. Rev. Resp. Dis.*, 1966, *94*, 309–315.

Pierce, A. K., Sanford, J. P. Aerobic gram-negative bacillary pneumonias. *Am. Rev. Respir. Dis.*, 1974, *110*, 647–658.

Plein, E. M., Plein, J. B. Aging and drug therapy. *Annu. Rev. Gerontol. Geriatr.*, 1981, *2*, 211–253.

Powell, K. E., Farer, L. S. The rising age of the tuberculosis patient: a sign of success and failure. *J. Infect. Dis.*, 1980, *142*, 946–948.

Reichman, C. B., O'Day, R. Tuberculosis infection in a large urban population. *Am. Rev. Resp. Dis.*, 1978, *117*, 705–712.

Ries, K. Endocarditis in the elderly. In D. Kaye (Ed.), *Infective endocarditis.* Baltimore, Md.: University Park Press, 1976, pp. 143–154.

Ries, K., Levison, M. E., Kaye, D. Transtracheal aspiration in pulmonary infection. *Arch Intern. Med.*, 1974, *133*, 453–458.

Roberts-Thomson, I. C., et al. Aging, immune response and mortality. *Lancet*, 1974, *2*, 368–371.

Rooney, J. J. Jr., et al. Further observations on tuberculin reactions in active tuberculosis. *Am. J. Med.*, 1976, *60*, 517–522.

Rossman, I., Rodstein, M., Bornstein, A. Undiagnosed diseases in an aging population. *Arch. Intern. Med.*, 1974, *133*, 366–369.

Rowe, J. W., et al. The effect of age on creatinine clearance in man: a cross-sectional and longitudinal study. *J. Gerontol.*,1976, *31*, 155–163.

Rowley, M. J. "Natural" antibody in man to flagellar antigens of *Salmonella* adelaide. *Aust. J. Exp. Biol. Med. Sci.*, 1970, *48*, 249–252.

Sahn, S. A., Neff, T. A. Miliary tuberculosis. *Am. J. Med.*, 1974, *56*, 495–505.

Sanford, J. P., Pierce, A. K. Lower respiratory tract infections. In J. V. Bennett, P. S. Brachman (Eds.), *Hospital infections*, Vol. 1. Boston: Little, Brown and Company, 1979, pp. 255–286.

Schillaci, R. F., Iacovoni, V. E., Conte, R. S. Transtracheal aspiration complicated by fatal endotracheal hemorrhage. *N. Engl J. Med.*, 1976, *295*, 488–490.

Schonberger, L. B., et al. Guillain-Barré syndrome following vaccination in the national influenza immunization program, United States, 1976–1977. *Am. J. Epidemiol.*, 1979, *110*, 105–123.

Siber, G. R. , et al. Impaired antibody response to pneumococcal vaccine after treatment for Hodgkin's disease. *N. Engl. J. Med.*, 1978, *299*, 442–448.

Smith, C. R., et al. Double-blind comparison of the nephrotoxicity and auditory toxicity of gentamicin and tobramycin. *N. Engl. J. Med.*, 1980, *302*, 1106–1109.

Smith, J. W., et al. Recurrent urinary tract infections in men. *Ann. Intern. Med.*, 1979, *91*, 544–548.

Somers, H., Kuhms, W. J. Blood group antibodies in old age. *Proc. Soc. Exptl. Biol. Med.*, 1972, *141*, 1104–1107.

Spencer, C. D., Beaty, H. N. Complications of transtracheal aspiration. *N. Engl. J. Med.*, 1972, *286*, 304–306.

Sprunt, K., Redman, W. Evidence suggesting importance of role of interbacterial inhibition in maintaining balance of normal flora. *Ann. Intern. Med.*, 1968, *68*, 579–590.

Stamey, T. A., Meares, E. M., Winningham, D. G. Chronic bacterial prostatitis and the diffusion of drugs into prostatic fluid. *J. Urol.*, 1970, *103*, 187–194.

Stamm, W. E. Guidelines for prevention of catheter-associated urinary tract infections. *Ann. Intern. Med.*, 1975, *82*, 386–390.

Stead, W. W. Tuberculosis among elderly persons: an outbreak in a nursing home. *Ann. Intern. Med.*, 1981, *94*, 606–610.

Styblo, K. Recent advances in epidemiological research in tuberculins. *Adv. Tuberc. Res.*, 1980, *20*, 1–63.

Sullivan, R. J., et al. Adult pneumonia in a general hospital: etiology and best risk factors. *Arch. Intern. Med.*, 1972, *129*, 935–942.

Thell, R., Martin, F. H., Edwards, J. E. Bacterial endocarditis in subjects 60 years of age and older. *Circulation*, 1975, *51*, 174–182.

Thompson, N. J., Glassroth, J. L., Snider, D. E. Jr. The booster phenomenon in serial tuberculin skin testing. *Am. Rev. Resp. Dis.*, 1979, *119*, 587–597.

Tillotson, J. R., Finland, M. Bacterial colonization and clinical super-infection of respiratory tract complicating antibiotic treatment of pneumonia. *J. Infect. Dis.*, 1969, *119*, 597–624.

Turner, T. B., Velasco-Joven, I. A., Prudovsky, S. Studies on the prophylaxis and treatment of tetanus. I. *Bull. Johns Hopkins Hosp.*, 1958, *102*, 71–84.

Unger, K. M., Moser, K. M. Fatal complications of transtracheal aspiration: a report of two cases. *Arch. Intern. Med.*, 1973, *132*, 437–439.

Valenti, W. M., Trudell, R. G., Bentley, D. W. Factors predisposing to oropharyngeal colonization with gram negative bacilli in the aged. *N. Engl. J. Med.*, 1978, *298*, 1108–1111. (a)

Valenti, W. M. Jenzer, M., Bentley, D. W. Type-specific pneumococcal respiratory disease in the elderly and chronically ill. *Am. Rev. Resp. Dis.*, 1978, *117*, 233–238. (b)

Van Scoy, R. E. Bacterial sputum cultures: a clinician's viewpoint. *Mayo Clin. Proc.*, 1977, *52*, 39–41.

Von Reyn, C. F., Levy, B. S., et al. Infective endocarditis: an analysis based on strict case defintions. *Ann. Intern. Med.*, 1981, *94*, 505–518.

Wade, J. C., Schimpff, S. C., Wiernik, P. H. Antibiotic combination-associated nephrotoxicity in granulocytopenic patients with cancer. *Arch. Inter. Med.*, 1981, *141*, 1789–1793.

Weinstein, L., Goldfield, M., Chang, T. W. Infections occurring during chemotherapy. A study of their frequency, type and predisposing factors. *N. Engl. J. Med.*, 1954, *251*, 247–255.

Weinstein, L., Rubin, R. H. Infective endocarditis—1973. *Prog. Cardiol. Dis.*, 1973, *16*, 239.

Weksler, M. E., Hutteroth, T. H. Impaired lymphocyte function in aged humans. *J. Clin. Invest.*, 1974, *53*, 99–104.

Wright, A. E., et al. Observations on prophylactic inoculation against pneumococcus infections and on the results achieved by it. *Lancet*, 1914, *1*, 1–10, 87–95.

Wynne, J. W., Modell, J. H. Respiratory aspiration of stomach contents. *Ann. Intern. Med.*, 1977, *87*, 466–474.

Zavala, D. C. The threat of aspiration pneumonia in the aged. *Geriatrics*, 1977, *32*, 46–51.

Zweiman, B., Besdine, R. W., Hildreth, E. A. The effect of the scorbutic state on tuberculin hypersensitivity in the guinea pig: II. In vitro mitotic response of lymphocytes. *J. Immunol.*, 1966, *96*, 672–675.

Depression in the Elderly: A Review of Recently Published Studies

BARRY J. GURLAND, M.R.C.P. (LONDON),
MRC. PSYCH.
CENTER FOR GERIATRICS AND GERONTOLOGY
COLUMBIA UNIVERSITY FACULTY OF MEDICINE;
NEW YORK STATE OFFICE OF MENTAL HEALTH
NEW YORK, NEW YORK

JOHN A. TONER, ED.D.
HARLEM VALLEY PSYCHIATRIC CENTER;
CENTER FOR GERIATRICS AND GERONTOLOGY
COLUMBIA UNIVERSITY FACULTY OF MEDICINE;
NEW YORK STATE OFFICE OF MENTAL HEALTH
NEW YORK, NEW YORK

Two competing stereotypes often cloud a perspective on depression in the elderly. The first is that the advent of any mental disorder in advanced age is an indication of an underlying dementing process; the second, that old age is characteristically a time of losses and reactive depression. The former stereotype suggests that depression in old age is itself inconsequential; the latter, that depression is normal. Both views can lead to a failure to recognize and treat remediable depression among the elderly. An examination of epidemiological findings on depression in old age can help to set the record straight.

EPIDEMIOLOGY

Estimates of the frequency of depression and its variation across the life span will depend on the criteria used for diagnosis and on the population under study. Rates of depression derived from the use of threshold scores on symptom checklists are usually higher than the rates based on the diagnosis of clinically significant depressive disorder; moreover, depressive symptoms and attitudes are generally reported to be highest in youth and in old age, while the depressive diagnoses are highest in middle age (Gurland, 1976).

The clinical depressions are mainly a subset of those defined by the criteria for the determination of the severity of symptom levels (Gurland et al., 1980). The larger category probably corresponds to the demoralization syndrome described by Frank (1973) and Dohrenwend et al. (1979, 1980). The key features distinguishing the clinical variety from the demoralization syndrome are severity, the presence of vegetative symptoms, episodic nature of the depression, its occurrence in states of relatively good general health, positive family history, increased use of psychotropic medication, and the good response to physical treatments that characterize the clinical state.

Estimates of rates of depression by different investigators may be in conflict because of discrepancies in the use of labels (Vickers, 1976) and in criteria for classification categories. Indeed, Busse and Pfeiffer (1969) point out that "different diagnostic criteria are used in different studies, and the cutoff between what is seen as still within normal limits and what is seen as pathological is by no means uniform" (p. 190). The difficult task in diagnosis of depression is to differentiate between depression as a mood, a symptom, or an illness. Weissman and Myers (1979) point out that the differences between the normal and pathological aspects of depression can be indistinct. Thus, it is not surprising that different researchers arrive at varying estimates of depression in the elderly population.

With these reservations, the rates of clinically significant depression are in the region of 10 to 15 percent of the general elderly population; 2 to 3 percent would fit the criteria for major affective disorder or manic-depressive disorder (Gurland et al., 1980; Weissman et al., 1979). Probably the rates of demoralization are at least double that of the clinical depressions.

Blazer and Williams (1980) applied the operational criteria established in DSM-III to a stratified random sample of 997 elderly people living in the community insofar as there were suitable items in their

survey schedule (the OARS, Pfeiffer, 1975). An arbitrary cutoff on a rationally derived subscale of dysphoria was also established. "Substantial" depressive symptomatology was found in 14.7 percent of the sample: 4.5 percent were judged dysphoric, 6.5 percent had medically related depressive symptoms, and 3.7 percent met the DSM-III criteria for a major depressive disorder. About half of the latter group showed depression as a primary symptom and half as a secondary symptom (i.e., symptoms of cognitive or schizophrenic disorder were considered primary). The author concludes from the analysis of data in the study that much of the depression found in the elderly is secondary to physical, social, and economic difficulties.

Demoralization syndromes certainly, and probably clinical depressions as well, occur at considerably increased rates in the presence of physical illness and disability and in care and treatment settings where the latter conditions prevail (e.g., medical clinics, long-term-care facilities). The proportion of elderly psychiatric patients who have clinical depressions is about 30 to 40 percent in short-term treatment settings (Gurland and Cross, in press).

The contrast between males and females in rates of depression is striking. In middle age the rates of clinical depression are higher in females than in males, but after the age of 75 the highest rates are found in males (Gurland et al., 1980). Rates of clinical depression rise with age in males but fall in females. These relationships correspond closely to the rates of suicide in the United States, which rise with age in white males but fall in white females and in both sexes among nonwhites (Shulman, 1978). Such findings are not predicted by any of the prevailing biological, behavioral, or social theories of depression. More important, these findings clearly show that the aging process is not necessarily, or even usually, accompanied by increased rates of depression.

DIAGNOSIS

Among the most important reasons for a failure to treat a depression in an elderly person is a failure to recognize it. Clinically significant depression in the elderly is an eminently remediable condition but if untreated may become refractory and chronic (Gerner, 1979), occasion a shortened life expectancy due to suicide and other mechanisms (Ost-

feld, 1980; Roth, 1955), or cause social dysfunction (Gurland et al., in press), increased drug utilization, and greater physical morbidity (Avery and Winokur, 1976).

Recognition

Post (1981) gives a succinct and clear description of depressive disorder in old age. The sufferer may report or evince sadness, emptiness, and detachment; anxiety and panic states may occur with or without euphoria and excitement as an associated, cyclic aspect of the affective state. Speech is slowed and diminished, or repetitive and importuning if anxiety is a dominant symptom. There is a lowering of self-esteem and a loss of usual interests. The patient may be convinced that he is wicked and has sinned and that his bodily contents are impaired and objectionable. In all but the mildest episodes, sleep, appetite, body weight, and other vital functions may be disordered. In the most severly psychotic depressives, delusions of physical ill health, poverty, guilt, and self-depreciation may be expressed. Bizarre hypochondriacal and nihilistic delusions and pseudo-hallucinations may occur. Some patients are mute. In some cases, paranoid symptoms may be conjoined with an empty or hostile affect superficially resembling paraphrenia. Neurotic depressives retain insight into their depressive symptoms and frequently exhibit phobias; anxiety is often more obvious than the underlying depression. The anxiety may be communicated as a feeling of restlessness or fluttering in the abdomen.

Misdiagnosis

Not everyone agrees that misdiagnosis occurs with substantial frequency. Shraberg (1978) considers such misdiagnosis rare. Others regard it as occurring often (Blusewicz et al., 1977). Jarvik (1980) suggests that misdiagnosis occurs more commonly in acute-care settings and unusually in tertiary-care settings with an academic affiliation. Cross-national comparisons have shown that cases that would be diagnosed as depressive disorder in London or Toronto are frequently diagnosed senile dementia in New York (Copeland and Gurland, 1979; Duckworth and Ross, 1975).

It is not so much the atypical nature of the presentation of depression in the elderly that makes for misdiagnoses as the context in which

the symptoms occur. That context includes the doctor's relationship with his elderly patients and his expectations regarding disorders associated with aging. The symptoms of depression may be attributed to other conditions, their true cause thus being missed. Contributing to the problem is that common depressive symptoms may resemble those of dementia (Gerner, 1979; Roth, 1955), physical illness (Epstein, 1976), the aging process itself (Jarvik, 1976), or psychosocial problems that are common in old age (Gurland et al., in press).

Assessment

An assessment technique for detecting depression among elderly subjects may be either clinical and unstructured or structured but based on the traditional psychiatric interview, a psychological test, or a self-administered instrument. Relatively few of these techniques have been developed specifically for elderly subjects; notable exceptions are the Geriatric Mental State Schedule (GMS; Copeland et al., 1976; Gurland et al., 1976), and the OARS Multidimensional Functional Assessment Method (Pfeiffer, 1975). Other such measures have been recently reviewed (Gurland, 1980).

Bond et al. (1980) derived from the GMS a highly structured technique, the Survey Psychiatric Assessment Schedule (SPAS), for large-scale survey purposes. A total of 246 people, aged 65 or over, were administered the SPAS by a trained nonpsychiatric interviewer and were independently diagnosed by a psychiatrist who used the GMS. The subjects were selected from a psychiatric hospital ($N = 33$), geriatric hospital ($N = 33$), local authority home ($N = 34$), psychogeriatric day hospital ($N = 47$), and a general practice ($N = 99$). A split-half analysis was used so that development of cutting points on the scales was kept separate from the testing of their validity with diagnosis as the criterion. Sixty-one of the subjects were diagnosed by the psychiatrist as having solely an affective disorder or psychoneurosis. The agreement between the psychiatrist's diagnosis and the classification based on the SPAS for affective disorder or psychoneurosis was relatively low (kappa = 0.56). However, it is estimated that over 80 percent of respondents in a representative community sample would be correctly classified by the SPAS. A major disadvantage of the SPAS mentioned by the authors is that it cannot define a main diagnosis where respondents are assessed as having both an organic and an affective disorder. Gurland et al. (1981) have shown that the use of a

scale of cognitive impairment in conjunction with a scale of depression allows a more accurate separation of affective from organic disorder than do unidimensional approaches. However, they recommend the use of operational rules for diagnoses based on information from structured interview techniques for identification of depressed cases in the community elderly. These authors have demonstrated that such diagnoses can be reliably and validly made by nonpsychiatrists after a one-week training program (Gurland et al., 1980).

Self-administered measures for assessing depression in the elderly offer the advantages of removing interviewer bias and intrusiveness from the situation, allowing responses by mail, and making data gathering less costly. By contrast, interviewer-administered techniques for assessing mood allow the interviewer to assist the respondent in understanding the questions and to record responses correctly. The interview also permits more complex characteristics to be assessed and observations and judgments to be made by the interviewer. A negative feature of self-administered techniques is that the elderly may fill out the self-administered forms incorrectly or incompletely because they lack the sophistication to interpret the questions precisely, or they may have difficulty in switching from positive to negative responses indicating symptoms, or be handicapped by perceptual difficulties or frailty (Plutchik, 1979). McDonald (1981) concludes from the relevant literature that there are numerous problems encountered in the assessment of emotional states in elderly persons via self-rating scales: The rating forms have not been designed for the elderly; there is a lack of normative data on the elderly; the print size and format for responding may create difficulties for some elderly persons; and older persons seem to be more prone than younger persons to response sets. McDonald modified existing scales to make them more suitable for the elderly by doubling the print size, simplifying the presentation of response alternatives, and spending time with each subject to make sure he or she understood the instructions. These modified scales have been used in two published studies (McDonald and Spielberger, in press; McDonald and Suchy, 1980). With hospitalized geriatric patients it was still necessary for the psychologist to administer (i.e., read aloud) the instrument in 25 percent of cases and to mark the forms for many of these patients who were either unable to write, easily distracted, or insufficiently motivated. Hedlund and Vieweg (1979) reviewed the literature specifically on the Zung Self-Rating Depression Scale (SDS) and concluded that trained observer ratings were favored for diagnosis and for evaluation of treatment, with the SDS being principally a screening instrument.

Differential Assessment

Whatever the mode of administration, the majority of measures of depression rely on the self-reports of the subject rather than observation or testing. The validity of these self-reports has been questioned on the grounds that they do not adequately distinguish between the symptoms of depression and those of normal aging or of the diseases of old age (Blumenthal, 1975; Oltman et al., 1980; Zemore and Eames, 1979), nor between depressive disorder and demoralization or life-dissatisfaction (Dohrenwend et al., 1979, 1980), and are vulnerable to underrepoprting by the elderly (Craig and Van Natta, 1979).

Gilleard et al. (1981) administered a 10-item depression scale and an 8-item life-satisfaction scale to 15 patients in a general psychiatric admission ward and 30 patients in a psychogeriatric ward. The patients all had a diagnosis of depression and a mean age over 71. An accompanying comparison group of normal volunteers was obtained with a similar mean age and sex distribution. Responses were a mixture of self- and rater administration. Those diagnosed depressed, when compared with the normals, showed higher depression and life-dissatisfaction scores. Furthermore, all these self-report variables were correlated with observed signs of weeping and expressed death wishes by the patients. The authors conclude that self-report is a valid indication of depression in the elderly. On retesting 18 patients six to eight weeks later, the depression scores improved but the past-achievement component of life-satisfaction turned out to be relatively stable over time, suggesting that states of mood should be distinguished from attitudinal traits.

Pseudodementia

Pseudodementia refers to the presence of symptoms caused by depression but which mimic the symptoms of a dementia (Gerner, 1979). It is a purely descriptive term and not a diagnosis (Schraberg, 1978). The syndrome occurs in about 15 percent of the elderly with severe depression (Roth, 1976) and includes cognitive and memory impairment, inability to perform self-care tasks, apathy, confusion, difficulty in sleeping, early morning wakening, and agitation (Gerner, 1979). Performance on objective tests of memory may be faulty (Miller and Lewis, 1977). Post (1978) points to the need for accurate historical information whenever there is the possibility of pseudodementia. In cases where well-kept historical information suggests rapid onset with

prior episodes of affective disorder or a family history of psychosis, the patient may respond well to antidepressive treatment. Epstein (1976) points out also that historical records often reveal that with depressive pseudodementia the symptoms of depression precede those of cognitive loss, whereas with dementia any symptoms of depression usually appear following the onset of cognitive and memory impairment.

Given the possibility of misdiagnosis of dementia, it is important for clinicians to have suitable tools for identifying pseudodementia. Some suggestions have been made regarding the diagnostic uses of psychometric test performance to differentiate depression and true dementia (Feinberg et al., 1979; Ron et al., 1979), but Gerner (1979) suggests that such tools are not presently refined enough for such purposes. Neville and Folstein (1979) studied the patterns of performance on tests of perception, attention, and recall for 28 elderly patients. The sample included 12 patients with dementia, 10 patients with depression, and 6 patients with Korsakov's syndrome. Nineteen volunteer elderly subjects served as a control group. The authors report that the depressed subjects performed better than the dementia group on the perceptual-task tests. On the attention tasks patients in all groups had poorer performance than the control group. On the tests of recall, the depressed subjects performed better than the dementia group and the Korsakov syndrome group and were indistinguishable from the control group on cognitive performance tasks.

The failure to recognize that depression may occur in conjunction with other diagnoses may also lead to misdiagnosis. Schraberg (1978) describes an 85-year-old widower who was brought to the psychiatric service after he began to withdraw from activities, refused to eat, and no longer groomed himself after a short illness. Records revealed that this man had a lifelong history of unipolar depression and had responded well to antidepressant medication treatment only one year earlier. Yet complete medical studies yielded a diagnosis of moderate cerebral atrophy. Psychiatric testing provided further evidence of a dementing illness.

Somatic Symptoms

A number of papers have reviewed the difficulties of determining whether symptoms expressed by the elderly patient are due to depression or physical disorder or both (Hirschfeld and Klerman, 1979; Kreitman et al., 1965; Salzman and Shader, 1978). These difficulties may arise for several reasons. (1) The elderly who have a primary

depression may prefer to report the associated somatic symptoms rather than the alteration of mood and attitude. (2) The symptoms of certain physical disorders may resemble those of depression. (3) The presentation of an otherwise occult physical disorder may be through depressive symptoms. (4) Depression may coexist with physical disorder either by chance or because of etiological interaction and may exaggerate the latter symptoms.

Although the symptoms of depression in the elderly are generally similar to those characteristic of depression in other age groups (Blumenthal, 1980), there is a tendency for the elderly depressed patient to report the mood disturbance with less intensity than does the younger patient and to give more emphasis to the somatic symptoms of depression (Gurland, 1976). Some of this minimizing of mood and somatizing of complaints may stem from generational (cohort) effects, from the reinforcing attitudes of physicians, or from the depressive sensitization of the patient to the coincident physical disorders common in old age.

The vegetative somatic symptoms of depression (sleep, appetite and weight disturbance, constipation, fatigue, etc.) are well known, as are the vague aches and pains that are sometimes generalized and sometimes referred to a system of particular concern to the patient. Salzman and Shader (1978) add that in their experience commonly somatized symptoms of depression include also flatulence, dysuria, and oral discomfort (bad taste, burning tongue, toothache, etc.).

Blumenthal (1980) suggests that depression be suspected in the case of complaints relating to the cardiac, gastrointestinal, and musculoskeletal systems which "do not diminish in response to reassurance, and seem out of proportion to the degrees of (physical) illness" (p. 34). However, some of these complaints will be associated with hypochondriacal neurosis rather than being hypochondriacal symptoms of depression.

Presentation as Social Dysfunction

Complex behavioral patterns may also mask depression. These patterns include abuse of family members (leading to frequent complaints by family and friends about the demands made on them) and an exaggeration of a sense of helplessness.

It is common clinical experience that depression may have a profound effect on social function in the elderly, but more precise evidence of this relationship is hard to come by. Gurland et al. (1981) have described a wide range of behaviors that are crucial to adequate

fulfillment of social roles in the elderly and have shown that in states of clinical depression in community subjects 65 years and older, there is an associated impairment of many of these behaviors; the behaviors were as diverse as interpersonal relationships (irritability, excessive demands), doctor–patient relationships (increased visits, dissatisfaction), distraction from problem solving (preoccupation with worrying), and decreased defenses against the threat of crime. However, it is difficult to separate causes from consequences among the associations of social dysfunctions with depression. Post (1962), in a longitudinal study of 100 geropsychiatric patients, noted that social changes (in interpersonal relationships, leisure, and "useful functions") seemed secondary to changes in the level of depression. For a more definitive analysis of these relationships it would be helpful to replicate on a sample of elderly depressed patients the kind of research design used by Weissman et al. (1974), who studied depressed women aged 25 to 60 years; the subjects were randomly assigned to antidepressives, placebo, or no pill, with or without psychotherapy, and followed for eight months to determine the effect on symptoms and social dysfunction. While awaiting clarification of this causal chain it is necessary to discern on clinical grounds which social dysfunctions might be due to an underlying depression so that appropriate treatment can be instituted.

Masked Depression

Gerner (1979) believes that one-third of cases of depression among the elderly are "masked," that is, hidden from the diagnosing clinician. Masking must be distinguished from misdiagnoses arising because the physician is either blinded to the implications of evident symptoms of depression or distracted by coexisting symptoms suggesting alternative diagnoses. Masking may be said to occur where a very careful interview fails to elicit a characteristic description of disturbed mood from the depressed patient. Hirschfeld and Klerman (1979) have postulated that self-rating measures of depression (such as the Zung Self-Rating Depression Scale) may unmask the relevant symptoms in certain elderly persons who are reluctant to express their dysphoria during a face-to-face interview.

Some cases of depression are masked by the denial of the patient, who may feel stigmatized by an avowal of psychiatric symptoms, or be unwilling to ask for emotional help, or wish to keep the physician's attention focused on physical problems. However, it is possible that the aging process affects the capacity to localize and describe painful

sensations, as is seen, for example, in the relatively high proportion of episodes of coronary insufficiency, peptic ulcer, or infections that are silent in the elderly. Furthermore, the elderly person may not have learned a conceptual framework against which to interpret emotional and bodily sensations as being characteristic of depression.

SUBTYPES OF DEPRESSIVE DISORDER

The majority of cases of depressive disorder in elderly persons are considered to be unipolar, that is, without a manic admixture (Kay, 1976). Moreover, mania by itself is considered to be exceedingly rare in old age and is almost always associated with depressive admixtures or phases (Post, 1978). However, Shulman and Post (1980) selected the records of cases over the age of 60 who had been hospitalized with a clear-cut depressive episode and a history of a manic episode lasting two weeks or requiring antipsychotic treatment. Sixty-seven cases were found in this single psychiatric hospital over a 10-year period; the authors claim that this dispels the myth that bipolar affective disorder is rare in old age. Most cases had begun with a depressive episode; there was an average latent interval between the depression and the first manic episode of 10 years, while the mean age of onset of mania was not until age 60 (often after several depressive episodes). Thus, caution must be exercised in diagnosing unipolar depression before the life pattern of the episodes has been disclosed. Only three patients developed dementia, but cerebral-organic or neurological abnormality (unrelated to dementia) was found in 7 of the 18 males and may suggest a reason for the conversion of unipolar to bipolar disorder after many years.

Jacoby (1981) has drawn attention to a revival of interest in the possibility of an organic basis to the emergence of depression in old age. Prior to the seminal studies of Roth (1955; Roth and Morrissey, 1952) and Post (1962), it was widely held that depression in old age was precipitated by a dementing process and was thus its herald. Roth, Post, and others, using symptom comparisons, psychometric tests, and longitudinal follow-up as distinguishing features, showed that depression in the elderly was generally a functional disorder with the prospect of full return to normality in mood and cognition with adequate treatment. This separation of the functional and organic states has become emphasized in the teaching of geriatric psychiatry in recent years,

partly in order to minimize the therapeutic nihilism associated with bias toward assuming an organic basis for psychiatric disorder in old age. However, Hendrickson et al. (1979) found some similarity of changes in the auditory evoked response between some elderly depressives and cases of senile dementia, thus opening up again this issue of the relationship between depression and dementia in old age.

Jacoby and Levy (1980) examined a consecutive series of 41 elderly patients with affective disorders and compared the clinical and computer-assisted tomographic (CT) data with a group of 50 healthy elderly controls. There was no significant difference between patients and controls on the CT indicators of cortical atrophy and ventricular size, nor between patients with poor and good performance on the cognitive tests. However, the age correlation with cortical atrophy found in healthy controls was missing in the affective patients, as in a group of senile dementias (though the affectives differed from dements in other age correlates of CT variables). Nine affective patients had enlarged ventricles, and when compared with the remaining patients, they showed significantly less anxiety and more endogenous depression, were older, and had a later age of onset of the depression; yet the outcome of the affective episode at three months did not distinguish these two groups of depressives. The authors conclude that there may be a subgroup of elderly depressives whose symptoms are precipitated by cerebral atrophy, though probably not by senile dementia. Longer-term follow-up will help to settle the matter.

PROGNOSIS

Since depressions, especially in the elderly, tend to recur, Epstein (1976) indicates that the long-range prognosis for an elderly depressed patient is not generally good, but that the short-term, immediate prognosis is very good, especially for the "young-old patient." Kral (1976) estimates that endogenous depression in the elderly lasts longer on the average than for younger persons, sometimes for two or more years. Gerner (1979) points out that depression in the elderly becomes more and more severe if left untreated and becomes resistant to treatment after a period of two years. He indicates that favorable outcome to treatment for depression is also more likely with onset of the affective symptomatology before the age of 70, presence of a family history of depression, previous history of recovery from an affective disorder,

extroversion, involvement in leisure activities, and severe depressive symptoms.

Post (1981), while admitting that elderly depressives who are hospitalized are likely to be the cases where ambulatory treatment has failed, found in his series of 100 inpatients over 60 years of age that only one-quarter remained completely well over the subsequent three years, while just over one-tenth suffered chronic and unremitting depression. About three-quarters of the cases in this series required continuous or intermittent antidepressant therapy during the follow-up period of three years. In the author's opinion, lithium maintenance may greatly reduce the number of relapses.

Cadoret et al. (1980) report that in a study of 154 depressed patients treated in a solo family practice over a 24-year period greater age of onset of depression was a significant factor predictive of chronicity. The authors categorized patients according to three groups: "nonchronics," "short-chronics" (taking antidepressant medication for one to three years, 11 months), and "long-chronics" (taking antidepressant medication for four years or longer). The long-chronics were significantly older at age of onset of depression than the short-chronic and nonchronic groups; the mean age of onset for the long-chronics group was 63.4 years, contrasted with a mean age of onset of 52.3 years for the short-chronics group. The authors concur with Winokur (1974), who studied a sample of hospitalized depressed patients and found that later age at onset of last episode of depression was a significant factor of chronicity in female patients.

PHARMACOTHERAPY AND
OTHER SOMATIC TREATMENTS

The use of psychotropic agents and other somatic treatments for depression has a well-established place in geriatric psychiatry, but the limits of its scope and effectiveness are not as well known as for younger subjects.

Pharmacotherapy

In general, much the same principles guide the administration of these physical agents to the elderly as to younger persons but with due allowance made for the biological changes of aging. The rule of thumb

for antidepressive medication for the elderly is that the initial dosage of the drug, its increments, and its therapeutic levels should be kept substantially lower than for younger patients. In other words, one starts low and goes slow until a therapeutic response is obtained or the side effects require dose reduction or the patient remains unresponsive to four to six weeks of optimal dosage.

There is little disagreement that depressions in the elderly respond well to physical treatments. However, treatment may be lengthy. Cadoret et al. (1980) found that 39 percent of their patients had been on antidepressive medication for one or more years (an older subgroup for four or more years), usually because of recurrence of symptoms when an attempt was made to reduce dosage.

Tricyclic antidepressants are by far the most extensively used specific agents for depression in the elderly. Blumenthal (1980) recommends for the elderly patient the following dose schedule for tricyclics such as imipramine and amitriptyline: a starting dose of 10 mg twice a day, increased to 3 times a day in 2 or 3 days, and later to 4 times a day. In the absence of both improvement and side effects, the maximum daily dose can be increased to 50, 75, 100, and 150 mg in divided doses. Nies et al. (1977) suggest that dosages of tricyclic antidepressants should be about one-third to one-half lower in older than in younger patients. They recommend a maximum of 100 mg a day for most patients over 65 years of age, starting at 25 mg a day and increasing every 4 to 7 days until maximum is reached or side effects intervene. Because of the extended half-life of the drugs, steady states will tend to take longer to reach. Frequent monitoring is indicated initially and 3 to 6 weeks may be required before a therapeutic effect is obtained.

In view of the lag time for therapeutic action of tricyclics, Fann (1976) sees a place for concomitant administration of stimulants such as amphetamine and methylphenindate, where an urgent clinical response is crucial. This approach requires full recognition of the short-term relief provided by these stimulants and the accompanying anorexia and cardiovascular effects.

Doxepin (Sinequan), a dibenzoxepine tricyclic antidepressant, is widely regarded as being relatively free of side effects in the elderly (Ban, 1978). There is also a suggestion that it may improve cognitive function in the elderly (Goldberg et al., 1975). Ban (1978) summarizes the status of doxepin as being generally as effective as other tricyclic antidepressaants and especially well tolerated by the elderly probably due to its comparatively low cardiovascular toxicity, weak hypotensive effects, relatively low anticholinergic action, and relative compatibility with antihypertensive drugs of the guanethidine type.

Viloxazine (Vivalan) is an antidepressant but neither a tricyclic nor an MAO inhibitor. Von Knorring (1980) finds that viloxazine is particularly suitable for treating depression in the elderly because it is nonsedative, has minimal anticholinergic activity, and has little effect on the heart. He reports a double-blind comparison of viloxazine against placebo. The subjects were 21 patients aged 60 to 86 years with severe long-standing depression. Tricyclics were contraindicated in this group because of cardiac disease, a tendency to urinary retention, or the development of confusion during tricyclic administration. Improvement on Vivalan was significantly better than with placebo after two weeks (but not after one week) of treatment. The maximum daily dose was 200 mg viloxazine; few side effects and no serious toxicity were observed. The author related these results to other comparative studies of viloxazine, most of which show it to be as effective as tricyclic antidepressants.

Mukherjee and Holland (1979) gave viloxazine in an open trial to 20 depressed patients (10 with neurotic depression and 10 with manic-depressive psychosis) in the age range 59 to 76 years. Dosage was 50 mg morning and noon for 7 days with increments of 50 mg a day at the seventh and fourteenth day if appropriate. Significant improvement occurred on the Hamiltom and Zung depression scales at 7 days and over the next 2 weeks as well as on a clinician's global rating of improvement. No marked alteration of blood pressure or ECG occurred, and there were no anticholinergic side effects. Headaches and nausea were the most troublesome side effects. Mukherjee and Holland (1979) suggest that reports of confusion and somatic side effects of viloxazine (Lavagna et al., 1977; Ropert et al., 1979; Tristan et al., 1977) can probably be ascribed to dosage schedules over 200 mg daily.

Monoamine oxidase (MAO) inhibitors are in theory especially suited to the treatment of severe depression in the elderly, because the monoamine oxidase neurotransmitters show increased activity with aging (Robinson, 1975; Robinson et al., 1972). There are potentially dangerous side effects, however, especially liver damage and hypertensive crises. The side effects of the MAO inhibitors have discouraged their use; if given, then strict supervision of the diet and other medications is required. However, they do not have the undesirable anticholinergic actions of the tricyclic antidepressants.

The advantages of using MAO inhibitors in the elderly have recently been further explored by Ashford and Ford (1979). Fourteen patients with a mean age of 70, hospitalized with depression and unresponsive to other antidepressants, were given tranylcypromine, 20–30 mg, or phenelzine, 30–60 mg, daily for one to six weeks. Five

patients had Alzheimer's dementia in association with depression; their mood improved but the cognitive impairment did not. Four of the six patients with unipolar or bipolar depression responded favorably. The remaining patients either did not respond or their medication was terminated because of side effects, though neither hypertensive crisis nor hepatotoxicity occurred. The authors find these results to be most promising with respect to treating depression related to dementia. Furthermore, since these patients were refractory to treatment with other drugs, the authors feel that MAO inhibitors should be studied further with the focus on cases of primary depression in the elderly.

Foster et al. (1977) state that lithium carbonate is as effective in the control of manic states in the old as it is in younger patients and is of help in cyclic mood disorders but go on to say that "the literature on using lithium in the elderly is meager" (p. 299). The following cautious regimen is recommended: a test dose of 50–75 mg of lithium carbonate repeated if tolerated at 4-hour intervals to a maximum of 300 mg on the first day. By incremental daily increases, 450–600 mg is reached on the fifth day, and held from 4 to 6 days, to be followed possibly by a small further increase. Usually, blood levels of lithium are maintained at between 0.4 and 0.7 mEq/liter and the daily dosage at no more than 900 mg. Signs of therapeutic results or of toxicity are closely observed rather than relying only on the lithium blood levels. The authors claim to have had no serious toxic problems at these levels along with generally excellent therapeutic results with the manic aspects of bipolar mood disorders. Adjunctive antidepressants may be required for depressive swings, however.

Cox et al. (1977) treated 16 females aged 68 to 95 with lithium carbonate. Eleven patients had persistent apathy and were withdrawn and hypochondriacal, with "mild delusions"; five had recurrent unipolar depressions with apparently normal mood in the intervals. On a dosage of 250 mg q.i.d. of lithium carbonate for 2 weeks, the former but not the latter group showed an elevation of mood. However, the main thrust of this paper is on biochemical changes in depression and on lithium administration, and little evidence is advanced with respect to changes in mood or to the effect of age in the comparison of their results with those of other investigators.

Ban (1978) points out that glomerular filtration rate consistently declines with age by more than one-third so that lithium, which is mainly excreted by the kidneys without prior metabolism, will build up blood levels more quickly than in younger persons. However, Foster et al. (1977) point out that there are no reports in the literature of serious

lithium side effects in the elderly when the dosage is under 900 mg daily and serum levels are under 1.0 mEq/liter.

Hewick et al. (1977) analyzed the case notes for 82 psychiatric outpatients, ranging from 21 to 84 years, receiving lithium prophylaxis and with steady-state plasma lithium levels. The majority of the diagnoses were of manic-depression. Dosage, plasma lithium levels, and the presence of lithium side effects of a minor nature (fine tremor of hands, polyuria, polydispia, edema, weight gain, or diarrhea) or serious nature (coarse tremor of hands, vomiting, dysarthria, vertigo, or tinnitus) were noted. The mean daily weight-related dose of lithium decreased about 50 percent between the third and eighth decades. The mean lithium dose required to maintain the same steady-state lithium level declined over the sixth to eighth decades. However, interindividual variation overshadowed the effect of age (the latter accounted for about 40 percent of the variance). The frequency of minor side effects was not age related and serious side effects were absent altogether (in this maintenance steady-state phase). The lower dosage given to the elderly patients made due allowance for reduced lithium excretion and kept side effects at a level comparable to that of the younger patients.

Further Note on Side Effects of Antidepressant Medication. Nies et al. (1977) examined the relationship between age and tricyclic antidepressant plasma levels as a means of partially explaining the frequent toxic responses of these drugs in the elderly. They found that older patients tend to have higher plasma levels and longer plasma disappearance half-lives of imipramine and amitriptyline and the demethylated metabolite. Thus, it is not necessarily a nonspecific age-related intolerance to pharmacological agents, but rather decreased biotransformation of the tricyclic antidepressants that may lead to side effects in the elderly and calls for lower dosages than in younger patients.

The most troublesome of these side effects of tricyclic antidepressants in the elderly, according to Fann (1976), are postural hypotension, tachycardia, congestive heart failure, twitching, tremor, ataxia, and dryness of the mouth which can cause difficulty with dentures. Anticholinergic effects may precipitate glaucoma, constipation, a confusional state, or urinary retention. A tendency to urinary retention is a contraindication to tricyclic antidepressants according to Von Knorring (1980). Elderly depressives may often have associated cardiac disorders either clinically or on EEG evidence and thus be vulnerable to the cardiotoxic side effects of antidepressant medication. Blumenthal (1980) regards congestive heart failure, left bundle branch block, and premature ventricular beats as contraindications to the use of tricyclic antidepressants in the elderly.

Reed et al. (1980) conducted a controlled study of the cardiac effects of standard doses of the tricyclic antidepressant nortriptyline. Twelve elderly depressed inpatients were compared with three younger depressives. Most of the patients achieved plasma levels of nortriptyline within or slightly above the therapeutic window. No clinically significant effects on the ECG were observed, even where there was preexisting (stable) cardiac disease, though intracardiac conduction was slowed in one patient. Some orthostatic hypotension was induced by the drug. These results are concluded to be more favorable than previously reported by Vohra et al. (1975) and Burrows et al. (1976), probably because the blood levels of antidepressant were lower in this study. Furthermore, there were no patients with concomitant acute cardiac problems. The authors recommend plasma level monitoring to identify patients whose blood levels of antidepressant may lead to cardiac complications. They point to some similarities between these results and those reported for imipramine (e.g., Glassman et al., 1979) but are reserved about generalizations.

Blumenthal (1980) takes a serious view of orthostatic hypotension as a side effect of tricyclics. It increases the risk of stroke and myocardial infarction and can lead to falls and fractures as well as to anxiety and excess disability. She recommends a comparison of the lying (five minutes) blood pressure with that obtained after the patient then rises and stands. If the blood pressure falls 25 mmHg systolic or 10 mmHg diastolic, or the patient complains of dizziness, then the dosage should be reduced.

While the need for appropriate antidepressant medication is clear, it is necessary to warn about the danger of polypharmacy in the elderly. Fann (1976) stresses the dangers of combining antidepressants with other drugs. For example, recrudescence of hypertension may follow giving a tricyclic antidepressant to a patient on alpha-methyl-dopa or guanethidine; a toxic accumulation of lithium may occur when sodium-depleting diuretics are concomitantly administered; and a hypertensive crisis may be precipitated when MAO inhibitors are combined with sympathomimetics found in many over-the-counter cold preparations.

Additional drug interactions singled out by Ban (1978) for caution in the elderly on antidepressives include the following:

- antacids (aluminum or magnesium gel) because they decrease absorption of tricyclics
- barbiturates because they decrease serum levels of tricyclics
- phenothiazines, thioxanthenes, butyrophenones because they increase serum levels of tricyclics

- chlordiazepoxide (particularly when given with amitriptyline) because it impairs motor function
- amphetamine or methylphenidate because they increase serum levels of tricyclics
- epinephrine because of the danger of arrythmias
- antiparkinsonian agents because of constipation, urinary retention, and acute glaucoma
- propranolol because the tricyclics antagonize the antiarrythmic action
- anticoagulants because the tricyclics enhance liver enzyme metabolism and decrease the level of anticoagulants

Electroshock Therapy

The use of electroshock therapy (EST) in the elderly, while gaining currency, is still unnecessarily avoided by some psychiatrists on the alleged grounds that it is a strenuous treatment and that the elderly are particularly vulnerable to its effects on memory. In fact, it is often a safer treatment than drug therapy. Moreover, according to Hirschfeld and Klerman (1979) "the problem of memory loss, which often occurs with bilateral EST, has essentially been eliminated with unilateral nondominant hemisphere EST without a reduction in the efficacy of treatment" (p. 53). Merrill (1978) agrees that

> ECT . . . has the advantage of being a rapid and effective means of relieving almost any depression and can usually be done as an office procedure. Contraindicaitons are few, and complications are even fewer. . . . Many psychiatrists consider electroconvulsant therapy to be the treatment of choice, particularly in older age groups . . . (p. 16d–102).

Freeman and his colleagues in Edinburgh examined the attitudes of 166 patients towards EST and the effects of this treatment on cognitive performance (Freeman and Kendell, 1980; Freeman et al., 1980; Weeks et al., 1980). The mean age of these patients was between 50 and 54 years and a number of patients were over the age of 60 years. The vast majority were suffering from a depressive disorder. There were two deaths which were possibly related to EST, both in elderly patients with a recent myocardial infarction, who were on tricyclics. Retrospectively, only 16 percent of patients admitted to having been very anxious or frightened of the treatment and only 13 percent said they would be reluctant to have the treatment again; 59 percent agreed they would

readily have the treatment again. Less than 20 percent thought it was more upsetting than going to the dentist. However, many patients felt that they had not been given an adequate prior explanation of the treatment. Possible brain damage was the worry most commonly expressed, though by only a small minority. Memory impairment was far and away regarded as the worst side effect; 25 percent of the sample reported this side effect as severe. More than three-quarters of the sample thought that EST had helped them either a little or a lot, and only one thought it had made him much worse (a young subject).

In another study, these authors compared cognitive function in matched groups of EST-treated and non-EST-treated depressives and also normal volunteers (Weeks et al., 1980). The age range was 18 to 70 years. Nineteen tests were used to measure a wide range of cognitive functions prior to giving EST and at one week, three weeks, and six months post treatment. It was found that EST did not produce any impairment of cognitive function than the controls. When 15 patients receiving bilateral EST were matched with 15 receiving unilateral EST, it was found that the two types of EST were equally effective at relieving depression. However, the patients on the unilateral EST were less cognitively impaired at one week (being close to normal levels). By four months after treatment this difference between the treatment groups had disappeared. The authors conclude that unilateral EST was just as effective as an antidepressant treatment and appeared to cause virtually no impairment of cognitive functioning. The complaints of memory impairment often expressed by patients are due partly to the effects of the depression itself and partly to the slight cognitive changes induced by bilateral EST.

Kral (1976) regards EST as the safest and quickest way to treat patients with endogenous depression who have a high risk of suicide or who refuse to eat. To minimize the advent of a temporary amnestic syndrome, he advises that EST be given with adequate intervals and be replaced with antidepressants at the first signs of improvement. Patients with recent coronary thrombosis or decompensated heart failure should be excluded. However, the presence of senile or arteriosclerotic brain disease is not a contraindication.

Other Physical Treatments

Ban (1978) reviews the possibility that hormonal imbalance (such as lowered concentrations or relative excess of progesterone) may contribute to the occurrence of depression in the elderly. In particular, he

notes the favorable impact on the feeling of well-being in geropsychia-
tric patients who are given extended courses of the anabolic-andro-
genic compound fluoxymesterone (Kral and Wigdor, 1961; Lehmann
and Ban, 1970).

In a study of the ability of sleep deprivation to relieve a depressive
episode, Svendsen (1976) selected 77 patients with an age range of 20
to 72 years. The majority of these patients had an endogenous depres-
sion. The patients were kept awake for 36 to 40 hours. Social activities
helped to pass the time. Sleep deprivation consisted of either a single
treatment or weekly treatments for five weeks. A good effect (im-
provement maintained over seven days) occurred in 29 percent of the
patients and some temporary relief in another 38 percent. There was
no clear relationship between therapeutic effect and age. The best
results were obtained with the more numerous sleep deprivations. The
effects were evident in under one week, and there were no adverse
side effects. Svendsen finds sleep deprivation a useful adjuvant to drug
therapy and believes that it should be "the first choice of treatment for
all endogenously depressed patients who are not in immediate need of
EST" (p. 191).

Of the many rejuvenant and recuperative effects claimed for Ge-
rovital, none has been able to withstand critical review (Ostfeld et al.,
1977), though it has been conceded that there may be a nonspecific
antidepressant action. A possible effect on the lightening of mood has
been advanced also to partially explain why subjects on Gerovital may
claim physical improvements that cannot be objectively measured; the
placebo effect is one alternative hypothesis.

In vitro (but not in vivo) studies have shown that Gerovital is a
weak, reversible MAO inhibitor (Fuller and Roush, 1977), but it is
safer than the more generally used MAO inhibitors. A study by Zung
et al. (1976) lent support to the presence of an antidepressant action
even superior to imipramine on the part of Gerovital. Olsen et al.
(1978) therefore further examined the effectiveness of Gerovital as an
antidepressant. Twenty-five volunteers were selected who were over 48
years of age and had a mild to moderately severe nonpsychotic depres-
sion of at least several months' duration but who were free of acute
physical illness and were not chronic users of psychoactive drugs. The
results, after four weeks of treatment, showed no significant differ-
ences between the Gerovital and placebo groups; both groups im-
proved significantly on several measures of depression. Switching non-
improvers from placebo to Gerovital in a second four-week phase did
not alter the results. The authors admit that their subjects differed
from those in double-blind studies reporting an antidepressant effect of

Gerovital (Kurland and Hayman, 1974; Zung et al., 1974, 1976); moreover, the placebo effect in this study was greater than for the other two studies. The issue of the antidepressant effect of Gerovital remains open.

PSYCHOLOGICAL TREATMENTS

There is a dearth of hard data on the effectiveness of psychotherapy with depressed elderly patients. Gerner (1979) points out that in two extensive reviews of the topic (Lieberman, 1975; Luborsky et al., 1975) no studies of the treatment of depression in the elderly using psychotherapy were found to meet "minimal scientific standards." The studies that have been published are commonly case histories which provide little evaluative information regarding the methods used in the psychotherapy.

Verwoerdt (1981) points out that the literature indicates that psychotherapy with the elderly is not utilized as often as is needed. However, he believes that it is unwise to use one treatment approach exclusive of others that might be useful. He lists the obstacles to psychotherapy of the elderly patient and advises the following compensatory techniques: talking slowly, being repetitious, and also writing down advice; being aware that transference may lead the elderly patient to view even a younger therapist as a parent; taking family attitudes into account; gaining insight into countertransference related to one's own attitudes toward parents and to unresolved fears of aging and death. Helpful assistance is the spirit of therapy rather than alteration of long-standing character patterns. Physical touching may be important. Nondirective, free-associative techniques have only a limited place; the therapist may have to reach out to the patient and also take a hand in reducing environmental demands on the patient. Specifically with regard to depression, the author suggests including in the treatment of depressive apathy the avoidance of overtranquilization and the provision of group experiences (resocialization and remotivation). If "exhaustion" has supervened, the therapist should encourage supportive rapport by promoting dependence.

Many therapists favor an active approach that is both client centered and directive. They believe that the older client should be instructed, encouraged, and assisted to develop more appropriate behaviors. Goldfarb (1975) suggested that in treating the older depressed

patient the clinician should be reassuring and supportive and that the treatment should be goal directed; the major objectives of therapy being to aid the individual to use his other resources effectively and to take control of the environment by accepting his other limited capacities. Willner (1978), in a study conducted with elderly depressed patients at the Douglas Gardens Outpatient Health Center in Florida, reports that the use of "insight-oriented dynamically based" techniques yielded results indicating that most elderly depressed patients improve when such approaches are utilized. He concluded that psychotherapy can be very rewarding and gratifying for the therapist as well as the client.

Individual psychotherapy, both short-term and long-term treatment, remains the most frequently used psychotherapy and can be effectively used to assist the older individual in working through his depressive condition (Hirschfeld and Klerman, 1979; Miller, 1980; Tyce, 1977). Sessions for the older depressed patient need not take a long period of time; 15–20-minute sessions seem to be the most comfortable duration (Blazer and Friedman, 1979; Willner, 1978; Schwab, 1976).

Vickers (1976) reports that group therapy may be particularly helpful for withdrawn patients and may be indicated for both melancholic and reactive depressions, even though different group techniques are employed for each. He points out that with the melancholic depressive, "long term closed ended non-directive groups are used which allow for a review of the patients' entire life situation" (p. 316). For the reactive depressive, short-term, supportive groups and psychodrama seem to be more appropriate. Burwell (1977) reports that the use of psychodrama, a form of role-playing in which the depressed individual is encouraged to deal with feelings and personal conflicts they have had by dramatizing interactions with those significant others, has yielded very positive results with elderly depressed patients.

Lipman and Covi (1976), in a study of the effects of combining antidepressant medication treatment with psychotherapy, report that subjects responded well to antidepressant medication but that psychotherapy alone had little or no effect on depressive symptoms. Weissman (1978) cautions against the exclusion of somatic treatment, especially antidepressant drugs, in favor of psychological treatments in cases where somatic therapy is indicated.

Kovacs (1980) points out that many nonpsychotic depressed outpatients do not benefit from pharmacotherapy; some may respond initially but then relapse into chronicity. Thus, alternative or adjunctive treatments to the physical antidepressant regimes are necessary. She

addresses the efficacy of cognitive and behavior therapies for depression. In essence, these treatments "seek to increase the patient's adaptive problem solving repertoire through teaching specific verbal and behavioral strategies " (p. 1495). The processes of the patient's thinking and self-evaluation are central concerns of therapy.

Positive results have been reported on the behavioral treatment (contingency management) of isolated depressive symptoms and behaviors. For example, Lewinsohn's social skills model (1974) seeks to counteract behavioral deficits by increasing the frequency of emitted behaviors that are associated with positive social reinforcement. However, methodological shortcomings of evaluative studies preclude definitive conclusions about behavioral treatments, according to Kovacs.

Self-control programs (e.g., Marston and Feldman, 1972) are classed as cognitive behavioral therapies by Kovacs because cognition is treated as an appropriate goal for modification. It is assumed that in depression the patient selectively attends to negative events, has overly stringent performance criteria, and has learned faulty (punishing) habits of self-reinforcement. Patients are taught to increase pleasant events in their lives, set reasonable goals, and attend to long-term and positive rewards. This treatment appeared promising in a controlled trial by Rehm et al. (1979) with moderately depressed women, but its generality is still in question.

Cognitive therapy in Beck's terms focuses on analyzing and modifying the patients's relevant mode of thinking (Beck et al., 1979). This approach assumes that depressive symptoms are due to the patient's distorted self and world view. Patients are taught to question their "depressogenic" cognitive schemata and to engage in "mastery" experiences. The cognitive therapy of depression assumes that changes in cognition precede the depressive affect. Hewstone et al. (1981) studied the association between changes in personal constructs that a person uses to view the self and other changes in mood during recovery from a depressive neurosis. The repertory grid (Kelly, 1955) and the Zung Self-Rated Depression Scale (Zung, 1965) were used with 10 female psychiatric inpatients ranging in age from 28 to 71 years, and 10 matched nonpsychiatric controls. Patients were tested before and after hospitalization. Small but significant changes in self-construing and social perception were noted, which the authors tentatively suggest are commensurate with (and mediate) the observed change in depressed mood.

In a recent study (Rush et al., 1977), cognitive therapy was found to result in significantly greater symptomatic improvement and lower dropout rates than did pharmacotherapy (imipramine) in primary de-

pressive disorder. Nevertheless, Kovacs concludes that here too methodological issues make any conclusions premature about the efficacy of these treatments. Also greatly needed are evaluations of these treatments applied specifically to depression in elderly persons.

PHYSICALLY INDUCED DEPRESSIONS

The following are physical disorders that are particularly likely to mimic or precipitate depression, according to Salzman and Shader (1978; misleading symptoms are in parentheses):

- idiopathic Parkinson's Disease (decreased mobility, mask-like faces, decreased speech)
- secondary brain tumors (inattention, decreased initiative, lethargy)
- hyperthyroidism (weight loss, "nervousness," sometimes apathy)
- hyperparathyroidism (irritable depression with a lack of spontaneous activity)
- carcinoma of the head of the pancreas (feeling of doom and other depressive symptoms but no impairment of drive)
- uremia, pernicious anemia, diabetes, adrenal disturbances, cerebrovascular disorders (lethargy, decreased attention)

Hirschfeld and Klerman (1979) include also systemic lupus erythematosus, porphyria, leukemia, and congestive heart failure.

Blumenthal (1980) provides a lengthy list of depression-inducing drugs variously including phenacetin, benzodiazepines and barbiturates, phenylbutazone and indomethacin, certain antibiotics and anticonvulsants, antihypertensives (L-methyldopa, clonidine, hydralazine, propranolol, and reserpine), L-dopa, phenothiazines and haloperidol, amphetamines, digitalis, alcohol, choline, steroids, and physostigmine. She finds that reserpine is the most commonly implicated in drug-induced depressions. Hirschfeld and Klerman (1979) add to this list antituberculous agents such as cycloserine, certain immunosuppressives such as vincristine or vinblastine, and the hormones estrogen and progesterone.

Salzman and Shader (1978) review the characteristic features that distinguish the various drug- and medically induced secondary depressions. In some instances there are diagnostically useful features; for

example, reserpine depression differs from endogenous depression in that the former evokes anxiety and not guilt or self-depreciation. There is also a suggestion that depression preceding physical illness shows a labile mood, a gradual onset, with alteration of personality and cognitive ability, and a lack of insight. Furthermore, these authors hold that lassitude, sleepiness, and apathy in the elderly are more likely to be signs of physical disease or drug toxicity than of depression, especially if these symptoms persist when the depressed mood is lifting.

Steuer et al. (1980) warn that "without a thorough medical examination it can be especially difficult to sort out diagnosable physical illness from somatic complaints of psychological origin" (p. 683). The authors explored this issue in the course of two clinical trials of antidepressants. The 60 subjects had a median age of 64.5 years and a range of 48 to 79 years. They were free of significant cardiac, hepatic, and renal disease but had unipolar major depressive disorder. All completed the Zung Self-Rating Depression Scale (SDS). Physicians rated the health of the subjects on a four-point scale. The relationship between the physician's ratings of health and total SDS scores was not significant, but a somatic symptoms subscale of the SDS showed a significant correlation ($r = 0.31$) with health ratings. Furthermore, the associations between the individual somatic items and total SDS score were lower than for the nonsomatic items. Specifically, fatigability, diurnal variation, and enjoyment of sex were significantly related to both depression and physical health.

Counterbalancing the view of Steuer et al., as cited above, Cadoret et al. (1980) point out that somatic symptoms fluctuate with the course of the depression so that "the appearance of somatic symptoms during a depression need not elicit a flurry of diagnostic tests on the part of the primary care physician. Rather, a careful history would reveal that the complaints might better be ascribed to depression (if not a side effect of medication) and treated as such" (p. 629).

Where it is necessary and difficult to disentangle physical and psychiatric causes of possible depressive symptoms, a thorough physical evaluation of each patient and a review of the medication history should be carried out. Salzman and Shader (1978) advise also the following battery of laboratory tests: blood count, urinalysis, blood urea nitrogen, liver function, pancreatic amylase, glucose tolerance test, and blood drug levels where indicated.

Surgical interventions in the elderly may be associated with depression either pre- or postoperatively. Millar (1981) examined 100 patients aged 65 and over undergoing elective surgery, a consecutive

series from a general surgical unit. A standardized psychiatric interview was used prior to surgery and in the postoperative period as well as nurses' observations and additional screening interviews. Eight patients had an affective (depressive) illness prior to operation, often with concern about impending surgery and in one case seriously delaying the operation. The three cases of depression that persisted after the operation and the three new cases that then emerged appeared related to continuing severe physical illness, though in one case the depression cleared up after an incision abscess was treated. Mixed states of depression and intellectual impairment did occur postoperatively, but generally these conditions could be clearly distinguished from each other.

The treatment of depression in the elderly can be complicated by the presence of a physical disorder insofar as the latter may be (1) a primary cause of the depression, (2) an indirect cause of the depression by virtue of the side effects of medication, (3) an impediment to the use of antidepressant physical treatments, or (4) a distraction from the coincident depression.

The treatment of depression secondary to physical disorder should include attention to the underlying medical condition. An illustrative report on a 73-year-old woman with depression arising during long-term diuretic therapy is presented by Taylor (1979). The patient became confused, suspicious, and uncooperative with nihilistic and paranoid delusions. She improved partially when her cardiac failure was controlled and antidepressants prescribed. She relapsed two years later with clear-cut depressive symptoms and no disorientation. She had hyponatremia, hypochloremia, and elevated plasma bicarbonate. Antidepressants then made no impact on her mental state but improvement followed restoration of normal electrolyte balance.

Blumenthal (1980) emphasizes that the management of depression accompanying physical disorder includes both rehabilitation of the physical disability and bolstering the social support system. Depression arising as a side effect of medication for other psychiatric or physical disorders can best be treated by suspension of the offending drug. The secondary depression usually recedes in a few weeks.

Dunn and Gross (1977) show that depression coinciding with a physical disorder can be treated effectively using tricyclic antidepressants cautiously, but, of course, only after the coincident depression is recognized. They cite the case of a 71-year-old widower who was transferred to an acute psychiatric unit after having been hospitalized with severe chronic obstructive pulmonary edema, cor pulmonale, angina pectoris, extraventricular arrhythmias, and a medication

list of digoxin, quinidine, and sublingual trinitroglycerine. Despite numerous treatments for the pulmonary problem, the patient's general condition worsened and he became withdrawn, inactive, and apathetic. A psychiatric consultant described him as depressed, tearful, self-critical, and with suicidal thoughts. A history obtained from the patient revealed that after the loss of his wife, he had become depressed and suffered sleep disturbances with loss of weight and energy and obsessional rumination over his physical illness. However, he had not been observed to be depressed until his third hospital admission. He was cautiously and successfully treated with amitriptyline. His cardiopulmonary function remained stable while the depression was relieved and his dependence on supplemental oxygen dramatically improved.

Ashford and Ford (1979) report the treatment with MAO inhibitors of five elderly patients who had Alzheimer's dementia as well as depression that was refractory to other antidepressants. The depression was relieved though the cognitive impairment did not improve. Schraberg (1978) treated a case of depression and dementia with imipramine, which changed the patient from a withdrawn state to being talkative, alert, and socially active. Young et al. (1977) report the treatment with lithium carbonate of three patients who had an admixture of manic symptoms in the course of an organic brain syndrome; the manic symptoms receded and there was no ill effect on the organic brain syndrome. Furthermore, Kral (1976) finds, as already cited, that the presence of senile or arteriosclerotic brain disease is not a contraindication to electroshock therapy for endogenous depression in the elderly.

The reports on the treatment of the depression in dementia, while favorable to the alleviation of mood disturbance, do not suggest any substantial benefit obtained for the cognitive state. The presence of coexisting chronic organic brain syndrome should not preempt the treatment of supervening functional disorder. Depressive and manic syndromes which occurring alone would warrant psychotropic drugs will often respond to these drugs when occurring as a complicating disorder in dementia. The course of the dementia need not be aggravated by the direct action of the drugs, while indirectly the patient's cognitive performance may possibly be improved when the functional disorder is alleviated, to say nothing of the relief of the patients's distress. Conversely, Ban (1978) finds that the use of digoxin or cerebral vasodilator drugs, when appropriate, is frequently followed by relief of the accompanying depression. Yet he views the studies showing an antidepressant effect for Hydergine in cognitively impaired el-

derly (e.g., Shader and Goldsmith, 1976), as reflecting a mode of action not on vasodilation but on norepinephrine reuptake similar to that of tricyclic antidepressants.

SUICIDE AND PARASUICIDE

Shulman (1978) reviewed suicide and parasuicide (i.e., unsuccessful suicide attempts) in old age, emphasizing the exceptionally high rates among elderly white males in many different countries. Suicidal efforts are more likely to be lethal as age advances (Benson and Brodie, 1975; Kreitman, 1976a,b; Sendbuehler and Goldstein, 1977). The vast majority of elderly suicides have been suffering from a depressive illness, not necessarily severe; it is often the first episode, commonly with hypochondriacal symptoms or associated with real physical illness; in the vast majority of cases, the person was seen by a physician within three months preceding death (Barraclough, 1971). Recent bereavement with its associated isolation is a period of great risk for suicide in the elderly. Shulman suggests that early identification, especially by primary-care workers, of the elderly at high risk for suicide is the best means of prevention.

Certain behaviors may lead to self-destruction but cannot confidently be labeled suicidal because of uncertainty regarding the motivation and goal-directedness of the behaviors. They have been termed indirect self-destructive behaviors (ISDB) by Nelson and Farberow (1977). Included in this concept are alcohol and drug abuse, hyperobesity, victim-precipitated aggression, reckless driving, withdrawal, and disregard for one's health. These authors have summarized previous findings on ISDB, inter alia, that elderly, indirectly self-destructive hospital patients tend to be depressed, confused, and dissatisfied with life and that there is an association between ISDB and a tendency to deny the consequences of an illness, to have a weak support network, and to have suffered significant losses. Nelson and Farberow (1980) examined the occurrence of ISDB among 99 male, predominantly elderly, nursing-home patients. Nursing staff rated the patients on an ISDB scale including such items as refusing food, noncompliance with medication regimes, conflict with other patients, and self-neglect. Patients were interviewed to assess personality dimensions hypothesized to be related to ISDB (e.g., rigidity, life satisfaction, risk-taking, suicide potential, and manipulativeness) and to determine the patient's

perception of his life situation, pain and discomfort, life history, and sense of futurity. Significant correlations were found between ISDB and suicide risk, dissatisfaction with life, low religious commitment, dissatisfaction with treatment, and losses. Half of this selected sample had slight to moderate impairment of cognitive function. There was a significant relationship between ISDB score and the prospects of discharge from hospital. Subjects expecting to return to their families tended to have the lowest levels of ISDB. The authors conclude that

> when physical and mental health limitations preclude the possibility for positive change . . . . and when they are further exacerbated by conditions of social isolation and other support deficits, a higher frequency of ISDB tends to occur, accompanied by pervasive feelings of dissatisfaction and unhappiness [p. 956].

They characterize the psychological state as one of depression and anger. The ISDB serves as an alternative to overt suicidal efforts, gaining extra care from the staff, venting feelings of frustration, and reestablishing some control over decisions affecting oneself.

THE REFERRAL PROCESS

Adequate treatment of depression in an elderly person may require a psychiatrist's expertise because of the importance of early and energetic treatment, and difficulties of steering a course between caution and effective intensity of therapeutic agents, and the additional complications of dealing with cases that are refractory to initial intervention. The involvement of a psychiatrist is usually dependent on the formal and informal referral processes; there appear to be some obstacles and inertias in this system. A disproportionately low number of clients in community mental health centers and in private psychiatric practice are elderly (Redick et al., 1973).

It is of interest to examine from the viewpoint of the treatment of depression a study by Margo et al. (1980) of referrals to psychiatric service from old people's homes, where the frequency of depression is likely to be high (Mann, 1981). Research records were extracted on 100 consecutive referrals ranging in age from 64 to 96 years and coming from 10 different old people's homes. Diagnoses were made by a consultant psychiatrist and confirmed at follow-up one year later. Ten cases were diagnosed as an affective disorder and a further 12 as a

neurotic disorder; a majority of the former and a minority of the latter were admitted to the hospital as day or inpatients. The affective psychoses were likely to recur during the follow-up year. Of the total sample six cases were referred because of subjective suffering and seven for assessment only; no data are given on the relationship between reason for referral and diagnosis. The vast majority of referrals were for agitation, restless interfering behavior, aggression, and socially unacceptable behavior; any of these problems could have a depressive underlay. Other reasons for referral included need for reassurance, lack of cooperation, wandering, complaining, noisiness, dangerous activity, and frailty. Only 9 of 100 cases became long-stay patients in the hospital. The authors conclude that the provision of psychiatric consultative and treatment services enable homes to cope with previously intolerable behavioral problems. It would be of great importance to know which of the behavioral problems were found to be related to the presence of depression and also the proportion of depressives who were not referred and not treated.

Pitt (1980) has underlined the need to include untrained people like home helpers and care assistants in residential homes in educational programs. These workers "need to understand why some of their charges are disturbed, difficult, depressed or confused, so that they will be less likely to resent or reject them" (p. 9). Macdonald (1980) has prepared a concise and straightforward description of depression and an explanation of its recognition and treatment. This description was designed for circulation among care staff of residential facilities for the elderly and is published by MIND, a British national voluntary organization which campaigns for the rights of the mentally ill and mentally handicapped.

REFERENCES

Ashford, J. W., Ford, C. V. Use of MAO inhibitors in elderly patients. *American Journal of Psychiatry,* 1979, *136* (11), 1466–1467.

Avery, D., Winokur, G. Mortality in depressed patients treated with electroconvulsive therapy and anti-depressants. *Archives of General Psychiatry,* 1976, *33,* 1029–1037.

Ban, T. A. The treatment of depressed geriatric patients. *American Journal of Psychotherapy,* 1978, *32,* (1) 93–104.

Barraclough, B. Suicide in the elderly. In D. W. K. Kay, A. Walk (Eds.), *Recent Developments in Psychogeriatrics.* Ashford, Kent: Royal Medico-Psychological Association, Headley Brothers, 1971.

Beck, A. T., Rush, A. J., Shaw, B. F. Emery, G. *Cognitive Therapy of Depression.* New York: Guilford Press, 1979.

Benson, R. A., Brodie, D. C. Suicide by overdoses of medicines among the aged. *Journal of the American Geriatrics Society,* 1975, *23,* 304–308.

Blazer, D. G., Friedman, S. W. Depression in late life. *American Family Physician,* 1979, *20* (5), 91–96.

Blazer, D., Williams, C. D. Epidemiology of dysphoria and depression in an elderly population. *American Journal of Psychiatry,* 1980, *137* (4), 439–444.

Blumenthal, M. D. Measuring depressive symptomatology in a general population. *Archives of General Psychiatry,* 1975, *32,* 971–978.

Blumenthal, M. D. Depressive illness in old age: Getting behind the mask. *Geriatrics,* 1980, *35* (4), 34–43.

Blusewicz, M. J., Dustman, R., Schenkenberg, T., Beck, E. Neuropsychologic correlates of chronic alcoholism and aging. *Journal of Nervous and Mental Disease,* 1977, *165,* 348–355.

Bond, J., Brooks, P., Carstairs, V., Giles, L. The reliability of a survey psychiatric assessment schedule for the elderly. *British Journal of Psychiatry,* 1980, *137,* 148–162.

Burrows, G. D., Vohra, J., Hunt, D., Sloman, J., Scoggins, B., Davies, B. Cardiac effects of different tricyclic antidepressant drugs. *British Journal of Psychiatry,* 1976, *129,* 335–341.

Burwell, D. Psychodrama and the depressed elderly. *Canadian Nurse,* 1977, *73* (4), 54–55.

Busse, E. W., Pfeiffer, E. Functional psychiatric disorder in old age. In E. Busse, E. Pfeiffer (Eds.), *Behavior and Adaptation in Late Life.* Boston: Little, Brown, 1969.

Cadoret, R. J., Widmer, R. B., North, C. Depression in family practice: Long-term prognosis and somatic complaints. *Journal of Family Practice,* 1980, *10* (4), 625–629.

Copeland, J. R. M., Gurland, B. J. Evaluation of diagnostic methods: International comparison. In F. Post (Ed.), *Studies in Geriatric Psychiatry.* New York: John Wiley and Sons, 1979.

Copeland, J., Kelleher, M., Kellett, J., Gourlay, A. (U. K. team) with Gurland, B., Fleiss, J., Sharpe, L. (U. S.). A semi-structured clinical interview for the assessment of diagnosis and mental state of the elderly: The Geriatric Mental State Schedule I. Development and reliability. *Psychological Medicine,* 1976, *6,* 439–449.

Cox, J., Pearson, R., Brand, H. Lithium in depression: A biochemical study. *Gerontology,* 1977, *23,* 219–235.

Craig, T. J., Van Natta, P. A. Influence of demographic characteristics on two measures of depressive symptoms. *Archives of General Psychiatry,* 1979, *136,* 148–153.

Dohrenwend, B. P., Oksenberg, L., Shrout, P. E., Dohrenwend, B. S., Cook, D. What brief psychiatric screening scales measure. *National Center for Health Services Research, Health Survey Research Methods: Third Biennial Research Conference.* Washington, D.C.: U.S. Department of Health and Human Services, DHHS Publication No. (PHS) 81–3268, 1979a, 188–198.

Dohrenwend, B. P., Shrout, P. E., Egri, G., Mendelsohn, F. S. What psychiatric screening scales measure in the general population: Part II: The

components of demoralization by contrast with the dimensions of psychopathology, 1979. (b) mimeo report.

Dohrenwend, B. P., Shrout, P. E., Egri, G., Mendelsohn, F. S. Nonspecific psychological distress and other dimensions of psychopathology. *Archives of General Psychiatry*, 1980, *37*, 1229–1236.

Duckworth, G. I., Ross, H. Diagnostic differences in psychogeriatric patients in Toronto, New York and London, England. *Canadian Medical Association Journal*, 1975, *112*, 847–850.

Dunn, C. G., Gross, D. Treatment of depression in the medically ill geriatric patient: A case report. *American Journal of Psychiatry*, 1977, *134* (4), 448–450.

Epstein, L. J. Depression in the elderly. *Journal of Gerontology*, 1976, *31* (3), 278–282.

Fann, W. E. Pharmacotherapy in older depressed patients. *Journal of Gerontology*, 1976, *31* (3), 304–310.

Feinberg, I., Jernigan, T., Zutz, L., Price, L., Fein, G. Relation of computed tomography measures of brain atrophy to psychometric performance in well functioning elderly persons. Paper presented at the American Psychiatric Association Annual Meeting, Chicago, May 1979.

Foster, J. R., Gershell, W. J., Goldfarb, A. I. Lithium treatment in the elderly. I. Clinical Usage. *Journal of Gerontology*, 1977, *32*, (3), 299–302.

Frank, J. D. *Persuasion and Healing*. Baltimore: Johns Hopkins University Press, 1973.

Freeman, C. P. L., Kendell, R. E. ECT I: Patients' experiences and attitudes. *British Journal of Psychiatry*, 1980, *137*, 8–16.

Freeman, C. P. L., Weeks, D., Kendell, R. E. Patients who complain. *British Journal of Psychiatry*, 1980, *137*, 17–25.

Friedman, M. J., Bennett, P. L. Depression and hypertension. *Psychosomatic Medicine*, 1977, *39* (2), 134–142.

Fuller, R. W., Roush, B. W. Procaine hydrochloride as a monoamine oxidase inhibitor: Implications for geriatric therapy. *Journal of the American Geriatrics Society*, 1977, *25*, 90–93.

Gerner, R. Depression in the elderly. In O. Kaplan (Ed.), *Psychopathology of Aging*, New York: Academic Press, 1979.

Gilleard, C. J., Willmott, M., Vaddadi, K. S. Self report measures of mood and morale in elderly depression. *British Journal of Psychiatry*, 1981, *138*, 220–235.

Glassman, A. H., Bigger, J. T., Giardina, E. V., Kantor, S., Perel, J., Davies, M. Clinical characteristics of imipramine—induced orthostatic hypotension. *Lancet*, 1979, *1*, 468–472.

Goldberg, H., Finnerty, R., Cole, J. The effect of doxepin in the aged: Interim report on memory changes and electro-cardiographic findings. In J. Mendels (Ed.), *Sinequan. A Monograph of Recent Clinical Studies*, Amsterdam: Excerpta Medica, 1975.

Goldfarb, A. Depression in the old and aged. In F. F. Teach, S. C. Draghi (Eds.), *The Nature and Treatment of Depression*. New York: John Wiley and Sons, 1975.

Gurland, B. J. The comparative frequency of depression in various adult age groups. *Journal of Gerontology*, 1976, *31* (3), 283–292.

Gurland, B. J. The assessment of the mental health status of older adults. In J.

E. Birren, R. Sloane (Eds.), *Handbook of Mental Health and Aging.* Englewood Cliffs, N. J.: Prentice Hall, Inc., 1980.

Gurland, B. J., Cross, P. Epidemiology of mental disorders in old age. In L. Jarvik (Ed.), *The Psychiatric Clinics of North America* (in press).

Gurland, B., Dean, L., Cross, P., Golden, R. The epidemiology of depression and dementia in the elderly: The use of multiple indicators of these conditions. In J. Cole, J. Barrett (Eds.), *Psychopathology in the Aged,* New York: Raven Press, 1980.

Gurland, B., Dean, L., Cross, P. The effects of depression on individual social functioning in the elderly. In L. Breslau, M. Haug (Eds.), *Depression in the Elderly.* New York: Springer Publishing Company (in press).

Gurland, B., Fleiss, J., Goldberg, K., Sharpe, L. (U.S. team), with Copeland, J., Kelleher, M., Kellett, J. A semi-structured clinical interview for the assessment of diagnosis and mental state in the elderly. The Geriatric Mental State Schedule II: A factor analysis. *Psychological Medicine,* 1976, *6,* 451–459.

Gurland, B. J., Golden, R. R., Challop, J. Unidimensional and multidimensional approaches to the differentiation of depression and dementia in the elderly. *Recent Advances in Dementia.* New York: Raven Press, 1981.

Hedlund, J. L., Vieweg, B. W. The Zung Self-Rating Depression Scale. A comprehensive review, *British Journal of Psychiatry,* 1979, *10* (1), 51–64.

Hendrickson, E., Levy, R., Post, F. Averaged evoked responses in relation to cognitive and affective state of elderly psychiatric patients. *British Journal of Psychiatry,* 1979, *134,* 494–501.

Hewick, D. S., Newbury, P., Hopwood, S., Naylor, G., Moody, J. Age as a factor affecting lithium therapy. *British Journal of Clinical Pharmacology,* 1977, *4* (2), 201–205.

Hewstone, M., Hooper, D., Milles, K. Psychological change in neurotic depression: A repertory and personal construct theory approach. *British Journal of Psychiatry,* 1981, *139,* 47–51.

Hirschfeld, R. M., Klerman, G. L. Treatment of depression in the elderly. *Geriatrics,* 1979, *34* (10), 51–57.

Jacoby, R. J. Depression in the elderly. *British Journal of Hospital Medicine,* 1981, *25* (1), 40–47.

Jacoby, R. J., Levy, R. Computed tomography in the elderly. 3. Affective disorder. *British Journal of Psychiatry,* 1980, *136,* 270–275.

Jarvik, L.F. Aging and depression: Some unanswered questions. *Journal of Gerontology,* 1976, *31* (3), 324–326.

Jarvik, L.F. Diagnosis of dementia in the elderly: 1980 perspective. In C. Eisdorfer (Ed.), *Annual Review of Gerontology and Geriatrics* (Vol. 1). New York: Springer Publishing Company, 1980.

Kay, D. W. K. The depressions and neuroses of later life. In K. Granville-Grossman (Ed.), *Recent Advances in Clinical Psychiatry,* Edinburgh: Churchill Livingstone, 1976.

Kelly, G. A. *The Psychology of Personal Constructs* (Vol. 1). New York: Norton, 1955.

Kovacs, M. The efficacy of cognitive and behavior therapy for depression. *American Journal of Psychiatry,* 1980, *137,* 1495–1501.

Kral, V. A. Somatic therapies in older depressed patients. *Journal of Gerontology,* 1976, *31* (3), 311–313.

Kral, V. A., Wigdor, B. T. Further studies on the androgen effect on senescent memory function. *Canadian Psychiatric Association Journal*, 1961, *6* (6), 345–352.

Kreitman, N. The coal gas story. *British Journal of Preventive Society Medicine*, 1976(a), *30*, 86–93.

Kreitman, N. Age and parasuicide (attempted suicide). *Psychological Medicine*, 1976(b), *6*, 113–121.

Kreitman, N., Sainsbury, P., Pearce, K., Costain, W. Hypochrondriasis and depression in outpatients of a general hospital. *British Journal of Psychiatry*, 1965, *111*, 607–615.

Kurland, M., Hayman, M. Gerovital-H3 in the treatment of depression in a private practice population: A double blind study. Paper presented at Annual Meeting of Academy of Psychosomatic Medicine, Scottsdale, Arizona, November 1974.

Lavagna, J., Capdeville, C., Vernet, J., Broccini, T., Myquet, M., Darcourt, G. A study of viloxazine. *Psychologie Medicale*, 1977, *9*, 1979–1981.

Lehmann, H., Ban, T. A. Pharmacological load tests as predictors of pharmacotherapeutic response in geriatric patients, In Wittenbom, J., Goldberg, S., May, P. (Eds.), *Psychopharmacology and the Individual Patient*. New York: Raven Press, 1970.

Lewinsohn, P. M. A behavioral approach to depression in the psychology of depression: Contemporary theory and research. In Friedman, R. J., Katz, M. M. (Eds.), *Psychology of Depression: Contemporary Theory and Research*. New York: John Wiley and Sons, 1974.

Lieberman, M. Survey and evaluation of the literature on verbal psychotherapy of depressive disorders. Report prepared for the Clinical Research Branch, National Institute of Mental Health. Rockville, Maryland, 1975.

Lipman, R., Covi, L. Outpatient treatment of neurotic depression: Medication and group psychotherapy. In R. L. Spitzer, D. F. Klein (Eds.), *Evaluation of Psychological Therapies*. Baltimore: Johns Hopkins University Press, 1976.

Luborsky, L., Singer, B., Luborsky, L, Comparative studies of psychotherapies. *Archives of General Psychiatry*, 1975, *32*, 995–1008.

Macdonald, A. Depression and elderly people in residential homes. *MIND*, May 1980, 1–14.

Margo, J. L., Robinson, J. R., Corea, S. Referrals to a psychiatric service from an old people's home. *British Journal of Psychiatry*, 1980, *136*, 396–401.

Mann, A. Personal communication. October 2, 1981.

Marston, A. R., Feldman, S. E. Toward the use of self control in behavior modification. *Journal of Consulting and Clinical Psychology*, 1972, *39*, 429–433.

McDonald, R. Self report measurements of emotional states in elderly persons. Paper presented at the XII International Congress of Gerontology, Hamburg, 1981.

McDonald, R., Spielberger, C. Measuring anxiety in hospitalized geriatric patients. In C. Spielberger, B. Diaz-Guerro (Eds.), *Cross-cultural Anxiety (Vol. 2)*. New York: Hemisphere Publishing Co. (in press).

McDonald, R., Suchy, I. Der Einfluss subjektiver Beschwerden auf Leistung und Befindlichhiet im Alter 3.2 *Gerontologie*, 1980, *13*, 346–358.

Merrill, G. G. How to help your patients with retirement depression. *Medical Times*, 1978, *106* (1), 10D (102)–16D (102).

Millar, H. R. Psychiatric morbidity in elderly surgical patients. *British Journal of Psychiatry*, 1981, *138*, 17–20.

Miller, P. Interrupting the depression cycle. *Geriatric Nursing*, 1980, *1* (2), 133–135.

Miller, E., Lewis, P. Recognition memory in elderly patients with depression and dementia: A signal detection analysis. *Journal of Abnormal Psychology*, 1977, *86* (1), 84–86.

Mukherjee, P. K., Holland, R. P. Study of "Vivalan" in geriatric patients suffering from depression. *Journal of International Medical Research*, 1979, 7 (6), 583–591.

Nelson, F., Farberow, N. Indirect suicide in the elderly chronically ill patient. In K. Achte, J. Lonngvist (Eds.), *Suicide Research*. Helsinki: Psychiatria Fennica, 1977.

Nelson, F. L., Farberow, N. L. Indirect self-destructive behavior in the elderly nursing home patient. *Journal of Gerontology*, 1980, *35* (6), 949–957.

Neville, H. J., Folstein, M. F. Performance on three cognitive tasks by patients with dementia, depression or Korsakov's Syndrome. *Gerontology*, 1979, *25* (5), 285–290.

Nies, N., Robinson, D. S., Friedman, M. J., Green, R., Cooper, T. B., Ravaris, C. L., Ives, J. O. Relationship between age and tricyclic antidepressant plasma levels. *American Journal of Psychiatry*, 1977, *134* (7), 790–793.

Olsen, E. J., Bank, L., Jarvik, L. F. Gerovital-H3: A clinical trial as an antidepressant. *Journal of Gerontology*, 1978, *33* (4), 514–520.

Oltman, A. M., Michaels, T. J., Steer, R. A. Structure of depression in older men and women. *Journal of Clinical Psychology*, 1980, *36*, 672–675.

Ostfeld, A. Physical and biological effects (of depression). Paper presented at symposium, Depression in the Elderly: Causes, Care, Consequences. Center on Aging and Health Care. Western Reserve University, October 3, 1980.

Ostfeld, A., Smith, D. M., Stotsky, B. A. The systemic use of procaine in the treatment of the elderly: A review. *Journal of the American Geriatrics Society*, 1977, *25*, 1–19.

Pfeiffer, E. Multidimensional functional assessment: The OARS methodology. Center for the Study of Aging and Human Development. Durham, N. C., 1975.

Pitt, B. Growing points in the psychiatry of old age. Part I: Speciality and body of clinical knowledge. Part II: Organization of services. *Canadian Journal of Psychiatry*, 1980, *25* (1), 1–25.

Plutchik, R. Conceptual and practical issues in the assessment of the elderly. In A. Raskin, L. Jarvik (Eds.), *Psychiatric Symptoms and Cognitive Loss in the Elderly*. New York: John Wiley and Sons, 1979.

Post, F. *The Significance of Affective Symptoms in Old Age*. Maudsley Monograph No. 10. London: Oxford University Press, 1962.

Post, F. The functional psychoses. In A. Isaacs, F. Post (Eds.), *Studies of Geriatric Psychiatry*. Chichester: John Wiley and Sons, 1978.

Post, F. Affective illnesses. In T. Arie (Ed.), *Health Care of the Elderly*. London: Croom Helm, 1981.

Redick, R., Kramer, M., Taube, C. Epidemiology of mental illness and utilization of psychiatric facilities among older persons. In E. Busse, E. Pfeiffer (Eds.), *Mental Illnesses in Later Life*. Baltimore: Garamond/Pridemark Press, Inc., 1973.

Reed, K., Smith, R., Schoolar, J., Hu, R., Lubavathi, E., Mann, C., Lippman, L. Cardiovascular effects of nortriptyline in geriatric patients. *American Journal of Psychiatry*, 1980, *137* (8), 986–989.

Rehm, L. P., Fuchs, C. Z., Roth, D. M., Kornblith, S., Romano, J. A comparison of self control and assertion skills treatment of depression. *Behavior Therapy*, 1979, *10*, 429–442.

Robinson, D. S. Changes in monoamine oxidase and monoamines with human development and aging. *Federation Proceedings* 1975, *34*, 103–107.

Robinson, D. S., Nies, A., Davis, J., Bunney, W. Ageing monoamines, and monoamine-oxidase levels. *Lancet, 1972, i*, 290.

Ron, M., Toone, B., Garralda, M., Lishman, W. Diagnostic accuracy in presenile dementia. *British Journal of Psychiatry*, 1979, *134*, 161–168.

Ropert, R., Petitjean, S., Caillaro, S. Therapeutic problems posed by antidepressive treatment in the elderly. *Gazette Medicale de France*, 1979, *86*, 1063–1065.

Roth, M. The natural history of mental disorders in old age. *Journal of Mental Science*, 1955, *101*, 281–301.

Roth, M. The psychiatric disorders of later life. *Psychiatric Annals*, 1976, *6*, 417–444.

Roth, M., Morrissey, J. D. Problems in the diagnosis and classification of mental disorder in old age with a study of care material. *Journal of Medical Science*, 1952, *95*, 66–80.

Rush, A. J., Beck, A. T., Kovacs, M., Hollon, S. Comparative efficacy of cognitive therapy and pharmacotherapy in the treatment of depressed outpatients. *Cognitive Therapy and Research*, 1977, *1*, 17–37.

Salzman, C., Shader, R. I. Depression in the elderly. I. Relationship between depression, psychologic defense mechanisms and physical illness. *Journal of the American Geriatrics Society*, 1978, *26* (6), 253–260.

Salzman, C., Shader, R. I. Depression in the elderly. II. Possible drug etiologies: Differential diagnostic criteria. *Journal of the American Geriatric Society*, 1978, *26* (7), 303–308.

Schraberg, D. The myth of pseudodementia: Depression and the aging brain. *American Journal of Psychiatry*, 1978, *135* (5), 601–603.

Schwab, J. J. Depression among the aged. *South Medical Journal*, 1976, *69* (8), 1039–1041.

Sendbeuhler, J. M., Goldstein, S. Attempted suicide among the aged. *Journal of the American Geriatrics Society*, 1977, *25*, 245–248.

Shader, R., Goldsmith, G. Dihydrogenated ergot alkaloids and papaverine: A status report on their effects in senile mental deterioration. In D. Klein, R. Gittelman-Klein (Eds.), *Progress in Psychiatric Drug Treatment* Vol. 2). New York: Brunner/Mazel, 1976.

Shulman, K. Suicide and parasuicide in old age: A review. *Age and Ageing*, 1978, *7*, 201–209.

Shulman, K., Post, F. Bipolar affective disorder in old age. *British Journal of Psychiatry*, 1980, *136*, 26–32.

Steuer, J., Bank, L., Olsen, E., Jarvik, L. Depression, physical health, and

somatic complaints in the elderly: A study of the Zung Self-Rating Depression Scale. *Journal of Gerontology,* 1980, *35* (5), 683–688.

Svendsen, K. Sleep deprivation therapy in depression. *Acta Psychiatrica Scandinavica,* 1976, *54* (3), 184–192.

Taylor, J. W. Mental symptoms and electrolyte imbalance. *Australian and New Zealand Journal of Psychiatry,* 1979, *13* (2), 159–160.

Tristan, M., Delage, M., Demouchel, A., LeGouley, J., Nitzberg, P., Poirier, G. A new antidepressant—viloxazine. *Actualities Psychiatriqules,* 1977, *5,* 16.

Tyce, F. A. Depression in the aging patient. *Minnesota Medicine,* 1977, *60* (8), 581–584.

Verwoerdt, A. Psychotherapy for the elderly. In T. Arie (Ed.), *Health Care of the Elderly.* London: Croom Helm, 1981.

Vickers, R. The therapeutic milieu and the older depressed patient. *Journal of Gerontology,* 1976, *31* (3), 314–317.

Vohra, J., Burrows, G., Hunt, D., Sloman, G. The effect of toxic and therapeutic doses of tricyclic antidepressant drugs on intracardiac conduction. *European Journal of Cardiology,* 1975, *3,* 219–227.

Von Knorring, L. A double-blind trial: Vivalan against placebo in depressed elderly patients. *Journal of International Medical Research,* 1980, *8* (1), 18–21.

Weeks, D., Freeman, C. P. L., Kendell, R. E. Enduring cognitive defects? *British Journal of Psychiatry,* 1980, *137,* 26–37.

Weissman, M. Psychotherapy and its relevance to the pharmocology of affective disorder: From ideology to evidence. In M. A. Lipton, A. Di Mascio, K. R. Killam (Eds.), *Psychopharmacology: A Generation of Progress.* New York: Raven Press, 1978.

Weissman, M. M., Klerman, G. L., Prusoff, B., Hanson, B. Treatment effects on social adjustments of depressed patients. *Archives of General Psychiatry,* 1974, *30,* 771–778.

Weissman, M., Myers, J. Depression in the elderly: Research directions. *Journal of Geriatric Psychiatry,* 1979, *12* (2), 187–192.

Willner, M. Individual psychotherapy with the depressed elderly out-patient: An overview. *Journal of the American Geriatrics Society,* 1978, *26* (5), 231–235.

Winokur, G. Genetic and clinical factors associated with course in depression. *Pharmakopsychiatrie Neuro-psychopharmakologie* 1974, *7,* 122–125.

Young, L. D., Taylor, I., Holmstrom, V. Lithium treatment of patients with affective illness associated with organic brain symptoms. *American Journal of Psychiatry,* 1977, *134* (12), 1405–1407.

Zemore, R., Eames, N. Psychic and somatic symptoms of depression among young adults, institutionalized aged, and noninstitutionalized aged. *Journal of Gerontology,* 1979, *34* (5), 716–722.

Zung, W. W. K. A self rating depressing scale. *Archives of General Psychiatry,* 1965, *12,* 63–70.

Zung, W., Gianturco, D., Pfeiffer, E., Wang, H., Whanger, A., Bridge, P., Potkin, S. Pharmacology of depression in the aged: Evaluation of gerovital-H3 as an antidepressant drug. *Psychosomatics,* 1974, *15,* 127–131.

Zung, W. W., Gianturco, D., Pfeiffer, E. Treatment of depression in the aged with Gerovital H3: Clinical efficacy and neurophysiological effects. *Psychopharmacological Bulletin,* 1976, *12* (2), 50–51.

Psychopharmacology of Depression in the Elderly

ALLEN RASKIN, PH.D.
PHARMACOLOGIC AND SOMATIC TREATMENTS BRANCH
NATIONAL INSTITUTE OF MENTAL HEALTH
ROCKVILLE, MARYLAND

INTRODUCTION

One may reasonably ask why the editors of this volume felt it desirable or even necessary to devote a chapter to the psychopharmacologic treatment of depression in the elderly. Is depression a serious mental health problem in the elderly? Does depression manifest itself differently in older as compared to younger individuals, and, if so, what are the implications for drug treatment? Do elderly depressed patients respond differently to antidepressant drugs than their younger counterparts? Are there special precautions in using antidepressants with the elderly? Do certain antidepressants appear to better meet the needs of elderly depressed patients than others? This article will address these and related questions, focusing primarily on the published literature of the past five years. However, it may be necessary, at times, to go further back into the literature to obtain the proper perspective on more recent findings.

DEPRESSION IN THE ELDERLY

Incidence and Prevalence

Depression is a serious mental health problem in the elderly. The Director of the National Institute on Aging has reported that depression is probably the most common psychiatric complaint among older adults (Butler and Lewis, 1976). Although few would quarrel with this statement, there is little valid empirical data from epidemiological studies of the incidence and prevalence of depression in the elderly. In psychiatric settings the presence of depressive symptomatology in older patients is considerably higher (50 percent; Pfeiffer, 1977) than the presence of clinically diagnosed depression (6 percent; Gurland, 1976). Blazer and Williams (1980) surveyed 997 elderly community residents and found depressive symptomatology present in 14.7 percent of subjects. Within this sample 3.7 percent had symptoms of a major depressive disorder using diagnostic criteria set forth in the Research Diagnostic Criteria (Spitzer et al., 1977).

The systematic and well-designed community survey by Blazer and Williams (1980) lends credence to anecdotal reports and prior survey data indicating a high prevalence of depressive symptomatology and of depression diagnoses in the elderly. Given this pool of potential antidepressant drug users, are these drugs frequently prescribed for the elderly? Here too the systematic and well-controlled survey data necessary to answer the question are not available. Much data cited to support misuse or overuse of psychoactive drugs in the elderly derive from nursing-home surveys, and the culprits in these reports are generally major tranquilizers and not antidepressants. It has been reported that although persons 65 years of age and older make up only 11 percent of the U.S. population, they receive approximately 25 percent of prescriptions for psychopharmacologic medication (Prien, 1980). Australian elderly, although comprising only 9 percent of that country's population, received nearly 34 percent of all tricyclic antidepressants prescribed (Chapman, 1976).

The Course of Depression in the Elderly

It has been widely accepted that the high rate of depressive symptomatology in the elderly derives, in large measure, from negative or stressful life events associated with the aging process. Examples include

death of a spouse or other losses of emotional support, failing health, reduced sensory acuity such as failing eyesight or hearing loss, reduced income, and inability to adjust to retirement. In general, it is assumed that the depression associated with many of these stresses is of short duration, lasting only a few days or weeks. These so-called reactive depressions are said to account for 60 to 90 percent of all depressions in the elderly (Lipton, 1976; Post, 1975). One may reasonably question the value of antidepressants for reactive depressions, which are generally self-limited and of brief duration, although antidepressants have been successfully used to treat neurotic depression (Leff et al., 1970; Paykel et al., 1969).

Antidepressants or electroconvulsive therapy (ECT), because they act relatively quickly, may be particularly useful in those cases where there is concern about a possible suicide attempt, a not infrequent occurrence in the elderly (U.S. Public Health Service, 1968). Since 1966 there has been an especially sharp rise in suicide rates among elderly white males. Further, unlike younger persons who attempt suicide about seven times more often than they commit suicide, the number of aged persons attempting suicide roughly equals the number committing suicide (Fann and Wheless, 1975). Although antidepressant drugs may reduce the risk of a suicide attempt, their use in patients who are at risk for suicide needs to be scrupulously monitored to prevent the possibility of a drug overdose.

An additional issue related to the course of depression in the elderly that has also not been adequately addressed is the rate at which new cases of depression emerge (incidence rather than prevalence), especially in those 60 years of age or older. A prospective study conducted some years ago by Hagnell (1962) found 41 new cases of depression over a 10-year period in 2,480 persons surveyed who had no prior history of depression. Prospective studies are essential to identify the risk factors most often associated with depression in the elderly. Recent data from two sources suggest that many depressed elderly individuals have either had prior episodes of depression or suffer from chronic depression. Blazer and Williams (1980) state "depression in the elderly may be less cyclic than it is during other stages of the life cycle. The depressive symptomatology uncovered in this community survey may represent true cases of chronic depressive disorder that, for the most part, go undetected in the community" (p. 443). In a recent study designed primarily to obtain comparative data on a new geriatric test battery, 22 percent of the patients sampled were diagnosed as having chronic depressive disorder, 26 percent were diagnosed as having major depressive disorder, and only 7 percent fell in the category

of adjustment disorder with depressed mood (Raskin and Rae, 1981). These diagnoses were based on the third edition of the *Diagnostic and Statistical Manual* of the American Psychiatric Association. Patients included in this study had applied for either inpatient or outpatient treatment at a psychiatric facility or nursing home. What was surprising was the high percentage of chronic depressive disorder patients and the low percentage of patients diagnosed as adjustment disorder with depressed mood. In the paper it was suggested that patients with adjustment disorders were not well represented in the study because these patients are likely to be treated by their internists or family practitioners and not likely to seek treatment in inpatient or outpatient psychiatric settings. Data from this study are also consistent with evidence that the elderly make less use of psychiatric services than their younger counterparts.

From the above, it appears that many elderly patients treated in psychiatric facilities either have had prior episodes of depression or their depression is of fairly long-standing duration. The less severely ill elderly patients with reactive depressions seem to avoid contact with mental health professionals. If these latter patients are receiving medication for their depression, it is probably being dispensed by their internists or family practitioners. If this finding holds up, it may mean that many elderly depressed patients treated in mental health facilities may be less responsive to antidepressant drugs than their young counterparts because of the high incidence of chronic depressions and of prior episodes of depression in these patients.

Depression Subtypes and Treatment Response

A dichotomy that may have relevance for the elderly is the endogenous-reactive or endogenous-neurotic distinction in depression. Endogenous–neurotic is the preferred terminology for this dichotomy today as efforts to find important precipitating events for most nonendogenous depressions have generally not proven fruitful. However, because of the losses of support and other stressful events associated with old age, the concept of reactive depression appears to have greater validity for elderly depressed patients (Lipton, 1976; Post, 1975). This dichotomy was first proposed by Gillespie (1929) over 50 years ago, and a variant of this distinction still has currency in the concept of endogenomorphic depression by Klein (1974). An editorial in the *British Medical Journal* (1964) summarized the major symptom differences between these two types of depression:

Reactive depression is characterized by the prominence of anxiety and tension. The symptoms are worse near the end of the day. The patient has difficulty in getting to sleep and in waking in the morning. Phobic anxiety and somatic complaints may be evident. Endogenous depression is characterized by early waking, feeling worse in the morning than later in the day, thoughts of self-reproach, retardation, loss of weight, sweating and dry mouth [p. 552].

Accurate diagnosis is important for treatment, since patients with endogenous depression show a better response to the tricyclic antidepressants than those with reactive or neurotic depression (Greenblatt et al., 1962; Kalinowsky, 1959; Kuhn, 1958; Raskin and Crook, 1976). Many of the symptoms ascribed to endogenous depression are often considered signs of normal aging, including signs of vegetative disorders such as loss of appetite and associated weight loss, early morning awakening, psychomotor retardation, and feelings of hopelessness and helplessness. One factor used by a number of authors to characterize endogenous depression is "age over 40" (Raskin, 1968). When the endogenous–neurotic distinction was originally proposed, it was assumed that there was a physiological imbalance or genetic predisposition that triggered endogenous depression and that environmental stresses were primarily responsible for neurotic or reactive depression. It is difficult to know how to reconcile this thinking with the presence of endogenous symptoms in elderly patients when many of their "endogenous" symptoms are associated with physiological and social factors related to the aging process itself. In other words, are elderly endogenous patients different from younger endogenous patients in the meaning of their symptom patterns, and are these differences reflected in differential responses to the antidepressant drugs? This is an issue that has never been adequately explored.

The endogenous-neurotic distinction is also important in monitoring plasma levels of the antidepressants to enhance clinical efficacy and reduce drug toxicity. The relationship of plasma levels of the antidepressants to clinical efficacy and adverse drug effects merits separate discussion, but such a relationship is documented for some of the antidepressants, most notably nortriptyline (Asberg, 1974; Kragh-Sorensen, 1975). However, the Swedish investigators who have done most of the work with nortriptyline assert that the "U" curve or therapeutic window seen with nortriptyline obtains only in endogenous depressions (Asberg, 1974; Kragh-Sorensen, 1975). The phrase *therapeutic window* was coined to indicate an optimal range of plasma levels associated with a good therapeutic response; patients with plasma levels above or below the window do not do well clinically.

Because of pharmacologic factors associated with aging, which will be described later, the elderly are especially sensitive to the toxic effects of the antidepressants, and monitoring plasma levels to minimize toxicity is especially important. However, if the Swedish investigators are correct, the use of plasma levels, or possibly even saliva levels of the drugs (Jeffrey and Turner, 1978), as a means of monitoring treatment effects may have value only for a subgroup of elderly patients, that is, those with endogenous depression.

Another important classification distinction for antidepressant drug treatment in the elderly is the ability to distinguish depressive pseudodementia from true dementia. Depressive pseudodementia refers to the appearance of symptoms and signs of dementia, such as perplexion, apathy, listlessness, forgetfulness, and disorientation, in elderly individuals who are depressed and not demented. Post (1976) estimated the prevalence of depressive pseudodementias in patients diagnosed as demented to be between 7 and 19 percent. The prevalence approaches 50 percent if one broadens the definition to include elderly individuals with memory *complaints* associated with an underlying depression (Kahn et al., 1975).

The failure to recognize and treat depression in the depressive pseudodementias can have serious consequences for these patients as they often stop eating and become withdrawn and isolated, exacerbating existing health problems or creating new ones. The expectation is that these depressive pseudodementia cases would make a good response to antidepressant medication, including an improvement in their perceived memory function. However, this hypothesis or expectation has never been tested directly.

Physical Illness and Depression

A number of physical illnesses have been directly associated with depression, such as Parkinson's disease, hyperthyroidism, pernicious anemia, and disease of the pancreas (Salzman and Shader, 1979). In other physical illnesses such as cancer or heart disease, depression is often a serious secondary concern. As one might expect, physical illnesses are more prevalent with age and there is a particularly close association between physical illnesses and depressive reactions in old age (Pfeiffer and Busse, 1973). The role of antidepressants in treating the depression associated with physical illnesses in the elderly has not been systematically explored; but factors such as the severity, duration and rate of progression of the physical illness as well as the depression would be expected to play a role in modifying the response to antidepressants.

Signs and Symptoms of Depression in the Elderly
and Treatment Response

Depression is often unrecognized or misdiagnosed in the elderly because behaviors such as listlessness, anorexia, and sleep disturbance are often regarded as "normal" in the elderly. In this context some authors have suggested that the signs and symptoms of depression in the elderly do not necessarily parallel those seen in younger patients. If there are distinctive symptoms or symptom patterns associated with depression in the elderly, do these have implications for differential drug treatment?

Studies in this area have generally focused on two issues, the preponderance of somatic complaints in elderly depressed patients and the state of apathy and withdrawal that characterizes many elderly patients.

Birkmayer et al. (1973) studied the symptomatology of depression using a self-devised rating scale in 105 patients below age 65 and in 53 patients above age 65. The symptom profile was similar in both groups, but the geriatric patients showed an increased prevalence of insomnia, loss of appetite and weight, headaches, and dizziness.

On the basis of clinical observation, a number of authors noted that somatic complaints tend to be emphasized and may be the predominant complaints in elderly depressed patients (Busse and Pfeiffer, 1973; de Alarcon, 1964). Using data from the U.S.–U.K. Cross National Project, Gurland (1976) compared a group of 32 patients 65 years of age and older with a group of 173 patients 20 to 59 years of age on scores derived from the Geriatric Mental Status Examination. Both groups were diagnosed by project psychiatrists as suffering from depressive disorders. He found that somatic concerns were more evident in the older than in the younger depressed patients. Similarly, Salzman, van der Kolk, and Shader (1975) reported that of 152 consecutive depressed inpatients over age 60, 64 percent were found to have "physically unjustified bodily complaints." The most frequent complaints were gastrointestinal disorders (32 percent), head symptoms (19 percent), and cardiovascular symptoms (8 percent).

The distinction between justified and unjustified physical complaints is not always easy to make. It has been reported, for example, that about 80 percent of people 64 to 74 years of age have some form of chronic illness, and that this figure rises to 87 percent for those over age 74 (Bell, 1973; Shanas, 1974).

The relevant literature frequently observes that depressed elderly patients appear apathetic, seem disinterested in their surroundings, and lack drive (Epstein, 1976; Fann, et al., 1976; Levin, 1963; Zung

and Green, 1972). Smith et al. (1977) rated 370 ambulatory geriatric patients on the 28-item Geriatric Rating Scale. When this scale was factor analyzed, three factors emerged; the first and largest factor consisted of 11 items and was labeled Withdrawal-Apathy. However, this study was performed on a heterogeneous sample of ambulatory geriatric patients with a variety of psychiatric disorders. Hence, one has to be careful to separate the apathy and withdrawal that is often seen in depressed older persons from the motor retardation and emotional withdrawal that occurs in other psychiatric conditions such as schizophrenia. Elderly depressed patients are often reluctant to admit feelings of dysphoric mood and sadness (Davies, 1965; Salzman and Shader, 1973), prompting many clinicians to diagnose depression based on apparently unjustified somatic complaints and on the appearance of apathy and withdrawal.

Different results were reported in a recent study comparing and contrasting psychiatric symptomatology in 33 patients diagnosed as progressive idiopathic dementia, senile onset; 28 diagnosed as dysthymic disorder; 33 diagnosed as major depression; and 290 normal subjects (Raskin and Rae, 1981). Patients admitted to this study were ambulatory, residing in the community and 60 years of age or older. Evaluations of psychopathology were performed on self-report measures as well as on rating scales completed by psychiatrists/psychologists and by friends or relatives of the subjects. Contrary to prior reports, the elderly depressed patients in this study were not reluctant to admit feelings of dysphoric mood and it was the self-report measures that showed the sharpest distinctions between the depression samples and the other patient groups. There was also not a distinctive symptom pattern associated with depression in the major depression patients. Rather, they rated themselves high on all of the major factors of psychopathology on the self-report scales, including factors labeled Cognitive Disturbances, Depressed Mood, Tense-Irritable, Inept-Helpless, Somatic Complaints, and Fatigue. The concern voiced by the authors was not the failure of these patients to admit to signs of depression, but conversely the broad range of psychopathology which seemed to trouble these patients. But these subjects were all community residents applying for treatment at outpatient clinics, and different results might be obtained with hospitalized patients or patients seen by family practitioners or private psychiatrists. An additional finding was the absence of psychopathology in the normal elderly subjects. If these individuals were experiencing stressful life events associated with aging, it was not reflected in their self-reports on the measures of psychopathology nor on the observations of the psychiatrists/psychologists who interviewed them. The two areas where these normal subjects did

admit some distress were cognitive disturbances, including memory complaints, and sexual disturbances.

To sum up, there is evidence that somatic complaints as well as apathy and withdrawal are more prominent symptoms of depression in older than in younger patients, but this may be less true of ambulatory elderly who are still active and residing in the community. The ideal antidepressant drug for these patients would be one with activating or energizing properties and few adverse effects. The tricyclic antidepressant drugs that come to mind are disipramine or nortriptyline. Both are mildly activating and less anticholinergic in their effects than amitriptyline or doxepin, which have sedating effects. A separate section of this chapter, where these issues will be explored in greater depth, will be devoted to the topic of the ideal antidepressant(s) for use with the elderly.

AGE AND THE PHARMACOLOGY
OF THE ANTIDEPRESSANT DRUGS

The relationship between age and the pharmacology of the psychoactive drugs has progressed in two directions. The first, pharmacodynamics, involves age-related changes in receptor sensitivity to drugs. The second direction involves age-related changes in pharmacokinetics, that is, in the absorption, distribution, metabolism, and excretion of the antidepressant drugs.

Pharmacodynamics

There is evidence of changes in the number and sensitivity of neural receptors during aging of the central nervous system. For example, during aging various changes occur in brain neuron/glia ratios, regional brain glucose consumption, dendritic aborization, spine number of brain neurons, and neurotransmitter concentrations (Ball, 1978; London et al., 1981; Puri and Volicer, 1977; Scheibel et al., 1975; Smith et al., 1979; Vernadakis, 1975). In old animals one effect of these changes is decreased synthesis and hydrolysis of acetylcholine (Domino et al., 1978). As a consequence the cholinergic receptors in these animals showed increased sensitivity to both cholinergic agonists and antagonists. Age-related changes in the metabolism of certain neurotransmitters, including the biogenic amines, have also been noted in

humans. For example, human postmortem brain studies have indicated that aspects of catecholaminergic neurotransmission are affected by increasing age in the normal population. For instance, the activity of tyrosine hydroxylase, the initial enzyme in catecholamine biosynthesis, has been shown to decline with increasing age in the human corpus striatum (McGeer et al., 1977). Some of the tricyclic antidepressants, such as amitriptyline, have fairly strong anticholinergic effects. The decline in biogenic amine synthesis cited in the human and animal studies lead to exaggerated anticholinergic responses in the elderly. The anticholinergic effects of greatest concern in the elderly include delirium, aggravation of narrow-angle glaucoma, severe constipation with the possibility of fecal impaction, urinary retention, and dry mouth.

Pharmacokinetics

Absorption. In the elderly there is a reduction in gastric pH, delayed gastric emptying, reduced intestinal blood flow and motility, and a possible reduction in the function and/or number of absorbing cells in the intestine (Bender, 1968). Drugs with potent anticholinergic activity, such as a number of the tricyclic antidepressants, also inhibit gut activity and gastric emptying. However, to date there is little evidence to suggest any major alteration in the absorption of psychoactive drugs from the gastrointestinal tract.

Distribution. Drug action is modified by changes in serum albumin levels, which frequently decline in the elderly. As a result, protein-bound drugs are forced to compete for binding sites, thus increasing the ratio of free to bound drug with a greater risk for drug toxicity. This factor has been cited to explain the high free levels over time of both the benzodiazepines and tricyclic antidepressants in elderly individuals (Lamy, 1974; Salzman and Shader, 1974; Salzman et al., 1976).

As a part of the aging process, functional tissue is also replaced by fat. Most psychoactive drugs are highly lipid soluble and are drawn to and localized in body fat. A number of investigators (Holloway, 1974; Lenhart, 1976; Stotsky, 1970) have noted that storage of these lipid soluble drugs in body fats decreases their immediate effectiveness but also increases the duration of their effects.

Another aspect of distribution which may have important implications is the maintenance of the blood–brain barrier to the metabolites of the antidepressant drugs. There is evidence that drugs with both central and peripheral nervous system effects show important changes

with age in their central effects and not in their peripheral effects
(Bender, 1964). Increased toxicity to morphine in old rats has also
been ascribed to increased permeability of the blood–brain barrier
(Bender, 1969). However, another investigator working with aged rats
reports no evidence of an age-related breakdown in the cerebrovascu-
lar integrity of the blood–brain barrier (Rapoport et al., 1979). In-
stead, this investigator suggests the possibility of age-related changes in
the stereospecific transport of substrates for brain metabolism; the
result is slowed brain metabolism, which can lead to toxic drug effects.
These findings suggest that the sensitivity to psychoactive drug effects
noted in some elderly individuals may be due to an increase in cen-
trally active effects associated with either a breakdown in the integrity
of the blood–brain barrier or slowed drug metabolism in the brain or
both.

   Excretion. Factors which slow down the excretion or elimination
of psychoactive drugs are reductions in renal blood flow, glomerular
filtration rate (GFR) and tubular secretory capacity in the aging kidney
(Bender, 1974; Lamy, 1974; Lamy and Vestal, 1976).

   The decline in the glomerular filtration rate with advancing age is
probably the most important factor slowing down the excretion or
elimination of psychoactive drugs. Rowe, Andres, Tobin, Norris, and
Shock (1976) have shown a decrease in creatinine clearance or GFR
with age that is not secondary to diseases which become prevalent in
the elderly.

   These examples of the physiological effects of age on the pharma-
cology of psychoactive drugs were cited to illustrate that, in general,
there is a decrease with age in the body's efficiency in processing the
psychoactive drugs and a tendency toward longer half-lives of the
drugs over time. As a result, there is a greater risk of adverse drug
reactions, and it is generally recommended that lower dosage levels be
used initially and that the buildup of dosage levels be very gradual in
the elderly (Baker, 1974; Freeman, 1974; Hall, 1975).

PHARMACOTHERAPY

A broad spectrum of drugs has been used to treat depression in the
elderly, including tricyclic antidepressants, monoamine oxidase inhibi-
tors (MAOIs), lithium, and psychostimulants. Newer classes of antide-
pressant drugs such as the tetracyclic antidepressants also seem to hold
promise for use with the elderly. Some of the antianxiety and antipsy-

chotic agents have also demonstrated antidepressant properties. For example, it has been reported that thioridazine, an antipsychotic, is superior to the tricyclic antidepressants in reducing agitated depression (Overall et al., 1964). Antianxiety agents, such as diazepam, have also shown antidepressant effects, particularly in anxious depression or for sleep disturbances (Raskin et al., 1974).

Tricyclic Antidepressants

Clinical Efficacy. Tricyclic antidepressants (see Table 9-1) are used most often in treating depression in all age groups, including the elderly (Hirschfeld and Klerman, 1979). Although the point was previously made that the manifestations or symptoms of depression may differ in older as compared to younger patients, there is little empirical evidence to suggest that the tricyclic antidepressants are either more or less effective in the elderly than in younger age groups. Friedel (1981) recently reviewed 16 controlled studies which evaluated the effects of tricyclic antidepressants in elderly depressed patients. Eight of these studies involved tricyclic-placebo comparisons. In six studies (75 percent) the tricyclic antidepressant was superior to a placebo and in two studies there was no significant difference between the active drug and the placebo. For comparative purposes, Friedel compiled data on 83 drug trials in which a tricyclic antidepressant was compared to a placebo in non-elderly subjects and found the active drug superior to a placebo in 53 of the 83 trials (64 percent).

Freidel also reviewed data from eight additional studies in which a tricyclic antidepressant was compared to another tricyclic antidepressant or to some other psychoactive agent in elderly individuals. There were no clear "winners" in these comparisons, although amitriptyline

Table 9-1
Tricyclic Antidepressant Drugs

Chemical Type	Generic Name	Trade Name
Iminodibenzyls	Desipramine	Pertofane, Norpramin
	Imipramine	SK-pramine, Presamine, Tofranil, Imavate, Janimine
Dibenzocycloheptenes	Amitriptyline	Elavil, Endep
	Nortriptyline	Aventyl
	Proctriptyline	Vivactil
Dibenzoxepin	Doxepin	Sinequan, Adapin

was superior to imipramine in the two trials in which only these drugs were compared.

A number of investigators have also examined the influence of age per se on drug efficacy. Some found the tricyclic antidepressant drug(s) more effective in older patients (Kiloh et al., 1962; Raskin et al., 1970), others found the drug less effective in older patients (Chesrow et al., 1964; Wittenborn et al., 1973), and one team of investigators found no response difference in patients under age 40 and those 40 years of age and older (Rickels et al., 1970). For a variety of reasons these results are very difficult to interpret. First, in a number of these studies patients over the age of 60 were excluded, so the age range was truncated. The "older" patients were 40 to 60 years of age. Second, in a number of these studies there was a relationship between age and severity of illness, with older patients rated as more severely ill than their younger counterparts. These older, more severely ill patients were also more likely to display symptoms associated with endogenous depression such as appetite loss, early morning awakening, and slowed speech and movements. Patients with an endogenous symptom pattern or who can be characterized as suffering withdrawn-retarded depressions seem to show a better response to the tricyclic antidepressants than those with other depression subtypes such as hostile or agitated depressions (Overall et al., 1965). In other words, the presenting symptom pattern and overall severity of illness rather than age appear to be the critical factors that predict a good response to the tricyclic antidepressant drugs.

The Choice of a Tricyclic Antidepressant Drug for the Elderly. There have been some interesting changes over the years in the preferred tricyclic antidepressant for use with the elderly. For many years amitriptyline was the preferred drug primarily because it was more sedating than imipramine and therefore deemed of greater use in treating elderly agitated or anxious depressed patients (Fann, 1976). However, in recent years amitriptyline has lost some of its popularity for use in elderly patients because of frequent cardiotoxicity (Elonen, 1974) and intense anticholinergic effects (Maas, 1975). As many elderly depressed patients have preexisting cardiovascular disease, physicians are understandably wary of prescribing potentially cardiotoxic tricyclic antidepressants to these patients.

When first administered, tricyclic antidepressants exert a hypotensive effect, enhancing the danger of symptomatic orthostatic hypotension (Kantor et al., 1978), which can result in falls and injuries and poses a serious danger to a frail elderly person (Fann, 1976; Morrant, 1975). Patients with preexisting bundle-branch disease may be at increased risk for further adverse cardiac effects (Kantor et al., 1978).

Doxepin, another tricyclic antidepressant (Ayd, 1971; Davies et al., 1975), produces fewer cardiotoxic effects than either imipramine or amitriptyline. However, one complicating factor with doxepin is that it is not felt to be as potent on a milligram to milligram basis as either imipramine or amitriptyline. Consequently, if more doxepin has to be given than either imipramine or amitriptyline to attain the same therapeutic response, its apparent advantage with regard to lessened cardiotoxicity would be seriously compromised.

Friedel (1975) has provided some preliminary data on effective dose levels of doxepin in elderly subjects. He examined the relationship between blood levels of doxepin and clinical response in 15 elderly depressed patients. His findings indicated that 150 mg/day of doxepin was generally sufficient to raise the plasma concentrations of free doxepin and desmethyldoxepin above 100 ng/ml and to also result in a positive clinical response. This amount of doxepin does not appear excessive when compared to similar therapeutic dosages of imipramine and amitriptyline used with this age group.

Conflicting literature exists regrading relative cardiotoxic effects of antidepressants. For example, Vohra and associates (1975) and Burrows and his co-investigators (1976), examining the clinical and experimental effects of antidepressants on intracardiac conduction, concluded that nortriptyline may be particularly cardiotoxic and that it may have substantially greater effects on several ECG parameters than doxepin. Ziegler, Co, and Biggs (1977) reported the development of premature ventricular contractions in a 65-year-old man treated with nortriptyline. Freychuss and associates (1970) reported that nortriptyline had very little effect on inducing orthostatic hypotension. Reed and his colleagues (1980) found nortriptyline free of cardiotoxicity in their sample of 12 elderly patients receiving the standard 150 mg daily dose and noted that the studies by Vohra and co-workers (1975) and Burrows and associates (1976) recorded mean plasma levels of 196 ng/ml, well above the therapeutic window, implying that patients were receiving cardiotoxic doses. The patient studied by Zeigler et al. (1977) who developed premature ventricular contractions had a nortriptyline level of 176 ng/ml, also well above the therapeutic window or range for this drug. However, contrary to the results of Freychuss et al. (1970), who reported no increase in orthostatic hypotension due to nortriptyline, Reed et al. (1980) found a substantial effect of nortriptyline on systolic orthostatic hypotension. Glassman et al. (1979) have also recently reported that nortriptyline produced less orthostatic diastolic hypotension than imipramine. However, as noted by Reed et al. (1980), the clinical significance of the systolic versus the diastolic component of orthostatic hypotension is unclear, although it is generally

accepted that systolic orthostatic hypotension is of greater clinical importance.

Bigger and associates (1977) have extensively examined the cardiotoxic effects of the tricyclics, especially imipramine, in depressed patients with preexisting cardiac disease. Although the age range of their patients was 35 to 71 years, many were over age 60. These authors noted exaggerated intraventricular conduction delays with imipramine, but to their surprise it diminished atrial and ventricular premature contractions. These authors have stated that with proper monitoring for cardiotoxic effects, the tricyclic antidepressants can be safely used in patients with preexisting cardiac disease.

Anticholinergic side effects are another major concern when using tricyclic antidepressants in elderly patients. One effect, which is more common in the elderly, is a central anticholinergic confusional reaction with a marked disturbance of short-term memory, disorientation, impaired attention, anxiety, and visual and auditory hallucinations (Davis, 1974; Hollister, 1976). Fann (1976) notes that this deliriform psychotic state is often mistakenly viewed as an increase in psychiatric symptoms and the dose levels of the drugs are then increased, further exacerbating the condition. This anticholinergic effect can be reversed by administering physostigmine. One atropinelike effect, the inhibition of bowel motility, can lead to constipation, followed by fecal impaction and paralytic ileus. Similarly, acute urinary retention can also develop. Blurred vision is an additional anticholinergic effect which can aggravate unsuspected and untreated cases of narrow-angle glaucoma.

Among the major tricyclic antidepressants, desipramine is least anticholinergic and for this reason has been recommended as a potentially good drug for use with the elderly. However, the advantage of desipramine over imipramine in this regard may be more academic than real as imipramine is rapidly metabolized to desipramine and, according to Glassman and associates (1977), as much as 80 percent of ingested imipramine may be so converted.

In recent years there has been considerable interest in nortriptyline as a suitable tricyclic antidepressant for the elderly. In part, this interest stems from nortriptyline's low anticholinergic effects. Much of this interest has evolved from the extensive work of Scandanavian investigators on the pharmacokinetics of this drug and on the relationship of plasma levels of this drug to both clinical efficacy and side effects (Asberg, 1974; Asberg et al., 1970). Also, a substantial number of the depressed patients in these studies were 60 years of age or older. These investigators found wide interindividual variability in plasma steady-state levels of the tricyclic antidepressants. The steady-state

level is the level obtained after repeated administration of the drug over a two or three week period. Some evidence suggests that the interindividual variability in plasma steady-state levels is greater in older than in younger persons. Convincing evidence exists of a therapeutic window for nortriptyline with poor clinical effect at plasma levels below 50 ng/ml and above 170 ng/ml and increased adverse drug reactions as well above the upper limit of the window (Asberg et al., 1971; Kragh-Sorensen et al., 1973). Research is currently in progress to determine whether there is a therapeutic window for nortriptyline with elderly depressed patients and whether there is a shift downward in this window for elderly patients who may be more sensitive to both the positive and the negative effects of the antidepressant drugs.

Nortriptyline also seems to have one other advantage over the other antidepressant drugs for use with the elderly; there is less nortriptyline accumulation over time in elderly depressed patients than amitriptyline, imipramine, or desipramine (Nies et al., 1977). However, these results must be interpreted cautiously since nortriptyline was not administered to the patients directly; rather, it was measured as a metabolite of ingested amitriptyline.

In sum, there is little evidence that the tricyclic antidepressants are more or less efficacious in the elderly than in younger patients, or that one of the tricyclic antidepressants is clinically more efficacious for the elderly than another. The major differences among the tricyclics appears to be in their sedative-hypnotic properties, propensity for cardiotoxicity, anticholinergic effects, and, perhaps, tendency to accumulate in the body with repeated use. Even these differences are offered tentatively since attitudes about these drugs and their use in the elderly are undergoing constant change.

Drug Dosage. For many reasons, including the age-related pharmacodynamic and pharmacokinetic changes for antidepressant drugs previously described, there is no "standard dose" of these drugs for use with the elderly. Some elderly individuals show a heightened sensitivity to these drugs, both in clinical efficacy and in adverse effects; and some elders can be adequately treated with doses as small as 10 mg/day (Jarvik, personal communication). The generally recommended procedure is to start elderly patients on 10 to 25 mg/day and to slowly increase dosages to the usual maximum or until therapeutic or toxic effects are seen (Hirschfeld and Klerman, 1979). The initial therapeutic response usually appears after one to two weeks of treatment and may not peak until four to six weeks of treatment. If patients still fail to show a favorable response after four to six weeks of treatment, it is probably advisable to consider alternative treatment.

An additional issue related to the management of the antidepressant drugs in the elderly is single versus divided daily dosages of medication. Advocates of a single daily dose prior to bedtime stress the fact that the patient is less likely to forget a dose if all the medication is taken at one time and is also less likely to be troubled by side effects such as drowsiness if the medication is taken shortly before retiring (Ziegler et al., 1977). Taken prior to bedtime, the medication is also likely to improve any sleep disturbances. But elderly individuals often arise during the night to go to the bathroom, and the total dose taken at night may produce more severe orthostatic hypotension and falling when they get out of bed. It has also been noted that some of the adverse effects of the tricyclic antidepressant occur more frequently when there are wide fluctuations in plasma concentrations of the drug such as might occur using a single daily dose. These fluctuations are less likely to occur on a twice or three times a day dosage schedule than on a once a day schedule. This is obviously an issue that needs to be resolved on an individual basis depending on the total amount of medication prescribed and the patient's sensitivity to the drug's effects.

Monitoring of plasma concentrations of the antidepressants may be an especially useful procedure with elderly patients. Appelbaum et al. (1979) reported on a 68-year-old woman with recurrent depression who failed to respond to 100 mg/day of imipramine. In addition to her depression, this woman also showed signs of agitation and confusion. Total antidepressant blood level was very high (805 ng/ml), with desmethylimipramine very high relative to imipramine. Three days after imipramine was discontinued the patient became less agitated, cooperated with the nursing staff, and began taking part in social activities on the ward. Asberg and associates (1970) have also shown a relationship between high plasma levels of nortriptyline and fainting in one patient, and development of a right bundle-branch block during an ECG exercise test in another patient.

Although monitoring of blood levels may be helpful in managing drug treatment in the elderly, as in the cases described above, the relationship of the blood level of a drug to its central and peripheral effects has not been systematically explored. Plasma ranges associated with specific adverse drug effects have not been sytematically documented. These ranges may also show considerable interindividual variability, especially in the elderly. Most of the data in this area have been obtained from case reports of drug overdose, which may have little relevance to the therapeutic dosage levels used with elderly patients.

Negative Drug Interactions and Polypharmacy

The combination of a tricyclic antidepressant with an antipsychotic drug is often used where both symptoms of depression and anxiety predominate or with delusional depressed patients. However, these combinations must be used with caution, especially in the elderly, because of the additive anticholinergic effects of these drugs (Fann and Wheless, 1975; Kral, 1976; Schmidt, 1974). Sedatives are also frequently prescribed for the elderly in addition to antidepressant drugs. Barbiturates induce microsomal enzymes which, in turn, speed up the metabolism of the tricyclic antidepressant drugs and lower their blood levels and efficacy (Piland, 1979).

The above are cited as examples of potential adverse drug interactions with the tricyclic antidepressants specially worrisome in the elderly. For a more detailed discussion of this topic the reader is referred to a recent chapter by Blaschke (1981).

Monoamine Oxidase Inhibitors

The second major class of antidepressant drugs contains the monoamine oxidase inhibitors (MAOIs). The antidepressant effect of these drugs is probably related to their deactivation of biogenic amines associated with neuronal transmission, such as dopamine. There are two classes of MAOIs, the hydrazines and the nonhydrazines (see Table 9-2). The best known hydrazine MAOI is phenelzine. Although phenelzine is the most popular MAOI in current use, the hydrazine MAOIs produce liver toxicity. However, most reports of liver toxicity have been with iproniazid rather than phenelzine. Tranylcypromine is the best known nonhydrazine MAOI and for many years was felt to be an effective treatment for a small group of depressed patients who re-

Table 9-2
Monoamine Oxidase Inhibitors

Chemical Type	Generic Name	Trade Name
Hydrazines	Isocarboxazid	Marplan
	Phenelzine	Nardil
	Iproniazid	Marsalid
Nonhydrazines	Pargyline	Eutonyl
	Tranylcypromine	Parnate

sponded to this drug but not to other antidepressants. However, this drug was temporarily withdrawn from the market after it was implicated in a number of fatalities associated with severe hypertensive crises. These hypertensive crises were later found to be potentiated in patients taking MAOIs by the biogenic amine tyramine, which is found in certain foodstuffs such as beer, wine, and some cheeses (Bethune et al., 1964). Although concerns about hypertensive crises with the MAOIs persist to the present, phenelzine has been safely used with outpatients; but these patients were cautioned against eating certain foods (Robinson et al., 1973). However, there is some danger in using these drugs with elderly patients or with any patients with memory problems who may inadvertently eat foods that could trigger this reaction. Other side effects reported with the use of the MAOIs include anxiety, agitation, manic symptoms, exacerbation of psychotic episodes, constipation, edema, nausea, diarrhea, abdominal pain, weakness, drowsiness, tachycardia, blurred vision, impotence, chills, and headache (Fann and Wheless, 1975). MAOIs also potentiate the action of a number of frequently prescribed drugs for the elderly such as anesthetics, adrenal corticosteroids, barbiturates, atropine, morphine, ganglion blocking agents, and 4-amino-quinoline compounds such as chloroquine and amodiaquine (Fann and Wheless, 1975). Because of concerns with their side effects and negative interactions with other drugs, the current prevailing opinion among clinicians has been to not use the MAOIs with elderly patients unless they have failed to respond to an adequate trial with a tricyclic antidepressant.

Interest in the use of the MAOIs with elderly depressed patients has recently increased, following findings which indicated that there is an increase in MAO levels with age (Robinson et al., 1972) and that depressed patients over age 60 showed a better response to phenelzine than younger patients (Robinson, 1981). The sample of elderly patients treated with phenelzine in the Robinson et al. (1972) study was small ($N = 13$), and additional studies are needed to confirm this apparent advantage of phenelzine for older patients. Ashford and Ford (1979) have also recently shown both tranylcypromine and phenelzine to be effective in a small sample ($N = 14$) of elderly depressed inpatients, particularly depressed demented patients. The MAOIs are also said to have activating properties that may recommend them for use with apathetic and fatigued elderly patients.

Recent interest in the MAOIs has also been stimulated by the finding that a significant clinical effect with these drugs was not observed until there was at least 80 percent platelet MAO inhibition (Robinson, 1981). This generally required a dose of at least 60 mg/day in contrast to the smaller doses that had been used previously. This

finding also suggests that the dose of phenelzine to individual patients be titrated to attain 80 percent platelet MAO inhibition.

Examination of phenelzine plasma levels also revealed higher levels in older patients with the difference between young and old patients most marked during the first two weeks of treatment (Robinson, 1981). It was felt that higher plasma levels in the older patients may reflect a decreased apparent volume of distribution of the drug in the elderly. There was also a modest but statistically significant correlation ($r = 9.33$; $p < 0.01$) between phenelzine plasma levels at six weeks and improvement on total Hamilton Depression Scale scores. There was no mention in this study of any relationship of plasma levels of phenelzine to side effects nor was there any suggestion of a therapeutic window for this drug, that is, the association of very high plasma levels to poor clinical efficacy.

In brief, most of the recent work with one of the MAOIs, phenelzine, suggests that not only is it a safe drug for use with the elderly when proper attention is paid to dietary restrictions but it may also have some special benefits for the elderly. Further studies are obviously needed to replicate Robinson's finding (1981) of greater drug efficacy in older than in younger depressed patients; and if more effective, the mechanism must be documented as well—perhaps elevation of MAO level with age.

Psychostimulants

Central nervous system stimulants are used in the elderly in an attempt to overcome the fatigability and impaired cognitive performance associated with senility. More than 20 percent of the prescriptions written by private practice physicians for methyphenidate (a psychostimulant) are for persons over 65 years of age and 14 percent of these prescriptions are for the treatment of senility (Prien and Caffey, 1977). Psychostimulants are also used to treat mild depression in the elderly. Hackett (1978) has specifically recommended their use for certain clinical indications occurring frequently in the elderly, including (1) to decrease lassitude, inertia, and lack of "zest" in postsurgical and convalescing patients, especially for orthopedic patients with prolonged convalescence; (2) to activate individuals beginning socialization after a prolonged grief reaction following loss; (3) to improve mood and restore the sense of humor of terminally ill patients; (4) to help in the differential diagnosis of pseudodementia. Cognitive impairment secondary to depression may improve following a test dose of amphetamine.

It is generally recommended that the psychostimulants be used

only for very brief periods. Their beneficial effects diminish rapidly over time, and it is not uncommon for patients on stimulants to eventually experience a "crash" with a significant recurrence of depressive symptoms (Fann, 1976; Fann et al., 1974). Other concerns with the use of psychostimulants are the potential for drug addiction and withdrawal effects such as depression, lethergy, and dysphoria. In high dosages the psychostimulants can also cause a paranoid psychosis that closely resembles paranoid schizophrenia. Additional side effects of the stimulants of special concern to the elderly are excessive stimulation with possible rage reactions, insomnia, increased blood pressure, tachycardia, anorexia, and nervousness. Tachycardia and hypertension may lead to cerebrovascular accidents in elderly patients with preexisting impaired cerebral circulation (Fann and Wheless, 1975).

Methylphenidate, because it is less cardiotoxic than the amphetamines, is generally the psychostimulant of choice in the elderly (Salzman, 1981), but only in doses of 10 to 30 mg daily. At higher doses, say, 45 mg, heart rate and blood pressure increased substantially in elderly patients (Crook, 1979). A number of studies have also demonstrated mild to moderate improvement in depression and/or fatigue with this drug in elderly patients (Branconnier and Cole, 1979; Davidoff et al., 1959; Jacobson, 1958; Salzman and Shader, 1973).

Salzman (1981) recently offered the following conclusions regarding stimulants in the elderly: (1) Stimulants are not useful for most cognitive problems of the elderly. (This conclusion was also reached by Crook, 1979, in his review of stimulants in geropsychiatric patients.) (2) Stimulants are decreasingly useful for patients as they get older, the longer they have symptoms, and the longer they are institutionalized. (4) Stimulants may produce cardiovascular and central nervous system toxicity, but methylphenidate appears to be the least toxic of the major stimulants. (5) Drug–drug interactions must be kept in mind when using stimulants. For example, stimulants in combination with other catecholamine-increasing drugs such as tricyclic antidepressants or monoamine oxidase inhibiting drugs may increase the risk of serious cardiotoxicity. (6) Methylphenidate is clinically the most promising of the stimulants.

Electroconvulsive Therapy

Electroconvulsive therapy (ECT) is included in this review because a number of clinicians feel this treatment is often overlooked and underutilized in depressed geriatric patients. For example, in a recent review on the evaluation and management of depression in the elderly, Lazar and Karasu (1980) stated:

Convulsive treatments . . . are indisputably effective in treating depressive illness—at least as effective, in fact, as antidepressant medication. ECT is currently underutilized in geriatrics. The risk is essentially that of a series of brief (several minute) general anesthesias. The most alluded to side effect—impaired memory—resolves completely within a few weeks even in elderly patients. In situations, therefore, where the patient is delusional or suicidal, or ·where medical complications make tricyclic drugs risky, ECT may be the treatment of choice [p. 53].

A review of electroconvulsive therapy in the *American Journal of Psychiatry* (1977) also concluded that ECT is underutilized in the elderly. In his book, *Convulsive Therapy: Theory and Practice,* Fink (1979) lists depression in the elderly as a primary diagnostic indicator for ECT. In the text he notes, "There is no decrement in efficacy [of ECT] with age (indeed, the efficacy seems to improve in the elderly)."
Unfortunately, there are few hard empirical data to support the safety and efficacy of ECT for elderly depressed patients. In one study (Fink, 1979) age was a weak indicator of a favorable response to ECT in a sample of 170 depressed patients. Other factors such as a history of previous hospitalization, feelings of self-depreciation and guilt, retardation, and loss of libido were stronger indicators of a good ECT response. Other prediction studies found that age over 40 (Roberts, 1959) and age over 50 (Gold and Chiarello, 1944; Kahn et al., 1959) were good predictors of positive response to ECT. On the other hand, Ottosson (1962) reported that it took longer to obtain a good response to ECT in older patients.
It is very difficult to evaluate these studies because of the small number of patients 60 years of age or older included, the diagnostic heterogeneity of the patients sampled, and the confounding effects of age upon severity of illness and presenting symptoms.

Lithium Salts

The lithium salts are simple inorganic substances that have proven clinically effective in the treatment of acute mania and as an antiphasic drug in cyclic affective disorders such as manic-depressive illness. Lithium is usually prescribed as lithium carbonate, although there was a brief flurry of interest in lithium citrate, which was felt to cause less gastric distress than the carbonate. Lithium also appears to prevent recurrent bouts of depression, especially in bipolar depression where the depression alternates with episodes of mania. There is also evidence that lithium may prevent some flare-ups of unipolar depressive

illness. However, lithium has not proven effective in the treatment of acute depression and is not a substitute for the tricyclic antidepressants or MAOIs in relieving the acute symptoms of depression.

There is no reason to suppose that lithium would be more or less efficacious in the elderly than in younger patients as a prophylactic for bipolar or unipolar depressive illness. There is general agreement, however, that both the therapeutic effects of lithium and its toxic effects occur at lower dosages and blood levels in the elderly than in younger patients (Prien, 1981b).

The elevated lithium levels noted in the elderly are primarily due to reduced lithium clearance by the aged kidney. Lithium is handled like sodium by the renal tubule, and glomerular filtration rate (GFR) declines linearly in normal aging adults after age 30 to 40 years (Rowe et al., 1976). This decline in GFR reduces lithium clearance in the kidneys and can result in toxic serum lithium concentrations.

Confusion, accompanied by neuromuscular irritability and impaired consciousness, is a common sign of lithium toxicity in the elderly (Prien, 1981b), and progression to coma may develop. Hence, mild confusion, forgetting, or lethargy often ascribed erroneously to aging may be early signs of lithium toxicity.

Bech and associates (1979) noted that fine hand tremor, a sign of lithium toxicity, occurs more frequently in patients over 60 than in those 60 years of age or less. Increased thirst with polyuria, another sign of lithium toxicity, is also seen more often in patients over the age of 60. However, both of these effects can occur in the elderly on stable lithium levels of 0.6 to 1.2 mEg/L.

Elderly patients taking lithium also appear to be more at risk for thyroid toxicity in the form of goiter or hypothyroidism than their younger counterparts (Prien, 1981b).

A variety of dosing schedules and strategies have been proposed to reduce the risk of lithium toxicity in aged persons (Foster et al., 1977). In general, these schedules try to attain a plasma lithium level of 0.4 to 0.6 or 0.07 mEg/L. This is considerably below the levels recommended with younger patients (0.6 to 1.2 mEg/L).

New Antidepressants

Roughly 25 years have elapsed since the introduction of the tricyclic antidepressants and MAOIs. Only in the past few years have new classes of antidepressants appeared which, if their potential or claims are realized, could threaten the dominance of the older drugs. Three

of the new antidepressants are now marketed in the United States: amoxapine (Asedin), maprotiline (Ludiomil), and trimipramine (Surmontil). Two more new drugs are undergoing review by the Food and Drug Administration, trazodone (Desyrel) and nomifensine (Meriyal). Another new antidepressant, mianserin, has been used extensively in Europe and has been undergoing clinical trials in this country as an investigational drug.

One of the disadvantages of the tricyclic antidepressants is their slow onset of action, generally requiring two to six weeks to reach peak efficacy. Amoxapine (Prien, 1981a), maprotiline (Claghorn and Mathew, 1981), trazodone (Fabre et al., 1979), and mianserin (McGrath et al., 1981) are all marketed as faster acting than the tricyclic antidepressants. They are not said to have greater clinical efficacy than the tricyclic antidepressants, but only to have a faster onset of action. A second major disadvantage of the older antidepressants, especially for the elderly, is their potential for cardiotoxicity. Trazodone, mianserin, and nomifensine are all reported to be less cardiotoxic than the tricyclic antidepressants (Crome and Newman, 1977; Gomoll and Byrne, 1979). The anticholinergic effects of the tricyclic antidepressants, for example, dry mouth, constipation, nasal congestion, and blurred vision, are also of special concern to the elderly. Both trazadone and nomifensine are reported to have fewer anticholinergic effects than the tricyclic antidepressants (Fabre et al., 1979; Prien, 1981a). Some of these new drugs are also purported to have very specific indications. Amoxapine is said to have antipsychotic as well as antidepressant properties and is being recommended for use with depressed schizophrenics (Prien, 1981a). Trimipramine has sedative effects, and its ability to improve sleep patterns rapidly is being stressed in its advertising. One of the claims made for mianserin by McGrath and associates (1981) is that it has a low potential for lethal overdose.

Although the newer antidepressants cited in this brief review do hold promise, especially for use with the elderly, their putative advantages over the older antidepressants have not been systematically investigated. In this context, one is reminded of the early claim that desipramine, a metabolite of imipramine, was faster acting than the parent compound, a claim that was not substantiated because of the speed with which imipramine is metabolized to desipramine (Glassman et al., 1977).

REFERENCES

Appelbaum, P. S., Vasile, R. G., Orsulak, P. J., and Schildkraut, J. J. Clinical utility of tricyclic antidepressant blood levels: A case report. *American Journal of Psychiatry*, 1979, *136*, 339–341.

Asberg, M. Plasma nortriptyline levels—relationship to clinical effects. *Clinical Pharmacology and Therapeutics*, 1974, *16*, 215–229.

Asberg, M., Cronholm, B., Sjoqvist, F., and Tuck, D. Correlation of subjective side-effects with plasma concentrations of nortriptyline. *British Medical Journal*, 1970, *4*, 18–21.

Asberg, M., Cronholm, B., Sjoqvist, F., and Tuck D. Relationship between plasma level and therapeutic effect of nortriptyline. *British Medical Journal*, 1971, *3*, 331–334.

Ashford, J. W., and Ford, C. V. Use of MAO inhibitors in elderly patients. *American Journal of Psychiatry*, 1979, *136*, 1466–1467.

Ayd, F. J. Long term administration of doxepin (Sinequan). *Diseases of the Nervous System*, 1971, *32*, 617–622.

Baker, H. M. Drug therapy in geriatrics. *Journal of the Indiana State Medical Association*, 1974, *67*, 171–174.

Ball, M. J. Topographic distribution of neurofibrillary tangles and granuloracular degeneration in hippocampal cortex of aging and demented patients. *Acta Neuropathologica (Berlin)*, 1978, *42*, 73–80.

Bech, P., Thomsen, J., and Prytz, S. The profile and severity of lithium-induced side effects in mentally healthy subjects. *Neuropsychobiology*, 1979, *5*, 160–166.

Bell, W. G. Community care for the elderly: An alternative to institutionalization. *Gerontologist*, 1973, *13*, 349–354.

Bender, A. D. Pharmacologic aspects of aging: A survey of the effect of increasing age on drug activity in adults. *Journal of the American Geriatrics Society*, 1964, *12*, 114–134.

Bender, A. D. Effect of age on intestinal absorption: Implications for drug absorption in the elderly. *Journal of the American Geriatric Society*, 1968, *6*, 1331–1339.

Bender, A. D. Geriatric pharmacology, age and its influence on drug action in adults. *Drug International Bulletin*, 1969, *3*, 153–158.

Bender, A. D. Pharmacodynamic principles of drug therapy in the aged. *Journal of the American Geriatrics Society*, 1974, *22*, 296–303.

Bethune, H. C., Burrell, R. H., Culpan, R. H., and Ogg, G. T. Vascular crises associated with monoamine-oxidase inhibitors. *American Journal of Psychiatry*, 1964, *3*, 245.

Bigger, J. T. Jr., Kantor, S. J., Glassman, A. H., and Perel, J. M. The cardiovascular effects of tricyclic antidepressant drugs. In A. DiMascio (Ed.), *Ten years of progress in psychopharmacology*. New York: Raven Press, 1977.

Birkmayer, W., Neumayer, E., and Riederer, P. In P. Keilholz (Ed.), *Masked depression*. Bern: Hans Huber, 1973.

Blaschke, T. F. Potential drug interactions in aging patients. In A. Raskin, D. S. Robinson, and J. Levine (Eds.), *Age and the pharmacology of psychoactive drugs*. New York: Elsevier North-Holland, 1981.

Blazer, D., and Williams, C. D. Epidemiology of dysphoria and depression in

an elderly population. *American Journal of Psychiatry*, 1980, *137*, 439–444.

Branconnier, R. J., and Cole, J. O. The therapeutic role of methylphenidate in senile organic brain syndrome. Paper presented at the annual meeting of the American Psychopathological Association, 1979.

Burrows, G. D., Vohra, J., Hunt, D., Sloman, J. C., Scoggins, B. A., and Davies, B. Cardiac effects of different tricyclic antidepressant drugs. *British Journal of Psychiatry*, 1976, *129*, 335–341.

Busse, E. W., and Pfeiffer, E. Mental disorders in later life—affective disorders, paranoid, neurotic and situational reactions. In E. W. Busse and E. Pfeiffer (Eds.), *Mental illness in later life*. Washington, D.C.: American Psychiatric Association, 1973.

Butler, R., and Lewis, M. *Aging and mental health*. St. Louis: Mosley, 1977.

Chapman, S. F. Psychotropic drug use in the elderly. *Medical Journal of Australia*, 1976, *2*, 62–64.

Chesrow, E. I., Kaplitz, S. E., Breme, J. T., Sabatini, R., Vetra, H., and Margunadt, G. H. Nortriptyline for the treatment of anxiety and depression in chronically ill and geriatric patients. *Journal of the American Geriatrics Society*, 1964, *12*, 271–277.

Claghorn, J. L., and Mathew, R. J. Clinical trials with new bicyclic and tetracyclic compounds: Zimelidine and maprotiline. *Psychopharmacology Bulletin*, 1981, *17*, 23–26.

Crome, P., and Newman, B. Poisoning with maprotiline and mianserin. *British Medical Journal*, 1977, *12*(6081), 260.

Crook, T. Central-nervous-system stimulants: Appraisal of use in geropsychiatric patients. *Journal of the American Geriatrics Society*, 1979, *28*, 476–477.

Davidoff, E., Best, J. J., and McPheeters, H. L. The effect of Ritalin (methylphenidylacetate hydrochloride) on mildly depressed ambulatory patients. *New York State Journal of Medicine*, 1959, *57*, 1753–1757.

Davies, B. M. Depressive illness in the elderly patient. *Postgraduate Medicine*, 1965, *38*, 314–320.

Davies, G., Burrows, G., Dumovic, P., Vohra, J., Hunt, D., Sloman, G., and Scoggins, B. Effects on the heart of different tricyclic antidepressants. In J. Mendel (Ed.), *Sinequan, a monograph of recent clinical studies*. Amsterdam: Excerpta Medica, 1975.

Davis, J. M. Use of psychotropic drugs in geriatric patients. *Journal of Geriatric Psychiatry*, 1974, *7*, 145–159.

de Alarcon, R. Hypochondriasis and depression in the aged. *Gerontologia Clinica*, 1964, *6*, 266–277.

Domino, E. E., Dren, A. T., and Giardina, W. J. Biochemical and neurotransmitter changes in the aging brain. In M. A. Lipton, A. DiMascio, and K. F. Killa (Eds.), *Psychopharmacology: A generation of progress*. New York: Raven Press, 1978.

Editor. Special Section: Electroconvulsive therapy—Current perspectives. *American Journal of Psychiatry*, 1977, *134*, 991–1019.

Editorial. Drugs for depression. *British Medical Journal*, 1964, *2*, 522–523.

Elonen, E. Correlation of the cardiotoxicity of tricyclic antidepressants to their membrane effects. *Medical Biology*, 1974, *52*, 415–423.

Epstein, L. J. Depression in the elderly. *Journal of Gerontology*, 1976, *3*, 278–282.

Fabre, L. F., McClendon, D. M., and Gainey, A. Trazodone efficacy in depression: A double-blind comparison with imipramine and placebo in day-hospital type patients. *Current Therapeutic Research*, 1979, *25*, 827–834.

Fann, W. E. Pharmacotherapy in older depressed patients. *Journal of Gerontology*, 1976, *31*, 304–310.

Fann, W. E., and Wheless, J. C. Depression in elderly patients. *Southern Medical Journal*, 1975, *68*, 468–473.

Fann, W. E., Carver, E. F., and Richman, B. W. Psychopharmacological treatment of disorders of senescene. *North Carolina Medical Journal*, 1974, *35*, 672–677.

Fann, W. E., Wheless, J. C., and Richman, B. Treating the aged with psychotropic drugs. *Gerontologist*, 1976, *16*, 322–328.

Fink, M. *Convulsive therapy: Theory and practice.* New York: Raven Press, 1979.

Foster, J., Gershell, W., and Goldfarb, A. Lithium treatment in the elderly. *Journal of Gerontology*, 1977, *32*, 299–302.

Freeman, J. T. Some principles of medication in geriatrics. *Journal of the American Geriatric Society*, 1974, *22*, 289–295.

Freychuss, F. J., Sjoqvist, F., Tuck, D., and Asberg, M. Circulatory effects in man of nortriptyline, a tricyclic antidepressant drug. *Pharmacologia Clinica*, 1970, *2*, 68–71.

Friedel, R. O. Relationship of blood levels of Sinequan to clinical effects in the treatment of depression in aged patients. In J. Mendels (Ed.), *Sinequan, a mongraph of recent clinical studies.* Amsterdam: Excerpta Medica, 1975.

Friedel, R. O. The effects of age on the pharmacology of tricyclic antidepressants. In A. Raskin, D. S. Robinson, and J. Levine (Eds.), *Age and the pharmacology of psychoactive drugs.* New York: Elsevier North-Holland, 1981.

Gillespie, R. D. The clinical differentiation of types of depression. *Guy's Hospital Reports*, 1929, *9*, 306–344.

Glassman, A. H., Bigger, J. T., and Giardina, E. V. Clinical characteristics of imipramine induced orthostatic hypotension. *Lancet*, 1979, *1*, 468–472.

Glassman, A. H., Perel, J. M., Shostak, M., Kantor, S. J., and Gleiss, J. L. Clinical implications of imipramine plasma levels for depressive illness. *Archives of General Psychiatry*, 1977, *34*, 197–204.

Gold, L., and Chiarello, C. J. The prognostic value of clinical findings in cases treated with electric shock. *Journal of Nervous and Mental Disease*, 1944, *100*, 577–583.

Gomoll, A. W., and Byrne, J. E. Trazodone and imipramine. Comparative effects on canine cardiac conduction. *European Journal of Pharmacology*, 1979, *57*, 335–342.

Greenblatt, M., Grosser, G. H., and Wechsler, H. A comparative study of selected antidepressant medications and EST. *American Journal of Psychiatry*, 1962, *119*, 144–153.

Gurland, B. The comparative frequency of depression in various adult age groups. *Journal of Gerontology*, 1976, *31*, 238–292.

Hackett, T. T. Use of stimulant drugs. Paper presented at the annual meeting of the American Psychiatric Association, Atlanta, 1978.

Hagnell, O. *A prospective study of the incidence of mental disorder.* London, Sweden: Svenska Bokto, 1962.

Hall, M. R. P. Use of drugs in elderly patients. *New York State Journal of Medicine*, 1975, *75*, 67–71.

Hirschfeld, R. M. A., and Klerman, G. L. Treatment of depression in the elderly. *Geriatrics*, 1979, *34*, 51–54.

Hollister, L. E. Clinical use of tricyclic antidepressants. *Diseases of the Nervous System*, 1976, *37*, 17–21.

Holloway, D. A. Drug problems in the geriatric patient. *Drug Intelligence and the Clinical Pharmacy*, 1974, *8*, 632–642.

Jacobson, A. The use of Ritalin in psychotherapy of depression of the aged. *Psychiatric Quarterly*, 1958, *32*, 475–483.

Jarvik, L. F. Personal communication, 1980.

Jeffrey, A. A., and Turner, P. Relationship between plasma and salivary concentrations of amitriptyline. *British Journal of Clinical Pharmacology*, 1978, *5*, 268–269.

Kahn, R. L., Pollack, M., and Fink, M. Sociopsychologic aspects of psychiatric treatment in a voluntary mental hospital: Duration of hospitalization, discharge ratings and diagnosis. *Archives of General Psychiatry*, 1959, *1*, 565–574.

Kahn, R. L., Zarit, S. H., Hibert, N. M., and Niederehe, O. Memory complaint and impairment in the aged. *Archives of General Psychiatry*, 1975, *32*, 1569–1573.

Kalinowsky, L. B. Convulsive shock treatment. In S. Arieti (Ed.), *American handbook of psychiatry*. New York: Basic Books, 1959.

Kantor, S. J., Glassman, A. H., Bigger, J. T., Perel, J. M., and Giardina, E. V. The cardiac effects of therapeutic plasma concentrations of imipramine. *American Journal of Psychiatry*, 1978, *135*, 534–538.

Kiloh, L. G., Ball, J. R. P., and Garside, R. G. F. Prognostic factors in treatment of depressive states with imipramine. *British Medical Journal*, 1962, *1*, 1225–1227.

Klein, D. F. Endogenomorphic depression: A conceptual and terminological revision. *Archives of General Psychiatry*, 1974, *31*, 447–454.

Kragh-Sorensen, P. The relationship between nortriptyline plasma levels and clinical effects. *Proceedings of the Royal Society of Medicine*, 1975, *68*, 99–102.

Kragh-Sorensen, P., Hansen, C. E., and Asberg, M. Plasma-nortriptyline levels in endogenous depression. *Lancet*, 1973, *1*, 113–115.

Kral, V. A. An overview of psychopharmacology of old age. *Psychopharmacology Bulletin*, 1976, *12*, 51–52.

Kuhn, R. The treatment of depressive states with G-22355 (imipramine hydrochloride). *American Journal of Psychiatry*, 1958, *115*, 459–464.

Lamy, P. P. Geriatric drug therapy. *Clinical Medicine*, 1974, *81*, 52–57.

Lamy, P. P., and Vestal, R. E. Drug prescribing for the elderly. *Hospital Practice*, 1976, *11*, 111–118.

Lazar, I., and Karasu, T. B. Evaluation and management of depression in the elderly. *Geriatrics*, 1980, *35*, 47–53.

Leff, M. J., Roatch, J. F., and Bunney, W. E. Environmental factors preceding the onset of severe depression. *Psychiatry*, 1970, *33*, 293–311.

Lenhart, D. G. The use of medications in the elderly population. *Nursing Clinics of North America*, 1976, *11*, 135–143.

Levin, S. Depression in the aged: A study of the salient external factors. *Geriatrics*, 1963, *18*, 302–307.

Lipton, M. A. Age differentiation in depression: Biochemical aspects. *Journal of Gerontology,* 1976, *31* (3), 293–299.

London, E. D., Nespor, S. M., Onata, M., and Rapoport, S. I. Local cerebral glucose utilitation during development and aging of the Fisher-344 rat. *Journal of Neurochemistry,* 1981, *37,* 217–221.

Maas, J. Biogenic amines and depression. *Archives of General Psychiatry,* 1975, *32,* 1357–1361.

McGeer, P. L., McGeer, E. G., and Suzuki, J. S. Aging and extrapyramidal function. *Archives of Neurology,* 1977, *34,* 33–35.

McGrath, P. J., Quitkin, F. J., Stewart, J. W., Leibowitz, M., Fyer, A., Davies, R. M., and Klein, D. F. Novel antidepressants: A clinical trial of mianserin. *Psychopharmacology Bulletin,* 1981, *17,* 21–23.

Morrant, J. C. A. Medicines and mental illness in old age. *Canadian Psychiatric Association Journal,* 1975, *20,* 309–312.

Nies, A., Robinson, D. S., Friedman, M. J., Green, R., Cooper, T. B., Ravaris, C. L., and Ives, J. O. Relationship between age and tricyclic antidepressant plasma levels. *American Journal of Psychiatry,* 1977, *134,* 790–793.

Ottosson, J. O. Electroconvulsive therapy of endogenous depression: An analysis of the influence of various factors on the efficacy of therapy. *Journal of Mental Science,* 1962, *108,* 694–703.

Overall, J. E., Hollister, L. E., Johnson, M., and Pennington, V. Computer classifications of depressions and differential effect of antidepressants. *Journal of the American Medical Association,* 1965, *192,* 561.

Overall, J. E., Hollister, L. E., Meyer, F., Kimbell, I. Jr., and Shelton, J. Imipramine and thioridazine in depressed and schizophrenic patients. *Journal of the American Medical Association,* 1964, *189,* 605–608.

Paykel, E. S., Myers, J. K., Kienett, M. M., Klerman, G. L., Lindenthal, J. J., and Pepper, M. P. Life events and depression. *Archives of General Psychiatry,* 1969, *21,* 713–760.

Pfeiffer, E. Psychopathology and social pathology. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold Company, 1977.

Pfeiffer, E., and Busse, E. W. Affective disorders. In E. W. Busse and E. Pfeiffer (Eds.), *Mental illness in later life.* Washington: American psychiatric Association, 1973.

Piland, B. The aging process and psychoactive drug use in clinical treatment. In *The aging process and psychoactive drug use, services research monograph series.* Washington, D.C.: U.S. Department of Health, Education and Welfare, 1979.

Post, F. Dementia, depression and pseudodementa. In D. F. Benson and D. Blumer (Eds.), *Psychiatric aspects of neurologic disease.* New York: Grune and Stratton, 1975.

Post, F. Diagnosis of depression in geriatric patients and treatment modalities appropriate for the population. In D. M. Gallant and G. M. Simpson (Eds.), *Depression: Behavioral, biochemical, diagnostic and treatment concepts.* New York: Spectrum Publications, 1976.

Prien, R. F. Problems and practices in geriatric psychopharmacology. *Psychosomatics,* 1980, *21,* 213–223.

Prien, R. F. A synopsis of the status of the new antidepressants. *Psychopharmacology Bulletin,* 1981a, *17,* 10–11.

Prien, R. F. Age related changes in lithium pharmacokinetics. In A. Raskin, D. M. Robinson, and J. Levine (Eds.), *Age and the pharmacology of psychoactive drugs.* New York: Elsevier North Holland, 1981b.

Prien, R. F., and Caffey, E. M. Pharmacologic treatment of elderly patients with organic brain syndrome: A survey of twelve Veterans Administration hospitals. *Comprehensive Psychiatry,* 1977, *18,* 551–560.

Puri, S. K., and Volicer, L. Effect of aging on cyclic AMP levels and adenylate cyclase and phosphodiesterase activities in the rat corpus striatum. *Mechanisms of Aging and Development,* 1977, *6,* 53–58.

Rapoport, S. I., Ohno, K., and Pettigrew, K. D. Blood–brain barrier permeability in the senescent rat. *Journal of Gerontology,* 1979, *34,* 162–169.

Raskin, A. The prediction of antidepressant drug effects: Review and critique. In D. H. Efron, J. O. Cole, J. Levine, and J. R. Wittenborn (Eds.), *Psychopharmacology: A review of progress 1957–1967.* Washington, D.C.: U.S. Government Printing Office, 1968.

Raskin, A., and Crook, T. H. The endogenous–neurotic distinction as a predictor of response to antidepressant drugs. *Psychological Medicine,* 1976, *6,* 59–70.

Raskin, A., and Rae, D. S. Psychiatric symptoms in the elderly. *Psychopharmacology Bulletin,* 1981, *17,* 96–99.

Raskin, A., Schulterbrandt, J. O., Reatig, N., Crook, T. H., and Odle, D. Depression subtypes and response to phenelzine, diazepam and a placebo. *Archives of General Psychiatry,* 1974, *30,* 66–75.

Raskin, A., Schulterbrandt, J. C., Reatig, N., and McKeon, J. J. Differential response to chlorpromazine, imipramine and placebo. *Archives of General Psychiatry,* 1970, *23,* 164–174.

Reed, K., Smith, R. C., Schoolar, J. C., Hu, R., Doddamane, L. E., Mann, E., and Lippman, L. Cardiovascular effects of nortriptyline in geriatric patients. *American Journal of Psychiatry,* 1980, *137,* 986–988.

Rickels, K., Gordon, P. E., and Weise, C. C. Amitriptyline and trimipramine in neurotic depressed outpatients: A collaborative study. *American Journal of Psychiatry,* 1970, *127,* 208–218.

Roberts, J. M. Prognostic factors in the electroshock treatment of depressive states: I. Clinical features from history and examination. *Journal of Mental Science,* 1959, *105,* 693–702.

Robinson, D. S. MAO inhibitors and the elderly. In A. Raskin, D. S. Robinson, and J. Levine (Eds.), *Age and the pharmacology of psychoactive drugs.* New York: Elsevier North-Holland, 1981.

Robinson, D. S., Nies, A., Colburn, R. W., Davis, J. M., Bourne, H. R., Bunney, W. E., Shaw, D. M., and Coppen, A. J. Aging, monoamines and monoamine-oxidase levels. *The Lancet,* 1972, *1,* 290–291.

Robinson, D. S., Nies, A., Ravaris, C. L., and Lamborn, K. R. The monoamine oxidase inhibitor, phenelzine, in the treatment of depressive-anxiety states. *Archives of General Psychiatry,* 1973, *29,* 407–413.

Rowe, J. W., Andres, R., Tobin, J. D., Norris, A. H., and Shock, N. W. The effect of age on creatinine clearance in men: A cross-sectional and longitudinal study. *Journal of Gerontology,* 1976, *31,* 155–163.

Salzman, C. Stimulants in the elderly. In A. Raskin, D. S. Robinson, and J. Levine (Eds.), *Age and the pharmacology of psychoactive drugs.* New York, Elsevier North Holland, 1981.

Salzman, C., and Shader, R. I. Responses to psychotropic drugs in the normal elderly. In C. Eisdorfer and W. E. Fann (Eds.), *Psychopharmacology and aging.* New York: Plenum Press, 1973.

Salzman, C., and Shader, R. I. Psychopharmacology in the aged. *Journal of Geriatric Psychiatry,* 1974, *7,* 165–184.

Salzman, C., and Shader, R. I. Clinical evaluation of depression in the elderly. In A. Raskin and L. F. Jarvik (Eds.), *Psychiatric symptoms and cognitive loss in the elderly.* Washington, D.C.: Hemisphere Publishing Corporation, 1979.

Salzman, C., Shader, R. I., Bessel, A., and van der Kolk, B.A. Clinical psychopharmacology and the elderly patients. *New York State Journal of Medicine,* 1976, *76,* 71–77.

Salzman, C., van der Kolk, B., and Shader, R. I. Psychopharmacology and the geriatric patient. In R. I. Shader (Ed.), *Manual of psychiatric therapeutics.* Boston: Little, Brown, 1975.

Scheibel, M. E., Lindsay, R. D., Tomiyasu, V., and Scheibel, A. B. Progressive dendrite changes in aging human cortex. *Experimental Neurology,* 1975, *47,* 392–403.

Schmidt, C. W. Psychiatric problems of the aged. *Journal of the American Geriatrics Society,* 1974, *22,* 355–359.

Shanas, E. Health status of older people. *American Journal of Public Health,* 1974, *64,* 261–264.

Smith, C. B., Fredericks, W. R., Rapoport, S. I., and Sokoloff, L. Effects of aging on regional cerebral glucose consumption in the rat. *Abstracts, 10th Annual Meeting of the Society of Neurochemical Transmitters,* American Society of Neurochemistry, 1979, *10,* (1), 171.

Smith, J. M., Bright, B., and McCloskey, J. Factor analystic composition of the Geriatric Rating Scale (GRS). *Journal of Gerontology,* 1977, *32,* 58–62.

Spitzer, R., Endicott, J., and Robins, E. *Research diagnostic criteria (RDC).* New York: New York State Psychiatric Institute, 1977.

Stotsky, B. Use of psychopharmacologic agents for geriatric patients. In R. I. Shader and A. DiMascio (Eds.), *Clinical handbook of psychopharmacology.* New York: Science House, 1970.

U.S. Public Health Service. *Vital Statistics of the U.S.* (Vol. II). *Mortality* (Part A). Washington, D.C., 1968.

Vernadakis, A. Neuronal-glial interactions during development and aging. *Federation Proceedings: Federation of American Societies for Experimental Biology (Bethesda),* 1975, *34,* 39–95.

Vohra, J., Burrows, G., Hunt, D., and Sloman, G. The effect of toxic and therapeutic doses of tricyclic antidepressant drugs on intracardiac conduction. *European Journal of Cardiology,* 1975, *3,* 219–227.

Wittenborn, J. R., Kiremite, N., and Weber, E. The choice of alternative antidepressants. *Journal of Nervous and Mental Disease,* 1973, *156,* 97–108.

Ziegler, V. E., Co, B. T., and Biggs, J. T. Plasma nortriptyline levels and ECG findings. *American Journal of Psychiatry,* 1977, *134,* 441–443.

Ziegler, V. E., Knesevich, J. W., Wylie, L. T., and Biggs, J. T. Sampling time, dosage schedule and nortriptyline plasma levels. *Archives of General Psychiatry,* 1977, *34,* 613–615.

Zung, W. W. K., and Green, R. L. Detection of affective disorders in the aged. In C. Eisdorfer and W. E. Fann (Eds.), *Psychopharmacology and aging.* New York: Plenum Press, 1972.

CHAPTER 10

Nutrition and Aging

BONNIE S. WORTHINGTON-ROBERTS, PH.D.
CHILD DEVELOPMENT CENTER
UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

WILLIAM R. HAZZARD, M.D.
DIVISION OF GERONTOLOGY AND GERIATRICS
UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON

INTRODUCTION

The role of nutrition in health and disease is increasingly viewed as significant by most health care providers. Popular interest in nutrition has also grown to the extent that nutritional "cures" or "prevention regimens" now overwhelm the popular press and abound on health food store shelves as well. We have reached the age when health maintenance has become a priority among a large proportion of the population; fitness programs are commonplace and attention to healthful eating is often part of the life style. This enthusiasm has affected persons of all ages. The elderly and their caretakers especially have come to appreciate the importance of good nutrition in enhancing the quality of life.

This interest in nutrition has set the stage for increased research activity and expanded governmental support of nutrition-related projects for selected target populations. The elderly have been given increased attention through expansion of federally funded feeding programs and creation of research centers to investigate their special needs. In these centers as well as in other institutions, efforts have

been made to address those questions which to date have been inadequately explored.

In selecting among the aspects of the interrelationships among nutrition, aging, and age-related disease for review in this chapter, we have chosen to focus upon the nutritional needs of elderly persons, especially the macronutrients. In so doing we are cognizant of the particular irony of the relationship between gerontology and geriatrics as it applies to nutrition; namely, that prevention or retardation of the chronic, nutrition-related diseases so prevalent among the elderly may involve quite a different strategy than treatment of those diseases once expressed. This distinction will arise repeatedly as it represents one of the fundamental principles of nutrition in gerontology. We have further chosen to concentrate upon the nutritional needs of the average older American, who is living independently despite having one or more of the chronic disabilities which typify old age. Once such disorders bring the elderly within the chronic or, especially, acute health care system, the complexities of nutritional management increase dramatically (notably through diminished intake, which is nearly universal in such circumstances). However, consideration of such management is best carried out on a disease or problem-by-problem basis, clearly beyond the scope of this review, the complexity relating to the multiple problems which are the norm in persons in this age group (especially beyond 75 years).

NUTRITIONAL REQUIREMENTS OF OLDER ADULTS

General

In the very beginning it should be emphasized that individuals cannot be pooled into what is called the "old age group." Clearly this tendency would simplify the task of discussing the nutritional needs of older people, but common sense strongly supports the concept of increasing individuality with increasing age. Among other things, the great majority of elderly people have one or more chronic illnesses, such as the various manifestations of atherosclerosis, digestive disorders, rheumatologic problems, osteoporosis, alcohol abuse, periodontal disease, constipation, and a whole host of other medical and psychologic problems. It is therefore a real challenge to health care providers to identify and manage the great variety of medical problems of the aged but also to develop an appropriate nutritional program that

will ensure nutrient adequacy of individuals, particularly in the face of complex medical/social/emotional disturbances and well-established life style characteristics.

The Recommended Dietary Allowances (RDAs) of the Food and Nutrition Board of the National Academy of Sciences provide the best current estimate of suitable nutrient intake levels for healthy older Americans (NAS, 1980; see Table 10-1). These figures represent minimal needs plus a margin of safety to accommodate the variability among individuals.

It should be remembered that the RDAs were developed for use in assessment of nutritional needs of groups (as opposed to individuals) and for planning dietary programs (as opposed to individualized diet plans). They were also designed to apply to healthy individuals of "reference" body size, moderate activity, and living in a temperate environment. Of note, since relatively few data are available on spe-

Table 10-1
Recommended Dietary Allowances for Persons Over 51 Years of Age, Revised 1980[a]

Nutrient	Males	Females
Calories	2,050–2,400	1,600–1,800
Protein (gm)	56	44
Vitamin A (μg R.E.)[b]	1,000	800
Vitamin D (μg)[c]	5	5
Vitamin E (mg α TE)[d]	10	10
Ascorbic acid (mg)	60	60
Folic acid (mg)	400	400
Niacin (mg)	16	13
Riboflavin (mg)	1.4	1.2
Thiamine (mg)	1.2	1.0
Vitamin B_6 (mg)	2.2	2.0
Vitamin B_{12} (μg)	3.0	3.0
Calcium (g)	0.8	0.8
Phosphorus (g)	0.8	0.8
Magnesium (g)	0.3	0.3
Iron (mg)	10	10
Zinc (mg)	15	15
Iodine (μg)	150	150

[a]Adapted from: Food and Nutrition Board, National Research Council, *Recommended Dietary Allowances*, 9th edition. National Academy of Sciences, Washington D.C., 1980
[b]Retinol equivalents. 1 retinol equivalent = 1 μg retinol or 6 μg carotene
[c]As cholecalciferol. 10 μg cholecalciferol = 400 I.U. vitamin D
[d]α-tocopherol equivalents. 1 mg d-α-tocopherol = 1 α TE

cific nutritional requirements of very old people, the oldest category of dietary recommendations provided in the RDAs is for men and women 51 years and older. Just how close these guidelines come to defining a satisfactory level of intake for the 85-year-old, for example, is incompletely understood. By no means, however, do these comments imply that the Recommended Dietary Allowances should be disregarded; nevertheless, they are best used as guidelines around which assessment and management activities can be focused in the individual older person. If the RDAs are used as reference standards for interpreting records of food consumption, it should not be assumed that malnutrition occurs whenever the recommendations are not met; conversely, it is important not to assume that nutritional adequacy is ensured by fulfilling the Recommended Dietary Allowances.

Calories

With increasing age, a gradual reduction in energy requirement takes place. Part of this reduction reflects a reduction in basal metabolism resulting from the loss of functioning body cells. The cells that remain continue to demand the same nutritional support as cells from younger persons. In addition, a reduction in daily physical activity is commonly observed in the aging individual. This has been clearly documented in studies involving both men and women. Because of the decrease in physical activity with age, basal metabolism represents a higher proportion of the total energy needs of elderly persons than of young adults, who are physically more active. The Food and Nutrition Board of the National Academy of Sciences has recommended that calorie allowances be reduced as age increases (NAS, 1980). The allowances for the two older age groups represent mean energy needs over these age spans, allowing for a 2 percent decrease in basal metabolic rate per decade and a reduction in activity of 200 kcal/day for men and women between 51 and 75 years, 500 kcal for men over 75 years, and 400 kcal for women over 75 years.

In practice, caloric needs of individuals may vary according to age, sex, basal metabolism, size, occupation, environment, hormonal balance, and physical activity patterns. Total calorie intake should be adjusted to a level that will prevent both overweight and underweight. Both problems are common among the aged (Fig. 10-1). Regarding obesity (defined as a fat-fold measurement greater than the 85th percentile of measurements for young white adults), prevalence data from

Figure 10-1. Factors contributing to underweight and overweight in the elderly.

the Ten-State Nutrition Survey (1972) are provided in Fig. 10-2. The peak occurrence was seen during the fourth and fifth decades for both women and men. Master et al. (1959) found that among men 65 years of age and older, the proportion of moderate to severe overweight decreased from about 30 percent at age 65 to about 10 percent at ages 90 to 94. Similarly, the proportion of women who were obese decreased from 40 percent at age 65 to 10 percent in the 90- to 94-year-old group.

The trend toward lower body weights during and after the fifth decade not only reflects decreases in food intake but also may represent the change in makeup of the population group with the survival of the physically fit. Since studies of body composition of adults suggest that the proportion of body fat to body weight may increase with age, a desirable goal might be to avoid development of unnecessary adiposity with advancing years, which would result in limited weight loss in old age.

Generally, the problem of obesity in older adults is a result of the persistence of unrestricted liberal eating habits in conjunction with reduction in energy expenditure. Gluttony usually is not the cause, and people who claim that they eat no more than they used to are largely correct. Since a number of problems are thought to be caused or exacerbated by obesity (Van Itallie, 1979), health may be improved in some individuals by efforts to promote gradual weight reduction. Recommendations for modifying eating habits should be minimal, but those provided should be individualized to the needs of each person. In no case should rigorous "crash dieting" be attempted, and establishment of unrealistic weight-loss goals should be avoided. Suggestions for improving daily exercise routines should also be geared to individual characteristics of aged persons. A number of activities, if engaged in regularly, can lead to the expenditure of a significant number of calories and provide the additional advantages of maintaining lean body mass and supporting satisfactory gastrointestinal motility.

A case can be made for avoiding aggressive efforts to promote weight loss in moderately overweight people who are reasonably healthy. This viewpoint is nicely summarized by Andres (1980), who suggests that overweight in many individuals does not significantly increase morbidity and mortality. It is well recognized that food habits are difficult to change, especially if established for 80 or more years. Unless true benefits can be seriously expected, the painful experience of serious dietary change should not be advised for many overweight

Figure 10-2. Percentage of obese subjects by race, sex, and age. Data from the Ten-State Nutrition Survey, 1968–70.

elderly. This is one example in which the same condition, moderate obesity, may be rationally approached differently in middle versus old age, "benign neglect" being more appropriate in the latter epoch of life.

The greater challenge among the elderly would appear to be calorie maintenance, typical calorie consumption often being markedly lower than estimated needs (NCHS, 1974; Steinkamp et al., 1965; Ten-State Nutrition Survey, 1972). This is true in both institutionalized and noninstitutionalized populations, as summarized by Beaucheme and Davis (1979) in Table 10-2. In the Ten-State Nutrition Survey, approximately 40 percent of the males and 50 percent of the females 60 years and over had caloric intakes less than two-thirds of the RDA. Mean intakes of calories by Hanes' subjects were 64 and 75 percent of the standard (based on body weight for age, sex, and height) in black and white males age 65 years and over; comparable values for females were 69 and 77 percent, respectively. It must be remembered, however, that since specific data on caloric needs of older Americans are unavailable, a true definition of the problem of caloric inadequacy cannot be established. Undernutrition is obvious, however, in many hospitals and long-term residential facilities for the aged.

Table 10-2
Calorie Intakes for Institutionalized and Noninstitutionalized Aged Americans

	Number of Subjects	Calorie Intake (kcal/day)
Males		
RDA (1980)		2,050–2,400
Noninstitutionalized		
mean	3,417	1,888
range		1,536–2,210
Institutionalized		
mean	18	1,528
range		1,366–1,609
Females		
RDA (1980)		1,600–1,800
Noninstitutionalized		
mean	4,261	1,373
range		1,216–1,633
Institutionalized		
mean	92	1,341
range		1,291–1,388

Data from Beaucheme, R. E., and Davis, T. A. The nutritional status of the aged in the U.S.A. *Age* 2:23, 1979.

Protein

The protein needs of older persons are currently the matter of considerable controversy (Watkin, 1980). Irwin and Hegsted (1971), Zanni et al. (1979), as well as Miller and Stare (1968), and others (Cheng et al., 1978; Jordon, 1976; Uruy et al., 1978), have admitted that experimental data on protein requirements in the aged are equivocal and evidence for changing requirements with age inconclusive. Some investigators recommend less protein intake for the elderly because of the diminished ability of the aging kidney to handle the higher solute loads produced by breakdown products of proteins; they also suggest a reduced protein need to support the smaller lean body mass of the aged. Those who advocate an increased protein intake argue that the elderly show a decreased ability to digest protein and that only through consumption of protein-containing foods can the requirements for necessary trace elements be met.

Among the evidence supporting a higher dietary protein allowance for the aged is the observation that serum albumin falls with aging, while serum globulin shows a definite rise (Acheson and Jessop, 1962; East-

man, 1962; Karel et al., 1956; Morgan et al., 1955). Most investigators have blamed reduced protein synthesis by the liver for the lowered albumin content in the blood. Acheson and Jessop (1962) observed, however, that elderly people with low serum albumin and histories of low protein intake show an age-related increase in γ-globulin, which is reversed only in extreme old age. The success in increasing low albumin concentrations encountered in a variety of situations involving all age groups, with diets rich in high-quality protein, has led to the inference that high-protein diets may be desirable for the aged.

The present recommended dietary allowance for protein based on 0.8 gm protein/kg body weight) is 56 gm for men and 44 gm for women aged 51 or older (NAS, 1980). This amounts in both cases to about 10 percent of calories from protein. When calorie intake is adequate, it is generally true that protein intake can be met by a combination of animal and vegetable protein sources. A diet providing only vegetable foods may also be satisfactory if quantity and quality of intake is good and attention is paid to combining vegetables to achieve mixtures with an acceptable balance of essential amino acids. As calorie intake drops below 1,600 per day, conscientious selection of protein-rich foods may be necessary to provide a satisfactory level of protein, especially if health is compromised by acute illness or chronic disease.

Since protein intake is generally related to total level of calories consumed, healthy elderly populations whose diets have been evaluated rarely demonstrate mean protein intake below the RDA. The lowest mean protein intakes have been observed in institutionalized subjects by Brown et al. (1977), where men consumed 95 percent and women 106 percent of the RDA. Noninstitutionalized men and women had the highest mean protein intakes of 168 percent and 150 percent of the RDA, respectively. Only about 15 percent of all the aged subjects in the Ten-State Nutrition Survey (1972) consumed less than two-thirds the RDA for protein.

Research by Young (1976) in recent years found that total protein synthesis and breakdown expressed per unit body weight declined as age increased, paralleling the decline in metabolically active tissue. Protein metabolism per unit body weight in elderly subjects was 63 percent that of young adults but similar in both groups when expressed in relation to energy metabolism and higher when expressed per unit of creatinine. Young suggested that these latter findings support an increase in the contribution to total body protein metabolism of the synthesis and breakdown of visceral organs (intestine and liver) relative to skeletal muscle. Overall, these findings indicate a decrease in

protein synthesis and a reduction in the level and intensity of muscle protein metabolism with age. Young has hypothesized that this may lower the body's capacity for metabolic adaptation to environmental changes, and thus its ability to deal with unfavorable situations. He also noted that utilization of high-quality protein may be reduced in the aged and thus supports the idea that the FAO/WHO safe practical allowances for protein (0.52 gm/kg body weight/day) are not adequate for aged individuals. After considering all factors which might influence requirements, Young has recommended an intake of one gram of protein per kilogram of body weight per day for the elderly. As health deteriorates in the aged adult, protein needs may eventually increase (Watkin, 1980). Stress—particularly anxiety, infection, burns, physical injury, and metabolic disease—may increase nitrogen excretion, impose unique nitrogen demands for recovery, and thereby increase protein requirements. Major surgery may also increase protein needs for tissue replacement and wound healing.

Carbohydrates (Including Fiber)

Under most conditions, carbohydrates provide at least 50 percent of the total caloric content of the diet. They therefore represent an important energy source at all ages and should not be aggressively avoided in efforts to lose weight. When dietary carbohydrates are drastically reduced in a hypocaloric regimen, several phenomena may be observed. First, loss of tissue protein (amino acids) will be accelerated to make up the calorie deficit and to maintain the blood sugar concentration at appropriate levels. Second, a major renal loss of sodium and water may occur with potential development of dehydration and kidney damage. Even 10 percent of dietary calories from carbohydrate can prevent most of these problems. The human is known to exhibit a wide range of adaptability and thus no specific requirements for dietary carbohydrate have been defined (Worthington-Roberts, 1981a).

Of importance, however, is the observation that some aged persons consume large amounts of *refined* carbohydrates because foods containing such carbohydrates are either less expensive or preferred because of taste. However, diets rich in refined carbohydrates may be limited in their content of other important nutrients. *Complex* carbohydrates are qualitatively preferable in that the concentration of calories per unit of food is less (relevant for obese persons), the content of other nutrients usually is higher, and the presence of fiber is probably

vital to maintenance of health, particularly as related to the gastrointestinal system (Worthington-Roberts, 1981a).

Research related to dietary fiber has been enthusiastically supported during the past 10 years (Cummings, 1978; Eastwood, 1978; Food Technologists' Expert Panel, 1979; Kelsay, 1978; Kritchevsky, 1978; Mendeloff et al., 1978; Sandstead et al., 1978; Van Soest, 1978; Worthington-Roberts, 1981a). Procedures for dietary fiber quantitation have been refined and an array of specific dietary fibers have been described and isolated. Dietary fiber is now defined as including all of the nonabsorbable components of a food that are not broken down by enzymes in the human digestive tract. This class now includes hemicelluloses, pectic substances, gums, mucilages, and certain other carbohydrates, as well as lignin and cellulose. These chemical compounds are found largely in the cell walls of plant tissues and their total greatly exceeds that measure of "crude fiber" which is often provided in food composition books available today. "Crude fiber" simply represents the residue left after a food sample is treated in the laboratory with a solvent, hot acid, and hot alkali. This chemically inert residue is composed primarily of the lignin and most of the cellulose in the food being analyzed.

Claims have been made that fiber can cure multiple problems. A number of books have been sold for the lay public extolling the virtues of a fiber-rich regimen. The major claims made for dietary fiber fall into three categories, all of which are relevant to common disorders of old age:

1. Definite value—relieving constipation by increasing fecal water content
2. Probable value—treating (or preventing) diverticular disease
3. Possible value—reducing serum cholesterol, prevention of a variety of disorders such as hemorrhoids, varicose veins, ischemic heart disease, colon rectal cancer, diabetes, appendicitis, obesity, gallstones, phlebitis, dental caries, irritable bowel, ulcerative colitis, and the harmful effects of some ingested toxic substances

The evidence in support of these claims has been summarized (Table 10-3).

Since many consumers are now interested in fiber, a number of special bread products have been developed which contain from 6 to 8 percent crude fiber (about four times that found in whole wheat bread). Powdered food-grade cellulose is added to these products and

Table 10-3
Summary of Selected Data on the Effects of Dietary Fiber on Health in Mammals

Topic	Summary of Available Data
Dietary fiber and constipation	1. Scientific evidence that some dietary fibers increase stool weight, decrease intestinal transit time, and contribute to a softer stool 2. Numerous anecdotal and clinical observations on relief of constipation through increased intake of dietary fiber sources, like bran
Dietary fiber and diverticular disease	1. Sizable amount of epidemiological data on higher incidence of diverticular disease among populations with low fiber consumption (and vice versa) 2. Scientific evidence that intraluminal pressure in the lower bowel increases when dietary fiber intake is low and decreases when fiber intake is high 3. Clinical evidence that use of the high-fiber diet for treatment of diverticular disease is beneficial in many cases
Dietary fiber and hemorrhoids	1. Many theories about the etiology of hemorrhoids have been presented (e.g., inflammation, infection, erect posture, vascular stasis, hormonal factors, lack of exercise, straining by defecation, loss of rectal connective tissue elasticity with aging, poor diet) 2. Limited epidemiological evidence relating low fiber consumption to higher incidence of hemorrhoids 3. Numerous anecdotal reports of hemorrhoid remission with high dietary fiber intake 4. No subtantiating evidence for a direct relationship between dietary fiber level and prevention or management of hemorrhoids

Table 10-3 (continued)

Dietary fiber and diabetes	1. Hypothesized that prolonged consumption of a fiber-depleted diet is a causative factor in phenotypically predisposed individuals
	2. Limited clinical data support a therapeutic value of high-fiber diet in regulating blood sugar levels in insulin-independent and some insulin-dependent diabetics
	3. Experiments in both animals and nondiabetic humans suggest improved glucose tolerance with a high-fiber vs. a low-fiber dietary regimen
Dietary fiber and gallstones	1. Hypothesized that the metabolic defect behind cholesterol gallstone formation is caused by low-fiber diet in that it is calorically dense and conducive to development of obesity and leads to production of type of bile that is supersaturated in cholesterol (Limited animal and human observations support these views)
	2. Experimentally, bile acid syntheses and pool size diminsh with refined carbohydrate intake
	3. Experimentally, feeding bran reduces deoxycholate absorption which stimulates an increase in circulating chenodeoxycholate; the bile then produced is less saturated
	4. Clinical evidence on the ability of a high-fiber diet to reduce incidence and/or severity of gallstones remains to be obtained
Dietary fiber and serum cholesterol	1. Limited epidemiological evidence of low incidence of heart disease among populations with high-fiber diet
	2. Laboratory evidence that fibers differ in their hypocholesterolemic potential; pectin and guar gum appear to be the most

Table 10-3 (continued)

Topic	Summary of Available Data
	effective while bran shows a limited effect
	3. The overall hypocholesterolemic effect of fiber in general described as "low" to "moderate"
Dietary fiber and cancer	1. Scientific evidence that low fiber intake slows transit of waste products through the lower bowel. It is hypothesized that this allows a longer opportunity for conversion of substances like bile acids to carcinogens or procarcinogens
	2. Scientific evidence that the microorganisms which thrive in the bowel of an individual on a low-fiber diet are different (qualitatively or quantitatively) from those which reside there when dietary fiber intake is high
	3. Conflicting epidemiological evidence about the incidence of colon cancer and dietary fiber intake
	4. Conflicting laboratory evidence about the protective effect of dietary fiber on initiation of colon cancer in rats
	5. Overall, much controversy about a dietary fiber–cancer relationship
Dietary fiber and obesity	1. Experiments in human subjects indicate improved satiety with high-fiber diet vs. refined regimen
	2. Observations in human subjects of fecal losses of calories show twice as many calories when diet is high in fiber; overall loss in either case, however, is relatively low (< 150 kcal)
	3. No clinical evidence exists that a high-fiber diet in itself is a "sure cure" for overweight or obesity

Adapted from data provided by: Food Technologists' Expert Panel on Food Safety and Nutrition, *Dietary Fiber*, Institute of Food Technologists, January 1979.

310

its presence is identified on the product label. Since cellulose and the water it holds dilute other nutrients in normal bread, fiber-enriched bread is often promoted as a "calorie reduced" product (Mrdeza, 1978).

At the present time, almost no detailed information is available to serve as a guide for recommending either the quantity or type of dietary fiber to consume. Suggestions ranging from 6 to 24 gm of crude fiber per day can be found in both popular and scientific literature. During the past 50 years, dietary fiber intake of Americans has decreased from about 7 gm to about 5 gm per day. Whether or not the health of today's human would improve with substantial increase in the level of fiber intake remains to be seen (Food Technologists' Expert Panel, 1979).

One thing appears obvious, however, in reviewing clinical cases of the past several years: too much fiber in daily diet may be detrimental on several counts (Cummings, 1978; Kelsay, 1978; Sandstead et al., 1978; Worthington-Roberts, 1981a). Consumption of as much as 10 tablespoons of bran per day has led to diarrhea, gastrointestinal obstruction, and other digestive complaints. It has also been suggested that too much pectin may decrease vitamin B_{12} absorption. This would be an important concern for certain types of vegetarians whose diets are already low in this vitamin and high in fiber, or the elderly who are at special risk to vitamin B_{12} deficiency due to gastric achlorhydria and/or a deficiency in intrinsic factor (leading to pernicious anemia). There may also be increased loss of minerals, particularly zinc, iron, calcium, copper, and magnesium, due to binding of these minerals by phytic acid which is present in certain plant-based foods.

In summary, therefore, the data suggest that fiber is beneficial but moderation in its use should be exercised. A variety of whole grain products, fruits, and vegetables will ensure a good mixture of fiber constituents and make a positive contribution to overall dietary quality. If there are multiple beneficial effects from dietary fiber, they derive from more than one component of dietary fiber. Therefore, adding bran alone, for example, should be expected to have a limited effect other than augmenting gut peristalsis. Similarly, the benefits of adding cellulose alone to bread may be limited in reducing calorie intake. Any generalized statements about the use of dietary fiber as "a drug" to cure specific diseases should be viewed with reservations. In general, however, many elderly persons find some relief from constipation when dietary fiber and fluid intake is within a satisfactory range. Poor dietary fiber intake accompanied by excessive laxative use is a major problem in this population (Worthington, 1979).

Fat

The American diet is high in fat, although a reduction in intake has been noted during the past decade (Worthington-Roberts, 1981b). Recent statistics indicate that about 37 percent of the daily calorie intake is obtained from this source (Pao, 1974). This fat is derived largely from animal sources but increasing use of vegetable oils during the last several decades has contributed to a slow change toward intake of less animal fat and more vegetable fat (Table 10-4). Fat is needed by the body for a variety of reasons, not the least of which is its contribution of fatty acids for energy. Fats also serve as a vehicle for fat-soluble vitamin absorption and a stimulus in the stomach for reduced acid secretion and muscular activity. Satiety is improved when fats are part of a meal, and in most cases fats increase palatability of the diet. For these reasons, fats may be nutritionally, physiologically, and psychologically important to people. There is no conclusive proof, however, that they are an essential part of the adult diet other than their contribution of essential fatty acids, which are needed in small amounts (2 to 4 percent of calories) per day.

An impressive body of epidemiological evidence supports the positive correlation between rising intake of total dietary fat and increasing mortality from heart disease, rates of coronary heart disease, and myocardial infarctions (Worthington-Roberts, 1981b). The strength of these associations is statistically convincing. Added support of the association is provided by studies of populations that have migrated from one habitat to another. It has also been confirmed that modification of dietary cholesterol content, substitution of polyunsaturated for saturated fat, and modifications of dietary fat and cholesterol can also

Table 10-4
Change in per Capita Consumption in the
United States Between 1963 and 1975[a]

Product	Change
Vegetable fats and oils	44.1% increase
Animal fats and oils	56.7% decline
Butter	31.9% decline
Eggs	12.6% decline
Fluid milk and cream	19.2% decline

[a]Figures for calculating percentage changes were obtained from U.S. Department of Agriculture

reduce serum cholesterol levels, a principal risk factor in coronary heart disease (Worthington-Roberts, 1981b).

While conclusive statements cannot be made as to the definitive quantitative impact of dietary modification on the outcome of coronary heart or other chronic disease, both domestic and international expert committees have decided that the implicating evidence is conclusive enough to incorporate recommendations for the modification of dietary cholesterol, total fat, and saturated and polyunsaturated fats in their recommendations for heart disease prevention in the general population (Worthington-Roberts, 1981b). However, such recommendations appear less supportable in the elderly for the following reasons: (1) The relationship between total (principally reflecting low-density lipoprotein) cholesterol levels and atherosclerotic heart disease risk declines progressively with age, to the point where no clear association exists beyond age 60; (2) population lipid levels tend to decline above age 60 in both sexes, attributable most likely to decreasing relative body weight (and perhaps also to the premature disappearance from the surviving group of those with hyperlipidemia); (3) those who have lived into old age in spite of hyperlipidemia frequently have compensating factors (such as a high level of high-density lipoproteins) which continue to protect them from atherosclerosis. Hence, reduction in fat intake in old age, especially when calorie maintenance is in jeopardy due to any or all of the factors enumerated in Fig. 10-2, is seldom indicated. This is a clear example of a circumstance in which nutritional advice for the prevention of a common age-related disorder is less and less appropriate as the age of the population or individual increases.

Vitamins

One rarely sees *frank* vitamin deficiencies among elderly people in the United States (Harrill and Cervone, 1977). Even so, it is not uncommon to find that dietary intake of water-soluble vitamins is below recommended levels (Table 10-5). The dietary findings are usually not linked to any clinical manifestations of disease or malfunction. For this reason, it is difficult to determine their real importance. Nevertheless, past and present nutrition literature available to the lay public often recommends vitamin supplements to improve health and longevity among the elderly.

Nonspecific symptoms such as fatigue, weakness, and mild paralysis may sometimes result from prolonged inadequate vitamin intake.

Table 10-5
Percentage of Elderly Subjects with Inadequate Dietary Intake[a]

Study	Thiamine	Riboflavin	Niacin	Vitamin A	Ascorbic Acid
Ten-State Nutrition Survey (1972)					
low-income states	45	27	35	57	45
high-income states	43	19	23	50	35
NCHS (1974)					
below poverty index				63	38
above poverty index				54	21
Harrill & Cervone (1977)	47	9	43	21	13
Pao & Hill (1974)	34	39	—	54	49
Guthrie et al. (1972)	42	45	—	66	44

[a]Less than two-thirds of the RDA

Both the poor and the elderly who have severely restricted their diets without physician's advice may be especially prone to the development of vitamin deficiencies. Additionally, individuals with chronic diseases are especially susceptible. Since vague complaints of ill health, suboptimal performance, impaired resistance to infection, poor wound healing, and other qualities may improve by the elimination of vitamin deficit, efforts should be made to provide appropriate counseling about means of improving dietary intake of specific vitamins. If dietary improvement seems unlikely or long in coming, supplementation with appropriate, low-level multivitamin preparations is often desirable.

Unfortunately, there are surprisingly few well-controlled studies of the effects of vitamin supplementation on health of the elderly. One of the best efforts is a controlled, two-year study of chronically ill, hospitalized elderly patients (Taylor, 1968). In this population, 95 percent showed some sign of nutritional deficiency and 90 percent had low serum levels of vitamin C and thiamin. It was found that those patients receiving supplementary vitamin B complex and vitamin C showed highly significant improvement in physical and mental condition, although this improvement took up to one year to develop. When the vitamins were discontinued, signs of deficiency reappeared in about six months in many of the subjects, even while they were provided the general hospital diet, which was designed to be complete in all nutrients.

Unfortunately, elderly individuals who choose to use vitamin supplements may not be the ones with deficient diets. Several surveys have been conducted to judge dietary adequacy of older persons who

regularly took vitamin supplements (Mickelsen, 1976). Not surprisingly, it was found in one study that half of the vitamin users were consuming a completely adequate diet. Of the respondents whose diets were poor (less than two-thirds of the RDA), only one in four such people were using vitamin supplements that covered all of their vitamin shortages. Only two out of four persons were using preparations which provided some, but not all, of the nutrients in which their normal diets were deficient. One-fourth of the people whose diets were rated as poor were using the wrong supplements, that is, replacing none of the vitamins or minerals that their normal diet lacked.

Consideration should always be given to the possible danger associated with the indiscriminate use of vitamin supplements (Worthington-Roberts, 1981c). Available information suggests that water-soluble vitamins are generally nontoxic, even in large doses, since the body is believed to excrete excesses in the urine. Several cases have been reported, however, of adverse responses to large doses of vitamin C, niacin, vitamin B_6, and folic acid. The fat-soluble vitamins A and D have long been recognized as toxic in large amounts. Vitamins E and K may produce similar problems but only recently have case reports appeared in the scientific literature; complaints associated with vitamin E excess include nonspecific diarrhea, nausea, discomfort, fatigue, and other symptoms. Some trace elements in vitamin preparations may be toxic if dosage is excessive, and an additional problem might be the creation of vitamin imbalances by the use of single-vitamin preparations. Without doubt the greatest danger in the use of vitamin supplements is failure to recognize and treat the underlying disease/for example, cancer, or other problems that caused the deficiency state to begin with.

Minerals

General. A number of minerals are required by the body and each serves a specific role (or roles) of structural or regulatory character. Most mineral elements are well distributed in food with the exception of iron, calcium, chromium, and zinc. These minerals frequently are consumed in suboptimal amounts by the elderly, a situation which may contribute to anemia, osteoporosis, and impaired glucose tolerance. Hypotheses have even been introduced that the process of aging may depend significantly on relative trace element deficiency (Hsu, 1979). Other mineral deficiencies are occasionally seen in situations where disease or drug therapy exist. Excessive sodium intake is also quite

common and may well affect the severity of hypertension (and, of course, congestive heart failure) in some elderly individuals (Worthington-Roberts, 1981d).

Calcium. In the human body calcium accounts for 1.5 to 2 percent of total body weight. More than 99 percent is deposited in bone, with the remainder dissolved in body tissues and fluids. The calcium in the latter supports a number of vital functions, including its role as activator of numerous enzymes. It is involved in blood coagulation and participates in myocardial function, normal neuromuscular irritability, and integrity of intracellular cement substances and various membranes (Hegsted, 1973; Linkswiler, 1976).

Bone is the major site of calcium deposition, serving not only as the structural framework for the body but also as a vital physiologic tissue for storage of calcium and maintenance of calcium homeostasis. Throughout life, bone is constantly being formed and resorbed, a process that gradually slows down as aging occurs. In later life, resorption predominates over synthesis, bone loss gradually proceeding to noticeable levels (Albanese, 1977a,b). Garn (1970) has concluded that adult bone loss is a normal phenomenon in the human organism; it occurs with fair intensity in the fifth decade of life and progresses twice as fast in women as in men.

Osteomalacia is difficult to differentiate from osteoporosis. The most common cause of skeletal rarefaction in the elderly is osteoporosis rather than osteomalacia (Albanese, 1977a,b; Khairi and Johnston, 1978). Osteomalacia, or adult rickets, is caused chiefly by a deficiency of vitamin D, calcium, or both. This condition is particularly prevalent among women of the Orient and other parts of the world who have diets extremely low in calcium, get little sunshine, and yet need more calcium and vitamin D because of frequent pregnancies. It is less prevalent among peasant women who wear less clothing and work outdoors, even if their calcium intakes are low (Albanese, 1977a,b).

Osteoporosis is a condition in which the formation of bone does not keep pace with its resorption, the bone eventually becoming porous and thin. The etiology of the problem is by no means resolved, but most clinical investigators acknowledge the fact that it is multifactoral in origin. The schematic by Smith (1967) emphasizes factors believed to be related to the disease: old age, dietary deficiencies, physical inactivity, hormonal changes, metabolic abnormalities as well as other characteristics.

Over a 10-year period, Albanese, Edelson, and Lorenze (1969) surveyed a normal healthy middle-to-upper income population of about 4,000 females and 1,000 males between 10 and 95 years of age.

They found bone loss to be closely related to age; after 25 years of age, bone density is approximately 25 percent greater in males than in females. Appreciably subnormal bone density was also seen in 10 to 15 percent of people of both sexes as early as age 25 years. In addition to these apparent basic sex differences, factors that may contribute to the higher incidence of excessive subnormal bone density in females than in males include the following:

1. Women are more likely than men to go on reducing diets, even at an early age, with bone loss along with weight loss.
2. Childbearing takes a toll since a fetus requires additional calcium each day, and supplements may not be sufficient to meet needs of both mother and child.
3. During breastfeeding, a mother may lose 250 to 300 mg calcium each day.
4. Changes in hormonal balance at menopause accelerate bone loss.
5. Women usually live longer than men.

A U.S. Department of Agriculture survey in 1968 showed that of 5,500 "normal" females, those over 45 years of age consumed about 450 mg calcium/day (USDA, 1968). This was approximately 50 percent lower than the RDA of 800 mg/day established in 1974. The studies by Albanese et al. (1969) showed a high incidence of subnormal coefficients of bone density and spontaneous fractures in 313 women more than 55 years of age.

Further studies were undertaken by this group to determine bone density in relation to dietary calcium intake. Twenty-three healthy postmenopausal women were evaluated for dietary composition and bone density (Albanese, 1977b). It was clear that bone density increased as the intake of calcium increased and that dairy products constituted a major source of calcium. Overall, the findings clearly indicated that a daily intake of 800 to 1,000 mg of calcium was necessary to maintain normal or optimal bone health in postmenopausal women. To achieve this level of intake, a person would need to consume a quart of whole or skim milk or an equivalent of cheese products daily. Alternatively, heavy emphasis should be placed on other dietary calcium sources, or consideration should be given to regular use of a calcium supplement.

The value of calcium supplementation was examined by assessing the effects on bone density of daily administration of a supplement containing 750 mg calcium and 375 I.U. vitamin D_2 (Albanese, 1978).

One phase of the study involved 12 women between 79 and 89 years of age who resided in a nursing home and obtained approximately 400 mg calcium in their diet daily. With supplementation, their daily calcium intake was at least 1,000 mg. The controls consisted of a similar group of women who did not receive a calcium–vitamin D supplement. Serial measurements over a period of three years showed cessation of bone loss or an increase of up to 12 percent in bone density for the test group as compared with continuation of bone loss in the control group. Similar findings were reported in a second study that was designed much like the first. These results suggest that when calcium intake in elderly women is low because of inadequate consumption of calcium-containing foods, calcium supplementation may slow or reverse bone loss to a measureable degree.

In the work of Albanese, the pattern of change in bone density varied greatly among the subjects under study. On the whole, little or no improvement was observed during the first six to nine months of supplementation. After 36 months, however, the bone density of these female subjects rose to the level normal for men of comparable age. These and similar studies involving over 300 postmenopausal women who have participated in similar programs for two to eight years confirm the efficacy of continuous calcium supplement in countering the tendency toward development of osteoporosis when dietary intake of calcium is habitually low.

Potassium. While postassium deficiency is uncommon among healthy aged persons, complicating circumstances may arise which compromise potassium balance (Table 10-6). Excessive loss of extracellular fluid may occur through vomiting, diarrhea, excessive diuresis, or prolonged malnutrition. Use of certain drugs may also be important, and alcohol abuse may even play a role. In hypokalemia, cardiac

Table 10-6
Causes of Hypokalemia

1. Deficient diet
2. Gastrointestinal potassium wasting
3. Renal potassium wasting due to disease
4. Drug-induced potassium wasting
   a. diuretics including organomercurial thiazides
   b. antibiotics including carbenicillin and penicillin
   c. licorice and extracts of licorice
   d. laxatives
   e. corticosteroids
   f. nephrotoxic drugs, e.g., outdated tetracycline

failure may result from depletion of ionized potassium in heart muscle. Prevention of potassium deficiency is a high priority among patients with persistent gastrointestinal disorders, diuretic use, or adrenocortical hormone therapy. Consumption of foods rich in potassium should be recommended (unless contraindicated by other accompanying problems), and in some cases low-level potassium supplementation may be required.

Sodium. Sodium is required by humans for support of a variety of physiologic processes. Minimal metabolic requirements were defined in the 1940s and 1950s following studies of human subjects on limited salt intakes. These studies determined that metabolic equilibrium can be maintained with sodium intake ranging from approximately 40 to 200 mg/day, or approximately 100 to 500 mg of sodium chloride. Clearly, the vast majority of Americans consume far more sodium than is necessary. Hypertension has been linked to sodium intake in epidemiological studies, though as with all age-related disorders, multiple factors, especially those of a genetic nature, are involved, and not all hypertension is sodium related. Congestive heart failure is most universally aggravated by sodium intake. Therapeutic intervention against these conditions by sodium restriction is particularly difficult in the elderly, whose food habits are of longest standing and whose caloric maintenance is most in jeopardy.

Iron. Iron deficiency is common in the elderly. While the recommended level of iron intake is 10 mg/day, the mean level of intake was lower than this in the low-income group surveyed through NCHS (1974), all females over 59 years in the Ten-State Survey, females over 74 years in the USDA Survey, and the 69- to 75-year-old group. Blood loss, however, is a major etiologic factor in the development of anemia, and since aging is accompanied by an increased prevalence of situations which promote hemorrhage (e.g., GI tumors, diverticular disease, peptic ulcer, aspirin abuse), the importance of this factor should not be underestimated (Kalchthaler and Tan, 1980). Diagnostic efforts to define the significance and site of blood loss should precede any supplementation program.

Improvement in diet may be helpful, however, as was suggested by an iron-enrichment study in which moderately anemic elderly in Boston were evaluated (Gershoff et al., 1977). Increases in hemoglobin levels of aged participants were attributed to the dietary advice and counseling given participants. Both the group receiving iron-enriched products and those receiving unenriched ones exhibited increases in hemoglobin levels, which did not differ significantly. Both groups had received dietary counseling, and it was hypothesized that this improved

dietary practices so that both groups exhibited the improvement in hemoglobin levels.

Zinc. The functions of zinc and its requirements by man have been subjects of great interest during the past 10 years. Since the early reports in the 1960s of zinc deficiency in young men of the Middle East, efforts have been made to determine the extent of the problem among other populations of the world. Concern exists because zinc has been found to participate in a number of important biochemical functions and at the same time is not universally abundant in the food supply. Generally, animal proteins contain more biologically available zinc than cereal and vegetable products, so when these items are limited in diet, the potential for deficiency exists. Among the aged with low incomes and those residing in extended-care facilities (where lower cost vegetable dishes may be substituted for more costly animal products), limited zinc may be present in the daily diet (Gregor, 1977; Gregor and Geissler, 1978; Gregor and Sciscoe, 1977; Wagner et al., 1980). When anorexia is also present and food intake is poor, zinc intake may fall to extremely low levels.

Zinc intake and overall zinc status in the elderly has been examined by several investigators during the past five years. Holden et al. (1979) and Steidemann and Harrill (1980) observed that the majority of older persons they evaluated consumed well under 10 mg of zinc each day. Wagner et al. (1980) reported that among 135 elderly blacks, 39 percent had low hair and/or serum zinc concentration. Gregor (1977) evaluated 65 institutionalized aged subjects and found that while the institution's diet provided ample zinc (19 mg/2,400 cal), mean daily intake was only 8 mg for men and 8.6 mg for women. Five percent of the subjects had hair zinc levels indicative of zinc deficiency (below 75 μg/gm) and about 20 percent of the subjects demonstrated reduced taste acuity (a known result of zinc deficiency at any age). Reduced taste acuity was not correlated, however, with dietary zinc intake or hair zinc concentration. In a follow-up study (Gregor and Geissler, 1978), covering a 95-day period, zinc supplements or placebo were provided to institutionalized subjects in an effort to determine whether or not taste acuity would improve with extra zinc. While hair zinc levels increased with zinc supplementation, thresholds for sodium chloride and sucrose did not increase significantly and recognition thresholds for sodium chloride and sucrose were unaffected by supplementation. Reduced taste acuity in old age appears unrelated to zinc status.

The significance of zinc deficiency in the elderly population remains to be defined through continued observations. While reduced

taste acuity does not appear related, other symptoms of zinc deficiency which are seen frequently in aged persons may be associated to some degree with shortage of this nutrient. Until better data are available on this issue, blanket zinc supplementation plans should not be prescribed. While the low levels of zinc found in some multivitamin/mineral supplement products may not be harmful, excessive zinc may disturb overall mineral balance and ultimately lead to neutropenia and severe hypochromic macrocytic anemia (Porter et al., 1974).

Chromium. Since the physiological significance of chromium was defined in 1959, interest in dietary adequacy has been keen. Chromium is an active determinant of glucose tolerance and a necessary cofactor for insulin/glucose metabolism. Chromium levels in the tissues of humans are related to the levels of this nutrient present in the diet, and increasing age is associated with reduced tissue concentration of chromium (Hsu, 1979). Since chromium is found in natural sugars and grains and not in highly refined products, evidence supports the deterioration in chromium status with increasing use of processed foods (Holden et al., 1979).

Just what this means to the aging individual is not yet defined in scientifically acceptable fashion (Boyle et al., 1977). Chromium depletion in test animals results in decreased glucose tolerance, and dietary chromium supplementation readily reverses this manifestation. Fasting serum glucose stabilizes at a relatively low level in rats fed brown sugar (containing 0.12 to 0.24 ppm Cr) or white refined sugar with added chromium. Chromium supplementation has been reported to improve glucose tolerance in maturity-onset diabetics, malnourished children, and elderly human subjects (Hsu, 1979). Whether or not it should be recommended as a routine supplement for the elderly remains to be clarified. Dietary emphasis on minimally processed foods may go a long way toward maintenance of satisfactory chromium status.

ASSESSMENT OF NUTRITIONAL STATUS: PROCEDURES AND OBSERVATIONS RELEVANT TO THE ELDERLY

The basic principles underlying the evaluation of nutritional status are not much different from those used in general medical evaluation of a patient. The nutritional evaluation is based on (1) observing the general appearance of the individual, (2) obtaining a complete medical,

personal, and social history, (3) recording an accurate diet history, either elaborate or concise, (4) completing a thorough physical examination, including measures of body weight and height, and (5) compiling pertinent laboratory data as they relate to suspected nutritional deficits.

Most circumstances of nutritional deficiency are rather complex in the manner by which they develop (Fig. 10-3). Primary nutritional deficiency disease may occur solely because of inadequate dietary intake, but this is rare unless the poor diet persists for a long period of time. More commonly, especially in the elderly, such factors as malabsorption, decreased utilization of nutrients, increased excretion and destruction of nutrients, and increased nutritional requirements related to genetic or metabolic factors must be considered. The typical sequence of events in the development of clinical malnutrition is the initial desaturation of tissue content of various nutrients. Usually this is evidenced by biochemical alterations in the blood, urine, and biopsy

Figure 10-3. Factors contributing to malnutrition in the elderly.

specimens. As tissue depletion proceeds, biochemical deficits may become increasingly manifest. It should be recognized, however, that these biochemical changes in the blood, like clear-cut observable clinical changes attributable to malnutrition, seldom develop in well-defined stages but rather present in a series of gradations in which the duration of the deficit is most important. Nutritional deficiencies never appear as black or white problems but more often present as a spectrum of irregularities more appropriately assigned to the "gray zone." If the circumstance of malnutrition continues long enough, the classic anatomic and pathologic lesions or signs of deficiency disease become obvious. At this point of severe deprivation, complete responses to nutritional rehabilitation usually are slow. Clearly, then, it is important to diagnose malnutrition before the full-blown deficiency condition develops (Krehl, 1974).

NUTRITIONAL GUIDANCE FOR ELDERLY PATIENTS

Appropriate nutritional guidance for a given geriatric patient needs to be highly individualized. Information on which such guidance is based relates to the broad complex of physical, emotional, psychological, and socioenvironmental determinants of eating behavior. To provide the most effective counseling, the answers to a number of questions must be obtained. The first question should be, "Is the patient eating an adequate diet?" If the answer to this question is "no" or "probably not," the following questions may prove helpful in development of a more complete picture of the individual elderly patient who needs advice:

1. What are the patient's physical limitations?
2. Is the patient able to plan for his food needs?
3. Does the patient know what his food needs are?
4. Is the patient physically able to shop for his food?
5. Does the patient have a convenient means of transportation?
6. Can the patient handle the food himself and get it back to his residence?
7. If the patient has special nutritional needs or limitations, is he able to read and understand labels on food packages?
8. Does the patient understand his condition and needs well enough to follow dietary directions?

9. If the patient cannot shop for food himself, what other options are open to him?
10. What are the patient's housing arrangements?
11. Does the patient live alone or with others?
12. If the patient can't take care of himself, will those with whom he lives take over this responsibility?
13. Are they capable of this responsibility? Are they willing to accept it?
14. What facilities are available for food storage, refrigeration, preparation, cleanup, and garbage disposal?
15. Is the patient able to use the facilities to prepare an adequate diet?
16. What kinds of utensils are available?
17. Have the utensils been rearranged to be within easy reach?
18. Is there a pleasant place to eat comfortably?
19. Are there enough dishes and tableware for attractiveness and sanitation?
20. Does the person have someone with whom he can eat?
21. What is the person's usual eating pattern?
22. Is there an eating pattern?
23. Are there other foods which are disliked or don't agree with the patient?
24. Have any dietary limitations been prescribed?
25. What food items are eaten in a representative day?

These questions provide much information to the health care worker counseling the patient about nutrition. Using these data and knowledge of nutritional needs of the elderly, the counselor can make reasonable suggestions in tune with the patient's physical condition, life style, and unique circumstances. Budgeting tips may be very informative in that a small food budget is a common problem in this population. The skilled nutrition counselor is always on the lookout for well-designed nutrition education materials. The development of a repertoire of approaches and methods will serve the educator well in the real world, where individuals vary in their response to specific educational experiences.

CONCLUSIONS

The determinants of human eating behavior are numerous and the complexity of their interrelationships increases with age. While frank malnutrition is uncommon in contemporary America, the very old represent a group at special risk, attributable especially to their declining calorie intake, which encourages micronutrient deficiency. Superimposed upon this physiologic decrease in calorie consumption in old age are the several deterrents to caloric maintenance which are common in the elderly: social deprivation, psychological impediments (notably depression), physiological declines (as in taste perception and gingival recession leading to loss of teeth), and frank disease processes which are commonly heralded by anorexia and weight loss.

Appropriate nutritional therapy in the elderly, as at all ages, requires careful assessment of the individual patient by systematic review of interview, physical examination, and laboratory data. Given the many factors that inhibit adequate calorie intake in the elderly, restriction of calories or particular foodstuffs (appropriate for youth and middle age for prevention of the diseases of overnutrition) is seldom of primary concern and encouragement of adequate intake is more often the major area of emphasis.

While review of the relationships between nutrition and aging reinforces the interaction between the two, the importance of this relationship also exposes the major deficiencies in our knowledge of the subject. We hope a similar review a decade hence will demonstrate that these deficiencies have been overcome by research of high quality. Such information is most certain to disclose, as it has in studies of the early stage of life, that nutrition is a key determinant, perhaps *the* key determinant, of the health and longevity of the elderly.

REFERENCES

Acheson, R. M., and Jessop, W. J. E. Serum proteins in a population sample of males aged 65–85 years. *Gerontologia* 6:193, 1962.

Albanese, A. A. Bone loss: causes, detection and therapy. New York: Alan R. Liss, Inc., 1977a.

Albanese, A. A. Osteoporosis. *J. Am. Pharm. Assoc.* 17:253, 1977b.

Albanese, A. A. Calcium nutrition in the elderly. *Postgrad. Med.* 63:167, 1978.

Albanese, A. A., Edelson, A. H., and Lorenze, E. J. Quantitative radio-

graphic survey technique for detection of bone loss. *J. Am. Geriatr. Soc.* 17:142, 1969.

Andres, R. Influence of obesity on longevity in the aged. *Advances in Cancer Biology Series, Aging, Cancer and Cell Membranes.* New York: Stratton Intercontinental Medical Book Corporation, 1980.

Beaucheme, R. E., and Davis, T. A. The nutritional status of the aged in the U.S.A. *Age* 2:23, 1979.

Boyle, E., Mondschein, B., and Dash, H. H. Chromium depletion in the pathogenesis of diabetes and atherosclerosis. *South Med. J.* 70:1449, 1977.

Brown, P. T., Bergan, J. C., Parsons, E. P., and Krol, I. Dietary status of elderly people. *J. Am. Diet. Assoc.* 71:41, 1977.

Cheng, A. H. R., Gomez, A., Bergan, J. G., et al. Comparative nitrogen balance study between young and aged adults using three levels of protein intake from a combination wheat soy-milk mixture. *Am. J. Clin. Nutr.* 31:12, 1978.

Cummings, J. H. Nutritional implication of dietary fiber. *Am. J. Clin. Nutr.* 31:821, 1978.

Eastman, G. The plasma proteins—clinical applications. *J. Am. Geriatr. Soc.* 10:638, 1962.

Eastwood, M. A. Fiber in the gastrointestinal tract. *Am. J. Clin. Nutr.* 31:830, 1978.

Food Technologists' Expert Panel on Food Safety and Nutrition. *Dietary Fiber.* Institute of Food Technologists, January 1979.

Garn, S. M. *The Earlier Gain and Later Loss of Cortical Bone in Nutritional Perspective.* Springfield: Charles C. Thomas, 1970.

Gershoff, S. N., Brusis, O. A., Nino, H. V., and Huber, A. M. Studies of the elderly in Boston. I. The effects of iron fortification on moderately anemic people. *Am. J. Clin. Nutr.* 30:226, 1977.

Gregor, J. L. Dietary intake and nutritional status in regard to zinc of institutional aged. *J. Gerontol.* 32:549, 1977.

Gregor, J. L., and Geissler, A. H. Effect of zinc supplementation on taste acuity of the aged. *Am. J. Clin. Nutr.* 31:633, 1978.

Gregor, J. L., and B. S. Sciscoe. Zinc nutriture of elderly participants in an urban feeding program. *J. Am. Diet. Assoc.* 70:37, 1977.

Harrill, I., and Cervone, N. Vitamin status of older women. *Am. J. Clin. Nutr.* 30:431, 1977.

Hegsted, D. M. Calcium, phosphorus and magnesium. In R. S. Goodhart and M. Shills (Eds.), *Modern Nutrition in Health and Disease* (5th ed.). Philadelphia: Lea and Febiger, 1973, p. 323.

Holden, J. M., Wolf, W. R., and Mertz, W. Zinc and copper in self-selected diets. *J. Am. Diet. Assoc.* 75:23, 1979.

Hsu, J. M. Current knowledge on zinc, copper and chromium in aging. *Wld. Rev. Nutr. Diet.* 33:42, 1979.

Irwin, M. I., and Hegsted, D. M. A conspectus of research on protein requirements of man. *J. Nutr.* 101:429, 1971.

Jordan, V. E. Protein status of the elderly as measured by dietary intake, hair tissue and serum albumin. *Am. J. Clin. Nutr.* 29:522, 1976.

Kalchthaler, T., and Tan, M. E. R. Anemia in institutionalized elderly patients. *J. Am. Ger. Soc.* 28:108, 1980.

Karel, J. L., Wilder, V. M., and Beber, M. Electrophoretic serum protein patterns in the aged. *J. Am. Geriatr. Soc.* 4:677, 1956.

Kelsay, J. L. A review of research on effects of fiber intake on man. *Am. J. Clin. Nutr.* 31:142, 1978

Khairi, M. R. A., and Johnston, C. C. What we know—and don't know—about bone loss in the elderly. *Geriatrics* 33:67, 1978.

Krehl, W. A. The influence of nutritional environment on aging. *Geriatrics* 29:65, 1974.

Kritchevsky, D. Chairman, Workshop IV—fiber, lipids and cardiovascular disease. *Am. J. Clin. Nutr.* 31:S190, 1978.

Linkswiler, H. M. Calcium. In: *Present Knowledge of Nutrition* (4th ed.). Washington, D. C.: The Nutrition Foundation, 1976.

Master, A. M., Lasser, R. P., and Beckman, G. Analysis of weight and height of apparently healthy populations, ages 65 to 94 years. *Proc. Soc. Exper. Biol. Med.* 102:367, 1959.

Mendeloff, A. I, et al. *Fiber.* Columbus, Ohio: Ross Laboratories, 1978.

Mickelsen, O. The possible role of vitamins in the aging process. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, Longevity and Aging.* New York: Academic Press, 1976.

Miller, J. M., and Stare, F. J. Nutritional problems and dietary requirements. In T. H. Powers (Ed.), *Surgery of the Aged and Debilitated Patients.* Philadelphia: W. B. Saunders, 1968.

Morgan, A. F., Murai, M., and Gillium, H. L. Nutritional status of the aging. VI. Serum protein, blood, non-protein nitrogen, urea and creatinine. *J. Nutr.* 55:671, 1955.

Mrdeza, G. Trends in speciality breads. *Cereal Foods World* 29:635, 1978.

National Academy of Sciences National Research Council, Food and Nutrition Board. *Recommended Dietary Allowances* (9th ed.). Washington, D. C.: National Academy of Sciences, 1980.

National Center for Health Statistics. Preliminary findings of the First Health and Nutrition Examination Survey, U.S. 1971–1972. *Dietary Intake and Biochemical Findings.* DHEW Publ. No. (HRA) 74-1219-1. Washington, D. C.: U. S. Government Printing Office, 1974.

Pao, E. M., and Hill, M. M. Diets of the elderly, nutrition labeling and nutrition education. *J. Nutr. Educ.* 6:96, 1974.

Porter, K. G., McMaster, D., and Elmes, M. E. Anaemia and low serum copper during oral zinc therapy. *Lancet* 2:774, 1974

Sandstead, H. H., et al. Influence of dietary fiber on trace element balance. *Am. J. Clin. Nutr.* 31:S180, 1978.

Smith, R. W. S. Dietary and hormonal factors in bone loss. *Fed. Proc.* 26:1737, 1967.

Steidemann, M., and Harrill, I. Relation of immunocompetence to selected nutrients in elderly women. *Nutr. Rep. Int.* 21:931, 1980.

Steinkamp, R. C., Cohen, N. L., and Walsh, H. E. Resurvey of an aging population—fourteen year follow-up. *J. Am. Diet. Assn.* 46:103, 1965.

Taylor, G. F. A clinical survey of elderly people from nutritional standpoint. In A. N. Exton-Smith and D. L. Scott (Eds.), *Vitamins in the Elderly.* Bristol, England: John Wright and Sons, 1968, p. 51.

Ten-State Nutrition Survey, 1968–1970. V. Dietary. DHEW, Publ. No.

(HSM) 72-8133. Atlanta: U.S. Department of Health, Education and Welfare, Center for Disease Control, 1972.

Uruy, R., Scrimshaw, N. S., Rand, W. M., et al. Human protein requirements: obligatory urinary and fecal nitrogen losses and the factorial estimation of protein needs in elderly males. *J. Nutr.* 180:97, 1978.

USDA Research Services. Dietary levels of household. Washington, D.C.: U.S. Government Printing Office, 1968.

Van Itallie, T. B. Obesity: adverse effects on health and longevity. *Am. J. Clin. Nutr.* 32:2723, 1979

Van Soest, P. J. Dietary fibers: their definition and nutritional properties. *Am. J. Clin. Nutr.* 31:812, 1978.

Wagner, P. A., Krista, M. L., Bailey, L. B., et al. Zinc status of elderly black Americans from urban low-income households. *Am. J. Clin. Nutr.* 33:1771, 1980.

Watkin, D. M. Nutrition for the aging and the aged. In R. S. Goodhart and M. E. Shils (Eds.), *Modern Nutrition in Health and Disease.* Philadelphia: Lea and Febiger, 1980.

Worthington, B. S. Nutrition. In M. Patrick and D. Carnevalli (Eds.), *Normal Aging as a Baseline for Modification of Nursing Care.* Philadelphia: Lippincott, 1979.

Worthington-Roberts, B. S. Dietary fiber. In B. S. Worthington-Roberts (Ed.), *Contemporary Developments in Nutrition.* St. Louis: C. V. Mosby, 1981a.

Worthington-Roberts, B. S. Questions related to dietary fats. In B. S. Worthington-Roberts (Ed.), *Contemporary Developments in Nutrition.* St. Louis: C. V. Mosby, 1981b.

Worthington-Roberts, B. S. The water-soluble vitamins. In B. S. Worthington-Roberts (Ed.), *Contemporary Developments in Nutrition.* St. Louis: C. V. Mosby, 1981c.

Worthington-Roberts, B.S. Calcium and sodium. In B.S. Worthington-Roberts (Ed.), *Contemporary Development in Nutrition.* St. Louis: C. V. Mosby, 1981d.

Young, V. R. Protein metabolism and needs in elderly people. In M. Rockstein and M. L. Sussman (Eds.), *Nutrition, Longevity and Aging.* New York: Academic Press, 1976.

Zanni, E., Calloway, D. H., and Zezula, A. Y. Protein requirements of elderly men. *J. Nutr.* 109:513, 1979.

Psychological Assessment

K. Warner Schaie, Ph.D.
Department of Individual and Family Studies
The Pennsylvania State University
University Park, Pennsylvania

Vicki Stone, Ph.D.
Ethel Percy Andrus Gerontology Center
University of Southern California
Los Angeles, California

INTRODUCTION

Since formal psychological assessment has for some time been in disfavor, this chapter sets the stage by briefly discussing why psychologists ought to be interested in assessing old people and by raising some of the methodological issues that must be prefaced to any meaningful review of the research literature (more detailed discussions of these matters may be found in Miller, 1980; Schaie, 1980; Schaie and Schaie, 1977). We then proceed to identify recent general source materials and review the topics of interviewing techniques, neuropsychological assessment, psychophysiological assessment, assessment of intellectual functioning, assessment of memory and problem solving, and personality assessment. We conclude with some frankly editorial comments on what we think of the current state of the art and likely future directions.

Literature covered in this chapter includes primarily items published between 1975 and 1980. Older references have been included in some instances where needed for documentation of specific issues.

Why Should Psychologists Assess Old People?

Although relatively little attention has been paid to psychological assessment of the elderly, probably as part of the general neglect of this population by mental health professionals (cf. Lawton and Gottesman, 1974), there is a considerable body of research available for scrutiny. It shares, however, the frequently raised concern of clinicians as to whether psychological assessment has relevance to issues the practicing clinician should be concerned with. It is our contention that psychological assessment as an aid to treatment and intervention programs is even more appropriate when working with the elderly than is the case with younger patients. The reason is that treatment programs for older persons will be more likely to involve some immediate dispositional decisions rather than, as is often the case with younger patients, to result in assignment to a long-term psychotherapeutic relationship. Further, the typical presenting problem of older patients is likely to be only the "tip of the iceberg," requiring assessment of context and remaining assets before meaningful treatment recommendations can be made. We have identified five general problem areas where the psychologist's work is likely to be useful: (1) Diagnosis of behavior disorders; (2) assessment of psychological functioning related to voluntary and compulsory retirement decisions; (3) assessment of personal competence to function independently within the community; (4) baseline evaluation and monitoring of change in behavior intervention; and (5) review of adjustment to changed life role as a prelude to counseling.

Diagnosis of Behavior Disorders. In the elderly one of the critical issues in the diagnosis of behavior disturbances is to distinguish between behavior changes due to "normal" aging and those caused by pathology independent of or superimposed upon such age changes. In addition, many of the elderly function near the edge of their reserve capacity (Birren and Renner, 1977), and multiple system interactions may be elicited by stress-induced pathology in both physical and psychological systems (Pfeiffer, 1977). The clinician's view of what "normal" aging should be is often affected by inappropriate stereotypes about the elderly imposed from the life experience of the middle-aged professional (Schaie, 1973, 1981). A clear danger exists that evidence of early pathology will often be dismissed as normal aging at points where intervention would be possible. Dispositional questions must address themselves, consequently, not only to the presence of pathology, but also to its relative importance and the severity of the disabling symptoms.

Assesment for Retirement Decisions. Recent changes in mandatory retirement laws and practices have thrown the geropsychologist into

assessment problems in the industrial area. Assessment of the older worker's competence to hold a particular job becomes increasingly important in relation to attempts by employers to retire older employees for cause, or to provide counseling as to what type of job reassignment is likely to maximize the assets of the individual and the needs of the organization. The psychologist may well take on the role of arbiter between the concerns of the individual, employers, unions, and the government. Clinicians may also expect an increase of clients, particularly at the managerial and professional level, who will seek help in appraising their psychological status in relation to their own retirement decision.

Assessment of Competence to Function Independently. There has been much recent concern for the development of multiple levels of support systems for the elderly and the notion of a continuum of care. As aids in this effort, appraisal of remaining competence may be needed to determine the level of potential independent functioning or the specific environmental aids that may be required to support remaining competence. In addition to specific referrals from service agencies, the assessment may also aid in the channeling of clients as part of an initial information and referral process. Psychologists and psychiatrists will be increasingly involved in the legal process concerned with the imposition of guardianship and conservatorship, particularly as a new generation of less docile elderly will be more likely to resist attempts by younger relatives to obtain control over their persons and assets by legal means. Again, individuals are also likely to seek professional consultation to help them determine whether they should initiate changes in their living arrangements and other support systems, requiring assessment-based predictions of behavior change trajectories.

Baseline Evaluation and Monitoring of Behavior Intervention. It is obviously necessary to determine whether a potential client's remaining behavior repertory suffices for the intended intervention. But baseline determinations in the elderly are problematic because of substantial intra-individual variability. Nontraditional and highly individuated procedures may often be required to reduce the effects of unreliability due to the relatively low stability of functional levels in the elderly. Assessment instruments need to be considered in light of their ecological validity, that is, the extent to which they estimate accurately the client's actual capability in a naturalistic setting (Gaitz, 1973; Schaie, 1978). Assessment procedures must also be matched to the particular characteristics of the intervention procedures as well as to the situational context (cf. Scheidt and Schaie, 1978) within which behavior is

to be modified. Finally, monitoring of intervention programs is becoming more important because of increasing concern with cost-effectiveness and the need for continuous professional review of the intervention process.

Review of Adjustment to Changed Life Roles. One of the major contributions of assessment with the elderly may be its use in connection with counseling following changes of life roles. For most older persons major changes will involve retirement from the world of work and loss of a spouse or other familiar support systems. The interaction between environmental press and opportunities and the persons' psychological makeup may need to be defined. The counselor's contribution, however, will often also depend on understanding the older person's value systems and needs for assistance in coping with stresses and anxieties caused by societal change and intergenerational conflict.

Methodological Problems

Psychological assessment of older persons entails a number of special methodological concerns. The three most important ones to be discussed briefly involve the dilemma of what to do with techniques that seem problem-relevant but have been developed for and normed upon younger populations; special problems arising from the unique characteristics of older persons; and the external validity of assessment techniques.

Use of Techniques Developed for Younger Persons. Although this chapter will review a number of psychological assessment techniques developed specifically for work with the elderly, it should be recognized that these techniques are largely experimental, mostly without adquate norms, and frequently of unknown validity for clinical application. It remains as true today as it was in our last review (Schaie and Schaie, 1977) that most tests, questionnaires, and other procedures now used with the elderly either were devised in a nondevelopmental pathology-oriented context (e.g., MMPI or the Rorschach) or were based on adolescent or young adult standarization groups (e.g., Wechsler, Army Alpha, PMA intelligence tests, and questionnaires such as Cattell's 16 PF or the Guilford-Zimmerman). Thus, even where norms obtained on an elderly sample are available, there is still the question of their construct and/or predictive validity; these constructs may differ from those that determined the initial test responses for the younger population for which the test was constructed. Nevertheless, there is now substantial evidence to suggest that the structure of intellect or of personality does not change markedly as we approach old age. Longi-

tudinal studies suggest that intelligence declines somewhat past the mid-60s but also that the factor structure of test batteries used for measurement seems to remain quite similar into old age (Schaie, 1982). In the personality realm it appears that while there are few normative changes associated with chronological age, nonnormative events may have marked impact on individual personality (cf. Schaie and Parham, 1976). It should thus be obvious that the assessment specialist must carefully appraise the relevance and cohort specificity of available norms and treat profile analysis or automated reporting systems based on younger reference groups with great caution.

Special Problems in Assessing the Elderly. Most psychological assessment procedures developed for young adults assume that the examiner will not encounter many clients with impaired hearing or vision. Yet most elderly clients are likely to have some modest sensory and motor problems. The effects of these impairments on clinical interactions have been discussed elsewhere (Schaie, 1981). Let us mention here simply that prior to assessment the clinician ought to be satisfied that the client's visual acuity is corrected to the point that test material can be handled without significant interference and that precautions are taken to make sure that the client hears the test instructions correctly. Preference should be given to test materials printed in large type and containing sample problems. Redundancy of information is often needed to make sure that the older test taker's nervous system has the opportunity to receive the essential information. Because of increasing difficulty with visual motor coordination, test formats that require separate answer sheets should be avoided.

Clinical assessment of younger persons is often based upon an interaction where both client and clinician are highly motivated to produce relevant information. Elderly clients, however, are first of all known to be more cautious; because of their fear of receiving negative feedback, which might lead to loss of independence, they may engage in risk-avoiding behavior (cf. Botwinick, 1969). On the other hand some older clients are known to overreport symptoms that may have existed at an earlier time but are not of current concern (Denney et al., 1965).

In the absence of longitudinal data on a given client, it may be seductive to infer decremental losses whenever low test performance or maladaptive questionnaire response patterns are encountered. Much caution is in order to keep in mind the substantial generational changes in ability and expressed self-descriptions of needs and values that may appear to the younger observer as age-related losses. Thus, before diagnosing pathological change, the examiner must ask whether the client is not simply behaving in a manner that has been characteris-

tic throughout adult life and possibly quite adaptive in the past. It may well be that newly arising environmental pressures now make demands for which the previously adaptive behavior patterns no longer provide a sufficient reponse.

External Validity of Assessment Techniques. It is obviously possible for the clinician to evaluate the magnitude of change in longitudinal observations of the same client, as long as the reliability and variability of the test is known. When single observations are to be interpreted, however, the relevance of norms becomes critical. For example, scores on the Wechsler-Bellevue, standardized on a young adult group now in its 70s, might tell us where the individual falls on a cohort-relevant intelligence test. Age corrections are usually not very satisfactory because they are typically based on cross-sectional data; they might in fact conceal individual decrement by overcorrecting for the positive cohort trends seen on most ability tests. Indeed, there is a real question as to whether age-corrected norms should be used at all (see Schaie, 1980, for further discussions). What is needed is a continuous updating of test norms to deal with the changes in cohort levels. This problem is even more serious in personality tests because most of the age differences found on self-report inventories have little to do with individual change across age, but rather seem to be a function of intergenerational differences in early socialization patterns (Schaie and Parham, 1976).

Tremendous differences exist between the characteristics of such contrasting groups as those living in the community compared to those who have been institutionalized, or among those of different levels of education or life experience. To permit adequate assessment, either normative data have to be developed for groups like those to which the client belongs or the interpretation of findings must carefully take into account the ways in which the particular client differs from whatever norm group happens to be readily available.

GENERAL SOURCE MATERIALS

In the past five years, a number of excellent handbooks on aging have been published: *Handbook of the Psychology of Aging* (Birren and Schaie, 1977); *Aging and Mental Health* (Butler and Lewis, 1977); *The Clinical Psychology of Aging* (Storandt et al., 1978); *Handbook of Mental Health and Aging* (Birren and Sloane, 1980); *Handbook of Geriatric Psychiatry* (Busse and Blazer, 1980); and *Aging in the 1980s* (Poon, 1980). With the exception of *Aging and Mental Health,* these

handbooks are contributed volumes with a range of useful chapters by different authors for the professional charged with the task of assessing older individuals. Some of the chapters from these volumes that directly address the topic of assessment plus some other works are briefly summarized below.

Gallagher et al. (1980) outline specific recommendations for clinical assessment with special emphasis on the situational context surrounding the presented problems. The skilled clinician must be able to structure the clinical assessment according to the presenting problems of the client, taking into account any relevant contextual factors that affect the client's responses to the assessment situation as well as the patient's needs. The authors provide a list of brief screening devices useful in differentiating between organic and functional psychoses, as well as a description of some multidimensional batteries.

Aker et al. (1977) have compiled a comprehensive handbook dealing with the assessment and treatment of brain-damaged individuals. While this handbook is specifically targeted to professionals involved in courtroom procedures, it is useful for any practitioner who deals with older clients. A special feature of this handbook is annual supplements that update the material in the volume.

Another valuable source book for the interviewer is a compendium of instruments and measurement scales used with the elderly (Peterson et al., 1980). The compendium is arranged according to construct area with a critical review of the various instruments available in that area, followed by a list of the instruments and references. A number of the 33 construct areas reviewed are pertinent to assessment of older persons, for example, tests of intellectual ability, scales of kinship relations, and scales of friends, neighbors, and confidants.

Butler and Lewis (1977) provide a detailed description of the various stages of clincal assessment, beginning with the importance of establishing rapport and an atmosphere of confidentiality. They go on to recommend that the older patient be given "multiple evaluations," that is, evaluations spanning everyday functioning, medical as well as psychiatric symptoms, the home environment, and community sources of support. Their chapter on assessment includes an extensive personal data form, a psychiatric assessment checklist, and a mental status examination. They suggest using a mirror and self-drawings to elicit feelings about growing older, and include a section on commonly misdiagnosed or overlooked problems in elderly clients.

Pfeiffer (1980) outlines many of the common barriers to communication during the clinical interview of an older individual and provides a number of helpful suggestions for improving communication in this setting. He recommends comprehensive assessment of the individual's

present social functioning and an evaluation of the extent of the patient's social network and social support system.

In a different chapter of the same volume, Wang (1980) describes the laboratory procedures available for assessing structural and physiological changes in the aging brain, including X-rays, air encephalography, electroencephalography, cerebral angiography, cerebral blood flow, echoencephalography, and computerized tomography.

Schaie and Schaie (1977) provide a comprehensive summary of the clinical assessment of older people, reviewing the relevant literature through 1975. They discuss the multiple situations in which clinical assessment of older adults might be required and the many factors that may bias the results from the assessment. They also provide an overview of the many instruments available for clinical assessment with older patients. This chapter is especially well suited for the professional seeking a broad-scope review of the issues surrounding geriatric clinical assessment.

Specific topics of clinical assessment are discussed in greater depth in the volume edited by Storandt et al. (1978). One entire section of this volume is devoted to cognitive assessment in the geriatric clinical setting and another section is devoted to personality assessment. Information is provided about two important topics often not included in general texts for the gerontologist, alcoholism and psychosomatic complaints.

INTERVIEWING TECHNIQUES

Psychiatric Status Interviews

Psychiatric status interviews are structured or semistructured protocols designed to differentiate between organic and functional psychoses by ruling out gross cognitive dysfunction. There are several brief screening interview procedures available, generally containing only about 10 questions and requiring under 10 minutes for administration. The most widely used psychiatric status interview is the 10-item Mental Status Questionnaire (MSQ) (Kahn et al., 1960). Gurland (1980) describes the development of the MSQ and reviews the research that has established the reliability and validity of the MSQ. Some of the longer and more recently developed psychiatric status interviews are discussed below.

Gilleard and Pattie (1977) shortened the Stockton Geriatric Rating Scale (Meer and Baker, 1966) to an 18-item instrument by eliminating

items with low interrater reliability, as well as items of limited applicability. The 18 items include six related to physical disability, five related to apathy, five related to social disturbances, and two related to communication difficulties. (The correlation between the original and the shortened version was 0.97.) British normative data were obtained from a sample of 400 acute and nonacute psychiatric patients over the age of 60.

The Clifton Assessment Schedule (CAS; Pattie and Gilleard, 1976) is a longer psychogeriatric assessment procedure designed for the differential diagnosis among acute elderly psychiatric patients. It contains three sections, including Information/Orientation, Mental Ability and Psychomotor score, and the Stockton Geriatric Rating Scale. Two separate validation studies have shown that the Information/Orientation section provides the best predictive validity in the individual case, while the Mental Ability section appears to be of minimal value in differentiating functional from organic disorders.

The Geriatric Mental Status interview (GMS; Gurland et al., 1976) is designed to be a brief but thorough instrument, requiring less than one hour to administer. The length of the instrument varies from 100 to 500 questions, depending on whether the interviewee introduces certain topics which require further probing. In addition, the interviewer is required to make about 500 ratings of the patient based on observations.

The ability of the GMS to differentiate between organic and functional disorders was tested cross nationally in New York and in London (Fleiss et al., 1976). When a discriminant function analysis was computed in each sample using derived factor scores as the independent variables, separation of organically and functionally impaired individuals was achieved with almost 100 percent accuracy. On cross validation (e.g., applying the discriminant function derived from the New York sample to the London sample) the overlap between functional and organic patients was greater, but there was still a significant difference between groups on discriminant function scores.

Many of the brief screening devices for older adults are heavily loaded with memory items. Hare (1978) has suggested that overemphasis on memory skills may increase the risk of misdiagnosing dementia. She found that memory items on a checklist (the Kew test; McDonald, 1969) did not constitute a good predictor of response to treatment (and thus of organic brain syndrome). Items related to aphasia and parietal signs proved to be better predictors of outcome measured six months after initial admission.

Broad-range Interview Assessments. During the past five years, at

least two multidimensional batteries have been developed for assessment of the community elderly. They are designed to evaluate the older individual's level of functioning across psychological, self-care, and social dimensions.

The Older Americans Resources Services Questionnaire (OARS; Pfeiffer, 1975a,b) grew out of the longitudinal studies of aging at Duke University. It measures functioning across five dimensions—social and economic resources, mental health, physical health, and activities of daily living. It is in wide use in both research and service-delivery situations.

A much more extensive interview protocol—the Comprehensive Assessment and Referral Evaluation (CARE)—was developed by Gurland et al. (1977). In order to standardize administration of this instrument, a semistructured interview guide is provided, which consists of a series of questions that the interviewer reads. The interview is lengthy, usually requiring about an hour and a half to complete, and includes a standard set of questions asked of each interviewee, as well as contingent questions asked only when a particular topic requires additional probing. However, the interview protocol requires only one session to complete. The CARE contains four classes of items: self-report items, test items of rudimentary cognitive and memory skills, observation items based on the interviewee's behavior and affect during the interview, and global judgments made by the interviewer based on information gathered throughout the interview. Severity of a symptom is judged according to the degree of distress or disability it causes. The CARE is a versatile instrument because it can be administered by any trained health service professional or paraprofessional. It is particularly well suited to a multidisciplinary team approach.

A brief screening procedure can *never* justify a diagnosis of organic brain syndrome but, rather, can be used only to rule out such a diagnosis. When dementia is suspected, the importance of obtaining a thorough medical examination to rule out treatable cause cannnot be overemphasized (Steel and Feldman, 1979; Yesavage, 1979). Some of the treatable conditions that can produce behavior mimicking dementia include endocrinopathies, reactions to medication, salt and water imbalances, brain lesions, vitamine B_{12} deficiency, diseases of the heart and lungs, infectious diseases, as well as affective disorders and environmental changes. Victoriatros, Lenman, and Herzberg (1977) describe a study in which 52 suspected dementia patients were fully examined for the presence of a treatable condition. Five of these 52 individuals were found to have potentially treatable disorders. Furthermore, age per se was not predictive of a verifiable diagnosis of dementia; two of the five treatable cases were over the age of 65.

Psychodynamic Interviews

The psychodynamically oriented interview places emphasis on the intrapsychic processes of the individual and the historical development of the problem or condition that created the necessity for assessment. In the clinical setting, where the interview is likely to be unstructured, Robinson (1975) suggests two general guidelines for assessment. First, it is important to let the older patient establish his or her own pace for the interview. Second, Robinson notes that even irrelevant digressions by the patient are useful because they enable the assessor to note the patient's spontaneous thought and/or preoccupation.

Phenomenological-existential Interviews

An interview approach that focuses on the individual's self-perception in relationship to his or her own experience and to other people has been used by Schmitz-Schertzer and Thomae (1982) as part of their extensive (requiring two and a half days to one week for completion) assessment protocol. Their concern with self-perceptions about one's role in life stems from the cognitive theories of personality that emphasize behavior as an outcome of the perceived situation. Since this was a developmental longitudinal study, intra-individual change over time in perceived self was the variable of primary interest. A structured interview was used to elicit subjects' feelings about their respective roles in current life events and in events they recall from various time points in their past, including childhood. Historical occasions of social and economic consequence were used as reference points to trigger recall of circumstances and feelings in young and middle adulthood.

NEUROPSYCHOLOGICAL ASSESSMENT

The goal of neuropsychological assessment is to utilize cognitive test performance to detect the presence of cerebral damage. Its further purpose in a clinical setting is to lead to inferences about how successfully the individual will be able to function in his or her day-to-day environment.

On the simplest level, the brief psychiatric screening interviews discussed earlier are examples of neuropsychological tests. Presumably, the inability to answer correctly several simple questions or per-

form simple cognitive exercises flags some sort of brain dysfunction. As was emphasized earlier, these brief screening devices are appropriately used only to rule out gross organic brain syndrome. If the results from use of such an instrument point toward organic dysfunction, then the patient is generally referred for further medical, neurological, and neuropsychological testing.

Price et al. (1980) provide a dramatic illustration of the potential consequences of using neuropsychological tests standardized on a younger sample. They administered the WAIS and the Halstead-Reitan battery to a group of superior-functioning, highly educated older adults. On the WAIS, an age-corrected score differential in which the score for the verbal portion of the test is 10 or more points higher than the score for the performance portion of the test supposedly signals brain dysfunction. Although norms for the WAIS are available for the upper age brackets, Price et al. (1980) conclude that the normative data for the performance score are upwardly biased since every member of their superior-functioning sample demonstrated an age-corrected verbal–performance score differential exceeding 10 points.

Similarly, on the Halstead-Reitan battery, the proportion of subjects from the highly select sample scoring below the cutoff criterion for cerebral dysfunction ranged from 20 to 40 percent for the various subtests. Kesler (1979) reported that the Halstead-Reitan battery discriminated between brain-damaged and non-brain-damaged older persons with only 61 percent accuracy.

Klisz (1978) clarifies some of the issues related to separating age deficits from performance deficits associated with brain damage. First, she notes that age-related performance decline on the Halstead-Reitan battery is qualitatively different from performance decline associated with brain damage. There is one interesting exception to this general observation, however. Performance patterns of older persons without diagnosed brain damage is somewhat similar to performance patterns of younger persons with right hemisphere damage, leading one to speculate that "normal" later life cerebral changes are more pronounced in the right hemisphere. Klisz also points out that when brain damage is present in an older individual it tends to obscure age-related deficits. That is, the correlation between age and level of impairment on the Halstead-Reitan subtests is higher in normal older people than in older people diagnosed as brain-damaged. Knowledge of these findings may reduce the probability of mislabeling subjects in a research study. In the individual assessment situation, however, the risk of misclassification is high because of the absence of accurate age norms.

Thus, neuropsychological assessment of older persons provides only one tool—which must interpreted cautiously—within a multifaceted assessment approach.

PSYCHOPHYSIOLOGICAL ASSESSMENT

Electrocortical assessment is an evolving field in which new knowledge is being added steadily, if slowly. As is true in all areas of gerontology, a vast body of data describing normal age differences in electrocortical functioning as well as normative data from predefined pathological groups must be accumulated if this type of assessment is to become a generally useful and flexible tool in the assessment of older adults. Even at the present state of the art, however, some forms of electrocortical assessment provide a useful adjunct to other assessment procedures.

Marsh and Thompson (1977) have suggested that substantial diffuse slowing of the EEG is an indication of senile brain disease. This position is corroborated by Müller (1977), who compared EEG records obtained during the last year of life with autopsy reports in 100 older patients. He found that the intensity of the EEG slowing correlated positively with the degree of brain atrophy found at autopsy. Furthermore, the correlation was even higher between intensity of diffuse slowing and the amount of plaque and tangle formation. This suggests the possibility of a functioning relationship between diffuse EEG slowing and the causes of chronic brain disease.

There is some indication that the EEG coherence values provide useful information for clinical diagnostic purposes. Coherence is a measure of the synchronization of brain wave activity regulated by the cortex. O'Connor et al. (1977) found that coherence values were superior to conventional power measures in discriminating between three groups of older subjects, previously classified as having senile dementia, arteriosclerotic dementia, and depressive reaction.

Evoked potentials (EP) also provide clinically relevant information. The "endogenous" EPs are thought to underlie cognitive process, and the P3 component is the most pronounced endogenous EP. Squires et al. (1980) report 80 percent accuracy in classifying demented patients based on the endogenous P3 component of the auditory EP. While the latency of the P3 component increases as a function of normal aging, the increase in latency is substantially greater among older persons with dementia.

An excellent review of electrocortical assessment for clinical purposes is provided by Michalewski et al. (1980). They first outline the EEG changes that accompany normal aging and then describe the EEG patterns characteristic of various diagnostic subgroups including Alzheimer's-type dementia, cerebrovascular-type dementia, and focal lesions. They next describe normal age changes with respect to evoked potentials (EP) and then elaborate on the small body of clinical research utilizing EPs. In conclusion, they emphasize the value of combining EP results with EEG patterns to improve diagnostic accuracy. They further recommend a paradigm advocated by John (1977) in which various measures of brain activity are factor analyzed along with scores from psychometric instruments.

ASSESSMENT OF INTELLECTUAL FUNCTIONING

Distinguishing Between Decrement and Obsolescence

The gerontological clinician attempting to assess cognitive functioning in the older adult must be aware of how difficult it is to differentiate decrement from obsolescence. While in theory this task is not insurmountable, in practice there have been few advances that would aid the psychometrist in separating generation-based differences from genuine age decline. Furthermore, this situation will not be improved until psychologists undertake the tedious assignment of collecting normative data from representative samples of older subjects on many different instruments and begin to determine valid criteria against which to standardize intellectual performance.

Two decades of research conducted by the senior author (cf. Schaie, 1982) has conclusively demonstrated significant intergenerational differences in psychometric intelligence, irrespective of age. Such differences between adjacent generations (in this case, generations are defined by seven-year aggregates) are most pronounced during the birth-years preceding and following World War I. In other words, generation-based differences have been reliably documented between those persons who today are in their mid and late 60s, and persons less than a decade younger. The source of these differences probably involves the interaction of many psychosocial and health-related forces. Although pinpointing the causal factors leading to generational shifts in cognitive performance is not central to the present discussion, the point is that a low test score for an older person may represent either a generation-based handicap, ontogenetic decline, or a combination of the two.

The powerful influence of generation membership exacerbates problems of test interpretation caused by the absence of age norms for virtually all psychometric tests of intelligence, memory, and problem solving. Most test users recognize that test results from an older person must be qualified when normative data are available only from young adults, typically college students. Indeed, the popularity of the WAIS in geriatric clinical practice is due in large part to the fact that age norms up to 67 years are available. However, the availability of age norms collected some 20 years ago does not address the issues of generation-based differences; we would expect tomorrow's 65-year-old, who has had the advantage of enhanced educational opportunities, to be far better equipped to take the WAIS than the typical 65-year-old member of the 1953 standardization sample. In such a case, the available age norms would lead us to underestimate age-related decrement. Thus, while the absence of age norms for psychological tests seriously jeopardizes the evaluation of test results, the lack of generational norms may be even more problematic in clouding the distinction between decrement and obsolescence with respect to cognitive functioning.

Evaluating test scores in an assessment situation (as opposed to a research setting) goes beyond determining whether the obtained score represents maintenance or decline in cognitive functioning. Even if the professional conducting the assessment is confident that age-related cognitive dysfunction is actually present, what is the practical significance of the depressed test performance? Most intelligence tests were created with very narrow external criteria of validation in mind: predicting school achievement or, in the case of the earliest tests designed for adults, predicting success at officers' training. Criteria for successful functioning in later life are as multifaceted as the individual's life style. Few researchers attempt to demonstrate generalized validity for cognitive instruments. In at least one exceptional case where such an effort was made, no relationship was found between a paper-and-pencil test of spatial orientation and knowledge and utilization of the neighborhood among lower-income community-dwelling older persons.

Scheidt and Schaie (1978) have approached the issue of external validity from a different perspective. Based on interviews with older persons, they derived a taxonomy of situations in which older persons must display competent behavior. Raters were able to categorize situations into four bipolar continua: common–uncommon, supportive–depriving, social–nonsocial, and active–passive. A Q-sort instrument consisting of 80 items (five prototypic situations for each of the 16 possible combinations of situational categories) was then developed and has been used to permit elderly individuals to describe their per-

ceived competence relative to the different classes of situations. This instrument may be quite useful as a criterion measure of everyday perceived competence in individuals without significant cognitive impairment. That is, a relatively brief and simple technique is provided which permits obtaining an individual's judgment on his own relative competence in handing his or her daily affairs. Current work is underway to determine the reliability of this instrument across different populations.

Estimation of Intellectual Deficit

Even in the absence of longitudinal data, it may still be possible to estimate intra-individual intellectual deficit. Schaie and Schaie (1977) reviewed the literature in which intellectual deficit is estimated by comparing performance on subtests that typically do not change significantly in old age with performance on subtests typically sensitive to age change. Such comparisons are most often made by comparing scores from the verbal and performance sections of the WAIS. However, one serious flaw with this technique is that in the face of substantial cognitive impairment on psychiatric disturbances, performance on the verbal portion of the WAIS also frequently deteriorates (Savage, 1975), a finding that would lead to a biased estimate of cognitive change.

Schaie and Schaie (1977) suggest that knowledge of the individual's previous level of occupational attainment and socioeconomic status may provide a useful index of prior cognitive functioning against which to compare the current level.

Measures Used to Assess Intelligence in the Aged

The WAIS is, by far, the most commonly used instrument for individual assessment of intelligence. It has been argued that the WAIS differentially handicaps older test takers by imposing time limits (see Botwinick, 1977). To test this notion, Storandt (1977) administered the five timed WAIS subtests with and without time limits to young and old subjects matched on verbal scores. She also permitted subjects to attempt all of the problems in the Arithmetic and Block Design subtests regardless of the number of consecutive failures. The additional time allowance resulted in improved performance among the older subjects on only one subtest—Picture Arrangement. Permitting subjects to attempt all the problems of the Arithmetic and Block Design subtests benefited only 10 percent of the older subjects. Thus, Storandt concludes that the stan-

dard cutoff times on the WAIS are as valid for the old as for the young, and that modifying the normal termination procedures on Arithmetic and Block Design would result in minimal gain for the older person.

Other than the WAIS, there are only a few intelligence tests available with age norms that are appropriate for individual assessment. Schaie and Schaie (1977) review some of these, including the Quick Test (Ammons and Ammons, 1962) and the General Aptitude Test Battery (Fozard and Nuttall, 1971).

The Kendrick battery (Kendrick, 1965) is one of the few cognitive tests designed especially for an older population. In its original form, it consisted of two parts, the Synonym Learning Test (SLT), in which subjects are taught the meaning of new words, and the Digit Copying Test (DCT), a measure of psychomotor speed.

The Kendrick battery has been revised (Gibson and Kendrick, 1976) because of the stressful nature of the Synonym Learning Test. A replacement test has been constructed that requires subjects to recall familiar objects depicted by black-and-white line drawings. Validation studies indicate that the Kendrick battery discriminates with 90 percent accuracy between demented and nondemented subjects when used in a test–retest situation (Kendrick et al., 1978, 1979).

Normative studies examining the performance on the revised Kendrick battery by elderly depressives have produced conflicting results. For the most part these differences can be explained by examining the treatment history of the subjects (Kendrick and Moyes, 1979). Tricyclic antidepressant medication and/or a lowered activity level both result in lowered performance on the Kendrick battery.

Kuriansky et al. (1976) assembled a battery of psychological tests for the assessment of cognitive impairment in elderly psychiatric patients. It included the WAIS vocabulary test (as an indication of premorbid functioning), the Digit Copying Test (DCT), the Inglis Paired Associate Learning Test (PALT) to assess short-term memory impairment (Inglis and Ankus, 1965), and the Bender-Gestalt Test. Two of the tests in the battery, the PALT and the DCT, were shown to be as predictive of the outcome of hospitalization and the patient's capacity for self-maintenance as the examining psychiatrist's diagnosis.

Assessment of Everyday Competence

Kuriansky et al. (1976) designed an objective performance test to assess the geriatric adult's capacity for self-care in terms of activities such as dressing, grooming, and eating. This instrument, the Performance Test of Daily Living (PADL), is a measure of the individual's capabil-

ity to care for himself or herself at home or as a means of assessing the extent of nursing care required if the individual is institutionalized. The PADL is a standardized kit containing props that are used for individual tasks, and it can be administered with a minimum of instructions. The successive tasks are graduated in terms of difficulty in order to reduce initial anxiety.

ASSESSMENT OF INFORMATION PROCESSING, MEMORY, AND PROBLEM SOLVING

Information Processing

Information-processing approaches to the study of mental abilities, in which performance is evaluated as attributes of a cognitive task are systematically varied, holds a great deal of promise as a technique enabling one to pinpoint accurately specific areas of cognitive dysfunction. Several studies published during the past five years have advanced our understanding of the age differences in visual information processing (Till and Franklin, 1981; Walsh, 1976; Walsh et al., 1979). This basic paradigm has not yet been applied to the problem of individual assessment, however. At a theroretical level, Sternberg (1979) has developed a four-level hierarchy of mental processing which is potentially useful for assessment purposes. However, age norms for the tasks tapping the four levels are not available, nor has the validity of the hierarchical structure been tested across the adult life span.

Psychometric Assessment of Memory Function

A plethora of studies investigating age-related memory changes have appeared in the past five years, but most of these are more pertinent to basic research in memory than to memory assessment per se. Nevertheless, memory testing is essential to any comprehensive cognitive assessment of older individuals. Memory complaints are common among older persons. Furthermore, it has been pointed out (Savage and Britton, 1968) that in factor analytic studies of intelligence in old age, memory measures tend to load on other factors of intellectual functioning rather than forming their own, independent memory factor.

Memory function in the older adult may be underestimated using traditional psychometric procedures if age-group norms are not available. Schaie and Zelinski (1979) cite several examples of cohort bias that will disadvantage an older person relative to a young, standardization sample. These factors include the use of inefficient memory strategies, lack of recent active memory practice, and low self-expectations about memory performance.

However, Harkins et al. (1979) have recently suggested that some assessment techniques for recognition memory may actually lead to an inflated estimate of memory skills in the elderly. Using techniques derived from signal detection theory to examine the impact of response bias on recognition performance, they found that elderly subjects restrict their range of decision criteria when they must indicate their degree of certainty in a test response. This in turn maximizes their number of correct recognitions, positively biasing their overall memory scores.

Schaie and Zelinski (1979) also include specific recommendations for memory assessment. In particular, they suggest including a delayed recall measure in any memory battery, developing scoring procedures that identify the types of errors made, and questioning the individual about his or her perceived level of memory functioning. Indeed, in some cases, incidental learning paradigms may prove useful in determining whether any observed memory deficit may be due to expectations of failure held by some older person. Zelinski et al. (1978) found that older depressives performed at a lower level than their nondepressive counterparts only when they were told ahead of time that they would be required to recall the stimulus items.

Arenberg (1978) recently completed a study in an area that rarely receives attention in the gerontological memory literature: memory for nonverbal material. Partitioning data from the Baltimore Longitudinal Study into three cross-sectional and two longitudinal samples enabled him to examine age changes and age differences of the Benton Visual Retention Test. From the longitudinal data, Arenberg found evidence of within-cohort age decline past the age of 50 in memory for design. Longitudinal performance deficits were pronounced for men in their 70s. Interestingly, change scores on the Benton Visual Retention Test did not correlate with the generally small-magnitude WAIS change scores, indicating that adequate cognitive assessment of older persons must be multidimensional in its approach. Arenberg provides cross-sectional and longitudinal mean error rates by age-decades for a total of 857 men spanning the adult age range.

Problem-solving Behavior

The assessment of problem-solving behaviors may be especially reveal-
ing of the individual's level of functioning if one examines the methods
used to arrive at a solution as well as the quality of the final solution.
In his extensive critical review of problem-solving behavior in the el-
derly, Rabbitt (1977) points out that we should concern ourselves "not
merely [with] the study of decrements in performance . . . [but also
with] the study of adaptation to decrements in performance" (p. 623).
The study of problem-solving behavior, with its potential for alterna-
tive solutions and qualitatively distinct methods of arriving at a solu-
tion, is probably much better suited for the study of adaptation to
declining cognitive skills than are traditional memory tests of psycho-
metric batteries designed to measure intelligence.

Giambra and Arenberg (1980) advocate using a "thinking aloud"
procedure in the evaluation of problem-solving skills. This requires the
individual to verbalize various steps undertaken in the solution of a
problem. Such a procedure could be quite useful in an assessment
situation because it would enable the geriatrician or geropsychologist
to observe the types, extent, and consistency of an older individual's
problem-solving deficits.

These authors also recommend that the individual be assessed not
on just one, but on a variety of problem-solving tasks, because of the
difficulty and inconsistency in classifying various types of problem-
solving behavior. This implies that in the individual assessment situa-
tion, performance must be evaluated on more than a single task or a
small subset of tasks in order to assess general level of problem-solving
behavior.

Hayslip and Sterns (1979) investigated the relationship between
problem solving and intelligence. They compared fluid and crystallized
intelligence (Horn and Cattell, 1967) to problem-solving skills, follow-
ing Davis's (1966) division of problem-solving tasks into two categories
based on whether the components of the task represent familiar or
unfamiliar stimuli. Contrary to their hypothesis, they were not able to
show that these two classes of problem-solving behaviors could be
accurately predicted in elderly people by knowledge of their fluid and
crystallized intelligence scores.

Recently, increasing attention has been paid to improving prob-
lem-solving behavior in older persons through training. Training proce-
dures have not traditionally been used in the assessment of cognitive
functioning but they may become a most important part of the geratri-

cian's or geropsychologist's assessment battery. The older adult's ability to benefit from training provides important clues for disentangling true cognitive decrement from obsolescence in a rapidly changing world.

A variety of intervention stategies designed to improve performance have been utilized with the elderly. In a comprehensive review of this area, Denney (1979) classifies intervention strategies into six categories: modeling, direct instruction, feedback, practice, changing response speed, and other noncognitive strategies. Although results from the various studies are inconsistent, she concludes that modeling, direct instruction, feedback, and practice have all been shown to effect at least limited improvement in the problem-solving skills of older adults.

Assessment of post-training cognitive ability has taken place on three levels (see Labouvie-Vief and Gonda, 1976; Willis and Schaie, 1981): performance on tasks identical or similar to the stimuli used during training, generalizability of the training to dissimilar tasks, and durability of the post-training effects over time.

Labouvie-Vief and Gonda (1976) reported training effects on all three levels, although the nature of the training effect differed across forms of training. Improvement in performance on actual training tasks was greatest among groups receiving cognitive-strategy or anxiety-reduction training relative to a control group who only practiced the task without any instructional training. This latter "unspecific training" group, however, achieved the highest level of performance on transfer tasks. With regard to the *durability* of training effects, the anxiety-reduction and unspecific training groups maintained the highest level of functioning on the training tasks, while the cognitive strategy-group performed the highest on post-test transfer tasks.

PERSONALITY ASSESSMENT

While a large number of personality tests are available, few studies concerning their validity for use with the aged have appeared in the gerontological literature of the past five years. Schaie and Schaie (1977) reference over 25 different personality tests in their chapter on clinical assessment.

Structured Questionnaires

Probably the best-known personality test is the MMPI, but its usefulness for older adults is somewhat questionable. In addition to its being a lengthy and fatiguing instrument, its discriminating power with respect to older persons is questionable. In two separate studies, with chronic patients in a hospital setting and with newly admitted patients in an acute treatment facility (Davis et al., 1973), it was shown that the MMPI reliably discriminated between schizophrenics and nonschizophrenics only among young patients.

Other frequently used structured questionnaires for assessment include the Cattell Sixteen Personality Factor Questionnaire (Cattell et al., 1970) and the Guilford-Zimmerman Temperament Survey (GZTS; Guilford et al., 1976). The stability of the factor structure of these instruments across time and across age has recently been examined by Costa and McCrae (1976) and by McCrae et al. (1980). Using principal component analysis, McCrae et al. were able to demonstrate the factorial invariance of the GZTS in men assessed longitudinally over a 12-year period. On the GZTS, a cluster analytic approach revealed stability over time on two dimensions, Anxiety–Adjustment and Introversion–Extroversion (Costa and McCrae, 1976). Age-related change was found for the third dimension, Openness to Experience, with young men showing the greatest receptiveness to feelings, middle-aged men to rational thinking, and older men to a combination of the two.

Personality measures in gerontological assessment have been criticized because they do not meet the necessary psychometric criteria; reliability and validity have not been demonstrated in an older population, and age-group norms are not available (Lawton et al., 1980). For these reasons, even advocates of personality tests recommend that personality measures are justifiable only when they are used in conjunction with other assessment instruments (Kahana, 1978). The gerontologist who is searching for the optimal personality measure to include in a multidimensional assessment battery will find the chapter by Lawton et al. (1980) useful. They review age developmental research on several objective and projective tests, suggesting particular instruments for specific assessment goals, while emphasizing the limitations of each measure.

Costa and McCrae (1978) review objective personality tests, organizing their discussion around construct areas rather than particular instruments. They point out that for those instruments where age

changes have been shown to be minimal such as the 16 PF (Cattell et al., 1970), it may not be inappropriate to apply norms derived from young populations.

Rating Scales

To circumvent some of the logistical problems frequently encountered in administering standard psychometric protocols to nursing-home residents, rating scales are often useful for personality assessment. Apfeldorf and Hunley (1971) administered the Adjective Checklist (ACL) to 70 older male nursing-home residents. Residents presenting disciplinary problems scored significantly higher than others on the dimensions of agressiveness and desiring change. Correlations between self- and supervisor-rated variables were rather low, probably reflecting the limited contact between supervisors and residents typical of large institutions. ACL variables did correlate significantly with vocabulary scores and education.

Lennon (1973) developed a set of rating scales for evaluating older psychiatric patients in order to reduce subjective evaluations by the rater. Subjects were observed for seven days and then rated on four-point scales on 114 items derived from existing scales and information provided by geriatric mental health workers. A principal components analysis revealed 14 factors of disability on psychic distress, extending beyond the standard profile of the geriatric patient.

Projective Techniques

It has been suggested that the Rorschach is effective for measuring senescent changes and integrity of functioning. Ames (1970) used Rorschach responses to classify older residents of a residential facility according to their level of intactness or determination of function into four subgroups: normal, intact presenile, medium presenile, and deteriorated presenile (see also Ames, 1974). She also administered the Incomplete Man Test, the Bender Gestalt (Bender, 1946), Monroe's Visual Screening Test (Monroe, 1934), and the Color Tree test. Group differences among the four subgroups on all of the tests were significant at the 0.001 level, supporting the contention that the Rorschach has a modicum of differential diagnostic validity. While there was considerable individual variability on the various subtests, consis-

tency in rank order of scores was found across tests within various subgroups.

Panek et al. (1978) administered the Hand test to 175 community-dwelling women, ranging in age from 17 to 72. Protocols were scored by a different experimenter blind to the age of the respondent. Twelve of the 26 Hand test variables yielded significant differences between age groups. The direction of these differences was consistent with past investigations into age differences in response to projective tests: the aging personality was characterized by signs of constriction, social withdrawal, and rigidity. The authors note, however, that criteria typically used for the detection of personality deterioration may not be appropriate in assessing older adults.

The Gerontological Apperception Test (GAT) was designed to elicit more themes relevant to age-related loss, such as loss of sexuality, loss of attractiveness, physical limitations, family difficulties, and dependency (Wolk and Wolk, 1971). However, in a study comparing older adults' responses to the GAT and the Thematic Apperception Test (TAT), the GAT was superior to the TAT in eliciting themes of loss in only one of these areas, physical limitations. The two tests evoked an approximately equivalent number of stories related to dependency and family difficulties. In addition, there were no appreciable differences between the instruments in narrative style or involvement of the subjects in their stories.

Similar results were reported by Pasewark et al. (1976). They administered the GAT and TAT to young, middle-aged, and old-old adults matched by occupational levels. Protocols were analyzed across three dimensions: major theme of the story, outcome, and general mood. The only significant differences between the two instruments were that, across all age groups, the TAT elicited more themes of conflict and was characterized by an unhappy tenor, while the GAT produced more stories about physical limitations and stories with an aging emphasis.

Demonstrating suitable reliability and validity proportions of projective personality tests seems to be impossbile, leading some (Lawton et al., 1980) to conclude that projective instruments are of limited usefulness. However, Kahana (1978) points out that the skilled interviewer can learn much about the individual's self-concept and system of values, based on his or her responses to an ambiguous stimulus. Projective tests designed especially for the elderly do not appear to be superior in eliciting items related to age-relevant issues (Fitzgerald et al., 1974; Panek et al., 1978).

SOME CONCLUDING THOUGHTS

Arguments have been presented in this chapter to show why psychological assessment with elderly clients is alive and well and is likely to assume increasing importance for the clinician of the future. Our review of the literature, however, suggests that the development of assessment techniques specifically designed for our target population has been slow and painful. Proper normative data are still lacking for many of the more popular techniques. Test publishers seem not yet aware of the very substantial market that would open if such norms, some of which undoubtedly are already available in research files, could be made available to practitioners. Pressures for such efforts will increase as change in retirement laws and disability provisions regarding older individuals begin to require assessment of ability and personality. Needs for educational and vocational counseling for older persons will increase as provisions of the social security laws change, leading to more elders working, and educational institutions begin to pay greater attention to the substantial market of older learners. Futher impact upon clinicians is also likely as a consequence of the American Psychological Association's recent Boulder conference on training of psychologists working with the aged.

What is called for then is a renewed effort to apply our knowledge base, and the many methodological advances seen in the recent past, to the development of ecologically valid and socially pertinent instruments that can answer the kind of assessment questions raised in this chapter. With the increasing sophistication of psychometric scientists regarding developmental issues and the requirements of special populations, there is hope that we will see some high-quality developments in the next decade. It will be up to the geropsychologist to lead the way and to make sure that we learn from rather than repeat the mistakes made in the development of assessment techniques for younger target groups.

REFERENCES

Aker, J. B., Walsh, A. C., and Beam, J. R. *Mental capacity: Medical and legal aspects of the aging.* Colorado Springs: Shepard's Inc., 1977.

Ames, L. B. Projecting the future of a projective technique. *Journal of Projective Techniques and Personality Assessment,* 1970, *34,* 359–365.

Ames, L. B. Calibration of aging. *Journal of Personality Assessment,* 1974, *38,* 507–529.

Ammons, R. B., and Ammons, C. H. The Quick Test: Provisional Manual. *Psychological Reports,* 1962, *11,* 111–161.

Apfeldorf, M., and Hunley, P. J. The adjective check list applied to older institutionalized men. *Journal of Personality Assessment,* 1971,*35,* 457–462.

Arenberg, D. Differences and change with age in the Benton Visual Retention Test. *Journal of Gerontology,* 1978, *4,* 534–540.

Bender, L. *Visual Motor Gestalt Text.* New York: American Orthopsychiatric Association, 1946.

Birren, J. E., and Renner, V. J. Research on the psychology of aging: Principles and experimentation. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977, pp. 3–38.

Birren, J. E., and Schaie, K. W. *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977.

Birren, J. E., and Sloane, R. B. *Handbook of mental health and aging.* Englewood Cliffs, N.J.: Prentice-Hall, 1980.

Botwinick, J. Disinclination to venture response versus cautiousness in responding: Age differences. *Journal of Genetic Psychology,* 1969, *115,* 56–62.

Botwinick, J. Intellectual abilities. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977, pp. 580–605.

Busse, E. W., and Blazer, D. G. *Handbook of geriatric psychiatry.* New York: Van Nostrand Reinhold, 1980.

Butler, R. N., and Lewis, M. I. *Aging and mental health.* St. Louis: C.V. Mosby Co., 1977.

Cattell, R. B., Eber, H. W., and Tatsuoka, M. M. *Handbook for the Sixteen Personality Factor Questionnaire (16-PF).* Champaign, Ill.: Institute of Personality and Ability Testing, 1970.

Costa, P. T., and McCrae, R. R. Age differences in personality structure: A cluster analytic approach. *Journal of Gerontology,* 1976, *31,* 564–570.

Costa, P. T., and McCrae, R. R. Objective personality assessment. In M. Storandt, I. C. Siegler, and M. F. Elias (Eds.), *The clinical psychology of aging.* New York: Plenum Press, 1978, pp. 119–143.

Davis, G. A. Current status of research and theory in human problem solving. *Psychological Bulletin,* 1966, *66,* 36–54.

Davis, W. E., Mozdzierz, G. J., and Macchitelli, F. J. Loss of discriminative "power" of the MMPI with older psychiatric patients. *Journal of Personality Assessment,* 1973, *37,* 555–558.

Denney, D., Kole, D. M., and Matarazzo, R. G. The number of symptoms reported by patients. *Journal of Gerontology,* 1965, *20,* 50–54.

Denney, N. W. Problem solving in later adulthood: Intervention research. In P. B. Baltes and O. B. Brim, Jr. (Eds.), *Life-span development and behavior* (Vol. 2). New York: Academic Press, 1979, pp. 38–67.

Fitzgerald, B. J., Pasewark, R. A., and Fleisher, S. Responses of an aged population on the Gerontological and Thematic Apperception Tests. *Journal of Personality Assessment,* 1974, *38,* 234–235.

Fleiss, J., Gurland, B., and Des Roche, P. Distinctions between organic brain syndrome and functional psychiatric disorders: Based on the geriatric mental state interview. *International Journal of Aging and Human Development,* 1976, *7,* 323–330.

Fozard, J. L., and Nuttall, R. L. General Aptitude Test battery scores for men differing in age and socioecomonic status. *Journal of Applied Psychology*, 1971, *55*, 372–379.

Gaitz, C. M. Mental disorders: Diagnosis and treatment. In E. W. Busse (Ed.), *Theory and therapeutics of aging*. New York: Medcom Press, 1973.

Gallagher, D., Thompson, L. W., and Levy, S. M. Clinical psychological assessment of older adults. In L. W. Poon (Ed.), *Aging in the 1980s*. Washington, D.C.: American Psychological Association, 1980, pp. 5–18.

Giambra, L. M., and Arenberg, D. Problem solving, concept learning, and aging. In L. W. Poon (Ed.), *Aging in the 1980s*. Washington, D.C.: American Psychological Association, 1980, pp. 253–259.

Gibson, A. J., and Kendrick, D. C. The development of a visual learning test to replace the SLT in the Kendrick Battery. *Bulletin of the British Psychological Society*, 1976, *29*, 200–201.

Gilleard, C. J., and Pattie, A. H. The Stockton Geriatric Rating Scale: A shortened version with British normative data. *British Journal of Psychiatry*, 1977, *131*, 90–94.

Guilford, J. S., Zimmerman, W. S., and Guilford, J. P. *The Guilford-Zimmerman Temperament Survey handbook: Twenty-five years of research and application*. San Diego: Robert R. Knapp, 1976.

Gurland, B. J. The assessment of the mental health status in older adults. In J. E. Birren and R. B. Sloane (Eds.), *Handbook of mental health and aging*. Englewood Cliffs, N.J.: Prentice Hall, 1980, pp. 671–700.

Gurland, B., Copeland, J., Sharpe, L., and Kelleher, M. The geriatric mental status interview (GMS). *International Journal of Aging and Human Development*, 1976, *7*, 303–311.

Gurland, B., Kuriansky, J., Sharpe, L., Simon, R., Stiller, R., and Birkett, P. The comprehensive assessment and referral evaluation (CARE)—Rationale, development, and reliability. *International Journal of Aging and Human Development*, 1977, *8*, 9–42.

Hare, M. Clinical check list for diagnosis of dementia. *British Medical Journal*, 1978, *2*, 266–267.

Harkins, S. W., Chapman, C. R., and Eisdorfer, C. Memory loss and response bias in senescence. *Journal of Gerontology*, 1979, *34*, 66–72.

Hayslip, B., and Sterns, H. L. Age difference in relationships between crystallized and fluid intelligence and problem solving. *Journal of Gerontology*, 1979, *34*, 404–414.

Horn, J. L., and Cattell, R. B. Age differences in fluid and crystallized intelligence. *Acta Psychologica*, 1967, *26*, 107–129.

Inglis, J., and Ankus, M. N. Effects of age on short-term storage and serial rote learning. *British Journal of Psychology*, 1965, *56*, 183–195.

John, E. R. *Neurometrics: Clinical applications of quantitative electroencephalography* (Vol. 2). New York: John Wiley, 1977.

Kahana, B. The use of projective techniques in personality assessment of the aged. In M. Storandt, I. C. Siegler, and M. F. Elias (Eds.), *The clinical psychology of aging*. New York: Plenum Press, 1978, pp. 145–180.

Kahn, R. L., Goldfarb, A. I., Pollack, M., and Peck, A. Brief objective measures for the determination of mental status in the aged. *American Journal of Psychiatry*, 1960, *117*, 326–328.

Kendrick, D. C. Speed and learning in the diagnosis of diffuse brain damage in

elderly subjects: A Bayesian statistical approach. *British Journal of Social and Clinical Psychology*, 1965, *4*, 141–148.

Kendrick, D. C., Gibson, A. C., and Moyes, I. C. A. The Kendrick battery: Mark II. *Bulletin of the British Psychological Society*, 1978, *31*, 177–178.

Kendrick, D. C., Gibson, A. C., and Moyes, I. C. A. The revised Kendrick battery: Clinical studies. *British Journal of Social and Clinical Psychology*, 1979, *18*, 329–340.

Kendrick, D. C., and Moyes, I. C. A. Activity, depression, medication and performance on the revised Kendrick battery. *British Journal of Social and Clinical Psychology*, 1979, *18*, 341–350.

Kesler, M. S. The relationship of age to the neuropsychological differentiation of brain damage. *Dissertation Abstracts International*, 1979, *39*, 4037-B.

Klisz, D. Neuropsychological evaluation in older persons. In M. Storandt, I. C. Siegler, and M. F. Elias (Eds.), *The clinical psychology of aging*. New York: Plenum, 1978, pp.71–96.

Kuriansky, J., Gurland, B., and Cowan, D. The usefulness of a psychological test battery. *International Journal of Aging and Human Development*, 1976, *7*, 331–342.

Labouvie-Vief, G., and Gonda, J. N. Cognitive strategy training and intellectual performance in the elderly. *Journal of Gerontology*, 1976, *31*, 327–332.

Lawton, M. P., and Gottesman, L. E. Psychological services to the elderly. *American Psychologist*, 1974, *29*, 689–693.

Lawton, M. P., Whelihan, W. M., and Belsky, J. K. Personality tests and their use with older adults. In J. E. Birren and R. B. Sloane (Eds.), *Handbook of mental health and aging*. Englewood Cliffs, N.J., Prentice-Hall, 1980, pp. 537–553.

Lennon, W. J. Development of a behavior rating scale for geriatric psychiatric patients. *Dissertation Abstracts International*, 1973, *33*, 3949–3950B.

Marsh, G. R., and Thompson, L. W. Psychophysiology of aging. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging*. New York: Van Nostrand Reinhold, 1977, pp. 219–248.

McCrae, R. R., Costa, P. T., and Arenberg, D. Constancy of adult personality in males: Longitudinal, cross-sectional and times-of-measurement analyses. *Journal of Gerontology*, 1980, *35*, 887–883.

McDonald, C. Clinical heterogeneity in senile dementia. *British Journal of Psychiatry*, 1969, *115*, 267–271.

Meer, B., and Baker, I. A. The Stockton Geriatric Rating Scale. *Journal of Gerontology*, 1966, *21*, 393–403.

Michalewski, H. J., Thompson, L. W., and Saul, R. E. Use of the EEG and evoked potentials in the investigation of age-related clinical disorders. In J. E. Birren and R. B. Sloane (Eds.), *Handbook of mental health and aging*. Englewood Cliffs, N.J.: Prentice-Hall, 1980, pp. 163–191.

Miller, E. Psychological assessment. In J. E. Birren and R. B. Sloane (Eds.), *Handbook of mental health and aging*. Englewood Cliffs, N.J.: Prentice-Hall 1980, pp. 520–536.

Monroe Reading Aptitude Test. Boston: Houghton-Mifflin, 1934.

Müller, H. F. Electroencephalograms and autopsy findings in geropsychiatry. *Electroencephalography and Clinical Neurophysiology*, 1977, *43*, 516.

O'Connor, K. P., Shaw, J. C., and Ongley, C. O. The EEG and differential diagnosis in psychiatric disorders of the senium. *Electroencephalography and Clinical Neurophysiology*, 1977, *43*, 506.

Panek, P. E., Wagner, E. E., and Avolio, B. J. Differences in Hand Test response of healthy females across the life-span. *Journal of Personality Assessment*, 1978, *42*, 139–142.

Pasewark, R. A., Fitzgerald, B. J., and Dexter, V. Response of adolescent, middle-aged, and aged females on the Gerontological and Thematic Apperception Tests. *Journal of Personality Assessment*, 1976, *40*, 588–591.

Pattie, A. H., and Gilleard, C. J. The Clifton Assessment Schedule—further validation of a psychogeriatric assessment schedule. *British Journal of Psychiatry*, 1976, *129*, 68–72.

Peterson, W. A., Mangen, D. J., and Sanders, R. The development of an instrument bank: Assessment instruments and measurement scales for the study of aging and the elderly. First report AoA, Office of Human Development. HEW Contract HEW-105-76-3107. Midwest Council for Social Research in Aging. University of Missouri, Kansas City, 1980.

Pfeiffer, E. A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of the American Geriatrics Society*, 1975, *23*, 433–444. (a)

Pfeiffer, E. Multidemensional functional assessment: The OARS methodology. Durham, N.C.: Duke University, Center for the Study of Aging and Human Development, 1975. (b)

Pfeiffer, E. Psychopathology and social pathology. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging*. New York: Van Nostrand Reinhold, 1977, pp. 650–671.

Pfeiffer, E. The psychosocial evaluation of the elderly patient. In E. W. Busse and D. G. Blazer (Eds.), *Handbook of geriatric psychiatry*. New York: Van Nostrand Reinhold, 1980, pp. 275–284.

Poon, L. W. *Aging in the 1980s*. Washington, D.C.: American Psychological Association, 1980.

Price, L. J., Fein, G., and Feinberg, I. Neuropsychological assessment of cognitive function in the elderly. In L. W. Poon (Ed.), *Aging in the 1980s*. Washington, D.C.: American Psychological Association, 1980.

Rabbitt, P. Changes in problem solving ability in old age. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging*. New York: Van Nostrand Reinhold, 1977, pp. 606–625.

Robinson, R. A. The assessment center. In J. G. Howells (Ed.), *Modern perspectives in the psychiatry of old age*. New York: Brunner/Mazel, 1975.

Savage, R. D. Psychometric techniques. In J. G. Howells (Ed.), *Modern perspectives in the psychiatry of old age*. New York: Brunner/Mazel, 1975.

Savage, R. D., and Britton, P. G. The factorial structure of the WAIS in an aged sample. *Journal of Gerontology*, 1968, *23*, 183–186.

Schaie, K. W. Towards an ageless society. *Gerontologist*, 1973, *13*, 31–35.

Schaie, K. W. External validity in the assessment of intellectual functioning in adulthood. *Journal of Gerontology*, 1978, *33*, 695–701.

Schaie, K. W. Intelligence and problem solving. In J. E. Birren and R. B. Sloane (Eds.), *Handbook of mental health and aging*. Englewood Cliffs, N.J.: Prentice-Hall, 1980, pp. 262–284.

Schaie, K. W. Psychological changes from midlife to early old age: Implications for the maintenance of mental health. *American Journal of Orthopsychiatry*, 1981, *51*, 199–218.

Schaie, K. W. The Seattle Longitudinal Study: A twenty-one year exploration of psychometric intelligence in adulthood. In K. W. Schaie (Ed.), *Longi-*

tudinal studies of adult psychological development. New York: Guilford Press, 1982.

Schaie, K. W., and Parham, I. A. Stability of adult personality traits: Fact or fable? *Journal of Personality and Social Psychology,* 1976, *34,* 146–158.

Schaie, K. W., and Schaie, J. P. Clinical assessment and aging. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of aging.* New York: Van Nostrand Reinhold, 1977, pp. 692–723.

Schaie, K. W., and Zelinski, E. Psychometric assessment of dysfunction in learning and memory. In F. Hoffmeister and C. Mueller (Eds.), *Brain function in old age.* New York: Springer Verlag, 1979, pp. 134–150.

Scheidt, R. J., and Schaie, K. W. A situational taxonomy for the elderly: Generating situational criteria. *Journal of Gerontology,* 1978, *33,* 848–857.

Schmitz-Schertzer, R., and Thomae, H. Consistency and change of behavior in old age: Findings from the Bonn Longitudinal Study on Aging. In K. W. Schaie (Ed.), *Longitudinal studies of adult psychological development.* New York: Guilford Press, 1982.

Squires, K. C., Chippendale, T. J., Wrege, K. S., Goodin, D. S., and Starr, A. Electrophysiological assessment of mental function in aging and dementia. In L. W. Poon (Ed.), *Aging in the 1980s.* Washington, D.C.: American Psychological Association, 1980, pp.125–134.

Steel, K., and Feldman, G. Diagnosing dementia and its treatable causes. *Geriatrics,* 1979, *34,* 79–88.

Sternberg, R. J. The nature of mental abilities. *American Psychologist,* 1979, *34,* 214–230.

Storandt, M. Age, ability level, and method of administering and scoring the WAIS. *Journal of Gerontology,* 1977, *2,* 175–178.

Storandt, M., Siegler, I. C., and Elias, M. E. *The clinical psychology of aging.* New York: Plenum, 1978.

Till, R. E., and Franklin, L. D. On the locus of age differences in visual information processing. *Journal of Gerontology,* 1981, *36,* 200–210.

Victoriatros, G. C., Lenman, J. A. R., and Herzberg, L. Neurological investigation of dementia. *British Journal of Psychiatry,* 1977, *130,* 131–133.

Walsh, D. A. Age differences in central perceptual processing: A dichoptic backward masking investigation. *Journal of Gerontology,* 1976, *31,* 178–185.

Walsh, D. A., William, M. V., and Hertzog, C. K. Age-related differences in two stages of central perceptual processes: The effects of short duration targets and criterion differences. *Journal of Gerontology,* 1979, *34,* 234–241.

Wang, H. S. Diagnostic procedures. In E. W. Busse and D. G. Blazer (Eds.), *Handbook of geriatric psychiatry.* New York: Van Nostrand Reinhold, 1980, pp. 285–304.

Willis, S. L., and Schaie, K. W. Maintenance and decline of adult mental abilities: II. Susceptibility to intervention. In F. W. Grote and R. Feringer (Eds.), *Adult learning and development.* Bellingham: Washington University, 1981, pp. 40–57.

Wolk, R. L., and Wolk, R. B. *The Gerontological Apperception Test.* New York: Human Sciences Press, 1971.

Yesavage, J. Dementia: Differential diagnosis and treatment. *Geriatrics,* 1979, *34,* 51–59.

Zelinski, E. M., King, G., and Thompson, L. W. Orienting task recall in the depressed aged. Paper presented at the 11th International Congress of Gerontology, Tokyo, 1978.

Policy and Planning

This page intentionally left blank

Health Policy and the Aged

Philip R. Lee, M.D.
Institute for Health Policy Studies
Center for Advanced Study in the Behavioral Sciences
Stanford University
Palo Alto, California

Carroll L. Estes, Ph.D.,   Lauren LeRoy, C. Phil.,
Robert Newcomer, Ph.D.
Aging Health Policy Center
University of California
San Francisco, California

INTRODUCTION

The past two decades have witnessed a growing interest in the applica-
tion of social sciences and health services research to policy develop-
ment related to the health of the aged and health care for the aged. The
nation now faces a number of challenges concerning the provision of
health care to people 65 years of age and over. The 1960s and 1970s saw
a great expansion of policies affecting the elderly, including Medicare,
Medicaid, the Older Americans Act, Supplemental Security Income,
and Title XX (Social Services) of the Social Security Act. But, despite
the critical contributions of these programs to the welfare of the elderly,
public policies and programs have not alleviated the plight of millions of
the aged. In addition, the costs of social programs are rising rapidly, and
fiscal pressures are mounting throughout all levels of government.

Many studies have been made during the past decade that bear on policy issues relating to health policies and the aged. In this review, we will look at the available data with a view toward research findings that can be applied directly to issues with which policymakers are wrestling today. The translation of basic and applied research into policy, however, is not simple. The generation of basic information and data about aging, the elderly, health, and health care is not sufficient to assure appropriate application to policy choices in Congress and the executive branch, in state and local government, or by key policymakers in the private sector (e.g., Blue Cross). Such information must be analyzed in relation to other studies, the information from a variety of sources synthesized, and the policy implications identified. Then the information must be made available directly to the policymakers. The translation of basic information through these analytic stages and its dissemination to policymakers is an essential adjunct of research if it is to be useful to decision makers.

A number of major books, reports, and articles address the issues of health and older Americans that are of importance to scholars, policymakers, and the elderly themselves: the review of Shanas and Maddox, "Aging, Health and the Organization of Health Resources" (1976); Butler's book, *Why Survive? Being Old in America* (1975); Estes' examination of policies and programs for the elderly, *The Aging Enterprise* (1979); Ball's analysis of Social Security, *Social Security Today and Tomorrow* (1978); Shanas' report to the Administration on Aging, *National Survey of the Aged* (1980); the U.S. Congressional Budget Office reports, *Long Term Care for the Elderly and the Disabled* (1977) and *The Share of Federal Expenditures for the Elderly* (1978); the Surgeon General's report, *Healthy People* (U.S. Department of Health, Education, and Welfare, 1979b); *The Nation's Health* Lee et al., 1981); and *Vitality and Aging* (Fries and Crapo, 1981). A recent issue of *Generations* (1980) was devoted entirely to the subject of aging and health policies.

In recent years, research and analysis have expanded greatly the understanding of factors affecting health, particularly the importance of life style and social factors (Breslow and Enstrom, 1980; Caplan, 1964; Dubos, 1979; Hamburg and Killilea, 1979; McKeown, 1976; Paffenbarger et al., 1978; Syme and Berkman, 1976); the factors affecting the status of the elderly in society (Butler, 1975; Butler and Newacheck, 1981; Estes, 1979; U.S. House of Representatives, Select Committee on Aging, 1977); the use of health services (Aday and Andersen, 1975; Davis and Schoen, 1978; Kovar, 1977; U.S. Department of Health, Education, and Welfare, National Center for Health Statistics,

1977–1980; U.S. Department of Health and Human Services, Health Care Financing Administration, 1980a); the dominant role played by the physician in controlling demand for health services and in the allocation of resources for care, particularly for the aged (Enthoven, 1980; Reinhardt, 1977); the impact of public perceptions on public policy for the elderly (Butler, 1975; Edelman, 1977; Estes, 1979; Mechanic, 1972); and , finally, the impact of public policies on the status of the elderly, including their health status (Ball, 1978, 1980; Clark et al., 1978; Lee, 1980; Lee and Estes, 1979a, 1979b; Paringer et al., 1979).

In this review we will examine studies published primarily since the mid-1970s and consider the implications of this research for public policy. We begin with an examination of the changing concepts that are the foundation of aging and health policies. We will also discuss the policy issues that we believe will dominate the health policy agenda for the 1980s: the health care system and how the present organization and payment system contribute to rapidly rising costs; the role of Medicare and Medicaid in meeting the needs of the elderly and in contributing to the rising costs of care; the impact of public policies on long-term care, including medical and social services; and the more general policy problems of decentralization and fiscal crisis.

CONCEPTS OF AGING, THE AGED, AND AGING POLICIES

Three important studies since 1975 have helped shape the understanding of aging, the status of the aged in society, and the impact of public policies on the aged (Butler, 1975; Estes, 1979; Fries and Crapo, 1980). Studies of aging indicate that the elderly exist in an inhospitable and often hostile environment. Behind this lies a multiplicity of myths, stereotypes, prejudices, and biases about old age. Butler points out that it is erroneous to measure age by the number of years one has lived. Physiological aging varies vastly among individuals, as do social and psychological characteristics. "Aging refers to patterns of late-life changes which are eventually seen in all persons but which vary in rate and degree" (Butler, 1975). Thus, aging is a complex system of interrelated processes, cells, organs, and tissues that change at different rates in different people.

"Ageism" is discrimination against old people based on the kinds

of prejudice and stereotyping that exist in racism and sexism. It is manifested in policies and social attitudes that ignore the plight of the aged. The thinking that justifies these policies and attitudes is based on the notion that old people are different from the young, that they are inferior, inevitably senile, feeble, rigid, foolish, and generally deteriorated physically and mentally. According to Butler, "Ageism, like all prejudices, influences the self view and behavior of its victims. The elderly tend to adopt negative definitions of themselves and to perpetuate the very stereotypes directed against them, thereby reinforcing society's beliefs" (Butler, 1975).

In addition to his critically important contribution on the concept of ageism and its impact on the elderly, Butler addresses the full range of social, economic, cultural, and biological factors affecting the elderly. His study, *Why Survive? Being Old in America*, provides a framework for current research and analyses.

The recent synthesis and conceptual contribution to the understanding of aging and health by Fries and Crapo (1981) is also valuable. In their book, *Vitality and Aging*, they marshall evidence relating to human survival and the prospects for human health in the decades ahead. The authors suggest that a limited life span of 85 years is a fixed biological constant. They argue that death will occur naturally at or about this age. Evidence is discussed suggesting that premature death through accident and disease can be reduced further than it has been already, but the extension of life must end at a natural limit to the life span.

Fries and Crapo stress that the most fundamental shift in health trends is the decline in acute infectious illness and the onset of chronic illness and accidental and violent death. "Survival from the illnesses which used to kill early in life allowed the illnesses which occur later in life to apparently increase in frequency." With chronic disease as the major cause of death today, the authors say that "most remaining 'premature death' is concentrated in years over 60. . . ." Thus, major improvements in health will require that we delay the progress of chronic diseases through removal of the risk factors associated with them. This is the strategy that can change the process of human aging.

Fries and Crapo attribute much of the current burden of illness and disability to the premature onset of chronic disease and to death and disability due to accidents. Individual life style and thus individual choice are emphasized as of major importance in preventing or delaying the onset of chronic illness. If the advent of chronic illness is postponed, the period of a vigorous life is extended right up to the point where a brief illness ends life. Thus, the implications for the elderly are that the improvement of physical, mental, and social functioning lie "within very broad biological limits." Self-improvement is

the key and continues to be possible even late in life. "Death is inevitable. But the life which precedes it may be changed." Fries and Crapo state that the maximum life span can be fixed at about 100 years and the median life span at about 85. Should their hypothesis prove correct, the implications for the elderly and society are profound.

Schatzkin (1980) expresses a different view about life span and life expectancy. While he argues that major gains in life expectancy are possible through life style changes, such as reduction in animal fat intake and cigarette smoking, and through effective medical treatment of disease, he believes that the life span will be extended as well. In Schatzkin's view, "the precise biological upper limit to life will remain elusive, but prolongation of life is statistically and biologically possible."

In *The Aging Enterprise*, Estes (1979) examines the four major social theories of aging—disengagement, activity, developmental, and symbolic interactionist theories—and outlines their limitations as effective tools for policy analysis. She argues that it is not biological and psychological processes that determine the role and status of the aged. Instead, it is politics and economics (and the social policies that flow from them) that determine the quality of life in old age.

Politics, economics, and social structure strongly influence how we think about aging and the aged, and thus they determine the resources and opportunities we allocate to this segment of the population. What is done for and about the elderly, as well as what we know about them, are products of our conceptions of aging.

The most important conceptions of aging that influence U.S. policies are described as follows: (1) older people are defined as a "social problem"; (2) old people are seen as special and different, requiring special or different programs (supporting separatism of the aged via major income, health, and social services policies); (3) the problems of older persons are thought of as individually generated and as best treated through the provision of services (largely medical services) at the individual level; and (4) old age tends to be characterized as a period of inevitable physical decline, validating a biomedical problem definition and the application of costly medical services (Estes, 1979).

These conceptions obscure an understanding of the social genesis of the status of the elderly in our society. Equally significant, such conceptions have fostered an old age policy structure (e.g., Medicare, Medicaid, Title XX Social Services, and the Older Americans Act) predicated on the notion that treating individuals is the way to treat "the problem" of aging. The dominant conception is that services, not income or employment, can solve "the problem."

The "medicalization of aging" legitimates current public policies that pay for high-cost, technology-based medical services for older

individuals and limits the range of policy solutions addressed to the extremely significant role of social and economic factors in the health and physical decline of the elderly.

CHANGING CONCEPTS OF HEALTH
AND HEALTH POLICY

Due in great part to the work of Dubos (1979), McKeown (1976), and Belloc and Breslow (1972), there is growing emphasis on the importance of the environment, social factors, and life style as major determinants of health status. This growing knowledge is receiving increasing attention by policymakers. The pioneering work of Dubos in enlarging the understanding of man's adaptation to his social and physical environment opened the doors to this new understanding of old ideas. McKeown pointed out the role of improved nutrition, changing personal habits, and sanitation in the marked improvements in health status during the past 150 years. He questioned the overemphasis that had been placed on medical care in improving health status.

A small group of epidemiologists, including Cassel (1976), Berkman and Syme (1979), Paffenbarger et al. (1978), MacMahon and Pugh (1970), and Hulley (1978), have added significantly to the understanding of risk factors in chronic disease, of the role of personal habits, and of the importance of social factors in relation to health and disease.

Translating these research findings into public policy and into changes in behavior has already begun. In the 1960s health policy was dominated by an emphasis on medical care—the need to provide it, to pay for it, to generate resources, and to create the knowledge base to improve it. Relatively little emphasis was placed on environmental and social factors, and despite the importance of the Surgeon General's report on smoking and health (U.S. Department of Health, Education, and Welfare, 1964), a coherent set of policies for prevention and health promotion did not emerge until the late 1970s.

In 1974, the Canadian Minister of Health and Welfare issued a landmark report, *A New Perspective on the Health of Canadians* (LaLonde, 1974). The report presented a detailed picture of the health problems of the Canadian people and outlined the major factors affecting health. It also proposed a new set of strategies for improving the health of the population. The most controversial idea in the report was that health care is not the major determinant of health.

The author of this historic document was the Canadian Minister of Health and Welfare, Marc LaLonde. He spearheaded this study after a universal program of publicly funded national health insurance was established in Canada. He suggested that providing access to health care and improving the quality of care were not the most effective steps toward improving the health of the population. After examining the major factors affecting health, LaLonde grouped these factors into four broad categories—human biology, environment (physical and social), life style, and health care organization—and proposed five policy intervention strategies.

Similar efforts followed in Great Britain, Australia, and the United States. In the 1970s dozens of articles, books, and conferences approached these issues from different perspectives: economic, epidemiological, ethical, clinical, historical, political, and social. A dozen books published between 1972 and 1981 illustrate the nature of the debate (Blum, 1976; Carlson, 1975; Cassell, 1976; Cochrane, 1972; *Daedalus*, 1977; Fuchs, 1974; Illich, 1976; McKeown, 1976; Rushmer, 1975; Somers, 1976; Thomas, 1974; Thomas et al., 1981).

A key issue is how much of the burden of illness borne by people of all ages, but particularly by the elderly, is due to biological factors, to their individual choices in behavior and life style, or to social, economic, and environmental conditions over which they exercise little direct control. Poor health habits are related to many of the major health problems of the aged: cardiovascular disease, cancer, emphysema, obesity, diabetes mellitus, liver disease, and alcoholism. In recent years, increasing attention has been directed to the potential for health promotion and disease prevention, to individual risk factor reduction, and to the modification of social factors affecting health.

Growing evidence linking behavior to health has been summarized in a series of background papers prepared as a supplement to the Surgeon General's Report on Health Promotion and Disease Prevention, *Healthy People* (U.S. Department of Health, Education, and Welfare, 1979c). The implications for health policy were spelled out in the Surgeon General's report and in the final report of the Task Force on Prevention, *Disease Prevention and Health Promotion: Federal Programs and Prospects* (U.S. Department of Health, Education, and Welfare, 1979a), which emphasized changes both in individual behavior and in social policy to reduce the burden of disease and promote health. These documents establish a conceptual framework for health policy similar to that advocated by LaLonde, suggest criteria for setting priorities, and outline specific plans for action. A recent review of the literature on exercise and health suggested health, education, and recreation strategies for national, state, and local action to maximize

the benefits of exercise in the prevention of disease, as well as enhancing its use in treatment (Thomas et al., 1981).

To describe the health problems of Americans in terms of behavior and life style is to oversimplify a complex problem. Furthermore, there are risks associated with the translation of this perspective into public policy. Recent policies emphasizing the importance of individual behavior and life style as determinants of health have been criticized for individualistic bias, victim-blaming, and lack of recognition of fundamental social, political, and economic conditions that promote and perpetuate known etiologic factors (Crawford, 1978; Garfield, 1979; Navarro, 1977). In times of economic crisis, rising costs, and challenges to regulatory policies, arguments regarding the limits of medicine and increased emphasis on individual responsibility for controlling risk factors may be utilized to justify burdening the individual with medical care costs and environmental hazards in both the workplace and the community. While Crawford recognizes the importance of individual behavior as a risk factor, he questions political strategies that focus on life styles and on individual behavior without changing the social and economic environment.

The growing emphasis on the relationship of life style to health tends to ignore studies showing the vital link between social networks or social support systems and health. Social support systems can be strengthened or weakened by public policies. The evidence linking stress, illness, and social support dates back nearly 50 years to the work of Cannon (1935). More recent studies including those of Hamburg and Killilea (1979), Berkman and Syme (1979), and Caplan (1964) provide strong evidence of the importance of social supports to health and life expectancy. Translating the results of this research into policy has been slow, because it does not fit the traditional biomedical model of disease and treatment.

Education and economic and social status, as well as public perceptions, all have an impact on health and health policies (Brody, 1977; Butler and Newacheck, 1981; Butler et al., 1981; Estes, 1979; Fuchs, 1974; Geiger, 1980). Recognition of the multiple causes of disease that include, but extend beyond, individual behavior—biological, sociocultural, and environmental—imply multiple opportunities for policy intervention (Lee and Franks, 1980; Thomas et al., 1981; U.S. Department of Health, Education, and Welfare, 1979b). This new knowledge can provide the foundation for a balanced health policy for the 1980s, one that includes health promotion, disease prevention, health regulation, health research, and health care, as well as social components.

MAJOR POLICY ISSUES IN THE HEALTH
OF THE AGING

The Costs of Health Care

Since 1950, when $12 billion was spent on medical care in the United States, expenditures have grown at an average annual rate of well over 10 percent. By 1978, health care spending had risen to $168 billion, or $753 per capita. For the elderly, expenditures totaled $49.4 billion, or $2,026 per capita. Although representing only 10.9 percent of the population, the aged incur 29.4 percent of the costs (Fisher, 1980). The costs for the aged are borne by public programs such as Medicare and Medicaid and directly out of pocket. The per capita out-of-pocket costs for the aged in 1978 were $747, an amount that was almost equal to the total per capita cost for those 19 to 64 years of age (Fisher, 1980). The major element in the rising cost of personal health expenditures is hospital care, which accounts for 45 percent of the national health care bill. Inflation is the most important factor contributing to cost increases (Gibson, 1980). The increased use of medical technology and the increasing complexity of care is the second most important factor, while the growth and aging of the population account for less than 10 percent of the increase in medical care costs.

A critical factor influencing skyrocketing medical care costs is the methods by which hospitals and physicians are paid (Hughes, 1981; Lee and LeRoy, 1980; Showstack et al., 1979). The fee-for-service payment of physicians assures that the physician earns proportionately more money for each service provided to the patient. Hospitals also earn more money for each service they provide. The third-party payment system insulates both providers and patients from the costs of these services. Thus, providers benefit from supplying services that are of marginal value to the patient.

The rapidly increasing cost of health care is probably the most crucial health policy issue of the 1980s (Shortell, 1981). Older people are particularly concerned about the continued increase in the cost of medical care. Not only are the aged likely to suffer most high-cost illness, but they are increasingly feeling the cost impact directly. In the decade after the implementation of Medicare (1966–1976), per capita expenditures for the elderly rose from $455 to $1,521 annually (Paringer et al., 1979). Although the most rapid increase was in hospital and physician services that are partially covered by Medicare, direct out-of-pocket medical costs for which the aged are responsible also have risen rapidly.

In 1965 per capita out-of-pocket expenditures by the aged were $331. By 1970—four years after the implementation of Medicare—they remained at the level. Six years later, however, they were rising rapidly and the aged's out-of-pocket costs were $576 per capita. In 1978 they had risen to $747 per capita. The largest out-of-pocket expenses were for nursing-home care ($279), physicians' services ($149), drugs and drug sundries ($112), and hospital care ($109). The costs of prescription drugs present a special problem for the aged because the costs are not covered by health insurance and the elderly bear a disproportionate share of the costs. Although the elderly comprise only about 10 percent of the population, they bear the costs of roughly 20 percent of all out-of-hospital drug expenditures. In 1978 drug and drug sundry expenditures totaled $15 billion, according to estimates by the Health Care Financing Administration (Gibson, 1980). Of this total, $3.2 billion was spent for drugs and drug sundries used by the elderly (Fisher, 1980; Lipton et al., 1981).

The problem of health care costs—the factors responsible and possible strategies for containing future cost increases—have been considered from a variety of perspectives (Zubkoff, 1976). In a careful examination of issues relating to health care costs, Rosenthal (1978) suggests that the current concern over controlling health care costs is relatively recent and is the result of past successes in providing better trained manpower, incorporating the latest advances in technology, and increasing access to care. He also argues that important trade-off decisions must be made, not only within health care, but also between health care and other desirable social programs. In discussing methods to contain costs, he points out that none of the approaches is likely to succeed in and of itself. In a recent examination of hospital cost-containment strategies, Hughes and associates (1978) provide an excellent discussion of the problems and the alternative approaches, including their own plan, which includes options for local area discretion.

The role of medical technology as a factor in rising costs has also been considered from a variety of perspectives (Altman and Blendon, 1979; Russell, 1979). Several studies have used aggregate data to estimate the contribution of technology to changes in medical care costs over time, notably those of Fuchs (1972), Fuchs and Kramer (1972), Feldstein (1971), Feldstein and Taylor (1977), Klarman (1965), and Mushkin (1976). Because of statistical problems, these estimates are crude, vary considerably and, indeed, reach contrary conclusions. While Fuchs estimates that technology accounted for 0.06 percentage points of the 8.0 percent annual increase in total health care expenditures in the period 1947 to 1967, Mushkin estimates that it reduced the

rate of annual spending by 0.5 percentage points in the period 1930 to 1975. Recent studies by Scitovsky give us better insight into this complex issue. Her investigations of patients treated at the Palo Alto Medical Clinic from 1951 to 1964 (Scitovsky, 1967) and from 1964 to 1971 (Scitovsky and McCall, 1975) identify changes in treatment as a significant factor affecting costs.

Hospital and Physician Reimbursement. A major factor in the rising costs of medical care is the growth of third-party payment and the methods used by third parties, including Medicare and Medicaid, to reimburse hospitals and physicians.

Over 90 percent of hospital costs, including the wide range of medical technologies (e.g., intensive care, X-ray, clinical laboratory, drugs) used within the hospital, are paid by third parties, primarily on the basis of incurred costs (Gibson, 1980). There is little incentive for physicians or patients to reduce the use of medical technologies under these circumstances.

The fee-for-service reimbursement system, which is the dominant method of paying for physicians' services, also provides little incentive to reduce the use of medical technologies. Recent studies of physician reimbursement (Almy, 1981; Delbanco et al., 1979; Lee and LeRoy, 1980) have concluded that changes are needed, particularly in the usual, customary, and reasonable (UCR) system used by most private insurance carriers and adopted by Medicare and many state Medicaid programs in determining physician payment. The problems with the current payment system were described by Showstack and associates:

> First, lack of knowledge among consumers about highly technologic medical care produces uncertainty about services that are needed. Second, providers of services in the medical care marketplace direct much of the demand for these services. Third, the consumer often does not pay directly for services; instead a third party transaction [such as payment by an insurance company] pays the provider, thus removing direct responsibility from the consumer of the service. Fourth, the amount of payment often is partially a function of the manner in which payment is determined and made for a specific service [Showstack et al., 1979].

The Organization of Health Services. Perhaps the solution to cost containment and the more rational use of medical technologies lies in organizational change in health care and in the development of prepaid systems of care, rather than in modifying the current UCR. A thorough assessment of available evidence on HMO performance has been carried out by Luft (1981). It is clear that medical care costs for HMO enrollees are 10 to 40 percent lower than for those in conventional plans. The factors that account for this reduced cost are less clear. It is

evident that HMOs dramatically reduce hospital admissions, and for those hospitalized, the length of stay and the use of services are slightly reduced. It is not clear whether part of the reduction in hospital use is due to the particular consumers who select HMOs, to the group-practice organization, or to the lack of financial incentives for physicians to hospitalize patients. A recent study comparing utilization patterns in a large multispeciality group practice and a prepaid group practice suggests that the group practice organization itself may be a critical factor in reducing hospital admissions (Scitovsky, 1980).

In analyzing the limited role that HMOs have played in the care of the elderly, Harper et al. (1980) examined the factors that may influence HMO efforts to attract the elderly, the factors that may stimulate older persons to consider joining HMOs, and the formidable obstacles to HMO enrollment of the elderly, particularly Medicare reimbursement of hospitals, the relationship of elderly patients to fee-for-service physicians, and people's reluctance to change to a new form of care. The authors concluded that HMO growth in serving the elderly will take place slowly unless there is a change in Medicare policy.

Another important issue is the effect of HMOs in promoting competition within the health care system. The "consumer choice plan" advocated by Enthoven is based on this premise, as are a variety of other procompetition proposals introduced in Congress during the last several years (Enthoven, 1978).

Controling Medical Care Costs Through Competition and Market Forces. A major new direction in health policy has been advocated by the Reagan Administration: stimulation of procompetitive market forces.

These strategies are based on the assumption that market forces can produce an effective competitive medical care system and that the present system is not competitive except in ways that increase costs. Two distinct market structures have been proposed to meet the requirements of a competitive system:

1. The cost-sharing approach (large front-end deductibles and co-insurance) based on provider price competition over service price
2. The health-plan approach (e.g., health maintenance organizations and other plans that provide specified benefits for a population at a fixed premium through various practice arrangements)

The cost-sharing approach has been advanced by Pauly (1980) and Seidman (1980). The lack of incentives for providers and consumers to

restrain costs as the result of the growth of third-party payment mechanisms led Feldstein to propose almost a decade ago that third-party coverage be limited to catastrophic costs and that transactions between patients and physicians in day-to-day care should be subject to normal competitive market forces.

The health plan approach advocated by Enthoven (1980) refers to the application of the following principles to health care financing:

1. **Multiple choice.** Each consumer would be offered the opportunity to enroll each year for the coming year in any of the qualified plans for health care offered in the area.
2. **Fixed dollar subsidy.** Each consumer would receive a fixed dollar subsidy (by his or her employer) toward the purchase of a health plan membership.
3. Use of the same rules for all competitors would govern premium setting practices, minimum benefit packages, catastrophic expense protection, and so on.
4. Organization of physicians into competing economic units, which could include group practices or other organizational arrangements, would be required.

Several "procompetitive" proposals were introduced in the 97th Congress, including: H.R. 850—National Health Reform Act of 1981 (Representative Gephardt); S. 443—Health Incentives Reform Act (Senator Durenberger); and S. 139—Comprehensive Health Care Reform Act (Senator Hatch). More will surely follow in the years to come.

Although the bills differed in detail, there were several elements that characterize the procompetitive approach. These are changes in tax treatment, for employers and/or employees, of employer contributions to health insurance plans; establishment of incentives or requirements for employers to offer employees multiple choice of health insurance plans subject to certain limitations with respect to coverage of services and cost sharing, including catastrophic benefits and preventive care; and establishment of Medicare and Medicaid voucher systems under which the elderly, disabled, blind, and AFDC eligibles would receive a fixed value voucher which could be used toward the purchase of a qualified health insurance plan.

One proposal that will be debated would provide Medicare-eligible elderly a voucher—initially worth perhaps $1,700, which Medicare now costs on average—with which they could purchase private health insurance. The voucher plan may also include the provision that beneficiaries may opt to retain current Medicare coverage and that no

voucher-eligible private plan can provide less coverage than Medicare itself. It is impossible to predict or provide an analysis of the likely consequences of this voucher proposal because to date vouchers have not been tested in the field of medical care. The voucher is potentially a mechanism for capping federal Medicare expenditures and shifting the financial risk to the individual. The elderly individual might control expenditures by selecting a health insurance plan with the minimum required benefits.

Vouchers have also been proposed for the Medicaid program. The amount of the voucher would probably be less than the cost of most insurers of financial health care and thus choices of low-income persons would be limited to a few private health plans. Services covered by the proposal do not include one of the most costly services—nursing-home care (U.S. Congressional Budget Office, 1981).

The voucher might be a viable alternative for the relatively healthy elderly, particularly those who do not have chronic illnesses requiring much medical and hospital care. However, for those with serious chronic illness and disability, particularly the poor, the picture is quite different. They will not be able to enroll individually in a plan that can meet the high costs that their care may entail. This is particularly true for the medically needy elderly who are in skilled nursing facilities or intermediate-care facilities.

Government Financing of Health Care

To an increasing degree health policy is dominated by federal programs that finance acute medical care and institutionally based long-term care for the aged: Medicare and Medicaid.

Medicare. Medicare is the major federal program covering medical services for people 65 years of age and older. It was designed to assure access to needed medical services for the aged and to protect them against the high costs of care. It provides coverage for hospital costs to all Medicare beneficiaries (Part A: Hospital Insurance—HI) and for physicians' services to beneficiaries who choose to pay a premium for it (Part B: Supplementary Medical Insurance—SMI).

The implementation of Medicare policies in 1966 was followed by a dramatic increase in the use of short-stay hospital services by the aged but little or no increase in the use of outpatient physician services. Indeed, the average number of outpatient physician contacts by persons aged 65 and over remained close to 6.5 visits per year from 1965 through 1978 (U.S. Department of Health and Human Services, 1980c). Use of physician services increased for the poor aged and

decreased for the nonpoor aged. Hospital utilization increased immediately and sharply. Total days of care in short-stay hospitals increased by 25 percent in the first year of the Medicare program. This rise reflected increases of 11 percent in the discharge rate per 1,000 beneficiaries and 12 percent in the average length of stay. While the hospital discharge rate continued to increase over time, the average length of stay decreased sufficiently after 1967 to counteract the increased discharge rate, resulting in a similar rate of hospital use (a combined measure of discharge rates and length of stay) in 1967 and in 1976.

Surgical rates have risen dramatically since the advent of Medicare. In 1965, there were 6,554 operations for every 100,000 people aged 65 and over; in 1975, there were 15,483 operations per 100,000—an increase of 105 percent. Cataract surgery more than doubled, from 525 to 1,115 operations per 100,000 elderly, and arthroplasty increased from 49 to 145 operations per 100,000 elderly people (Kovar, 1977). Use of prescription drugs rose even more rapidly during this period (Lee, 1980; Silverman and Lee, 1974).

In 1976, 5.1 million aged had much of their inpatient hospital care costs covered by Medicare Part A, and 12.7 million elderly had a portion of physician and related services covered by Medicare Part B.

In 1977, 60 percent of all health outlays in the federal budget were for Medicare (Gibson and Fisher, 1978). Medicare expenditures have risen steadily since the program was established. During the first 10 years of the Medicare program there was a four-fold increase in program expenditures for hospital services—from $2.8 billion in 1967 to $10.6 billion in 1976 (U.S. Department of Health and Human Services, 1980c). Total Medicare costs were $17.73 billion in fiscal year 1976, $20.70 billion in 1977, $24.6 billion in 1978, and $28.9 billion in 1979. Half of the increase between 1978 and 1979 was due directly to increased hospital costs and higher physician fees (U.S. Department of Health and Human Services, 1980b). Extension of program coverage in 1973 to disabled beneficiaries under Social Security and railroad retirement programs and persons with end-stage renal disease contributed to the cost of the program. Rapid inflation in hospital costs and physicians' fees, however, remains the major determining factor of Medicare expenditure increases. Escalating hospital costs also have diminished the intended purpose of the program to protect the elderly from the financial strain of needed medical care (Crawford, 1978).

Medicare expenditures for supplemental medical insurance (SMI) have risen sharply along with the costs of SMI for eligible Medicare beneficiaries. Monthly premiums for SMI coverage increased from $3 prior to April 1, 1968, to $9.60 on July 1, 1980. Additional out-of-pocket expenses include a $60 deductible and 20 percent of all charges

for covered services thereafter (U.S. Department of Health and Human Services, 1980a, 1980b).

The effect of rising costs to the Medicare program goes beyond Medicare beneficiaries to all taxpayers through the rapid increase in the percentage of Medicare funds derived from federal general revenues. While the primary source of hospital insurance financing (91 percent) comes from taxes on earnings (Social Security), 9 percent is derived from general revenues. In the case of SMI, increases in premiums are limited to the percent by which general Social Security benefit levels increased in the preceding year. Since the rate of inflation of medical prices has been considerably higher than the cost of living adjustments in Social Security, general revenue funds have had to fill the gap between increased medical prices and the increased premium payments by Medicare SMI beneficiaries. In 1979, general revenue funds contributed 70 percent of SMI income (U.S. Department of Health and Human Services, 1980b). For the entire Medicare program, general revenue contributions rose from 16.4 percent in 1974 to 26.4 percent in 1977 (Gibson and Fisher, 1978).

Concern has long been expressed about the cost of Medicare and the failure to control increases in program expenditures (U.S. General Accounting Office, 1977). While a number of proposals to limit cost increases have been introduced, there has also been a demand to extend Medicare coverage for such products and services as outpatient drugs, hearing aids, and routine physical examinations (U.S. House of Representatives, 1978a). It has been argued that in some cases new benefits could offer lower-cost substitutes for currently covered services and thus could reduce program costs.

The Medicare policy changes in the Omnibus Budget Reconciliation Act of 1981 increase significantly the copayments and deductibles paid by the elderly. The Part B deductible was raised from $60 to $75 per year. The Part A deductible for those hospitalized was increased from $204 to $250 (it had been scheduled to rise to $228) and to $328 in 1984. The coinsurance for extended hospital and skilled nursing facilities care was also raised.

Although appearing to be small, these increases become significant when viewed in the context of the rapidly rising out-of-pocket costs that are already borne directly by the elderly, estimated to be in excess of $1,000 per capita in 1979, and the increasing rate of poverty among the elderly.

Medicaid. Medicaid is the federally assisted, state-administered program that pays for basic medical care for the poor, the blind, and the disabled. It provides assistance in paying medical bills for over 21

million poor people. Although only 16.2 percent of people receiving Medicaid benefits in fiscal year 1976 were over 65 years of age, payments to providers for medical services for the elderly accounted for 38 percent of Medicaid expenditures (U.S. Department of Health, Education, and Welfare, Health Care Financing Administration, 1979). This is due to the disproportionate number of aged suffering from chronic illness and disability and the high cost of hospital and nursing-home care. The latter accounts for the major portion of Medicaid expenditures for the elderly.

Because of Medicare limitations on care for the chronically ill and disabled and its restrictions on nursing-home benefits, Medicaid has assumed the bulk of the public payments for long-term care services (Estes et al., 1981; Fox and Clauser, 1980; Trager, 1980; U.S. General Accounting Office, 1979). National health expenditures for nursing-home care totaled nearly $18 billion in 1979. Over half that amount was paid out by public funds, most of it (approximately $9 billion) by Medicaid. In contrast, Medicare reimbursement for nursing-home care in fiscal year 1979 amounted to only $373 million (less than 1 percent of total Medicare payments; Gibson, 1980).

Both in terms of services offered and program eligibility, states have discretion to limit Medicaid coverage selectively. Differences in policies regarding eligibility, program benefits, and utilization of services account for wide variations in Medicaid expenditures across states (Davis and Schoen, 1978; U.S. Department of Health, Education, and Welfare, Health Care Financing Administration, 1979). This is particularly true for the elderly (Estes et al., 1981; Newcomer et al., 1981). In some states, eligibility already is limited, and as fiscal constraints extend themselves at state and local levels, eligibility and scope of services continue to be reduced (Davis and Schoen, 1978; Holahan et al., 1977; Spitz and Holahan, 1977).Variations in state Medicaid expenditures also reflect both differences in length of stay in health facilities and inappropriate utilization of facilities—persons institutionalized at an improper level of care (Liu and Mossey, 1980; U.S. Congressional Budget Office, 1977; U.S. Department of Health, Education and Welfare, Health Care Financing Administration, 1979).

The Medicaid program requires states to implement utilization review procedures to determine that clients are using facilities appropriately. States vary, however, in how rigorously they pursue such activities.

These and other factors have contributed to an escalation in Medicaid costs. During the period 1968 to 1976, Medicaid expenditures rose from $3.5 billion to $14 billion. During this time the number of Medi-

caid recipients more than doubled—from 11.5 million to 24 million. The number of aged eligible for Medicaid has risen more slowly—from 1.5 million in 1970 to 2 million in 1976. The Urban Systems Research and Engineering, Inc. (1977) estimated that, even accounting for all increases in medical prices and utilization, Medicaid expenditures in 1976 would have risen to only $6.6 billion had there been no increase in the number of recipients from the 1968 level.

The Omnibus Budget Reconciliation Act of 1981 included a number of provisions related to Medicare and Medicaid that are expected to reduce federal expenditures for these programs in fiscal year 1982 by $2.5 billion. The 3 percent reduction in the federal share of Medicaid expenses is only one of these policy changes. Among the more important Medicaid policy changes are the following: (1) states are given greater flexibility with respect to coverage of and services for the medically needy; (2) states no longer need to reimburse hospitals at the Medicare rate; (3) the freedom of choice provision of the state Medicaid plan can be waived by the Secretary of Health and Human Services; and (4) participation in health maintenance organizations is encouraged.

In attempting to contain Medicaid costs, at least six options are available to the states: (1) reducing Medicaid eligibility; (2) reducing the scope of benefits; (3) holding reimbursement for hospitals, nursing homes, or physicians at current levels as costs rise; (4) improving program management to reduce fraud and abuse, reduce utilization, particularly of hospital services, and eliminate inappropriate payments; (5) initiating delivery system reforms (e.g., HMOs, prudent buyer, and vouchers); and (6) initiating program restructuring (e.g., long-term-care block grants).

In order to limit the rapid increase in Medicaid expenditures, eligibility could be modified for two categories of beneficiaries—the medically needy (currently covered in 33 states) and the medically indigent. The aged would be particularly hard hit by changes in eligibility for the medically needy category.

If the medically needy Medicaid category now established by many states were limited in eligibility, many aged would be removed from eligibility and would not be able to obtain needed services such as nursing homes, home care, hospitalization, and physician services, or they would be forced to pay for these services out of pocket. Many of these elderly individuals are in nursing homes at the time they become eligible for Medicaid. The have "spent down" their income and assets to a level that qualifies them for Medicaid. Reducing the income and asset requirements even further will shift the costs to the elderly and

their families—many of them hard pressed or unable to meet the costs of such care.

Another likely method for states to control Medicaid costs would be to reduce or eliminate optional benefits (e.g., prescription drugs, intermediate-care facilities, dentistry, physical therapy, prosthetics, optometry). There is little evidence that cutoff of certain optional benefits, such as prescription drugs, will reduce costs because some patients may have to be hospitalized in order to receive the necessary drug treatment. In such cases, the impact of eliminating some optional benefits may be to increase the overall program costs. Since the optional benefits of prescription drugs, dentistry, and porsthetics constitute a minor portion of the overall budget and the cost increases of the Medicaid program, eliminating such programs may not reduce the Medicaid budget. And most important, the cutoff of optional benefits will affect those with the worst chronic illnesses disproportionately, making them suffer the greatest hardships (Estes et al., 1981; Spitz and Holahan, 1977).

Among the other alternatives, the most likely to have an immediate impact are reducing hospital, nursing home, and physician reimbursement and further restricting Medicaid patients in their choice of private practitioner, community hospital, and nursing home. These changes may be the ones most strongly resisted by the medical lobbyists, who have indicated their preference for cuts in eligibility rather than cuts in reimbursement.

Improved program management, including prior authorization for elective hospital admissions, utilization review, fraud and abuse control, audits, and other management techniques have already been adopted in many state Medicaid programs. It is unlikely, in our view, that these will produce sufficient short-term savings to compensate for the rising costs of medical care and the reductions in the federal share of expenditures. Delivery system reforms are also unlikely to be initiated soon enough to have a substantial impact on Medicaid expenditures in the next few years. They are much more likely to be encouraged for patients with private health insurance or Medicare coverage. Finally, program reforms, such as long-term-care block grants, are likely to be considered, but are unlikely to deal with the fiscal crisis in the short run.

The largest problem with the federal Medicaid spending limitation is that, in itself, it does nothing to address the source of rising medical care costs, particularly the increase in hospital costs. It merely shifts to the states the difficult and politically treacherous decisions about how to deal with those costs and the resultant public expenditures. Further,

there has been little consideration of the possible cost shifts that the new Medicaid expenditure policy will generate—for Medicare or for programs funded by the state (e.g., SSI Supplements and social services for the elderly).

There has been no published analysis of the possible consequences for the Medicare program of the federal limitation on Medicaid. Such an expenditure shift could occur, for example, if patients who are no longer eligible for nursing-home coverage (because of Medicaid spending limits) are kept (at Medicare expense) for longer hospital stays than would occur if Medicaid nursing-home coverage were available.

Long-term Care. Long-term care encompasses a range of services that address the health, social, and personal-care needs of individuals who do not have the capacity for independent self-care. It includes diagnostic, preventive, therapeutic, rehabilitative, supportive, and maintenance services for those with chronic physical or mental impairment (U.S. Congressional Budget Office, 1977; Weissert, 1978). The inability to function without assistance, rather than a specific diagnosis or disability, determines the need for long-term care. Although individuals of any age with a physical or mental impairment may require publicly funded long-term care, it is the elderly who are in greatest need of services because of economic, social, and medical factors.

State discretionary policy is particularly important in relation to long-term care services for the elderly because Medicaid plays the major role in paying for long-term care and state officials have a number of options related to eligibilty, scope, and duration of benefits, reimbursement, standard of care, and utilization review. This results in a wide disparity among states in long-term-care services paid for by public funds (Estes et al., 1981).

A particularly costly policy decision by the states may be the liberal coverage of intermediate-care facilities (ICFs). One major study suggests that since 1973 many states have included ICFs as a mandatory benefit, perceiving these facilities to be a substitute for more costly skilled nursing facilities (SNFs) or inpatient hospital services (Holahan et al., 1977). However, it was found that savings effected through this substitution were outweighed by the fact that an increased number of eligible elderly whose health was not sufficiently impaired for care in an SNF or a hospital were now eligible for an ICF.

The shift from state mental hospitals to domiciliary facilities, boarding homes, and ICFs has been observed in a number of studies (Joe and Meltzer, 1976; Pollack, 1974; Scull, 1976; Wolpert and Wolpert, 1976). Although a number of studies conclude that mental hospital closings were state-level efforts to shift program costs to other federal or federal-state programs in order to lighten their own fiscal

burden for long-term care (Holahan et al., 1977; Rose, 1979; U.S. Senate, 1976), there is surprisingly little research on the configuration and consequences of policies concerning Medicaid, SSI, and Title XX. The latter compose most of the publicly financed institutional and community-based long-term care in the country. There is also little understanding of the cross-funding transfers and trade-offs between and among SSI, Medicaid, and Title XX.

A number of studies have dealt with the poor quality of long-term care, particularly the services provided in nursing homes. This relates to a variety of factors: poorly trained and poorly paid personnel, inadequate monitoring of quality, inadequate procedures to improve quality, a lack of social services, a lack of linkage with community hospitals, and poor medical supervision (Mendelson, 1975; Moss and Halamandaris, 1977; U.S. Senate, 1974). In addition, health and safety standards have been inadequate, and there has been fraud, abuse, graft, and corruption (Estes et al., 1981; U.S. Senate, 1976; Vladeck, 1980). Federal and state policies on licensure, quality of care, and reimbursement are factors that cannot be ignored in relation to the care provided in nursing homes.

In recent years, several studies have examined issues related to long-term care (Brody, 1977; Estes et al., 1981; Joe and Meltzer, 1976; Kutza, 1980; Lee and Estes, 1979b; Scanlon, 1980; U.S. Congressional Budget Office, 1977; Weeks and Spitz, 1978; Weissert, 1978). An important long-term-care policy initiative was launched by the Department of Health and Human Services in 1980, but its fate remains in doubt. This effort includes channeling demonstration projects, which offer screening and case management services. Many contend that it will not provide development of and reimbursement for necessary home health services (Reif, 1980; Reif and Estes, 1982). It has been argued that channeling represents a low-cost "alternative to institutionalization," and serves more the need to contain costs and utilization than to create major community-based long-term care services (Estes and Harrington, 1981).

A study of the institutionalized elderly identified the period immediately following the decision to seek institutional care as the most critical one in the lives of institutionalized aged (Tobin and Lieberman, 1978). The authors found that after the decision to seek institutionalized care is made, the aged individual undergoes rapid change. "The experience is that of being abandoned, and reaction to it is extreme. Increasingly the person becomes cognitively constricted, apathetic, unhappy, hopeless, depressed, anxious and less dominant in relationships with others." In assessing the implications of their study, Tobin and Lieberman observed: "It dictates the conclusion that if planners direct

their attention to options other than institutionalization, they may significantly delay not only the harmful effects of institutional life, but also those even more serious psychological and behavioral effects that have been shown to be associated with waiting for admission" (Tobin and Lieberman, 1978). A key policy issue in long-term care is the extent to which in-home and community health services will be developed as a viable option to nursing-home care for the elderly.

A major question for future consideration is the possible role of a new block grant for long-term care. Whether such a grant would include only the present Medicaid expenditures for long-term care or Title XX (social services) of the Social Security Act remains to be seen. This is certainly likely to be an issue actively considered in 1982.

Health Manpower Requirements:
The Needs of the Elderly

Recent figures estimate that 12 percent of the population will be over 65 by the year 2000 and that one-half of that figure will be over 75 (Kane et al., 1980). These demographic forecasts have catalyzed increasing interest and research into issues relating to health care of the aged. Although some preliminary work has been conducted in the area of geriatric manpower (Freeman, 1971; Kane et al., 1980; Libow, 1977; Panneton and Wesolowski, 1979), the issues of professional training and supply to meet the health-related needs of the elderly have not yet received sufficient attention. Projections of the numbers of educators, researchers, and practioners concerned with the aged and future requirements for these professionals form the basis for public policy regarding education and training. However, these issues are difficult to address because of the complexity and multidisciplinary nature of the problems and service needs of the elderly and a lack of consensus as to both the appropriate mix of services and the roles and responsibilities of different professionals.

Current work focuses primarily upon medical manpower, particularly the future of physician training and practice in geriatrics. In assessing the current status of geriatric manpower training, Libow (1977) analyzed the failure of the health care system to provide comprehensive and/or primary care to the aged. He determined from a survey of first-year students in eight U.S. medical schools that most would be interested in having geriatric medicine as part of their curriculum. In Freeman's survey of medical school catalogues (1971), he noted that over 50 percent of the publications failed to mention aging in any form

and only 3 of the 99 institutions had divisions of gerontology. Until several years ago, formal education in geriatrics was extremely limited. For example, the 1978 Faculty Roster of the Association of American Medical Colleges, which includes more than 49,000 paid medical school faculty, listed only seven faculty members with a primary specialty in geriatrics (Panneton and Wesolowski, 1979). Several researchers and agencies (Bureau of Health Manpower, Veterans Administration, National Institute on Aging, National Institute of Mental Health, Institute of Medicine) have examined this issue and have concluded that there is a widespread need for curriculum development for geriatric health professions programs (Panneton and Wesolowski, 1979).

In testimony to the House Select Committee on Aging in 1978 (U.S. House, 1978b), Libow reported that there is a current need for a cadre of 8,000 to 10,000 geriatricians, which represents 3.3 percent of the total number of physicians in practice. He attributed the system's failure to encourage geriatric manpower development to several factors including ageism, professional territoriality, patient passivity, time-income factor (aging patients are losing propositions for physicians from an economic point of view), and Medicare (which focuses on acute care and hospital care, not primary care, for the chronically ill).

A Rand Corporation study (Kane et al., 1980) reinforced Libow's position and noted that additional medical manpower will be required to meet the growth in the elderly segment of the U.S. population. After assessing the utility of four different models (continuation of status quo, academic geriatricians only, provision of care by academic and consultant geriatricians, and primary care geriatric practitioners), these researchers favored those models which place the geriatrician in both academic and practicing roles. From their data, these investigators projected that the United States will require between 7,000 and 10,300 geriatricians by 1980. This projection does not imply an absolute increase in physicians. Rather, it assumes that this goal can be attained by redistribution among specialty training programs.

No current method of predicting future requirements is without significant conceptual and methodological problems. As Stambler (1979) pointed out, factors such as shortages or surpluses of physicians' services—by either specialty, organizational setting, or geographic location—that exist in the current system usually are carried through the projections. However, basic changes in the system, such as instituting national health insurance or hospital cost controls, are not incorporated.

While increasing geriatric training is an important component of

manpower policy for the health needs of the elderly, the current emphasis on the training of geriatricians (i.e., physicians) must be carefully analyzed to assure that it does not become a costly substitute for meeting health-related needs of the elderly that could be met as well or better by other, less costly, approaches. It is not yet known what manpower needs exist because studies to date have been based on traditional occupational or professional categories. These categories do not necessarily examine the spectrum of needs in a way that would identify the full range of service roles required by the growing aged population. Multidisciplinary approaches to geriatrics training for all health professionals occur only on a very limited basis. Broadening approaches to meet the health needs of the aged even further to incorporate a full range of disciplines and professions beyond the traditional health professions remains an open area of debate on both training and service-delivery policies.

THE CHANGING ROLE OF GOVERNMENT

Just as the concepts of aging and of health have changed, so have relationships between levels of government and the relationship between government and the private sector. Particularly important have been the changing roles of the public and private sectors in financing health care, especially health care for the elderly. The changing roles are often due to the less well-acknowledged fact that many federal programs evolved because of the private sector's failure to provide needed support. The role and responsibility of the federal government in providing medical care reflect our changing perceptions toward health and health care, as well as toward government. Public perceptions about the role of government and about the role and responsibility of medicine also have a major impact on health policies for the elderly. These perceptions are changing.

The mood of the public and the public's perception of what the federal government can do is dramatically different from what it was 20 years ago. In the 1960s the problem was defined as lack of access to good medical care for the aged and the threat of financial catastrophe for those who became seriously ill. The answer was reflected in Medicare, Medicaid, a variety of outreach programs, and the development of medical resources—each with a large federal contribution (Aday and Andersen, 1975; Marmor, 1970).

Embarking on the 1980s, the mood seems to be one of mistrust of

government and government officials, skepticism about the ability of government to address complex social problems, active opposition to government programs, the feeling that "throwing money at a problem won't solve it," and a desire to cut taxes. The mood is against government regulation and spending, particularly programs that serve the poor (Davis and Schoen, 1978; Somers, 1975).

In the 1980s the problem is not defined in terms of access to care. Instead, the major concern with health is largely framed in terms of inflation, the high cost of care, rapidly rising expenditures for health, and cost containment (Zubkoff, 1976). Proposed policy solutions are not defined as requiring changes in reimbursement policies in public and private programs, but as requiring the stimulation of competition in the private sector (Enthoven, 1980) and the removal of government regulation (Feder et al., 1980; Vladeck, 1980).

The state of the economy affects the manner in which social problems are defined. When the economy is growing at a rapid rate, optimism abounds and generous resources are likely to become available for social problems of all types (Miller, 1976). But when economic growth slows, policies tend to favor less costly, more limited social programs, particularly for population groups, such as the aged, that are not thought of as productivity-linked (Estes, 1979). Current budget cutting and threatened retrenchment of programs for the disadvantaged reflect a growing perception of the limits of our economy.

Four major shifts in federal policy that will affect the health care of the elderly were adopted in 1981 by Congress at the urging of the Reagan administration: (1) decentralization (new federalism); (2) a significant reduction in federal funds for domestic social programs; (3) deregulation and stimulation of competitive market forces in medical care; and (4) tax cuts. The possible role of the competitive forces in medical care and related health policy issues have been discussed earlier in this chapter. The effects of the tax cuts are likely to be minimal on the elderly in greatest need: they will not benefit from reductions in taxes because they do not earn enough to pay taxes. The two health policy shifts that are likely to have an immediate impact on the aged are decentralization and the federal budget cuts in domestic social programs.

Decentralization

Health policies in the 1980s will be heavily influenced by the heritage of President Nixon's "new federalism" (decentralization) programs of the 1970s. The new federalism strategy was designed to decentralize

fiscal and political responsibility for domestic social programs to state and local governments through block-grant-type funding and to limit federal involvement in those programs (Estes, 1979). The development of new federalism gave a strong boost to the role of the states in domestic social programs, including those affecting health care. The block grants of the 1970s eased the constraints of categorical funding and of federally specified eligibility requirements in social services, housing, and other program areas, resulting in the increasing responsibility of state goverments for decision making in multiple programs that vitally affect the poor.

As the growing array of social programs that affect the disadvantaged have been decentralized in the last 15 years, state and local control has been expanded over program priorities, service emphasis, and recipient eligibility in such programs as Community Development Block Grants, Title XX, and the Older Americans Act.

The Supplemental Security Income program initiated in 1974 also has provided significant discretion to the states in supplementing the minimum federal payment and in eligibility determination. The Older Americans Act, first approved by Congress in 1965, has been amended several times, with increasing emphasis on state and local discretion since the 1973 amendments (Armour et al., 1981). Although enacted in 1965, Medicaid shares important attributes of programs of the new federalism period—in particular, the considerable policy discretion left to state and local authorities in setting eligibility requirements and optional service benefits.

Because decentralization was employed in the 1970s as a mechanism for curtailing the growth of federal programs, it essentially transferred the pressures for underwriting program expansion from the federal to state and local governments. It also generated fiscal and tax pressures at these levels sufficient to provide a hospitable environment for taxpayer revolts.

The fragmentation and diversification of policy in multiple social problem areas has been one consequence of the decentralization policy trend of the 1970s, as national policy goals have given way to more autonomous and variable state and local policy choices. Under the broadly defined grant enactments in which Congress only vaguely specifies its intentions, there is increased potential for the politicization of state and local policymaking and program implementation. The resultant ambiguity provides opportunities for political actors, vested interests, and agencies to "create" and shape health and human services policy in the implementation and administrative processes (Lowi, 1969). An important issue is the degree to which increasing decentral-

ization of programs for the poor fosters politically motivated, rather than need-based, priorities and allocations. These decentralization trends have augmented the influence of special interests and fostered extreme program variability and uncertainty in the income, health, and social service programs for the poor across the states (Estes, 1979; Lowi, 1969).

These and other issues arising from the complex American federal system, and the articulation of responsibilities among and between multiple levels of government (federal, state, and local) have produced both "power fragmentation" (Binstock and Levin, 1976) and "program fragmentation" (Hudson, 1973), which seriously affect public capacity for effective social intervention (Benjamin and Friss, 1980).

Of particular significance is the indication that the Reagan Administration is intent on building upon and augmenting the decentralization and block grant funding that is the new federalism hallmark and a legacy of the 1970s. Thus, the import and impact of decentralization continue to be major issues for domestic social programs and health policy related to the aging for the 1980s.

Efforts to assess the impact of federal-state health and social programs that provide significant state discretion and require major fiscal commitments are difficult because of the general problems of accountability inherent in federal programs that are complicated by multiple state policies and accounting systems utilized for the different decentralized programs (Estes and Noble, 1978). Federal reporting requirements rarely permit easy tracking of funding allocations to specific services or populations. The devolution of policy discretion to states and localities in the 1970s decreased federal capacity to assess the impact of federal funds—particularly on the population groups to be served, such as the elderly (Benton et al., 1977; U.S. Senate, 1976; U.S. Senate, 1978). Since both interstate and intrastate variability are enhanced under policies of decentralization (and they now are expanded under Reagan Administration policies), it is critical to develop an empirical basis for examining state policies and policy effects in the vital social and health problems that affect large numbers of older persons (Newcomer et al., 1981).

Accountability issues are both more significant and more complex because of the emergence of fiscal crisis conditions at various levels of government and the tax revolt fever that emerged in the late 1970s. Inflation and other changes in fiscal conditions have created pressures to redefine funding relationships among federal, state, and local governments. These are expected to produce new state and local strategies for shifting fiscal responsiblities within programs created or redesigned

within the new federalism era. Even more important, because the benefits provided by these federal-state programs for the poor elderly are heavily influenced by a state's willingness to underwrite the costs, there are mounting pressures for state-level policies of retrenchment (cutbacks) with the rise of fiscal constraints on state government (Lee and Estes, 1979a,b). Because the disadvantaged aged are heavily dependent on state-determined benefits, they are extremely vulnerable in this period of economic flux.

In this context of decentralized policy, the challenge will be great for health policymakers seeking to derive a sound national health policy for the elderly, particularly in view of the reality that each level of government will be attempting to shift its fiscal and political responsibility to other levels of government or the private sector for programs that vitally affect the health of the aged.

Reduced Federal Expenditures for Federal Programs: The Influence of the Fiscal Crisis

The effort that is currently underway to reduce federal expenditures for social programs has its roots in the growing fiscal crisis. *Fiscal crisis* is a term applied to the financial difficulties of a variety of governments in the United States. "Fiscal crisis" refers to the threat to the fiscal integrity of a government when it cannot service its debts (as in New York City and Cleveland) or it cannot meet current operating expenses (as in the "cash flow problems" of various states). Both strict and broad applications of the term *fiscal crisis* are based upon the tendency for government expenditures to rise faster than revenue—a tendency that may exist whether or not deficit spending actually occurs. Concern about fiscal crisis portends serious problems for the health care of the aged, particularly for long-term care and optional services funded by Medicaid and the income available to the poor aged through Supplementary Security Income.

Since 1975, there have been general declines in federal, state, and local expenditures as a percentage of the gross national product (GNP) and a decline in per capita expenditures in constant dollars. After intergovernmental transfers (i.e., federal and state to local, federal to local), the most significant declines are at the local level (Advisory Committee on Intergovernmental Relations, 1980). Since 1975 state and local expenditures have declined from 15.1 percent to 13.5 percent of GNP, while federal expenditures have decreased from 12.3 percent to 11.9 percent of GNP.

To meet the growing demands, governments raise taxes, which increasingly strain the ability and willingness of the public to pay. Popular and corporate resistance to taxation has been one factor preventing revenues from rising as rapidly as expenditures. Other factors constraining the tax bases of some governments include declining industrial bases, industrial relocation, outmoded physical plants, and most important, the overall economic slowdown. The current fiscal constraints movement takes various forms, including Proposition 13–style tax revolts, and it has already contributed to severe fiscal problems for certain local and state governments. In addition to the theoretical work that has contributed to an understanding of the structural causes of fiscal crisis (Gordon, 1977; Mollenkopf, 1977; O'Connor, 1973), a number of empirical studies have examined the nature of fiscal crisis and taxpayer revolt in specific jurisdictions (Alcaly and Mermelstein, 1977; Danziger and Ring, 1980; Howell and Stamm, 1979).

Structurally induced fiscal crises of particular governments are exacerbated by cyclical economic downturns that translate into fiscal strains on these jurisdictions. For example, during periods of recession, revenues (tax receipts) cannot keep pace with the rising demand for social services (welfare, unemployment insurance, etc.), thus contributing to the gap between expenditures and revenues. More recently, tax revolts have brought on fiscal crisis in a number of states (Bowen and Lee, 1979). In some cases, these revolts occurred in response to existing fiscal strains (Puryear and Ross, 1978). Tax and expenditure limits have occurred, however, where fiscal strain was not pronounced (e.g., in Texas and California), just as tax reform rather than tax revolt has occurred where fiscal strain did, in fact, exist (Avault et al., 1978; National Institute of Education, 1978).

In relating fiscal crisis to health and social service policies for the aged, two prominent tendencies emerge: (1) the escalation in expenditures for services for the elderly resulting in part from increased access but due primarily to the rising costs of medical and social services (Cambridge Research Institute, 1976; Millar et al., 1977; U.S. Department of Health, Education, and Welfare, Health Care Financing Administration, 1979; Wolfe, 1978); and (2) limitations on and decreases in revenues for such services imposed by both limits to federal funding under decentralization and the fiscal crisis and tax revolt in some cities and states.

Decentralized federal policies have made it difficult to define the appropriate roles of federal, state, and local governments in financing services for the elderly (Lee and Estes, 1979a). The problem has be-

come more complex with inflation, government fiscal crises, and the phenomenon of real or threatened "taxpayer revolts." These conditions have created pressures to redefine the funding relationships between and among all levels of government and are expected to produce new state and local strategies for shifting to the federal level fiscal responsibility for social and health programs for the elderly.

This is a particular problem for Medicaid-funded services. The rapid increase in Medicaid expenditures is outrunning the capacities of state governments to raise the necessary revenues (Estes et al., 1981). State Medicaid expendutures are rising rapidly because federal policy requires states to meet their percentage share of total Medicaid expenditures, because of the rapid increase in the cost of medical care, and because of the political risks associated with (and inhibiting the adoption of) cost-containment strategies that would affect providers, hospitals, or other entities. As a result, Medicaid expenditures have risen far more rapidly than revenue increases, creating serious fiscal difficulties for states as well as for local governments where they share in states' costs. In response, some states have reduced the number of beneficiaries by lowering the level of income allowed for eligibilty, reduced the scope of optional services, or reduced the duration of mandated and optional benefits (Holahan et al., 1977); some have also held rates of reimbursement for hospital physicians and nursing homes constant or increased them more slowly than costs have risen.

The decentralization of federal program responsibility to the states has a major impact on social services for the aged. The shift from categorical grants-in-aid to block grant type revenue sharing, in Title XX of the Social Security Act, had definite negative impacts on funding of social services (O'Donnell, 1978). Previous grants-in-aid programs effectively assured that those states that wished to could receive unlimited federal aid to the extent of the state's willingness to allocate matching funds. Title XX imposes by formula a limit to the amount of Title XX federal funds that each state can receive in a fiscal year. Overall, this has meant real constraints on federal funds for social services (Field et al., 1978; Millar et al., 1977).

The dollar ceiling on Title XX federal expenditures has forced states to cope with an increasing need for services in the face of a declining capacity to provide them (caused jointly by the federal ceiling and inflation). A recent study describes several strategies states have developed to cope with the federal dollar ceiling on Title XX expenditures. Applied in various ways by different states, they include ending program expansion, reordering service priorities, changing client groups served, reducing services to absorb administrative costs, and using other funding sources (Millar et al., 1977).

Although states and local governments were one source of additional funds during the first three years of Title XX, the evidence suggests that the largest actual and potential source for additional funds has been other major national programs, especially Medicaid, since it has had no federally imposed ceiling on expenditures. These findings suggest that such tranfers are likely to be a significant strategy utilized by states under conditions of fiscal restraint and that increased federal spending, particularly under Medicaid, is a likely consequence—unless the proposed federal cap is placed on Medicaid for the states. It will be important to assess the costs and effects of such strategies, as they may inadvertently result in more costly and higher levels of care than necessary.

PROSPECTS FOR THE FUTURE:
A PERSONAL NOTE

Policies affecting health care for the aged and other disadvantaged groups reflect society's perceptions of aging and the elderly, the public view about the appropriate role of government, the influential and expanding role of medicine in our society, and responses to real and perceived fiscal pressures. Medicine has been particularly important in influencing Medicare policies. Medicare emphasizes acute care, particularly hospital care. The structure of reimbursement for hospital and physician services has had a major impact on rising medical care costs, and those costs are increasingly pricing the aged out of the mainstream of medical care. State discretion over Medicaid policies has created great inequities in access to and quality of services.

The bias toward medical care in the allocation of public resources to meet the needs of the elderly has resulted in the medicalization of services, such as long-term care. In the process, however, long-term care has been accorded a low priority, because physicians and hospitals find it less economically rewarding than acute care. Institutional care has been emphasized at the expense of community and in-home services. Nursing homes have been required to perform multiple functions—custodial care, acute-illness care, rehabilitation, chronic care, and terminal care—without the resources to perform these tasks. Alternative policies for income maintenance and housing have not been adequately considered, because the medical model has been so dominant and has consumed resources that otherwise could have supported such policies.

This survey of issues related to health policy and the aged illustrates the vulnerability of the aged to capricious and complex federal and state health and aging policies, as well as to broader policy considerations, such as cost containment and decentralization of programs from federal to state and local governments. These policies have serious consequences for the elderly. In this period of inflation and perceived fiscal crisis, we expect an exacerbation of the already existing inequities among states in the eligibility and scope of services available to the most disadvantaged elderly. The narrow view of shared responsibility for the basic welfare of all citizens reflected in such policies raises serious questions about the fundamental values of a society.

What is called for is a major reexamination of federal and federal-state policies affecting the health and social needs of the elderly. Of major importance are policies on income maintenance, housing, medical care, and social services, as well as policies for health promotion and disease prevention for all ages. These may have a profound effect on the health of the elderly in the future.

A basic question that must be asked is whether or not particular health policy goals and priorities should be determined nationally or left to the vagaries of state or local politics. Given the structure of current programs, a complete understanding of "national" policy on health care for the aged cannot be obtained without systematic examination of policies across states. The goal of such an examination should be to distinguish those responsibilities that are logically state and local in nature from those that carry such great moral implications that only a single national policy can prevent the inequities that could arise from decentralization.

REFERENCES

Aday, L. A., and Andersen, R. *Access to medical care.* Ann Arbor: Health Administration Press, 1975.

Advisory Committee on Intergovernmental Relations. *Significant factors in fiscal federalism.* Washington, D.C.: The Committee, 1980.

Alcaly, R. E., and Mermelstein, D. *Fiscal crisis of American cities: essays on the political economy of urban America with special reference to New York.* New York: Vintage Books, 1977.

Almy, T. P. The role of the primary physician in the health-care "industry." *The New England Journal of Medicine,* January 22, 1981, *304*(4), 225–227.

Altman, S., and Blendon, R. *Medical technology: the culprit behind health care costs.* Washington, D.C.: U.S. Government Printing Office, 1979.

Armour, P. K., Estes, C. C., and Noble, M. L. Implementing the Older Americans Act. In R. B. Hudson (Ed.), *The aging in politics: process and policy*. Springfield, Ill.: C. C. Thomas, 1981.

Avault, J. E., Ganz, A., and Holland, D. M. Tax limitation: the view from Boston and Massachusetts. Paper presented at the Conference on Tax Limitation. Santa Barbara: University of California, December 14–15, 1978.

Ball, R. M. *Social security today and tomorrow*. New York: Columbia University Press, 1978.

Ball, R. M. Medicare: expectations, accomplishments, and next steps. *Generations*, May 1980, *4*(1), 36–37.

Belloc, N. B., and Breslow, L. Relationship of physical health status and health practices. *Preventive Medicine*, 1972, *1*, 409–421.

Benjamin, A. E., and Friss, L. R. 1978 amendments to the Older Americans Act. *Generations*, May 1980, *4*(1), 14–15, 74.

Benton, B., Field, T., and Millar, R. *State and area agency on aging intervention in Title XX*. Washington, D.C.: Urban Institute, 1977.

Berkman, L. F., and Syme, S. L. Social networks, host resistance and mortality: a nine year follow-up study of Alameda County residents. *American Journal of Epidemiology*, February 1979, *109*(2), 186–204.

Binstock, R. H., and Levin, M. A. The political dilemmas of intervention policies. In R. H. Binstock and E. Shanas (Eds.), *Handbook of aging and the social sciences*. New York: D. Van Nostrand, 1976.

Blum, H. R. *Expanding health care horizons*. Oakland, Calif.: Third Party Associates, 1976.

Bowen, M., and Lee, E. C. *Limiting state spending: the legislature of the electorate*. Research report no. 79-4. University of California, Berkeley: Institute of Governmental Studies, 1979.

Breslow, L., and Enstrom, J. E. Persistence of health habits and their relationship to mortality. *Preventive Medicine*, 1980, *9*, 469–483.

Brody, W. H. *Long-term care: a guide to selected resource materials*. University of California, San Francisco: Health Policy Program, 1977.

Butler, L. H., and Newacheck, P. W. Health and social factors affecting long-term care policy. In H. Richmond, J. Weltzner, and F. Farrow (Eds.), *Public policies for long-term care*. Chicago: University of Chicago Press, 1981.

Butler, L. H., et al. *Low income and illness: an analysis of national health policy and the poor*. Working paper. University of California, San Francisco: Health Policy Program, 1981.

Butler, R. N. *Why survive? Being old in America*. New York: Harper and Row, 1975.

Cambridge Research Institute. *Trends affecting the U.S. health care system*. (DHEW Publication no. HRA 76-14503). Springfield, Va.: National Technical Information Service, 1976.

Cannon, W. B. Stresses and strains of homeostasis. *American Journal of Medical Sciences* 1935, *189*, 1–14.

Caplan, G. *Principles of preventive psychiatry*. New York: Basic Books, 1964.

Carlson, R. J. *The end of medicine*. New York: John Wiley and Sons, 1975.

Cassel, J. The contribution of the social environment to host resistance. *American Journal of Epidemiology*, 1976, *104*(2), 107–123.

Cassell, E. J. *The healer's art: a new approach to the doctor–patient relationship.* Philadelphia: J. B. Lippincott, 1976.

Clark, R. B., Kreps, J., and Spangler, J. Economics of aging. *Journal of Economic Literature*, 1978, *16*, 919–962.

Cochrane, H. L. *Effectiveness and efficiency: random reflections on health service.* London: The Nuffield Provincial Hospitals Trust, 1972.

Crawford, R. You are dangerous to your health. *Social Policy*, January/February 1978, 11–20.

Daedalus. Doing better and feeling worse: health in the United States. Winter 1977, *106*, 1–281.

Danziger, N., and Ring, P. S. *Recent research of fiscal limitation measures: a selective survey.* University of California, Irvine: Public Policy Research Organization, 1980.

Davis, K., and Schoen, C. *Health and the war on poverty: a ten-year appraisal.* Washington, D.C.: Brookings Institution, 1978.

Delbanco, T. L., Myers, K. C., and Segal, E. A. Paying the physician's fee: Blue Shield and the reasonable charge. *The New England Journal of Medicine*, 1979, *301*(24), 314–320.

Dubos, R. *Mirage of health.* New York: Harper and Row, 1979.

Edelman, M. *Political language: words that succeed and policies that fail.* New York: Academic Press, 1977.

Enthoven, A. C. Consumer choice health plan. *The New England Journal of Medicine* (two parts), March 23 and March 30, 1978, *298*, 650–658 and 709–720.

Enthoven, A. C. *Health plan: the only practical solution to the soaring cost of medical care.* Menlo Park, Calif. Addison-Wesley Publishing Company, 1980.

Estes, C. L. *The aging enterprise.* San Francisco: Jossey-Bass, 1979.

Estes, C. L., and Harrington, C. Fiscal crisis, deinstitutionalization and the aged. *American Behaviorial Scientist*, July–August 1981, *24*(6), 811–826.

Estes, C. L., and Noble, M. L. *Paperwork and the Older Americans Act: problems of implementing accountability.* Staff information paper prepared for use by the Special Committee on Aging, U.S. Senate. Washington, D.C.: U.S. Government Printing Office, 1978.

Estes, C. L., et al. *Public policies and long-term care for the elderly: a multi-billion dollar dilemma.* Working paper no. 12. Submitted to the California Policy Seminar. University of California, San Francisco: The Aging Health Policy Center and the Health Policy Program, January 1981.

Feder, J., et al. *National health insurance: conflicting goals and policy choices.* Washington, D.C.: Urban Institute, 1980.

Feldstein, M. S. *The rising cost of hospital care.* Washington D.C.: Information Resources Press, 1971.

Feldstein, M. S., and Taylor, A. *The rapid rise of hospital costs.* Cambridge, Mass.: Harvard Institute of Economic Research, 1977.

Field, T., Millar, R., and Benton, B. *The effect of Title XX implementation on the allocation of social services.* Washington, D.C.: Urban Institute (working paper no. 0990-19), 1978.

Fisher, C. Differences by age groups in health care spending. *Health Care Financing Review,* Spring 1980, 65–90.

Fox, P. D., and Clauser, S. B. Trends in nursing home expenditures: impli-

cations for aging policy. *Health Care Financing Review*, Fall 1980, *2*(2), 67–74.

Freeman, J. T. A survey of geriatric education—catalogues of U.S. medical schools. *Journal of the American Geriatric Society*, September 1971, *19*, 746–762.

Fries, J. F., and Crapo, L. M. *The rectangular curve: aging, changing, and the barrier to immortality.* Stanford, Calif.: Stanford University Press, 1980.

Fries, J. F., and Crapo, L. M. *Vitality and aging.* San Francisco: W. H. Freeman and Company, 1981.

Fuchs, V. R. *Essays in the economics of health and medical care.* New York: National Bureau of Economic Research, 1972.

Fuchs, V. *Who shall live? Health, economics and social choice.* New York: Basic Books, 1974.

Fuchs, V. R., and Kramer, M. J. *Determinants of expenditures for physician's services in the United States 1948–1968.* Washington, D.C.: U.S. Department of Health, Education, and Welfare (Publication no. HSM 73-3013), 1972.

Garfield, J. Social stress and medical ideology. In C. Garfield (Ed.), *Stress and survival: the emotional realities of life threatening illness.* St. Louis: C. V. Mosby Company, 1979.

Geiger, H. J. Elder health policy: disaster. *Generations*, May 1980, *4*(1), 11–12, 52.

Generations, May 1980, *4*(1).

Gibson, R. M. National health expenditures, 1979. *Health Care Financing Review*, Summer 1980, *2*(1), 1–36.

Gibson, R. M., and Fisher, C. R. Age differences in health care spending, fiscal year 1977. *Social Security Bulletin*, 1978, *42*(1), 3–16.

Gordon, D. Capitalism and the roots of urban crisis. In D. Mermelstein (Ed.), *The fiscal crisis of American cities.* New York: Vintage, 1977.

Hamburg, B. A., and Killilea, M. Relation of social support, stress, illness and the use of health services. In U. S. Department of Health, Education, and Welfare, *Healthy People: The Surgeon General's report on health promotion and disease prevention. Background papers.* Washington, D.C.: U.S. Government Printing Office, 1979.

Harper, A., Butler, L. H., and Newacheck, P. W. *Health maintenance organizations and the elderly.* University of California, San Franciso: Health Policy Program, 1980.

Holahan, J., Scanlon, W., and Spitz, B. *Restructuring federal Medicaid controls and incentives.* Washington, D.C.: The Urban Institute, 1977.

Howell, J. M., and Stamm, C. F. *A comparative analysis of 66 U.S. cities.* Lexington, Mass.: Lexington Books, 1979.

Hudson, R. B. *State politics, federalism, and public policies for older Americans.* Paper presented at the Annual Meeting of the Science Association. New Orleans, 1973.

Hughes, E. F. X. Why does medical care cost so much? In *The Nation's Health*, article booklet. San Francisco: Boyd and Fraser Publishing Company, 1981.

Hughes, E. F. X., et al. *Hospital cost containment program: a policy analysis.* Cambridge, Mass.: Ballinger Publishing Company, 1978.

Hulley, S. B. (Ed.). Symposium on CHD prevention trials: design issues test-

ing the influence of lifestyle and health. *American Journal of Epidemiology,* 1978, *108,* 85–111.

Illich, I. *Medical nemesis: the expropriation of health.* New York: Pantheon, 1976.

Joe, T., and Meltzer, J. *Policies and strategies for long-term care.* University of California, San Francisco: Health Policy Program, 1976.

Kane, R., et al. *Geriatrics in the United States: manpower projections and training considerations.* Santa Monica, Calif.: Rand Corporation, May 1980.

Klarman, H. E. *The economics of health.* New York: Columbia University Press, 1965.

Kovar, M. G. Elderly people: the population 65 years and over. In National Center for Health Statistics. *Health United States, 1976–1977.* Washington, D.C.: U.S. Government Printing Office, 1977.

Kutza, E. A. Long-term care policy. Why the delay? *Generations,* May 1980, *4*(1), 43, 61–62.

LaLonde, M. *A new perspective on the health of Canadians.* Ottawa: Government of Canada, April 1974.

Lee, P. R. Health policy issues for the aged: challenges for the 1980s. *Generations,* May 1980, *4*(1), 38–40, 73.

Lee, P. R., and Estes, C. L. Eighty federal programs for the elderly. In C. L. Estes, *The aging enterprise.* San Francisco: Jossey-Bass, 1979a.

Lee, P. R., and Estes, C. L. Public policies, the aged and long-term care. *Journal of Long-term Care Administration.* Fall 1979b, *7*(3), 1–15.

Lee, P. R., and Franks, P. E. Health and disease in the community. In J. Fry (Ed.), *Primary care.* London: William Heinemann Medical Books, 1980.

Lee, P. R., and LeRoy, L. B. Paying for primary care—time for a change? *American Journal of Medicine,* March 1980, *68,* 319–321.

Lee, P. R., Brown, N., and Red, I. (Eds.). *The nation's health.* San Francisco: Boyd and Fraser Publishing Company, 1981.

Libow, L. The issues in geriatric medical education and postgraduate training: old problems in a new field. *Geriatrics,* February 1977, *32*(2), 99–102.

Lipton, H. L., Mitchell, F., and Lee, P. R. *Drugs and the elderly.* Unpublished report. University of California, San Francisco: Health Policy Program, 1981.

Liu, K., and Mossey, J. The role of payment source in differentiating nursing home residents, services and payments. *Health Care Financing Review,* Summer 1980, *2*(1), 51–61.

Lowi, T. *The end of liberalism.* New York: Norton Books, 1969.

Luft, H. S. *Health maintenance organizations: dimensions of performance.* New York: John Wiley & Sons, 1981.

MacMahon, B., and Pugh, T. F. *Epidemiology: principles and practice.* Boston: Little, Brown, 1970.

Marmor, T. *The politics of Medicare.* London: Routledge and Kegan Paul, 1970.

McKeown, T. *The role of medicine: dream, mirage or nemesis?* London: The Nuffield Provincial Hospitals Trust, 1976.

Mechanic, D. *Public expectations in health care.* New York: John Wiley & Sons, 1972.

Mendelson, M. A. *Tender loving greed: how the incredibly lucrative nursing*

home industry is exploiting America's old people and defrauding all of us.
New York: Vintage Books, 1975.

Millar, R., et al. *The impact of the federal expenditure ceiling on Title XX Social Services.* Working paper no. 0990-20. Washington, D.C.: Urban Institute, 1977.

Miller, S. M. *The political economy of social problems: from the '60s to the '70s.* Paper presented at the annual meeting of the Society for the Study of Social Problems, New York, August 1976.

Mollenkopf, J. H. The crisis of the public sector in America's cities. In D. Mermelstein (Ed.), *The fiscal crisis of American cities.* New York: Vintage, 1977.

Moss, F. E., and Halamandaris, V. S. *Too old, too sick, too bad: nursing homes in America.* Germantown, Md.: Aspen Systems Press, 1977.

Mushkin, S. J., Paringer, L. C., and Chen, M. M. *Returns to biomedical research 1900-1975: an initial assessment of impacts on health expenditures.* Washington, D.C.: Georgetown University Public Services Laboratory, October 1976.

National Institute of Education. *Tax wealth in the fifty states.* Washington, D.C.: U.S. Government Printing Office, 1978.

Navarro, V. *Medicine under capitalism.* New York: Prodist, 1977.

Newcomer, R. J., Harrington, C., and Gerard, L. *A five-state comparison of selected long term care expenditure and utilization patterns for persons aged 65 and older.* (Working paper no. 11). University of California, San Francisco: Aging Health Policy Center, 1981.

O'Conner, J. *The fiscal crisis of the state.* New York: St. Martin's, 1973.

O'Donnell, P. S. *Social services: three years after Title XX.* Washington, D.C., National Governor's Association, 1978.

Paffenbarger, R. S., et al. Energy expenditure, cigarette smoking and blood pressure level as related to death from specific diseases. *American Journal of Epidemiology,* July 1978, *108,* 12-18.

Panneton, R. E., and Wesolowski, E. F. Current and future needs in geriatric education. *Public Health Reports,* January-February 1979, *94,* 73-79.

Paringer, L. C., et al. *Health status and the use of medical services: evidence on the poor, the Black and the rural elderly.* Washington, D.C.: The Urban Institute, 1979.

Pauly, M. V. (Ed.). *National health insurance—what now, what later, what never?* Washington, D.C.: American Enterprise Institute for Public Policy Research, 1980.

Pollack, W. *Modeling the costs of federal long-term care programs: issues and problems.* (Working paper no. 0975-06). Washington, D.C.: The Urban Institute, 1974.

Puryear, D. L., and Ross, J. P. *Tax and expenditure limitations: the fiscal context.* Paper presented at the conference on tax limitation. Santa Barbara, University of California, December 14-15, 1978.

Reif, L. Expansion and merger of home health care agencies: optimizing existing resources through organizational redesign. *Home Health Care Services Quarterly,* Fall 1980, *1*(3), 3-36.

Reif, L., and Estes, C. L. Long-term care: a policy perspective. In L. Aiken and S. Gortner (Eds.), *Health policy issues affecting the growth of professional nursing practice.* Forthcoming, 1982.

Reinhardt, U. E. *Parkinson's law and the demand for physicians' services.* Paper presented to the Conference on Competition in the Health Care Sector. Washington, D.C.: Federal Trade Commission, June 1-2, 1977.

Rose, S. M. Deciphering deinstitutionalization: complexities in policy and program analysis. *Milbank Memorial Fund Quarterly*, Fall 1979, *57*(4), 429–460.

Rosenthal, G. Controlling the cost of health care. In M. Zubkof, I. Raskin, and R. Hanft (Eds.), *Hospital cost containment.* New York: Prodist, 1978.

Rushmer, Robert F. *Humanizing health care: alternative futures for medicine.* Cambridge, Mass.: MIT Press, 1975.

Russell, L. B. *Technology in hospitals.* Washington, D. C.: Brookings Institution, 1979.

Scanlon, W. J. Nursing home utilization patterns: implications for policy. *Journal of Health Politics, Policy and Law*, 1980, *4*, 619–641.

Schatzkin, A. How long can we live? A more optimistic view of potential gains in life expectancy. *American Journal of Public Health*, 1980, *70*(11), 1199–1200.

Scitovsky, A. A. *Changes in the costs of treatment of selected illness: 1951–52 to 1964–65.* Palo Alto, Calif.: Palo Alto Medical Research Foundation, 1967.

Scitovsky, A. A. *The use of medical services under prepaid and free-for-service group practice.* Working paper. University of California, San Francisco: Health Policy Program, 1980.

Scitovsky, A. A., and McCall, N. *Changes in the costs of treatment of selected illnesses 1951–1964–1971.* Discussion paper. University of California, San Francisco: Health Policy Program, September 1975.

Scull, A. T. The decarceration of the mentally ill: a critical view. *Politics and Society*, 1976, *6*, 173–212.

Seidman, L. S. Income related consumer cost sharing: a strategy for the health sector. In M. V. Pauly (Ed.), *National health insurance—what now, what later, what never?* Washington, D.C.: American Enterprise Institute for Public Policy Research, 1980.

Shanas, E. *National survey of the aged.* Report to the Aministration on Aging. Washington, D.C.: U.S. Government Printing Office, 1980.

Shanas, E., and Maddox, G. L. Aging, health and the organization of health resources. In R. H. Binstock and E. Shanas (Eds.), *Handbook of aging and the social sciences.* New York: Van Nostrand Reinhold, 1976.

Shortell, S. M. The organization of medical care. In *The nation's health*, article booklet. San Francisco: Boyd & Fraser Publishing Company, 1981.

Showstack, J. A., et al. Free-for-service physician payment: analysis of current methods and their development. *Inquiry*, Fall 1979, *16*, 230–246.

Silverman, M. S., and Lee, P. R. *Pills, profits and politics.* Berkeley: University of California Press, 1974.

Somers, A. R. (Ed.). *Promotion of health: consumer education and national policy.* Germantown, Md.: Aspen Systems Press, 1976.

Somers, H. M. Health and public policy. *Inquiry*, June 1975, *12*(2), 87–96.

Spitz, B., and Holahan, J. *Modifying Medicaid eligibility and benefits.* Washington, D.C.: The Urban Institiute, 1977.

Stambler, H. V. Health manpower for the nation—a look ahead at the supply

and the requirements. *Public Health Reports*, January/February 1979, *94*(1), 3–10.

Syme, S. L., and Berkman, L. F. Social class, susceptibility and sickness. *American Journal of Epidemiology*, July 1976, *104*(1), 1–8.

Thomas, G. S., et al. *Exercise and health: the evidence and the implications.* Cambridge, Mass.: Oelgeschlager, Gunn & Hain, 1981.

Thomas, L. *The lives of a cell: notes of a biology watcher.* New York: Viking Press, 1974.

Tobin, S. S., and Lieberman, M. A. *Last home for the aged.* San Francisco: Jossey-Bass, 1978.

Trager, B. Home health care and national health policy. *Home Health Care Services Quarterly*, Spring 1980, *1*(2).

U.S. Congressional Budget Office. *Long-term care for the elderly and disabled.* Washington, D.C.: U.S. Government Printing Office, 1977.

U.S. Congressional Budget Office. *The share of federal expenditures for the elderly.* Washington, D.C.: U.S. Government Printing Office, 1978.

U.S. Congressional Budget Office. An analysis of the National Health Care Reform Act of 1981 (H. P. 850). Working paper. Washington, D.C.: U.S. Government Printing Office, 1981.

U.S. Department of Health, Education and Welfare, Health Care Financing Administration. *Data on the Medicaid program: eligibility, services, expenditures, fiscal years 1976–1977.* Washington, D.C.: Institute for Medical Management, 1979.

U.S. Department of Health, Education and Welfare, National Center for Health Statistics. Annual report, *Health United States.* Washington, D.C.: U.S. Government Printing Office, 1977–1980.

U.S. Department of Health, Education and Welfare, Office of the Assistant Secretary for Health. *Smoking and health: report of the advisory committee on smoking and health to the Surgeon General.* Washington, D.C.: U.S. Government Printing Office, 1964.

U.S. Department of Health, Education and Welfare, Office of the Assistant Secretary for Health. Task Force on Prevention. *Disease prevention and health promotion: federal programs and prospects.* Washington, D.C.: U.S. Government Printing Office, 1979a.

U.S. Department of Health, Education and Welfare. Office of the Assistant Secretary for Health. *Healthy people: the Surgeon General's report on health promotion and disease prevention.* Washington, D.C.: U.S. Government Printing Office, 1979b.

U.S. Department of Health, Education and Welfare. Office of the Assistant Secretary for Health. *Healthy people: the Surgeon General's report on health promotion and disease prevention.* Background papers. Washington, D.C.: U.S. Government Printing Office, 1979c.

U.S. Department of Health and Human Services, Health Care Financing Administration. *Health care financing program statistics, Medicare: health insurance for the aged and disabled, selected state data, 1973–1977.* Washington, D.C.: Health Care Financing Administration, Office of Research, Demonstrations and Statistics, 1980a.

U.S. Department of Health and Human Services, Health Care Financing Administration. *Medicare annual report, fiscal year 1979.* Washington D.C.: Health Care Financing Administration, 1980b.

U.S. Department of Health and Human Services, Health Care Financing Administration. *Ten years of short-stay hospital utilization and costs under Medicare, 1967–1976.* Washington, D.C.: Health Care Financing Administration, Office of Research, Demonstrations and Statistics, August 1980c.

U.S. General Accounting Office. *History of the rising costs of the Medicare and Medicaid programs and attempts to control these costs: 1966–1975* (MWO-76-93). Washington, D.C.: U.S. Government Printing Office, 1977.

U.S. General Accounting Office. *Entering a nursing home—costly implications for Medicaid and the elderly.* Washington, D.C.: U.S. Government Printing Office, 1979.

U.S. House of Representatives, Committee on Ways and Means. *Medicare amendments of 1978* (report no. 95-1533). Washington, D.C.: U.S. Government Printing Office, 1978a.

U.S. House of Representatives, Select Committee on Aging. *Testimony of Dr. Leslie Libow.* Washington, D.C.: U.S. Government Printing Office, 1978b.

U.S. House of Representatives, Select Committee on Aging, Subcommittee on Health and Long-term Care. *Recent Medicaid cutbacks: shocking impact on the elderly.* Washington, D.C.: U.S. Government Printing Office, 1977.

U.S. Senate, Special Committee on Aging, Subcommittee on Long-term Care. *Nursing home care in the United States: failure in public policy—introductory report.* Washington, D.C.: U.S. Government Printing Office, 1974.

U.S. Senate, Special Committee on Aging. Subcommittee on Long-term Care. *Role of nursing homes in caring for discharged mental patients* (supporting paper no. 7). Washington, D.C.: U.S. Government Printing Office, 1976.

U.S. Senate, Committee on Human Resources, Subcommittee on Aging. *Oversight and Extension of the Older Americans Act,* hearings. Washington, D.C.: U.S. Government Printing Office, 1978.

Urban Systems Research and Engineering, Inc. *Comprehensive review of Medicaid eligibility.* Washington, D.C.: U.S. Department of Health, Education and Welfare, 1977.

Vladeck, B. C. *Unloving care: the nursing home tragedy.* New York: Basic Books, 1980.

Weeks, J., and Spitz, B. *Medicaid nursing home reimbursement in California.* Washington, D.C.: The Urban Institute, 1978.

Weissert, W. G. Long-term care: an overview in the U.S. Department of Health, Education and Welfare. In *Health United States 1978.* Washington, D.C.: U.S. Government Printing Office, 1978.

Wolfe, E. *Technical notes: summaries and characteristics of states' Title XX Social Services plans for fiscal year 1978.* Washington, D.C.: U.S. Government Printing Office, 1978.

Wolpert, J., and Wolpert, E. R. The relocation of released mental hospital patients into residential communities. *Policy Sciences,* 1976, *7,* 31–51.

Zubkoff, M. (Ed.). *Health: a victim or cause of inflation?* New York: Prodist, 1976.

Social and Community Services

This page intentionally left blank

CHAPTER 13
Education for Older Adults

HOWARD Y. McCLUSKY, PH.D.
INSTITUTE OF GERONTOLOGY
UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN

INTRODUCTION

In order to place the major focus of this paper in proper perspective, it will be helpful to introduce our presentation by indicating the relationship of its title to the more inclusive domain of education and aging. This approach will help us identify and become sensitive to the adjacent topical areas to which our assignment is related. It will also assist us in the definition of its substantive boundaries.

A comprehensive review of the relevant gerontological and educational literature will reveal at least four topics which can plausibly be subsumed under the more generic theme of education and aging (McClusky, 1974; Peterson, 1978; Peterson and Bolton, 1980; Sheppard, 1979; Tibbitts et al., 1980). First is the education (training) of personnel required to staff the agencies serving older adults. Second is the education of the not-yet-old, beginning as early as the elementary school, about their own aging, thereby helping them to age successfully and increase the probability of their enjoying the later years as a period of fulfillment. Third is the education of the not-yet-old about what it means to be old. The pursuit of this objective would be aimed at helping the young and middle-aged adult relate successfully to their aging parents. It would also serve to educate the general public to understand and support programs designed to aid older adults. A fourth topic that will be discussed in this chapter is education for older adults. While throughout the following discussion there will be occasional linkages to the first three topics listed above, the major focus

will be on the education for and of the older adult as client and participant in programs and processes of instruction.

At this point the reader should be reminded of the fragile character of the evidence on which our discussion will necessarily be based. In the first place, attention on the part of the mainline gerontologists and adult educators to the domain of education for and of the older adult is of relatively recent origin. If to this historic neglect we add the difficulty that researchers in adult education have had in agreeing on a common terminology for the pupose of systematic data collection, we will begin to understand why the data and documentation undergirding the field of education for and of the older adult are not as fully developed as they are for those areas of both gerontology and adult education that have had a longer history of productive scholarship (Long et al., 1980).

On the other hand, this limitation should not obscure the fact that the education of the older adult, especially since about 1974, has become one of the most rapidly growing departments of the field of lifelong learning and that the forces responsible for its growth are destined to increase in the years ahead. We hope that the following discussion will establish the substantive basis for this prediction.

ANTECEDENTS

If we can trust the record of the education of adults from the earliest colonial period to the present time, we can find little, if any, substantial evidence for the existence of either policies or programs aimed explicitly at the education of the older adult (Grattan, 1955).

In the second half of the 1940s (i.e., after World War II), the situation began to improve. The National Education Association's Department of Adult Education established a Committee on Education and Aging with Clark Tibbitts as chairman. At about the same time, the Universities of Chicago and Michigan began to experiment with courses on living in the later years. But it was not until the 1950 White House Conference on Aging that education for and of the older adult received official recognition on a level commensurate with its importance.

To a remarkable extent, the Section on Education of the 1950 Conference anticipated many of the actions recommended later by both the 1961 and 1971 White House Conferences. In addition, several actions occurred during the decade following which should be reported

in order to provide a fair assessment of the contribution of the period. First was the creation by the Adult Education Association of the USA (AEA/USA) Committee on Aging with Wilma Donahue as chairperson. Second was the preparation and publication by the AEA/USA Committee of a symposium entitled "Education for Later Maturity," the first substantial and scholarly exegesis of the field and, in many respects, still remarkably contemporary in its relevance (Donahue, 1955). Third was the publication by the Fund for Adult Education of a study/discussion program entitled "Aging in Today's Society" designed to assist programs of continuing education (usually university-based) to encourage middle-aged and older people to assess themselves and to pursue meaningful interests and activities in the preretirement and retirement years (Tibbitts et al., 1980). Fourth was the establishment by the New York State Department of Adult Education of a unit on Education and Aging headed by Henrietta Rabe.

The next event to be included in this brief chronicle is the 1961 White House Conference on Aging. The Section on Education did an excellent job of reviewing the then current status of programs and policies concerning education for aging in the United States and in recommending actions designed for their improvement (*The Nation and Its Older People*, 1961). In addition, it placed particular stress on the importance of reaching the "hidden," "difficult-to-involve," "underparticipant" older adult, who may be found at any level of the social structure, but is especially overrepresented in the ranks of the disadvantaged and minority portions of our population.

But again, as in the case of the 1950 Conference, the implementation of the recommendations of the 1961 Conference was disappointing. For example, Ambrose Caliver, at that time Chief of the Section on Adult Education of the U.S. Office of Education, planned to use the authority and prestige of his position to organize regional assemblies to carry out the actions proposed by the 1961 Conference. The response to Dr. Caliver's effort was so limited that much of what he had originally planned had to be canceled.

One bright and prophetic event of the period should be reported, however, for the sake of the record. It consisted of a conference under the title of "The National Pilot Institute on Education for Aging" held at Exeter, New Hampshire, in 1967. Subsidized by the Administration on Aging and co-sponsored by the Adult Education Association of the USA and the New England Center for Continuing Education, it was the *first national conference on aging devoted exclusively to the domain of education.*

But to summarize briefly, the 1950 and 1961 White House Confer-

ences and related activities were only fragile beginnings. As I have stated elsewhere (McClusky, 1978), in the summer of 1970, education for and of the older adult occupied the lowest rank in the priorities of both the gerontological and educational establishments. It was the "orphan in the attic of the stepchild."[1]

Not long into the 1970s, the picture began to improve. Whether or not this improvement can be attributed to the impact of the year-long preparation for and subsequent follow-up of the 1971 White House Conference on Aging is difficult to assess. The fact remains, however, that not long thereafter, three national educational organizations—the American Association of Community and Junior Colleges, the Academy for Educational Development, and the Adult Education Association of the USA—conducted comprehensive surveys of programs aimed at the education of older adults. All three revealed evidence for an impressive increase of activity in the field. The results of the Adult Education Association of the USA survey conducted by DeCrow were particularly impressive. For instance, of the agencies responding to his questionnaire, one-half indicated that they had made significant additions to their programs for the elderly in the year before the survey, and one-half indicated that they planned to make additions to their programs in the year following (DeCrow, 1974).

After the early 1970s, programs designed for the education of the elderly continued to appear and expand at an ever-increasing rate. This fact of expanding program development and increasing participant involvement will constitute much of the substantive basis for the discussion we will present in the remainder of this paper.

EDUCATION AS A POSITIVE APPROACH
TO THE FIELD OF GERONTOLOGY

Gerontology, dealing as it does with the status and condition of the whole person in the later years, is necessarily interdisciplinary. Since it is the product of specialization, each discipline is limited in outlook and views the phenomena of the later years in a manner unique to and determined by the discipline. It is not necessary at this juncture to

---

[1]As further evidence in support of the above point, the *1970 Handbook of Adult Education* published by the Macmillan Company for the Adult Education Association of the USA, the most widely consulted reference in the field and reflecting the "state of the art" at that time, allotted no space for the discussion of education and aging.

describe what the approaches of these various disciplines are (e.g., medicine, biology, economics, sociology,), but merely to point out that they exist and thereby pave the way for our exegesis of what we will call the "educational approach to the later years."

At the risk of appearing to be oversimplistic, we appear to be on defensible grounds in stating that the enterprise of education is based on two fundamental propositions: one is that the client of education is educable, that is, he is capable of an educative response to educational stimulation; and the other is that the outcome of education is an improvement in the function to which the educational experience is applied.

Applied to the realm of gerontology, the educational approach to the phenomena of the later years is (1) preventive, and/or (2) compensatory or rehabilitative, and/or (3) developmental. For example, the educational approach maintains that the object of education is to anticipate those dimensions in which decline is likely to occur and to engage in instruction designed to prevent, mitigate, or postpone its occurrence. An obvious example is education for physical fitness in order to prevent, delay, or possibly reverse the processes of physical deterioration that often accompany old age. If, however, prevention is impossible and some loss and limitation occur as a result, it is then the task of education to rehabilitate the person and/or develop skills and strategies that will enable him or her to compensate for such a loss.

Finally, the educational approach holds that the model of physical decline does not apply to the trajectory of the personality as a whole. It postulates that there are other dimensions of the personality that are capable of continuing development to the end of life. It is the task then of education to identify what these dimensions are, indicate the ones that have the highest contributory value, and engage in processes of instruction designed to encourage their continuing development.

In brief, the educational approach is positive in nature, providing a perspective to the field of gerontology that balances the dominant decremental view of changes in the later years.

A THEORY OF THE DYNAMICS OF
PARTICIPATION AND PROGRAM DEVELOPMENT

As a generic enterprise, education for and of the older adult encompasses a broad and diverse aggregate of instructional phenomena. Too much of its activity is ad hoc in character and lacks the integra-

tive influence of a systematic design. Some effort at conceptualizing and integrating an array of otherwise miscellaneous phenomena should be useful in placing the education of the elderly in comprehensible perspective. For this purpose I would like to offer for consideration a needs theory of the dynamics of participation and program development. It will be composed of two sections: one is called a "theory of margin" and the other, a "hierarchical theory of educational needs."

A Theory of Margin[2]

According to our theory, "margin" is a function of the relationship of "load" to "power." By "load" we mean the self and social demands made on a person in order for him or her to maintain a minimal level of autonomy. By "power" we mean the resources, abilities, possessions, positions, allies, and so on, that a person can command to cope with load. We can increase margin by reducing load or by increasing power, or we can decrease margin by increasing load or reducing power. In other words, we can control margin by modifying either load or power.

A key factor, therefore, for the individual at any stage in life, and particularly in the later years, is the ratio between load and power. Whatever the load and whatever the power, the crucial element is the surplus or margin of power in excess of load. It is this margin that confers autonomy on the individual, gives him an opportunity to exercise a range of options, and enables him to reinvest his psychological capital in growth and development. The rearrangement of load and power so as to preserve a favorable margin is one way of stating the major task of the later years. In fact, it is in the nature of this rearrangement that we may find the key to continuing development for older people.

Thus, the preeminent and universal educational need of the elderly is for that kind of education that will assist them in creating

---

[2]The discussion of the theories of "margin" and "hierarchy of needs" consists of direct and adapted quotations borrowed from portions of the chapter I wrote (McClusky, 1974) for Mason and Grabowski's *Learning for Aging* (1974). The theory of "hierarchy of needs" has been used and adapted by Tibbitts et al. (1980), Sheppard (1979), Weinstock (1978), and others.

Havighurst and Marcus (1980) have recently formulated a related, but somewhat less comprehensive conceptualization of the field (Baum, 1976; Campbell, 1975; Main, 1979; Stevenson, 1980) in the United States.

margins of power for the attainment and maintenance of well-being and continuing growth toward self-fulfillment.

A Hierarchical Theory of Educational Needs

Coping Needs. Since transition through the later years of maturity to old age involves, for the vast majority, substantial reductions in such things as income, position, influential affiliations, and energy, the power aspect of our ratio becomes a matter of central concern. Coping with this reduction in power becomes a preeminent need at this stage in the life cycle, for, in a hierarchical sense, unless minimal coping needs are met, no surplus or margin of power is left with which to meet higher needs. Thus, in any scale of priority, there is solid justification for placing the coping needs first.

Within the coping category we would give top priority to the need to educate for physical well-being and economic security. We do so because these conditions in a hierarchical sense are prerequisite to meeting such survival needs as housing, transportation, the management of legal affairs, and the like. Within the realm of instruction, we would place primary emphasis on basic education. Again, we do so for the obvious reason that, in a hierarchical sense, the ability to read, write, and compute is a prerequisite to participation in more advanced kinds of learning.

Expressive Needs. The category of expressive needs is based on the premise that people have a need to engage in activities for the sake of the activity itself and not always to achieve some goal to which the activity has only an instrumental relationship. Thus, motivation arises from the intrinsic interest in the expressive character of the experience that the activity produces.

There are plausible reasons for believing that the expressive need exists. First, much of our sense of well-being consists in the enjoyment of the healthy expression of our natural capacities. Second, expressive activity is characteristically spontaneous, making possible the liberation of more primitive levels of behavior. And, third, the maintenance routines and specialization of modern life involve only a fraction of the response potential of the human personality. It is postulated, therefore, that especially because of postponed desires and expectations in the later years, there is a large domain of unexpressed and underexpressed talent and interest which, if properly activated, would contribute substantially to the enrichment of living.

Contributive Needs. Underlying the category of "contributive

needs" is the assumption that older people have a need to give. They have a need to contribute something acceptable to others and to the community, blending the need to be useful and to be wanted. In a practical sense, this need can be identified as a desire to be of service. It could take the form of assistance to persons in special categories of deprivation or the part-time contribution of expertise to the management of programs of community service organizations and agencies.

Moreover, it would not be necessary that all these services be given without pay. Because many older people live on incomes lower than those to which they were previously accustomed, some payment for service would not be incompatible with the satisfaction of the contributive need. Evidence for this point is contained in the success of the "foster grandparent" and "senior companion" programs (Campell, 1975).

Influence Needs. It is not difficult to make a case for the fact that people in the later years have a need to exert far greater influence on the circumstances of their living and the world about them than they are apparently and customarily able to do. Not necessarily and not inevitably, but in general, the later years are years of declining power. Although older persons may be less powerful, they are not powerless. With the right kind of education, their decline in power could be arrested if not reversed. Such an outcome could help in shifting the emphasis (so common in current service programs) from "doing for" older people to helping them "do for themselves" as well as "do for the community."

The Need for Transcendence. So far in attempting to formulate a hierarchical needs theory as a guide for the development of educational programs for older persons, we have given priority to their need to satisfy those primary requirements essential for survival. Hence, the first claim on education is to help the older person establish and increase his "cope-ability." When this is done successfully, the resulting margin, that is, the excess of power over load, enables him to satisfy the expressive, contributive, and influence needs. There remains, however, a need uniquely relevant for the later years and which, in an ultimate sense, occupies the most basic position in the needs hierarchy. We refer to a *need for transcendence.* More specifically, an older person needs to rise above and beyond the limitation of declining physical powers and of diminishing life expectancy, that is, the need to become, in Peck's terminology, "body and ego transcendent" (Peck, 1968).

SYSTEMS FOR THE DELIVERY
OF EDUCATIONAL SERVICES

So much for theory; let us now turn to the domain of practice and review the informal and formal systems that are available for the delivery of educational services to the older adult.

Informal Systems

The Senior Center. Let us begin with an assessment of the Senior Center as an agency of instruction. Documentation here is limited, but in a recent survey, the National Council on Aging was able to locate 4,870 organizations which (1) had a program directed to older adults, (2) meeting at least once weekly on a regularly scheduled basis, and (3) providing some form of educational, recreational, or social activity (Leanse and Wagner, 1975).

At its best the senior center can be a highly effective instrument of instruction. It can be especially effective in educating, via its service programs, to meet the coping needs of older persons. It can also be used as an outreach station for the public library, art museum, historical society, and extension classes and lectures for local and regional adult education programs. In addition, when properly staffed, it can develop programs of research and instruction of its own (Kline, 1978; Leanse and Wagner, 1975).

Public Library. The facilities of the public library give it a unique advantage in serving the educational interests and needs of the elderly. It can specialize in the collection of large-print books and periodicals as well as cassettes and "talking books" for those with limited sight. It can assemble books in the fields of literature, history, and philosophy related to the experience of human aging, as well as select periodicals and books in the field of gerontology. It can also serve as a learning exchange and the headquarters for an information referral service, and finally, via its bookmobile and related features of its outreach program, provide "distance teaching" to nursing homes and convalescent and residential centers.

Cooperative Extension Service. The cooperative extension service of the land grant college and university system also has unique facilities for instructing the elderly. For example, the expertise of the home demonstration agent in the fields of consumer education and nutrition can be directly applied to the coping needs of the elderly. Moreover,

the 4-H Club provides an excellent opportunity for productive inter-generational relations between the older farmer and interested youngsters. Volunteering in such a group also provides excellent opportunities for meeting older persons' contributive needs.

Churches and Synagogues. In some respects the church and synagogue have an unequalled advantage in relating to the educational needs and interests of older persons. For instance, they are the only life span (i.e., "cradle to grave") institution in modern society. Moreover, since they are committed to the brotherhood and sisterhood of humankind, they may constitute a quasi-kinship system of support and interactive stimulation. At their best, they are especially well positioned for serving the contributive and transcendent needs of persons in the later years.

One of the notable features of the informal delivery systems as a whole is the nonprescriptive feature of their programs. Because they are not limited by the constraints of credentialism, they are particularly well suited to activate and respond to the initiative of the older learner and can formulate programs adapted to his or her unique pattern of needs.

To lend specificity to the preceding discussion, we will cite the following examples of programs of the agencies we have described. For the senior center, the Kerby Centre of Calgary, Alberta (Canada) (*Kerby Centre—Annual Report,* 1979), as well as the program in the humanities to which we will later refer; for the library, the library system of Lucas County (Toledo), Ohio; for the cooperative extension service, the Michigan State University; and for the church, the Shepherd's Center of Kansas City, Missouri (*Shepherd Center Network Newsletter,* 1980).

Formal Systems

Formal systems consist essentially of the schools and colleges of American society. They include the public and private K–12 schools and the public and private colleges and universities which collectively constitute the credential system of education in the United States. Each sector of this collectivity, according to its tradition and unique facilities, conducts programs of adult and continuing education and, as part of this effort, includes activities designed for the older adult. The K–12 programs, consistent with their traditional role, offer courses in adult basic education, which, to the surprise of many, still attract a sizable number of older persons as students. They also give equal

emphasis to programs of high-school completion for which, because of their dropout rate, older persons constitute a responsive market. In addition, they offer an array of activities, largely noncredit, ranging from courses in maintenance of health, consumer behavior, and job re-entry (i.e., the coping domain) to courses in esthetic appreciation, personal development, and recreation (i.e., the expressive domain and the domain of transcendence).

In the postsecondary or collegiate sector of the formal systems of education, in general, two types of programs are employed to serve the educational needs of older persons. One type consists of regular campus courses, as well as extramural courses in continuing education, which may be taken on either a credit or noncredit basis, often with a reduction or waiver of tuition. The other type consists of courses designed especially for older persons and administered separately from the regular course program.

Examples of the first type may be found in the increasing number of institutions that invite their alumni and others to return to the campus and rejoin the world of the regular student body. This practice has met with varying responses on the part of older persons, indicating that in some instances more than a simple "open door" policy is necessary to persuade them to return to an academic environment designed primarily for older youth and young adults. On the other hand, where special programmatic and administrative measures have been installed, the response of the elderly has been uniformly positive. Outstanding examples may be found in the Donovan Scholars Program at the University of Kentucky, the Bridge Program at Fairhaven College in Bellingham, Washington, and the Senior Center Project at Huron College, Huron, South Dakota, as well as a large number of community colleges throughout the United States (Weinstock, 1978).

An example of the second type of program, that is, one designed especially for older persons and conducted under a separate administration, is the Institute for Retired Professionals allied with the New School for Social Research in New York City. After some 18 years of independent existence, it is now an established feature of the cultural life of New York City and has served as a model for the development of similar programs in at least 12 institutions of higher learning in the country.

Another well-established and influential example of the second type of program is the Institute for Lifetime Learning sponsored by the American Association of Retired Persons.

Reliable data concerning the extent and distribution of involvement of the agencies discussed in the preceding section are practically nonexistent. But if we can allow for the sampling errors in his study,

which he frankly admits, the results of DeCrow's national survey conducted for the Adult Education Association and to which we have referred earlier are revealing and instructive. For example, of the 3,473 agencies returning answers to DeCrow's questionnaire, 601 came from public K–12 school districts, 359 from community colleges, 350 from colleges and universities, 185 from libraries, 895 from cooperative extension services, 393 from senior and community centers, and 541 from an omnibus category called "other community agencies," which presumably included churches and syagogues (DeCrow, 1974).

As indicated above, the preceding data do not lend themselves to valid, rigorous interagency comparison. But keeping in mind that they constitute only a fraction of the total universe of potential response from each category, it is highly significant that there was such widespread involvement in both the informal and formal systems and that in the case of each agency, involvement can be said to range from substantial (e.g., 185 libraries) to outstanding (895 cooperative extensions). In short, education for and of the older adult is not found exclusively in a single agency or a coterie of agencies, but is a function of the full range of educational programs in the community.

Moreover, according to the national Adult Education Survey of 1974, "Almost anything you can mention is being studied somewhere by some older people" (Tibbitts et al., 1980).

At this juncture it is appropriate to make more explicit what has been a theme for guiding our discussion. The theme is simply that education for and of the older adult is rapidly on its way to becoming a major emphasis in the fields of both gerontology and adult education.

To lend weight to the validity of our theme, we would like to present three programmatic and institutional developments that have occurred in recent years which in our judgment are the beginning of programs with significant implications for the future of the educational services for the older adult.

THREE RECENT PROGRAMMATIC AND INSTITUTIONAL DEVELOPMENTS

The Elderhostel

For our first exhibit let us describe the Elderhostel Program. The college campus is the hostel and the elders are the hostelers, hence the term *elderhostel*, borrowed from the term *youth hostel*, which in recent

years has been used to describe a low-cost, backpacking, summer vacation program for youth in Western Europe and the United States.

But in its present form, Elderhostel is a U.S.-based national network of colleges and universities

> engaged in providing short-term, on-campus, college level courses to the elderly at a very low cost. Although provision is made for commuters, about ninety per cent of those attending live in otherwise vacant dormitories, make their own beds, clean their own rooms, eat in the college dining hall, and take from one- to three-week long college courses taught by a regular faculty member of the college they are attending [Knowlton, 1977].

Interest in the program and a desire to learn, plus the ability to pay a modest fee, are the sole requirements for admission to the program, which is conducted without homework, examinations, grades, or the award of credit.

The growth of the Elderhostel movement has been spectacular. Beginning in the summer of 1975 with a network of five colleges in New Hampshire, the Elderhostel provided 15 weeks of instruction involving 220 participants. By 1978, Elderhostel programs were sponsored by 129 colleges and universities in 21 states and served 7,100 older persons. At the present rate of growth, it is estimated that by 1983, 400 colleges in all 50 states will be serving 60,000 participants (Elderhostel *Annual Report*, 1979; Knowlton, 1977).

The Senior Center Humanities Program

The Senior Center Humanities Program is a discussion program for older members of a community. Through the senior center network and its links to the community, the program takes place in senior centers, public libraries, nursing homes, nutrition sites, union halls, churches, community colleges, and other agencies providing services for the elderly. In eight weeks of sessions offered free to both participants and sponsoring agencies and guided by volunteer leaders, groups of 20 persons or less come together to reflect on and discuss selections from the works of well-known novelists, poets, playwrights, biographers, historians, and philosophers.

A series of seven study units collectively entitled "Self-Discovery Through the Humanities" are available as basic texts for discussion groups. Also available are cassette tapes on which professional actors

narrate the selections in the study guide for the use of participants with extremely limited vision and/or reading ability, as well as persons whose reading ability is confined to a foreign language.

The program is sponsored by the National Council on Aging under a grant from the National Endowment for the Humanities. Organized in 1976, by 1978 it had grown to include over 300 discussion groups in 41 states, and it is estimated that as of 1980 some 40,000 persons in 800 sites in 48 states had participated in the program (Kline, 1978; Peacock, 1978; *Senior Center Humanities Program Fact Sheet*, 1980).

The Humanities Program has been noteworthy for the rank-and-file character of the persons it has served. According to one survey, the average level of formal schooling was the eighth grade, somewhat lower than the level of schooling of the general population. It is also a prime example of a noninstrumental subject matter usually associated with the academic elite that can be adapted for the enjoyment of the older adult in the middle and lower range of the social structure.

Intergenerational Education and the Older Adult

One of the unfortunate features of American society is the trend toward the separation of older persons from their younger contemporaries. It is our contention that this separation of the generations constitutes a loss for both the younger and the older person. It is also a challenge to and an opportunity for the field of education. That the field of education is beginning to respond to this challenge is one of the most encouraging developments to occur since (to use Tibbitts' terminology) education began to "take off" in about 1973–74.

We return to the formal delivery system discussed earlier. One of the attractive features of the Donovan Scholar Program at the University of Kentucky, the Bridge Project at Fairhaven College in the State of Washington, and the Senior Center Project at Huron College, South Dakota, is the fact that in all three instances (all examples of the formal system) the older student mingles freely in and out of class with his younger college-age counterpart—and does so with the hearty acceptance of both young and old.

Again consider the elderhostel. In those instances in which the older hosteler shares classes with members of the college-age student body, again the response has been highly favorable. And finally, as at Duke University, wherever an Institute of Retired Professionals has been located close to a college or university campus, thus permitting

an exchange of educational experience and activities with younger students, the outcome has been positive.

Experience with intergenerational learning at elementary and secondary schools has been equally favorable. At the K–12 level, the older person plays the role of mentor. He rehearses the skills and knowledge he tries to transmit. In interaction with his young protégés, he revives his interest in process of inquiry, and in the activities he shares with the K–12 students, he learns again what it means to be young and renews his understanding and enjoyment of young people.

For examples let us visit the Thrasher Elementary School in Chattanooga, Tennessee, where residents of a senior housing center are aides to the teachers and the school librarian. Again let us take a look at the Teaching–Learning Community Program (T–LC) in Ann Arbor, Michigan. If we do, we will see retirees from the community, known as "grandpersons," donating their expertise to the enrichment of the humanities and arts curricula of the city's elementary schools (Mead, 1977). Finally, if we are interested at the level of the secondary school, we can drop in at the Brighton High School in Boston, Massachusetts, where older persons supplement the instruction in history classes by giving lectures or leading discussions based on their life experience. In all these instances and in many others throughout the United States as well as those stimulated by the National School Volunteer Program (*Guidelines for Involving Older School Volunteers*, 1978), we would discover that the performance of the older person is everywhere welcomed and approved by the pupils, teachers, parents, and administrative staff.

Another indication that the intergenerational approach to the instruction of the older adult is attracting substantial interest and gaining widespread support is the fact that two national conferences dealing with this topic were held in 1980, one under the auspices of an ad hoc national committee at the Wingspread Conference Center of the Johnson Foundation in Racine, Wisconsin, and the other under the sponsorship of the National Council on Aging in Washington, D.C.

THE SERVICE PROVIDER AS EDUCATOR

In practical and operational terms the major thrust of gerontology is the care and protection of the fragile elderly. To this end most legislation is directed and to this end the services, ranging from low-cost

housing to long-term medical care, are dedicated. If then, we can convert even a small portion of the enormous array of facilities, personnel, and programs of the service agencies to the use of educational processes, we will have made a formidable contribution to the satisfaction of the coping and survival needs of older persons.

The logic of the concept of the "service provider as educator" is simple. It is based on the obvious fact that a service is performed in response to a need, that is, some lack or loss, or some deprivation. Examples are nursing care, home-delivered meals, legal and financial counseling to name a few. In all these instances the involvement of the older persons is substantial and the provision of the service has great power as an "arousal stimulus." The provision of services thus constitutes what the educator regards as a "teachable moment" and if viewed as such, provides extremely responsive opportunities for instruction. For example, a low-cost meal at a senior center may be an occasion for instruction in good nutrition. Or a diagnostic medical examination may provide an opportunity for instructing the client in the maintenance of health. To pursue the last example at greater length, what is known as "patient education" is now becoming regarded as an integral and necessary part of nursing and medical care. In fact, there is a growing volume of evidence to indicate that when such education is employed, measurable improvements in the condition of the patient occur as a result (Bunning, 1978).

Similar processes of education can be employed by other service programs as well. They would stimulate the client to take more responsibility for the improvement of his condition and would go far toward transforming the programs of the service agencies and the training of personnel required for their operation.

SELECTED OVERSEAS DEVELOPMENTS

A number of interesting programs on behalf of the education of older adults are being offered in nations other than the United States. For purposes of our discussion, perhaps the most significant overseas development is the growth of the University of the Third Age (Costa, 1980). Organized for the first time in 1972 at the University of Toulouse in France, according to 1979 statistics (Anderson, 1979), it has spread to 32 other institutions of higher learning in France, as well as to Canada and several other countries in Europe (e.g., Belgium, Po-

land, Switzerland). While it has much in common with such projects in the United States as the Donovan Scholar Program at the University of Kentucky and the Institute for Retired Professionals at Duke University, it combines a number of features which give it a unique institutional identity of its own. For example, along with a strong emphasis on participation in the regular academic studies, it places high priority on participation in cultural and recreational activities and in the use of the University's medical services. In other words, its program is strikingly holistic in character. It also places great value on the interaction of the older student with the regularly enrolled student of college age. There are no academic requirements for admission and the cost to the participant is minimal.

According to Professor Costa, Secretary General of the Association of Universities of the Third Age, a special effort is being made to export the idea of the University of the Third Age to the universities in South America.

Programs comparable to many U.S. projects are going on in Australia (Pahs, 1978), as well as in Alberta and Saskatchewan, Canada (*Spring Session for Senior Citizens*, 1979). Reference should also be made to the fact that the elderhostel is being considered for adoption by colleges and universities in countries outside the United States (e.g., Canada, England, France, Switzerland; Elderhostel *Annual Report*, 1979).

A more comprehensive review of overseas programs designed for the Education of the Older Adult is contained in a report of an international survey conducted by the Educational Testing Service (Peterson et al., 1980).

THE DOMAIN OF SCHOLARLY INQUIRY
AND RESEARCH

Since we have empasized throughout this chapter that programs of education for and of the older adult are, in any sizable dimension, of relatively recent origin, it should not surprise the reader to learn that programs of scholarly inquiry and research in the field are equally new and have an even shorter history of production. For example, of the 117 items in the Annotated Bibliography of Education and Aging compiled by the Academy of Educational Development (*Never Too Old to Learn*, 1974), only 8 appeared before

1965, 30 between 1965 and 1969, but 79 in the four years 1970–73 inclusive.

Two major developments that have occurred since 1970 are largely responsible for the growth and encouragement of scholarly activity in the field. One consists of the projects of selected national organizations on behalf of the elderly. Another is the emergence of educational gerontology as a fledgling academic discipline. An example of the first category is the Adult Education Association's sponsorship of (1) the compilation of a comprehensive bibliography in the field, the first of its kind (Jacobs et al., 1970); and (2) the publication of *Learning for Aging,* the first substantive attempt to deal with the field as a whole (Mason and Grabowski, 1974) and DeCrow's national survey of educational programs for older Americans (DeCrow, 1974). This category should also include the national surveys of learning and teaching conducted by the Academy for Educational Development (Murphy and Florio, 1978; *Never Too Old To Learn,* 1974), as well as the investigations of the American Association of Community and Junior Colleges (Korim, 1974) and the national study of College Programs for the Education of the Elderly sponsored by the Educational Facilities Laboratory (Weinstock, 1978).

Educational Gerontology

The years since 1974 are also noteworthy for the emergence of Educational Gerontology as an aspiring discipline of academic inquiry. The term was probably first used at the University of Michigan in 1974 to apply to a course introduced there under that title (Peterson et al., 1979). It was the title of a National Congress held at Virginia Beach, Virginia, in 1976, the proceedings of which have been published under the title of *Introduction to Educational Gerontology* (Sherron and Lumsden, 1978). It is also used as the title of a new journal, first published in 1976, which is rapidly growing in acceptance and influence in the academic community and serves as the major outlet for the publication of scholarly work in the field.

Finally, while gerontology in the curricula of post–secondary education is a much more comprehensive domain than that covered in this chapter, that portion of the larger field which deals with education of the elderly is gradually receiving greater recognition in the programs of colleges and universities. According to Lumsden, in 1977, 19 colleges and universities were giving 48 courses with varying degrees of relevance for the field of educational gerontology (Lumsden, 1978). The

number of institutions of higher learning contributing to the expansion of the field of educational gerontology has, of course, increased since the publication of the results of Lumsden's survey in 1978.

Research and the Intelligence of Older Adults and Their Ability to Learn

At the risk of being too selective and therefore possibly unrepresentative in the choice of literature in the field, we offer the following review of the present status of our research-based knowledge about the intelligence of the older adult and his or her ability to learn.

Some years after the Stanford revision of the Binet Scale tagged the upper limit of the growth of intelligence at age 16 for the average adult and at age 18 for the superior adult, Jones and Conrad administered the Army Alpha Test of Intelligence (a product of World War I) to a number of persons in New England ranging from 10 to 60 years of age. According to their results, scores on the test peaked in the early 20s and declined gradually thereafter until age 60 (Jones and Conrad, 1933). Studies by Miles (1932) and data collected by Wechsler (1958) in the process of standardizing the WAIS confirmed the Jones-Conrad results. But the picture of early peaking followed by decline was attacked by Lorge (1955). He objected for two reasons. First, he asserted that the tests used by Jones and Conrad, Miles, Wechsler, et al. placed too great an emphasis on rate or speed of response and not on power, or what Thorndike called altitude, of response. He also stated that these earlier investigators ignored the significance of the negative correlations between age and test performance. That is, they did not allow for the fact that decreasing levels of formal schooling, and not age per se, may have been a better explanation for the decline in test performance of older persons.

The decisive critique of the rise and decline picture came from a recognition that the cross-sectional design employed in the research cited above yielded measures of difference in performance between generations (cohort differences) and not differences in the performance with age in the same persons. The early dependence on cross-sectional data can be partly explained by the fact that because of the youth of the testing movement, cross-sectional data were the only kind of data available for study at that time. But a few years later data derived from successive (longitudinal) measures of the same persons began to appear, the collective impact of which was to advance the years of peak intelligence and, for purposes of this discussion, refute

the cross-sectional picture of decline (Bayley and Oden, 1953; Kangas and Bradway, 1971; Owens, 1953). In recent years the picture of stability and, in some dimensions, the possible growth in intelligence has been confirmed and better understood as a result of the application of a sophisticated research design which combines both the cross-sectional and longitudinal approaches to the same population, thus separating cohort differences from ontological differences (Baltes and Schaie, 1974; Schaie, 1975). Especially revealing has been the application of contextual or ecological approaches to the cognitive performances of older adults which has made possible the identification of clusters or patterns of life experience as an explanation (not age per se) for change (Gribbin et al., 1980).

Finally, further validation has come from studies indicating that health is a crucial variable in the stability of intelligence (Riegel, 1967). Thus, the verdict of research is that if we accept the definition of intelligence as the ability to learn, and/or accept the fact that scores on tests of intelligence are highly correlated with learning performance, then we are on safe empirical grounds in concluding that the ability to learn continues at a stable level well into the later years. At the same time, however, we are confronted with the fact that studies of performance in certain learning tasks indicate that older adults do not perform as well as their younger competitors. Such is the evidence provided by Botwinick (1978) and Okun (1977); hence, the utility of the distinction between the primary ability to learn, on the one hand, and performance in tasks of learning on the other hand. That this distinction is plausible as an explanatory principle, is shown in the fact that in a large number of studies in the psychology laboratory, if the older adult is given ample time to study and respond to a stimulus, and/or if he is provided with cues for organizing the structure of a stimulus situation, his performance improves (Okun, 1977).

But even more significant is the fact that when an older person is given substantial training in the processes intervening between pre- and post-testing, marked improvement does in fact occur (Sanders et al., 1976; Waskel and Peterson, 1979). The Waskel–Peterson research is especially relevant for our discussion because their dependent variables were derived from elements of real life experience which older adults often confront, while the independent variables consisted of workshop sessions very similar to procedures used in typical instructional situations. More specifically, the data of the Waskel–Peterson study indicated that training in strategies of problem solving did significantly enhance the elderly participants' ability to generate more alternatives in applied problem settings. While Okun and, to some extent,

Botwinick use the results of laboratory studies to offer suggestions for the conduct of instruction, most of this advice is yet to be applied, observed, and recorded in any systematic way and is, therefore, still in the realm of recommendation and not that of performance or use. The advantage of the Waskel–Peterson research, however, is that it more nearly replicates actual classroom or workshop instruction as it actually occurs, which, according to the theory of identical elements, has a greater likelihood of transferring to the exigencies of everyday instructional practice.

Briefly then, based on the results of research on the intelligence of the older adult and his ability to learn, we can conclude that given good health, the primary ability to learn remains relatively stable and intact well into the later years. However, performance in learning some (not all) specific tasks may decline. At the same time, however, this decline should not be interpreted as indicating a loss in primary mental ability. By the application of appropriate measures of instruction it may even be reversed.

SOME GENERALIZATIONS

1. Existing programs of education for and of the older adult are much more responsive to "coping" and "expressive" needs of older persons, less but somewhat responsive to their "contributive" needs, and much less responsive to their need to influence; the situation concerning the need for "transcendence" is difficult to assess because of difficulties of identifying it as a discrete category of experience.

2. The nonprescriptive and noncredential systems of instruction are much more attractive to older persons than prescriptive and credential systems. This reflects the importance of the client-centered character of the interests and needs of the older learner and the necessity of the service systems, whether formal or informal, to be flexible and permissive in determining the content, method, and arrangements (i.e., location, scheduling) of instruction.

3. Experience to date indicates a growing recognition of the older adult as a resource, both in the process of his own instruction (e.g., via his personal experience, expertise) and a resource in the education of others. In a sense this point is a variation on the "contributive" theme as a partial explanation for the dynamics of participation.

4. In some respects, and especially for practical and operational purposes, the most striking outcome of recent experiences in the field

is the failure of the early efforts at needs assessment, and particularly the data concerning the rate of participation, to predict the volume and range of the response of older persons to educational programs that has occurred in recent years. This failure at prediction may indicate that conventional methods of needs assessment are not valid for older persons. It may also indicate that most communities do not provide enough images of programmatic potential for older persons to make a reliable judgment. Whatever the cause, traditional rates and measures of participation cannot be trusted to assess the response potential of older persons (Wasserman, 1976). Indeed, if Wasserman's results had been taken seriously by colleges and universities of the country, there would be no elderhostel.

In a sense, or to a degree, however, the growing rates of participation by older persons in educational activities is a de facto validation of the results of psychological research concerning the intelligence of the older adult and his ability to learn. The psychologists have assured us that the primary ability to learn does not decline, but, in fact, holds up well into the later years. The increasing volume and range of participation is a behavioral confirmation of this fact.

5. There is a great need for a more extensive and systematic documentation of the innovative and significant programmatic developments that are occurring in the field. This documentation should be centered in some information referral system whereby knowledge of successful current practice may be made available to interested persons throughout the country.

6. Similarly, there is a great need for research. Practically every phase of the teaching–learning process, its content, management, administration arrangements, leadership, and so forth, is researchable and would be greatly enhanced by systematic and controlled investigation.

IN CONCLUSION:
LIFELONG LEARNING AND THE FUTURE

In conclusion we will briefly consider one of the linkages to which we referred in the introduction to this chapter. In any ultimate sense, education for and of the older adult is now and in the future will increasingly be linked with the more generic movement for lifelong learning. The term *lifelong learning,* occasionally used in the earlier stages of adult education in the United States (Bryson, 1935), has now become a dominant and integrating theme for the examination of all

levels of education both in the United States and abroad. For "straws in the wind," note (1) the change, in 1977, of the title of the AEA/ USA's journal from *Adult Leadership* to *Lifelong Learning—The Adult Years;* (2) the Faure report for UNESCO (Faure, 1972); (3) the Exxon Education Foundation project (Peterson et al., 1979); and (4) Harvard's annual Institute for the Management of Lifelong Education.

It is already clear that what is now only a beginning is destined to increase significantly within the foreseeable future. In addition to the pressure exerted by increasing demographic changes, at least three trends already under way in academia will substantially contribute to this development. One is what we might call the "gerontologizing" of the curriculum (Peterson and Bolton, 1980; Seltzer et al., 1978). Another is the continuing expansion of lifelong developmental psychology (Baltes et al., 1980; Chickering et al., 1981; Knox, 1977; Schaie and Willis, 1978). And the third is the full-fledged extension by the adult educator of instruction to the *end* of life (Chickering et al., 1981; Havighurst and Marcus, 1980; Peterson et al., 1979; Sherron and Lumsden, 1978).

The implications of these developments for the enterprise of education as a whole is beyond the scope of this chapter, but implications for the education for and of the older adult are clear and decisive. Among other things, it will provide an opportunity to operationalize the concept of the "spiral curriculum," that is, the point that skills and ideas introduced initially in the elementary and/or secondary school may be reintroduced for increasing refinement and understanding at successively later stages in the life cycle (Bruner, 1960). It will also enable us to test the hypothesis that education for life at its culminating best should provide the criteria for education at all the earlier stages leading thereto (McClusky, 1974).

In brief, in the context of lifelong learning, education for and of the older adult will not be regarded as an experience apart, but as the culmination of educational experience whose antecedents reach back to the beginning of life.

REFERENCES

Anderson, S. H. French schools help the senior class. *The New York Times*, January 7, 1979, p. 25.

Baltes, P. B., and Schaie, K. W. Aging and IQ: The myth of the twilight years. *Psychology Today*, 1974, 7, 35–40.

Baltes, P., Reese, H. W., and Lipsitt, L. P. Life-span developmental psychology. *Annual Review of Psychology*, 1980, 31.

Baum, J. An exploration of widowhood: Implications for adult educators. Paper presented at the Adult Education Research Conference, San Antonio, Texas, April 5–7, 1976.

Bayley, N., and Oden, M. E. The maintenance of intellectual ability in gifted adults. *Journal of Gerontology*, 1953, *10*, 91–107.

Botwinick, J. *Aging and Behavior*. New York: D. Van Nostrand, 1978.

Bruner, J. *The Process of Education*. New York: Random House, 1960.

Bryson, L. *Adult Education*. New York: American Book Company, 1935.

Bunning, R. Patient teaching: Implications for university based adult educators. *Adult Education*, 1978, *28*, 121–126.

Campbell, R. A perceived need to contribute and its relation to a sense of fulfillment in later life. Unpublished Ph.D. dissertation, Ann Arbor, University of Michigan, 1975.

Chickering, A. W., et al. *The Modern American College*. San Francisco: Jossey-Bass, 1981.

Costa, F. A university for the third age. Memorandum, University of Toulouse, France, 1980.

DeCrow, R. *Learning for Older Americans: an Overview of National Effort*. Washington, D.C.: Adult Education Association of the USA, 1974.

Donahue, W. *Education for Later Maturity*. New York: William Morrow, 1955.

Elderhostel, Newton, Mass., *Annual Report*, 1979.

Faure, E., et al. *Learning to Be: The World of Education Today and Tomorrow*. New York: Unipub, 1972.

Grattan, C. H. *In Quest of Knowledge*. New York: The Associated Press, 1955.

Gribbin, K., Schaie, K. W., and Parham, I. A. Complexity of life style and maintenance of intellectual abilities. *The Journal of Social Issues*, 1980, *36*, 30–47.

Guidelines for Involving Older School Volunteers. Alexandria, Va.: National School Volunteer Program, 1978.

Havinghurst, R. L., and Marcus. Education for aging. In E. Boone et al., (Eds.), *Serving Personal and Community Needs Through Adult Education*. San Francisco: Jossey-Bass, 1980.

Jacobs, H. L., Mason, W. D., and Kauffman, E. *Education for Aging: A Review of Recent Literature*. Washington, D.C.: Adult Education Association, 1970.

Jones, H. E., and Conrad, H. S. The growth and decline of intelligence: A study of a homogeneous group between the ages of ten and sixty. *Genetic Psychology Monographs*, 1933, *15*, 223–298.

Kangas, J., and Bradway, K. Intelligence at middle age: A thirty-eight year follow-up. *Developmental Psychology*, 1971, 5(2), 333–337.

Kerby Centre—Annual Report, 1979. Kerby Building, Calgary, Alberta, Canada.

Kline, S. Humanities enrichment as road to self-discovery. *Perspectives on Aging*, 1978, March/April.

Knowlton, M. P. Liberal arts: The Elderhostel plan for survival. *Educational Gerontology*, 1977, *2*, 87–93.

Knox, A. B. *Adult Development and Learning*. San Francisco: Jossey-Bass, 1977.

Korim, A. S. *Older Americans and Community Colleges: An Over-View*. Washington, D.C.: American Association of Community and Junior Colleges, 1974.

Leanse, J., and Wagner, S. B. *Senior Centers: A Report of Senior Group Programs in America*. Washington, D.C.: The National Council on Aging, 1975.

Long, H., Hiemstra, R., et al. *Changing Approaches to Studying Adult Education*. San Francisco: Jossey-Bass, 1980.

Lorge, I. Capacities of older adults. In W. Donahue (Ed.), *Education for Later Maturity*. New York: William Morrow, 1955.

Lumsden, D. B. Graduate training in education and aging: results of a national survey, Part 2. *Educational Gerontology*, 1978, *3*, 1–7.

Main, K. The power-load-margin formula of Howard Y. McClusky as the basis for a model of teaching. *Adult Education*, 1979, *30*, 19–33.

McClusky, H. Y. Education for aging: The scope of the field and perspectives for the future. In D. Mason and S. Grabowki (Eds.), *Learning for Aging*, chap. 16. Washington, D.C., Adult Education Association of the USA, 1974.

McClusky, H. Y. Designs for learning. In L. Jarvik (Ed.), *Aging into the 21st Century*, chap. 12. New York: Gardner Press, 1978, pp. 169–185.

McClusky, H. Y. The Community of generations. In R. Sherron and D. B. Lumsden (Eds.), *Introduction to Educational Gerontology*, chap. 3. Washington, D.C.: Hemisphere Publishing Co., 1978, pp. 49–75.

Mead, M. Grandparents as educators. *The Saturday Evening Post*, March 1977, pp. 55–58.

Miles, C. C., and Miles, W. R. The correlation of intelligence scores and chronological ages from early to late maturity. *American Journal of Psychology*, 1932, 44–78.

Murphy, J., and Florio, C. *Never Too Old to Teach*. New York: Academy for Educational Development, 1978. *Never Too Old to Learn*. New York: Academy for Educational Development, 1974.

Okun, M. H. Implications of geropsychological research for the instruction of older adults. *Adult Education*, 1977, *27*, 139–150.

Owens, W. A. Age and mental abilities: A longitudinal study. *Genetic Psychology Monographs*, 1953, *48*, 3–54.

Pahs, D. Over sixties education. *Growing Older*, a quarterly journal of the Australian Council on the Aging, June, 1978, *7*, 6.

Peacock, V. S. Don't cold-water the old people. *Humanities*, 1978, 8.

Peck, R. C. Psychological developments in the second half of life. In B. Neugarten (Ed.), *Middle Age and Aging*, chap. 9. Chicago, Ill.: The University of Chicago Press, 1968.

Peterson, D. Toward a definition of educational gerontology. In R. Sherron and D. B. Lumsden (Eds.), *Introduction to Educational Gerontology*, chap. 7. Washington, D.C.: Hemisphere Publishing C., 1978.

Peterson, D. and Bolton, C. *Gerontology Instruction in Higher Education*. New York: Springer Publishing Co., 1980.

Peterson, R. E., Helnuck, J. E., Valley, J. R., Gaff, S. S., Feldmesser, R. A., and Neilson, H. D. *Adult Education Opportunities in Nine Industrialized Countries*. Princeton, N.J.: Educational Testing Service, 1980.

Peterson, R. E., et al. *Lifelong Learning in America*. San Francisco: Jossey-Bass, 1979.

Riegel, K. F., Riegel, R. M., and Myer, G. A study of the dropout rates in longitudinal research on aging and the prediction of death. *Journal of Personality and Social Psychology*, 1967, 5, 342–348.

Sanders, R. E., Sanders, J. A. C., Mayes, G. J., and Sielski, K. A. Enhancement of conjunctive concept attainment in older adults. *Developmental Psychology*, 1976, 12, 485–486.

Schaie, K. W. Age changes in adult intelligence. In D. S. Woodruff and J. E. Birren (Eds.), *Aging: Scientific Perspectives and Social Issues*, chap. 6. New York: D. Van Nostrand, 1975.

Schaie, K. W., and Willis, S. L. Life span development: Implications for education. *Review of Research in Education*, 1978, 6, 120–156.

Seltzer, M. M., Sterns, H., and Hickey, T. (Eds.), *Gerontology in Higher Education: Perspectives and Issues*. Belmont, Calif.: Wadsworth Publishing Co., 1978.

Senior Center Humanities Program Fact Sheet, Washington, D.C.: National Council on Aging, 1980.

Shepherds Center Network Newsletter, 5218 Oak Street, Kansas City, Mo., 64112, 1980.

Sheppard, N. A. *Educational Opportunities for Older Persons: A Review*. Columbia, Ohio: The Eric Clearinghouse on Adult, Career and Vocational Educational, the Ohio State University, 1979.

Sherron, R., and Lumsden, D. B. (Eds.). *Introduction to Educational Gerontology*. Washington, D.C.: Hemisphere Publishing Co., 1978.

Spring Session for Senior Citizens Brochure, Faculty of Extension, Corbett Hall, University of Alberta, Edmonton, Alberta, Canada, 1979.

Stevenson, J. S. Load power and margin in older adults. *Geriatric Nursing*, 1980, May/June, 52–55.

The Nation and Its Older People. Report of the White House Conference on Aging, 1961.

Tibbitts, C., Friedsam, H., Kerschner, P., 'Maddox, G., and McClusky, H. Y. *Academic Gerontology: Dilemmas of the 1980's*. Ann Arbor, Mich.: Institute of Gerontology, University of Michigan, 1980.

Waskel, S. A., and Peterson, C. *Problem Solving Strategies and the Elderly: A Systematic Approach*. Omaha, Neb.: University of Nebraska, The Gerontology Program, College of Public Affairs and Community Services, 1979.

Wasserman, I. M. The educational interests of the elderly: A case study. *Educational Gerontology*, 1976, 1, 323–331.

Wechsler, D. *The Measurement and Appraisal of Adult Intelligence* (4th ed.). Baltimore: Williams and Wilkins, 1958.

Weinstock, R. *The Graying of the Campus*. New York: Educational Facilities Laboratories, 1978.

Index