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**Aging Versus Disease: Current
Health Perceptions Among
the Elderly**

Sharon B. Arnold

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The original version of this study was prepared as a dissertation in January 1989 in partial fulfillment of the requirements of the doctoral degree in policy analysis at the RAND Graduate School. The faculty committee that supervised and approved the dissertation consisted of William Rogers (Chairman), Cathy Sherbourne, and Robert Kane.

PREFACE

This Note examines the definition of health as "the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." It addresses the concept that societal stereotypes may also play an important role in influencing the perception of health at different stages of life.

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The findings in this Note will be of interest to health services and to organizations dealing with current health perceptions and may have important implications for health behavior among the elderly.

SUMMARY

Societal stereotypes may play an important role in influencing self-perceptions of health at different stages of life. Our view of aging is one of inevitable multiple chronic illnesses and functional decline; this stereotype may be an important contributor to the elderly person's perceptions of health. This study examined differences in Current Health Perceptions among age groups in three samples: a general patient sample of persons visiting their physicians, a subset who report no chronic disease, and a sample of persons with chronic disease. Most, if not all, of the age-related decline in Current Health Perceptions is due to disease. In fact, older persons reported significantly better health perceptions after controlling for disease severity in the chronic-disease sample. These findings do not appear to be due to different rates of missing data between older and younger persons, or to differences in reference groups used to evaluate health. Analyses of longitudinal data support the theory that older persons lower their expectations regarding their health, which results in more optimistic perceptions of health than younger persons after controlling for disease. The increase in perceptions of health observed in the elderly may have important implications for health services use and health behavior among the elderly. The possible link between negative stereotypes of aging and lowered expectations of health suggests an opportunity for educational interventions.

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I. INTRODUCTION

Health is a multidimensional concept; the World Health Organization (WHO) has defined health as "the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). The measure of general health perceptions is an integrative concept of health, encompassing the three dimensions of health defined by the WHO. Since it does not mention specific dimensions of health, respondents can integrate both objective and subjective information into a determination of health perceptions. The subjective information, or perceptions, is an important component of health and health behavior. The determination of need for health services and other health-related actions may involve "integrating perceptions of both physical and mental health status along with other health-related perceptions...." (Davies and Ware, 1981, p.1).

Various external forces may influence self-perceptions of health. For example, one's expectations of health may influence health perceptions (Boyer, 1980). This is supported by the finding that older persons are more likely to attribute mild ambiguous symptoms such as weakness and aching to aging rather than illness (Leventhal and Prohaska, 1986), possibly because their expectations of aging include such symptoms.

Societal stereotypes may also play an important role in influencing perceptions of health at different stages of life. For many years, the stereotype of aging was one of inevitable multiple chronic illnesses and functional decline. The process of aging and disease were so inextricably intertwined that only recently has any attempt been made to dissociate the two. While it is clear that there is a definite correlation between age and the number of chronic conditions, there is by no means a one-to-one correspondence. Chronic illnesses accumulate with age; however, this does not necessarily imply that aging is synonymous with diseases or decline. Because persons with chronic disease are seen as being weak, helpless, and dependent (Zola, n.d.), those characteristics are automatically transferred to the elderly.

There is evidence that a greater understanding of disease processes, coupled with recent studies of aging in select populations, has contributed to significant changes in the definitions of disease and aging. For example, in 1970, Dovenmuehle defined aging as "any biological processes that are time-related, irreversible, and deleterious in nature," while illness was defined as a "time-related, reversible, deleterious change" (Palmore, 1970, p. 40). With the benefit of increased understanding, it has become clear that these definitions are no longer applicable. While some illnesses may be reversible, others are not (for example, many cancers). Some illnesses have been shown to be related to the aging process (for example, the accumulation of exposure has been implicated in many cancers and in the effects of blood cholesterol level and hypertension). Our increased understanding of illnesses has made way for a broader definition of disease as "any process that results in clearly adverse clinical sequelae measured as either morbidity or mortality" (Minaker and Rowe, 1985). Correspondingly, our definitions of processes associated with aging change as our definitions of disease evolve. What were once relatively clear lines drawn between aging and disease have become blurred. Many of the changes that were previously associated with aging, such as increases in blood pressure and cholesterol levels in the blood, are reversible, and now are increasingly being considered as indicators of disease.

Recent studies of aging have shown that the aged population is not homogeneous; considerable variation exists both in terms of disease status and functional ability (see Maddox, 1987). Although a relatively small proportion of elderly persons suffer from severe illnesses or disabilities, our stereotypes of all elderly as extremely frail and disabled color our perceptions of them and dominate the care and treatment of the aged. To the extent that society's perceptions of the health of the aged are negative, this stereotype may also adversely affect both the treatment available and the elderly person's own perception of health and the value of health care services. The stereotype of inevitable decline with age is also erroneous because

there is evidence that mental health increases with age. In one study of the mental health of persons with chronic disease (Cassileth et al., 1984), mental health was observed to increase with age; this was true across all diagnostic categories studied.

The system of health and social services in this country has been built on the myth of irreversible decline and dysfunction in the aged, and present policies often allocate resources on the basis of age, independent of disease status. This allocation may be accomplished both explicitly and implicitly--explicitly through economic and insurance policies and age cutoffs for some medical technological services, and implicitly through the decisions of patients to seek care and the treatment decisions of medical care professionals (Aaron and Schwartz, 1984). For example, an examination of the types of routine laboratory tests offered to patients of all ages indicates that physicians do not offer older persons routine screening tests that have been demonstrated appropriate, such as pap smears and breast examinations for older women (Radecki et al., 1988). Greenfield and his colleagues have found that older women with breast cancer are offered fewer treatment options, even when they present without comorbid conditions (Greenfield et al., 1987).

Although some have called for clear policies to ration costly services on the basis of age, with the justification that these services are less useful in older persons because they often only prolong dying (Callahan, 1987; Daniels, 1988), recent evidence suggests that the current insurance climate still favors the aged, at least for routine care. A recent study reported that elderly persons (defined as aged 65 and older) had better access to health care services than did insured younger persons of working age (Hayward et al., 1988).

In spite of their greater access to the health care system, many believe that the elderly receive poor care because of the failure of health care providers to complete a comprehensive health assessment (Minaker and Rowe, 1985). For example, physicians ignorant of recent knowledge regarding *normal aging* may incorrectly attribute a decline in some physiological measure (such as hematocrit) to a change associated with aging, instead of making a proper diagnosis of anemia and treating

the condition. Additionally, many cases of reversible dementia go untreated each year because of the persistent stereotype that dementia is an inevitable result of aging (McCartney and Palmeteer, 1985). Older persons with cancer may be offered fewer therapeutic alternatives (Greenfield et al., 1987).

This stereotype of the irreversible decline due to aging is so pervasive that even elderly persons themselves act on it. The underreporting of mild ambiguous symptoms such as weakness and aches in the aged is well documented (Brody, Kleban, and Moles, 1983; Leventhal and Prohaska, 1986) and is directly attributable to the belief that these symptoms are a direct result of the irreversible illness and functional decline associated with aging.

There are clear signs that the perceptions of health and the elderly's expectations regarding their health may be altered because of the pervasive stereotypes depicting aging as synonymous with inevitable and irreversible decline. Since perceptions of health are important in determining health behavior, including preventive practices and health services utilization, it is important to understand better how people of different ages perceive their health and to determine whether older persons perceive their health differently from younger persons, controlling for disease.

DESCRIPTION OF THE STUDY

This study describes differences in health perceptions across age groups. It attempts to determine the amount of decline in health perceptions attributable to disease, and the amount attributable to age. It does this by examining health perceptions across age groups controlling for disease. General health perceptions are used because they are a global measure of health, taking into account both objective and subjective aspects of health. Because of their subjective nature, health perceptions may be influenced by societal stereotypes and expectations. They are also an important policy variable because of their association with utilization and mortality.

This study addresses the following research questions:

1. How do general health perceptions vary among age groups?
2. Controlling for disease, do general health perceptions differ among age groups?
3. Are these differences among age groups the same for persons with no known chronic conditions, for a general patient sample, and for persons with chronic conditions?

Three samples will be used to answer these research questions: a general patient sample, a subsample that reports no chronic disease, and a chronic-disease sample (these samples are described more fully in Section II). It is not possible to make direct comparisons between the general patient and chronic-disease samples because of differences in the content and timing of the data collected. However, they do provide complementary information. The general patient sample is comparable in many ways to the general population; a range of variables to tap both diagnosed and undiagnosed disease is available for use in this sample. The subset with no reported chronic disease allows for the description of differences in health perceptions in the absence of disease. The chronic-disease sample is a specialized sample of persons with one of four chronic diseases; detailed information on the severity of the chronic diseases, their related comorbidities, and other general health and functioning measures are available from this sample. The chronic-disease sample provides the most comprehensive attempt to stage disease severity in any study that has examined health perceptions across age groups.

POLICY RELEVANCE

To the extent that our current policies and practices are based in part on an erroneous stereotype of aging, an examination of the changes in health perceptions associated with age, separate from disease, would be beneficial. Our ability to describe more clearly the extent to which decrements in health perceptions are due to disease as opposed to

the aging process would have clear beneficial effects on the elderly in our society.

At the most basic level, this information could be used to educate the public about the aging process itself. This education could be used to change expectations about each individual's future aging, as well as provide increased sensitivity and more accurate expectations for dealing with today's elderly. This information could also be used to educate the elderly themselves about their expectations regarding their own health. As mentioned previously, many studies have documented the fact that elderly persons do not seek care for potentially serious symptoms because they believe those symptoms to be a reflection of the so-called normal decline due to age. To the extent that we can re-educate the elderly to increase their expectations regarding their health, this may lead to more appropriate use of the health care system.

At the next level, this information can be used to educate health care providers. Many providers currently believe that it is appropriate for the elderly to have lower expectations regarding their health. Does this attitude stem from the difference in health status between the young and old? A clearer delineation of the changes in health perceptions with age, independent of disease status, may help providers make more appropriate treatment decisions.

At the third level, major policy changes could result from this information. Our current policies result in some degree of rationing for expensive and technological services on the basis of age. In spite of the fact that the elderly see their physicians more frequently than do younger persons, and the results of a recent study indicate that elderly persons are more likely to obtain routine care than are younger persons (Hayward et al., 1988), the use of many diagnostic and curative technologies is inappropriately withheld from the aged (Greenfield et al., 1987; Radecki et al., 1988). Our policies of rationing on the basis of age are due to the following reasons: (1) the high correlation between age and disease; (2) the belief that decrements in health occur as a result of age; (3) the interaction of reasons 1 and 2 to produce generally lower health states in the aged; and (4) age is an inexpensive

and easy way to ration. Some have called for a greater reliance on age as a criteria for rationing (Callahan, 1987). However, for persons of different ages with the same level of disease, is this an appropriate policy? Our increasing understanding of the disease process and our ability to make more accurate predictions about the future courses of disease could make the current rationing based on age both inappropriate and obsolete.

ORGANIZATION OF THIS NOTE

Section II reviews several areas of the literature relevant to this study. First, it reviews the literature on previous attempts to separate aging and disease effects. It then reviews the literature on measures of general health perceptions, the dependent variable used in this study. Finally, it critically reviews previous studies of differences in general health perceptions across age groups. Section III provides an overview of the methodology and study design. It describes the samples used in the study: the general patient sample, the subsample with no chronic disease, and the chronic-disease sample. Section III also includes an analysis of the adequacy of the health perceptions measure for use across age groups. Section IV presents the results of the analyses, looking at differences in Current Health Perceptions across age groups. It presents cross-sectional analyses from the general patient sample, the subset with no reported chronic disease, and the chronic-disease sample, as well as the longitudinal analysis from the chronic-disease sample. Section V sets forth the conclusions and policy implications.

II. LITERATURE REVIEW

INTRODUCTION

This section reviews the literature on aging and disease. This literature is intended to illuminate the debate on the physiological changes associated with aging, differentiated from disease, and to help us understand how these changes may affect health perceptions. It also discusses the literature on health perceptions, showing that the measure of general health perceptions is a good measure of general health and is appropriately used as such in this study.

THE RELATIONSHIP BETWEEN AGING AND DISEASE

Biological theories of aging predict physiological decline with age; however, it is uncertain how these physical changes relate to disease specifically, or to health in general.

Recently, various studies have attempted to separate the physiological changes associated with aging from those changes that are associated with specific diseases, as shown in Table 2.1. The first of these, the Duke Longitudinal Study, was an exploratory study designed to delineate the medical, psychiatric, psychological, and sociological changes associated with aging (Palmore, 1970), with a concentration on aging of the central nervous system (Busse and Maddox, 1985). This study was primarily exploratory in nature and was not guided by any theory of aging. Approximately 270 initially healthy subjects, aged 60 and above, volunteered for participation in the study. Subjects underwent extensive examinations on a regular basis (every two years for most subjects) for more than 20 years. The authors report significant decline with age on average in most of the limited physiological variables studied (for example, increased skin lesions, increased alterations in blood vessels, slower reaction times, hearing and vision impairment, EEG abnormalities), although no decline was observed for psychological and sociological variables (for example, intelligence test scores, risk aversion, or attitudes toward health). The authors note

that, although decrements in physiological measures occurred in most of the subjects, some subjects experienced significant improvements with age. They conclude that "the process of physical aging is not necessarily an irresistible and irreversible force. Health and functioning can and do improve for some aging persons just as they do for younger persons" (Palmore, 1970, p. 418).

A second study, the Duke Adaptation Study, was initiated in 1968. Conducted over an eight-year period, this study looked at the effects of stressful events on a cohort of 502 white persons aged 46 to 70 years living in Durham, North Carolina (Palmore, 1974). The subjects in this study, stratified by age and sex, were randomly selected from a listing of the members of a local health insurance association. The design of the study included examining the aging process for age groups (there were a total of ten age-sex cohorts) through the use of repeated measurement and testing. The findings of the Duke Adaptation Study were similar to the findings of the earlier Duke Longitudinal Study: an overall pattern of decline in health and physical functioning was observed, while little or no decline in social or psychological functioning was observed with age. For example, hearing and visual acuity were observed to decline; cardiovascular disease increased and appeared to result in impaired psychomotor performance. No decline in intelligence scores, reaction times, attitudes, cautiousness, or general adjustment was observed. In most cases, stable levels of physical and sexual activity were observed with aging. In spite of these consistent patterns observed over the course of the two Duke Longitudinal studies, considerable variation was found in these patterns; some persons showed little or no physical or health decline. The individual variability in scores was greater among older than younger persons (Palmore 1974, 1985).

Another study, the Normative Aging Study, was designed to describe the changes that occur with aging (Bell, Rose, and Damon, 1972). The Normative Aging Study included 2,032 male veterans, aged 25 to 75 years, living in the Boston area, who were screened for a high level of health at the time they entered the study. (A high level of health was defined

TABLE 2.1
MAJOR STUDIES OF "NORMAL AGING"

Study	Sample	Major Findings
Duke Longitudinal Study (Palmore, 1970)	Initially healthy volunteers, age 60+, living in Durham, N.C.; n = 267	Physiological variables (e.g., reaction time, hearing and vision impairment) decline with age; no decline observed in psychological and sociological variables (e.g., risk aversion, intelligence).
Duke Adaptation Study (Palmore, 1974, 1985)	Random sample of white persons age 46-70 on the roster of a local health insurance association in Durham, N.C.; n = 502	Measures of health and physical functioning decline with age; there is little or no decline in psychological and social measures with age. Individual variability in scores is greater in older than younger persons.
Normative Aging Study (Bell, Rose, and Damon, 1972)	White veterans age 25-75 living in Boston, MA; n = 2,032	Weight, height, and other physiological measures change with age; however, no clear pattern of aging could be discerned.
Baltimore Longitudinal Study of Aging (Shock et al., 1984)	Male volunteers age 17 to 96 living in Baltimore, MD; n = 1,142	Individual variation increases with age in physiological variables; there is great individual variation. Individual variation within age groups is greater than between age groups.

on the basis of physiological measures taken at an initial screening examination.) Data were obtained in a range of areas, including medical history, standard blood and urine tests, exercise tolerance electrocardiography, orofacial examinations, eye examinations, routine audiologic studies, and studies of memory and decision making. The authors were not able to determine clear age trends in the change in these measures with age; when present, these age trends varied so much among individuals that no single trend could be identified.

The Baltimore Longitudinal Study of Aging was designed to study the physiological and psychological effects of aging on a sample of 1,142 mostly white noninstitutionalized men in Baltimore who volunteered for the study (Shock et al., 1984). The Baltimore Longitudinal Study of Aging did not restrict its subjects to healthy individuals; no attempt was made to screen potential subjects on the basis of disease or socioeconomic status, although the majority of the subjects were in the upper-middle class segment of the population. A wide range of data were collected, including physical examinations, blood and urine analyses, family history information, biochemical and body composition tests, neuromuscular function and exercise, renal, pulmonary, and cardiovascular function tests, vision exams, audiometry, cognitive performance, and personality and behavior tests. Data were analyzed both cross-sectionally and longitudinally. The study reports that, for a large number of physiological variables, a significant decline in performance was observed across age groups and with increasing age within the same individual. However, the study also reports great individual variation within each age group; in many cases, the variation among individuals of the same age group is much larger than the variation observed in one individual over a twenty-year span. Additionally, different organ systems within the same individual may show different rates of change with age. The authors conclude that "because of the high degree of specificity of aging among different subjects and among different organ systems, chronological age itself is not a very reliable predictor of performance in individual adults" (Shock et al., 1984, p. 26).

The preceding studies are limited in their attempt to separate aging and disease effects for a number of reasons, including the sample, the measures studied, and their ability to control for disease. The samples studied were not generalizable to the U.S. population. All but one study included only males; white males predominated in two. In two studies, subjects were volunteers from the local community. These volunteers were more likely to be healthier, more affluent, and better educated than the general population. The other two studies selected persons who were initially healthy for inclusion into the study. Again, this is a very specialized group of individuals, and one cannot generalize to a larger population any aging trends that might be observed in these samples. The studies contained many specific clinical or biological measures, but they do not answer the question about how the decrements in each of the measures observed with age affect the individual's actual functioning. For example, the Duke studies showed that reaction time decreased with age; however, the impact of decreased reaction time on operating a car or household appliances, or other mechanical objects required for everyday life, was not studied. Additionally, the impact of these effects with aging was not evaluated in terms of their effect on the individual's global health status. Finally, the studies were limited in their ability to control for the decrements due to disease as opposed to aging. While the first Duke study and the Normative Aging Study selected out individuals who presented with chronic condition at entry into the study, no attempt was reported to control for the subsequent development of disease. In the other two studies, where anybody who volunteered could be accepted into the study, there was no attempt to select persons at specific stages of health or disease in large enough numbers to satisfy statistical requirements and to differentiate persons at various stages of health.

Although these studies contain certain limitations, common themes can be seen throughout. Shock (1984) summarized the changes found in the variables with aging and has categorized them as follows: (1) stability of some variables, such as intelligence and personality; (2) decline with age due to diseases associated with age, such as

cardiovascular function; (3) steady decline without apparent health or functional impact, such as creatinine clearance associated with renal function; (4) precipitous changes with aging due to disease, such as memory loss due to dementia; (5) compensatory changes in physiological processes that maintain function, such as changes in heart volume (Frank-Starling mechanism) to maintain cardiac output during exercise; and (6) cultural changes through the years, such as the impact of nutrition on health, especially in the area of the dietary impact on cardiovascular disease. On average, these studies have shown a decline in health and physical functioning variables associated with increased age. Measures of personality, intelligence, and activity levels (controlling for bereavement) remain essentially stable with age. Additionally, each of these studies also point out the large degree of variation in all measures across groups of people homogeneous with respect to age. This variation among individuals appears to increase with age.

These studies have allowed for the differentiation of elderly persons suffering from no apparent disease into two groups: those who are experiencing "normal" aging and those who are experiencing "successful" aging. Normal aging is characterized as physiological changes that are associated with age, in the absence of disease. Successful aging, on the other hand, is characterized by a lack of decline in the physiological measures that are associated with normal aging (Rowe and Kahn, 1987). However, the extent to which the decrement in these measures experienced by the "normal" aging group represents disease remains uncertain.

Brody and Schneider (1986) have attempted to make a distinction between age-dependent and age-related diseases. They define age-related diseases as those that are "opportunistic upon the host and will be expressed only if a combination of factors are present at a certain age." Diseases such as schizophrenia and multiple sclerosis are included in this category. Age-dependent diseases, on the other hand, are (as the name implies) to some extent dependent on the aging process. They would include such conditions as coronary heart disease and type II

diabetes. The physiological changes that predict these diseases have been found in elderly persons who show no outward signs of disease; the authors speculate that some age-dependent diseases may be indistinguishable from the normal aging process. However, to the extent that prevention and treatment can affect the onset or course of these conditions, some alteration of the aging process may be possible.

DISTINGUISHING BETWEEN AGING AND DISEASE

Our culture has equated aging with nonproductivity, incapacity, and a useless status in life. However, recent studies point to the possibility that many of the negative stereotypes of aging are a result of disease and not aging per se. To the extent that, with increased medical knowledge translated into prevention and treatment, the historical relationship between aging and disease can be modified, these stereotypes should be examined closely and possibly discarded.

Several studies (Steel et al., 1981; Lubitz and Prihoda, 1984; Jencks and Kay, 1987) show that many of the negative social consequences of aging (increased use of health services and other resources, increased risk of iatrogenic disease, and so on) are in fact a result of disease rather than of aging per se. Steel and his colleagues (1981) conducted a study to determine the risk factors for iatrogenic complications in patients admitted to a university hospital. They found that age had a simple association with risk of iatrogenic disease, but this was a secondary effect of the patient's condition on admission; older persons were more likely to be admitted in critical to poor condition, and condition was the factor most associated with iatrogenic illness.

Other studies have looked at the relationship between age and utilization of health services. These studies indicate that age has only a secondary association with the use of health services and the cost of these services, with disease having the closest association with utilization (Lubitz and Prihoda, 1984; Jencks and Kay, 1987; DesHarnais, Chesney, and Fleming, 1988). Subsequent death has been shown to be the best predictor of high costs of care in a given year (Lubitz and Prihoda, 1984).

Age in the absence of excess disease does not appear to influence costs of hospital care within Diagnostic-Related Group (DRG) category. Jencks and Kay (1987) examined the costs of hospital episodes of care for several classes of patients. They found that, while beneficiaries who were between the ages of 80 and 85 had charges that averaged 3.8 percent higher, beneficiaries older than 85 had charges 1.3 percent lower than the youngest group of Medicare beneficiaries (65 to 79). While this study does show higher charges in those 80 and older, the difference is small. Another study looked at the appropriateness of the current reimbursement policy, which pays more for persons within a DRG category who have comorbidities and complications, or who are over 70 years of age (DesHarnais, Chesney, and Fleming, 1988). They found that patients over age 70 without comorbidities and complications do not have charges or average lengths of stay significantly different from beneficiaries under age 70; they conclude that the current policy of paying the hospital more for an older client, in the absence of specific medical indications that they are sicker, is inappropriate. Of course, these studies have only examined the current policy and made the assumption that the extent of services provided to the elderly is appropriate. Others have claimed that the elderly are not receiving adequate services because of lack of assessment (Minaker and Rowe, 1985). To the extent that the elderly are underserved, the results from these studies may not be accurate.

GENERAL HEALTH PERCEPTIONS

In order to separate out the effects of aging from the effects of disease on health, an appropriate measure of health must be obtained. In this study, the measure of general health perceptions has been chosen. General health perceptions is a global self-rating of health that takes into account all aspects of health. Because it does not restrict the individual to thinking about only one aspect of health (for example, physical health or disease status), the individual is free to incorporate social and psychological factors as well as physical and clinical aspects of his/her condition in evaluating health. General

health perceptions, seen most often in the single-item question, "How would you rate your health? Excellent/good/fair/poor" (hereafter referred to as EGFP), is the most frequently used measure of health in the health services research literature.

Studies looking at the determinants of general health perceptions indicate that the concept includes various aspects of health, including psychological, social, physical functioning, and disease states. A review of a number of these studies appears in Table 2.2. In addition, a number of earlier studies have been reviewed by Ware and his colleagues (Ware, Davies-Avery, and Donald, 1978). These studies, which examine the determinants of general health perceptions, have been conducted on a number of different samples and contain a number of diverse measures. The measure of general health perceptions is not uniform among the studies; general health perceptions are measured using single-item measures and multiple-item measures. These items ask persons to rate their health without any specific reference and to rate their health in comparison with their peers; participants are also asked about satisfaction with their health at the present time, in addition to a simple health rating. In spite of these differences, some common themes emerge.

Relationship Between General Health Perceptions and Physical Functioning and Disease Status

Disease status or objective health status is consistently an important predictor of general health perceptions. These measures of disease status or objective health status include counts of the number of chronic conditions (Tissue, 1972; Fillenbaum, 1979; Linn and Linn, 1980; Jylha et al., 1986; Levkoff, Cleary, and Wetle, 1987; Davies and Ware, 1987); measures of symptoms and pain (Tornstam, 1975; Murray, Dunn, and Tarnopolsky, 1982; Jylha et al., 1986; Davies and Ware, 1987); and functional status (Maddox, 1962; Tissue, 1972; Fillenbaum, 1979; Boyer, 1980; Linn and Linn, 1980; Davies and Ware, 1987). In their comprehensive review of measures of general health perceptions, Ware and his colleagues (Ware, Davies-Avery, and Donald, 1978) found numerous

TABLE 2.2
PREDICTORS OF HEALTH PERCEPTIONS

Study	Sample	Measure	Major Findings
Maddox, 1962	Aged volunteers; n = 251	"How do you rate your health at the present time?" excellent/good/fair/poor	Controlling for disease, the following predict health perceptions: age, occupation, activity level, adaptation to environment, preoccupation with health.
Tissue, 1972	Aged welfare recipients; n = 256	"Generally speaking, how would you describe your present health?" good/fair/poor	Functional capacity, number of reported ailments, and morale predict health perceptions.
Tornstam, 1975	Community residents, age 45-74, in Sweden; n = 469	"To what degree are you satisfied with your health?"	Presence of aches is most important predictor; it is more important in older than in younger persons.
Wan, 1976	National sample of persons age 58-63; n = 1,153	Measure asked whether health was better or worse than others own age	Employment, education were important predictors; of those who were employed, happiness and life satisfaction were most important.
Garriety, Simes and Marx, 1978	Freshman university students; n = 2,710	Current Health Status measured using 10-point Cantril ladder	Psychological symptoms and recent life changes predict current health.
Markides and Martin, 1979	Random community sample; n = 522	"In general, how would you rate your health?" excellent/good/fair/poor	Health status was the most important predictor of health perceptions; income and education have small effects; age had an indirect effect through health.
Blazer and Houpt, 1979	Adults aged 65+; n = 997	A subjective assessment of health (good/fair/poor) was then compared with the interviewer's rating of health	Poor health assessments were associated with depression and hypochondriasis scales of Mini-Mult.

TABLE 2.2 (cont.)

PREDICTORS OF HEALTH PERCEPTIONS

Study	Sample	Measure	Major Findings
Fillenbaum, 1979	Random sample of community residents; n = 977; sample of institutionalized persons; n = 102	3-item scale includes the following questions: (1) "How would you rate your health at the following time?" excellent/good/fair/poor; (2) "How do you feel about your health problems?" (3) "How much do your health troubles stand in the way of doing the things you want to do?"	Subjective health is reflected by objective health status; community sample has higher ratings of health than institutionalized sample; controlling for disease, women rate their health better than men.
Boyer, 1980	Elderly residents of public housing; n = 414	"In general, how would you rate your health?" excellent/good/fair/poor	Health related to social participation once functional mobility was controlled for.
Graney and Zimmerman, 1980	National random sample of persons age 65+; n = 2,797	"How serious a problem would you say poor health is to you personally these days?"	Education, financial status, social participation/activities, "personal attitudes" are predictors.
Linn and Linn, 1980	Mostly aged persons living in residential housing; n = 263	Self-assessed health measured on a 5-point scale, from very good to very poor	Functional capacity, diagnoses, and medications currently taken all predict self-assessed health.
Murray, Dunn and Tarnopolsky, 1982	Random sample of London residents; n = 5,904	Global assessment of own health in past 2 weeks measures on a 5-point scale, from very good to very poor	Sleep distress, nervousness, depression, number of symptoms, and age all predict health perceptions.
Stoller, 1984	Noninstitutionalized older persons; n = 753	3-item scale includes a rating of own health; health of others own age; rating of own health in 5 years using 10-point Cantril ladder	Age, sex, objective health, social networks, and activities all predict health perceptions.
Jylha et al., 1986	Random sample of men between the ages of 31-35, 51-55, 71-75 living in a town in Finland; n = 547	"Do you consider your health at the present time to be ...?" poor/rather poor/fair/fairly good/good	Self-rated health best explained by physical fitness in youngest group, psychic well-being in middle-aged group, and chronic diseases and symptoms in oldest group.

TABLE 2.2 (cont.)
PREDICTORS OF HEALTH PERCEPTIONS

Study	Sample	Measure	Major Findings
Zonderman, 1986	persons age 17-95; n = 970	"How would you rate your health at the present time?" excellent/very good/good/fair/poor	Age, neuroticism, history of hypertension were important predictors; measured blood pressure was not important.
Davies and Ware, 1987	Community sample of persons age 14-67; n = 4,763	Seven different scales of health perceptions were studied: Current Health (k=7); Prior Health (k=3); Health Outlook (k=4); Resistance to Illness (k=4); Health Worry/Concern (k=5); Sickness Orientation (k=2); General Health Ratings Index (k=22)	All measures of health perceptions correlated with physical functioning and disease, mental health; there was low correlation between health perceptions and social circumstances; related to use of health services in past month; there was slight relationship with use of health services prospectively.
Levkoff, Cleary and Wetle, 1987	Persons age 45-89; n = 460	"In general, how would you rate your present physical health?" excellent/good/fair/poor	Sex, education, number of diagnoses, depression were important predictors of self-assessment of physical health; depression was most important predictor among those age 65+.

studies that reported a high correlation between general health perceptions and functional status, physical health, and disease status.

Relationship Between General Health Perceptions and Mental Health and Psychological Factors

In general, mental health has shown a positive relationship with general health perceptions, and other psychiatric symptoms have exhibited a negative relationship with general health perceptions (Ware, Davies-Avery, and Donald, 1978). Psychological factors, including morale (Tissue, 1972; Wan, 1976; Jylha et al., 1986) and life satisfaction (Ware, Davies-Avery, and Donald, 1978) are predictors of positive health perceptions. Psychiatric symptoms such as depression (Blazer and Houpt, 1979; Murray, Dunn, and Tarnopolsky, 1982; Davies and Ware, 1987), hypochondriasis or preoccupation with health (Maddox, 1962; Blazer and Houpt, 1979), nervousness (Zonderman, Leu, and Costa, 1986), and psychic distress (Garritty, Somes, and Marx, 1978; Murray, Dunn, and Tarnopolsky, 1982; Levkoff, Cleary, and Wetle, 1987; Davies and Ware, 1987) are all correlated with poor general health perceptions.

Relationship Between General Health Perceptions and Social Factors

The importance of social factors in predicting general health perceptions has been studied less frequently, but in those studies including such measures, social factors have generally been shown to be significant predictors of health perceptions. Maddox (1962) found that adaptation to environment was an important predictor of general health perceptions, after controlling for disease. Recent life changes were negatively correlated with general health perceptions in a young adult population (Garritty, Somes, and Marx, 1978). Social networks, social participation, and activity levels have been positively correlated with general health perceptions in several studies (Ware, Davies-Avery, and Donald, 1978; Boyer, 1980; Graney and Zimmerman, 1980; Stoller, 1984; Davies and Ware, 1987).

General health perceptions is a good policy variable because it is a more comprehensive measure of health than simply the absence of disease. In fact, several studies have shown general health perceptions to be a significant predictor of mortality, morbidity, and such behavior as health services utilization (Kaplan and Camacho, 1983; Mossey and Shapiro, 1982; Ware, Davies-Avery, and Donald, 1978). Mossey and Shapiro (1982) found that the single-item measure of health perceptions, EGFP, predicts mortality over and above that predicted by objective health measures. Weinberger and his colleagues (1986) found poor self-rated health perceptions to be a predictor for hospital and nursing home admission, although Branch and Jette (1982) did not find self-rated health perceptions to predict nursing home admission after controlling for functional disability. Data from the RAND Health Insurance Experiment (Manning, Newhouse, and Ware, 1981) indicate that the single-item measure of general health perceptions is a significant predictor of outpatient utilization. In their review of the literature on measures of general health perceptions, Ware and his colleagues indicate that general health perceptions is correlated negatively with frequency of medical care, number of doctor visits, last contact with doctor, regular checkups, and hospitalizations; general health perceptions was correlated positively with appropriateness of use of services and personal health practices (Ware, Davies-Avery, and Donald, 1978).

A number of studies have shown that general health perceptions are significantly related to objective measures of health (see Table 2.2). Health perceptions has a high, positive correlation with physician rating of health (Maddox and Douglass, 1973; Ware, Davies-Avery, and Donald, 1978). When there was a discrepancy between self-rating of health and physician rating, the individual's self-rating was generally higher (Maddox and Douglass, 1973). Additionally, self-ratings of health were a better predictor of subsequent physician rating of health than vice versa, indicating that the individual's general health perceptions are not simply a reflection of the labeling of disease by the physician.

DIFFERENCES IN HEALTH PERCEPTIONS ACROSS AGE GROUPS

Several studies have examined differences in general health perceptions across age groups, and a number of these are listed in Table 2.3. These studies generally show that older persons report poorer health perceptions than do younger persons. Mixed results have been reported when more objective measures of health are controlled for; two studies have reported that older persons rate their health more positively than do younger persons when health is controlled for (Levkoff, Cleary, and Wetle, 1987; Ferraro, 1980). One study reports that older persons rate their health less positively (Halpert and Zimmerman, 1986). When comparing health with peers, older persons rate their health as comparatively better (Cockerham, Sharp, and Wilcox, 1983).

These studies that examine differences in health perceptions across age groups are limited in a number of ways. The three studies that included a wide range of ages compared the health perceptions of a younger sample (including young and middle-aged persons) with only a single age group of persons 60 or 65 and older. Because the 65 and older age group is not homogeneous with respect to disease, functional status, income, or sex distribution, this does not allow for an examination of differences within the group of elderly. Other studies that look at differences within the elderly subgroup did not include younger persons in their sample. Only four of the six studies controlled for disease when comparing the health perceptions of young and old persons. Two of these four studies used a variable to indicate the number of chronic illnesses; one study used both the number of chronic illnesses and a symptom checklist, and one study used only a symptom checklist to control for disease. In the only study to attempt to control for disease severity, the authors used a scale constructed to represent the number of chronic conditions weighted by the extent to which they were bothersome (Levkoff, Cleary, and Wetle, 1987).

TABLE 2.3

DIFFERENCES IN HEALTH PERCEPTIONS ACROSS AGE GROUPS

Study	Sample	Measure	Control for Disease	Major Findings
Ferraro, 1980	National sample of low-income persons; n = 3,402	Single-item measure of general health perceptions	Number of illnesses (out of a possible 55)	Controlling for health status, persons age 75+ rated their health better than those age 65 to 74.
Cockerham, Sharp and Wilcox, 1983	Adults age 18-93; n = 660	"Compared to others your age, how would you rate your health?" excellent/very good/good/fair/poor	Symptom index	Persons age 16-60 show similar health perceptions; persons age 60+ rate their health significantly better than their peers.
Halpert and Zimmerman, 1986	Rural and small town persons age 60+; n = 148	"How would you rate your health at the present time?" excellent/good/fair/poor	None	55% of persons age 60-74 rated their health as excellent or good, while only 51% of persons age 75+ rated their health similarly.
Jylha et al., 1986	Random sample of men age 31-35, 51-55, 71-75 in Finland; n = 547	"Do you consider your health at the present time to be ___?" poor/rather poor/fair/fairly good/good	Number of chronic diseases, symptom index	The youngest group rated their health significantly better than the older two groups; there were no significant differences between ratings of 50- and 70-year-old groups.
Davies and Ware, 1987	Community sample of persons age 14-67; n = 4,763	Seven different scales of health perceptions were studied: Current Health (k=7&); Prior Health (k=3); Health Outlook (k=4); Resistance to illness (k=4); Health Worry/Concern (k=5); Sickness Orientation (k=2); General Health Ratings Index (k=22)	None	All measures of health perceptions except resistance to illness were negatively related to age.
Levkoff, Cleary and Wetle, 1987	Sample of persons age 45-89; n = 460	"In general, how would you rate your present physical health?" excellent/good/fair/poor	Number of chronic conditions weighted by intensity	Older persons rated their health less positively; psychic distress was the most important predictor among older persons.

SUMMARY

A number of studies of "normal aging" have been reviewed here. These studies attempt to separate aging and disease effects on older persons. However, these studies are flawed in several respects. They generally focus on select populations and study disease in terms of physiological measures instead of the effect of disease on general health or its effect on behavior. They have limited ability to control for differences in disease status across age groups. Thus our ability to make generalizations about the relative effects of disease and the normal aging process in health is limited.

General health perceptions measures have been widely used, and are appropriate for use, in studies such as these. General health perceptions measures are comprehensive and include physical, psychological, and social aspects of health. They are correlated with mortality, morbidity, and use of health services.

Previous research has studied differences in health perceptions across age groups, but these studies have been inadequate for determining the relative effects of disease and normal aging on health across age groups. These studies have generally not included a comprehensive range of age groups so that comparisons can be made. Also, disease is often either not included or included as only a single variable representing the number of chronic conditions.

III. EXPERIMENTAL DESIGN AND METHODS

INTRODUCTION

This section provides a description of the study design, the sample, and the data-gathering methods. The study samples are taken from the samples used for the National Study of Medical Care Outcomes (MOS), an ongoing RAND project designed to study health outcomes of patients with chronic diseases. Additionally, the measures and analytic methodology used in this study will be described.

THE DESIGN

The Medical Outcomes Study (MOS)

The MOS was designed to examine whether competing systems for the delivery of health care services produce different outcomes for patients with chronic conditions. The different systems under study include solo fee-for-service (FFS) practices, large multispecialty group practices with a mix of prepayment and fee-for-service, and health maintenance organizations (HMOs). The MOS includes a cross-sectional "screener" sample of 22,785 patients from 526 physicians; health and functioning data were collected on approximately half of this sample, and satisfaction with care information was collected on the other half. A subset of this cross-sectional sample ($n = 2,546$) was enrolled in the longitudinal panel; this sample contains adults with one or more of five chronic diseases: hypertension, diabetes, recent myocardial infarction, congestive heart failure, and depression. Data from the longitudinal sample were collected for two years and include health and functional status, satisfaction with care, and utilization of health care services.

This study utilizes part of the data from the MOS to examine the decline in health perceptions with age. Three samples are used: a general patient sample (which is a subset of the MOS cross-sectional screener sample) and two subsets of this sample--a no-chronic-disease sample of persons who reported none of 16 chronic conditions, and a chronic-disease sample with one of four chronic tracer conditions. This

chronic-disease sample is a subset of the MOS longitudinal panel. These samples are described in more detail below.

The three samples provide complementary data in examining differences in health perceptions across age groups; the general patient sample is most comparable to previous work in this field in terms of the health and functioning variables it contains. It provides information about the patient's health status in terms of the presence or absence of a large number of diseases and conditions, as well as information on acute disability, physical functioning, and pain. It differs from other studies previously undertaken in that it contains a large sample with a large proportion of persons in the upper age ranges (that is, age 65 and older). One of the major drawbacks of previous studies has been their small sample size and their corresponding inability to separate different age groups in the 65-year-and-older group. Within the general patient sample, there is a subsample of persons who report no chronic diseases; this sample provides an estimation of the decline in health perceptions with age in the absence of diagnosed disease.

The chronic-disease sample is a specialized sample of persons with one of the chronic diseases being studied in the MOS, therefore it is not directly generalizable to the population at large. However, in this sample, detailed disease staging is available; this allows for the statistical control for disease in a more precise way than has been available in previous research. Additionally, longitudinal data are available in the form of identical variables collected one year later. These longitudinal data will assist in teasing out some of the reasons for the cross-sectional differences observed. The pros and cons of each sample will be described in more detail in the analytic methods section.

THE SAMPLES

This study uses three samples to answer the research questions: a general patient sample, a no-chronic-disease sample, and a chronic-disease sample. These samples were taken from the MOS study, however there are some differences between the total MOS sample and the samples used in this study. First, the sampling strategy for the MOS will be

described briefly. Then, a description of each of the study samples will be presented.

Since the MOS was designed to answer questions about differences between systems of care, physicians and then patients were sampled from three systems of care in three geographic sites (Los Angeles, Chicago, and Boston). At each site, the following systems of care were sampled: prepaid group practice forms of HMOs, large multispecialty group practices (with a mix of prepayment and fee-for-service), and solo, predominantly fee-for-service practices. Providers were stratified by system of care and specialty training (family practice, general internal medicine, cardiology, endocrinology, psychiatry, and clinical psychology). All patients visiting the participating providers during a two-week period were screened for study eligibility; this sample constitutes the cross-sectional screener sample of 22,785 persons. A subset of this sample reported none of the following 16 chronic conditions: cancer within past three years, amputation of arm or leg, asthma, vision problems, arthritis, angina, hypertension, myocardial infarction, congestive heart failure, ulcer, major paralysis, bowel disease, diabetes, back problems, kidney disease, and allergies; this subset constitutes the no-chronic-disease sample. Patients with one or more of the tracer chronic conditions being studied in the MOS (diabetes, hypertension, recent myocardial infarction, congestive heart failure, and depression) were selected for the longitudinal panel. A total of 7,335 patients showed a high probability of eligibility; of these, 5,341 satisfied tracer condition criteria, 3,445 completed baseline information, and 2,546 were recruited into the longitudinal panel. A more detailed description of the sampling procedure appears in Appendix A.

The General Sample of Patients and Subsample with No Chronic Disease

More than 70 percent of patients visiting the participating physicians completed the screening form. Certain patient visits were considered ineligible because of patient age (under 18), inability to read or speak English, or the fact that it was the patient's second

visit during the screening period. Additional differences between the MOS sample and the sample used in this study include the elimination of patients with a mental health tracer condition only and the selection of patients who had complete health and functioning data. For the purposes of this study, only the 50 percent of patients who received the health and functioning portion of the screening questionnaire were used. In addition, all patients visiting mental health providers were eliminated from the sample used in this study because patients who visit mental health providers represent a small and select group of patients; including these patients in the sample and giving them the same weight as those seeing medical providers would have provided a misleading picture of a general patient sample, and weighting this sample according to their proportion in the population would have reduced their influence significantly. Because of the strong influence of mental health on self-assessments of health, by excluding those persons who were most likely to have significantly adverse mental health scores, it was thought that the relationship between disease status and self-assessed health would be clarified.

The general patient sample consisted of 9,807 persons, of which the average age was approximately 46. More than three-quarters (77.2 percent) were white, 42 percent were male, and the majority (88 percent) were high school graduates. Table 3.1 discusses the frequency with which select chronic conditions were reported among the sample across different age groups. The subsample with no chronic disease consisted of 2,730 persons. The average age was younger (38.9), there were fewer males (37 percent), and more than 90 percent had completed high school.

The Chronic-Disease Sample

The chronic-disease sample is a subset of the general patient sample described above. Patients were selected for the longitudinal panel in the MOS if they had one of the five tracer conditions. As with the general patient sample, all persons who had been selected with a primary mental health tracer (depression) were excluded from the chronic-disease sample.

Table 3.1
SELECT CHRONIC CONDITIONS BY AGE GROUP--
GENERAL PATIENT SAMPLE

	18-44	45-64	65-74	75-84	85+
Hypertension	9%	41%	49%	56%	40%
Diabetes	3	13	16	12	11
Arthritis	10	41	52	63	41
Asthma	10	11	14	11	8
Ulcer	5	9	9	11	6
Allergies	36	28	22	18	17
Kidney Disease	1	3	3	4	2
Back Problems	6	9	7	8	4

The chronic-disease sample consisted of persons with the following chronic conditions: diabetes, hypertension, congestive heart failure, and recent MI. The sample contained 1,735 persons, age 47 on average; 79 percent were white, 46 percent were male and 89 percent were high school graduates. Table 3.2 makes a brief comparison of select demographic characteristics of the sample.

THE MEASURES

Data collected for the general patient sample and the subsample with no chronic disease include brief provider and patient assessments of medical condition, sociodemographic data, brief measures of satisfaction with medical care, and measures of general health and functioning. Data collected from the chronic-disease sample at enrollment into the MOS and again one year later include more detailed measures of general health and functioning, satisfaction with medical care, and utilization of health services. In addition to Current Health Perceptions, three categories of independent variables were used in the analysis: sociodemographic variables and measures used to indicate both diagnosed and undiagnosed conditions. These included measures of disease, disease severity, and general health and functioning.

Table 3.2
DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLES

	General Patient	No Chronic Disease	Chronic Disease
Age	45.8	38.9	46.7
Sex (% male)	41.8%	37.1%	46.1%
Race (% white)	77.2%	77.5%	78.9%
High school graduate	88.2%	91.5%	88.9%
Income	\$36,850	\$36,950	\$35,140

In order to capture the individual's true disease status, measures other than the existence of diagnosed conditions were considered important. Several general self-report measures of health and functioning were chosen, including measures of physical functioning, pain, psychophysiological symptoms, and energy and fatigue. While the expectation was that these measures would pick up some subtle differences in health that might not be reflected in a diagnosis, the self-report nature of these measures poses additional concerns. By definition, any self-report measure indicates some objective or easily defined state that is then filtered through the individual's perceptions. Thus the responses to the self-report measures may be influenced by the individual's perceptions, which are also measured in the dependent variable, Current Health Perceptions. The extent to which these other health and functioning self-report measures reflect more subtle distinctions of disease status, as opposed to perceptions, can be tested using clinical measures of disease, when they are available. Changes in the values of certain clinical measures, such as blood pressure or insulin levels, may have an impact on health that might be picked up through these self-report measures. This is an area that requires further study.

The extent to which these other health and functioning measures reflect perceptions has implications for the interpretation of the results. This influence of perceptions on the independent variables will tend to weaken the effect observed in the dependent variable, Current Health Perceptions. Thus age-related differences that might exist if all of the effect of perceptions was picked up by the dependent variable may not be observed if some of these differences are picked up in the independent variables. While this effect might tend to bias the relationship between health perceptions and age toward zero, it is unlikely that a true relationship would not be observed at all.

A list of each of the variables used in the analyses, and the samples they were used for, is presented in Table 3.3. The measures used for each sample are described in the following paragraphs, along with information on basic psychometric criteria. Information on the mean and standard error for each of the variables is presented in the methods section. A list of the questionnaire items used in creating each of the measures is available in Appendix B.

The dependent variable is the five-item Current Health Perceptions Scale. Items included in the scale ask about health (and illness) in general and health compared to peers. A list of the items and response choices is presented in Table 3.4. To construct the scale, items were recoded as necessary so that a higher score indicated better health perceptions, and the items (each one with possible 1 to 5 scores) were added together and averaged. At least half (3 out of 5) of the items must have been completed to calculate the scale score; if two or fewer items were completed, the scale was coded as missing. The averaged scores were then transformed to a possible 0 to 100 score. The range and frequency of score responses is shown in Figure 3.1. The item variances were roughly equivalent, and each item appeared to be linearly related, as demonstrated by the high item-scale correlations, which ranged from 0.59 to 0.79 in the general patient sample and 0.62 to 0.75 in the chronic-disease sample. Reliability is the estimate of the proportion of measured variance that is true score as opposed to random error (Ware, 1984); reliability is considered acceptable for group

Table 3.3
STUDY VARIABLES

Variable Name	General Patient Sample	Chronic-Disease Sample
<i>General Health Perceptions</i>		
5-item Current Health	X	X
<i>Socioeconomic Variables</i>		
Age	X	X
Years of education	X	X
Sex (male)	X	X
Race (nonwhite)	X	X
<i>Diagnosed Disease Status and Severity</i>		
Existence of 16 conditions	X	
CHF severity		X
Diabetes severity		X
MI severity		X
Hypertension severity		X
Comorbidities		X
<i>Undiagnosed Conditions</i>		
Physical functioning	X	X
Psychophysiologic symptoms		X
Energy/fatigue		X
Bed days	X	
Pain	X	

comparisons when Cronbach's alpha (the reliability coefficient) is 0.50 and above, although others have recommended scores of 0.70 and above on well-established scales (Davies and Ware, 1981). The Current Health Perceptions measure meets the criterion of reliability; Cronbach's alpha for this measure is 0.87 in the general patient sample and 0.86 in the chronic-disease sample.

For the patient sample, data on health and functioning were obtained from patient self-reports. The data include sociodemographic data (age, sex, race, highest educational level attained), measures of health and functioning (physical functioning, pain, bed days), and whether the patient was suffering from any of 16 chronic conditions.

Fig. 3.1--Distribution of Current Health Perceptions scores (Current Health Perception Score)

Table 3.4
ITEMS AND RESPONSE CHOICES
FOR CURRENT HEALTH PERCEPTIONS MEASURE

Items	Response Choices
1. In general, would you say your health is ...	Excellent/very good/ good/fair/poor
2. I am somewhat ill.	Definitely true/mostly true/not sure/mostly false/definitely false
3. I am as healthy as anybody I know.	Definitely true/mostly true/not sure/mostly false/definitely false
4. My health is excellent.	Definitely true/mostly true/not sure/mostly false/definitely false
5. I have been feeling bad lately.	Definitely true/mostly true/not sure/mostly false/definitely false

The variable for physical functioning is a six-item measure in which the patient is asked about his or her ability to perform simple physical activities necessary for everyday life, such as the ability to participate in sports, carry groceries, or climb stairs. The responses, each with a possible score from 1 to 3, were added together, averaged, and converted into a 0 to 100 scale, with 100 indicating the best possible physical functioning. The item variances were equivalent, and the item-scale correlations ranged from 0.50 to 0.79 in the general patient sample. Reliability was high--0.88.

The pain variable is a single-item measure of the extent of global bodily pain. The response scores, which ranged from 1 to 6, were converted to a 0 to 100 scale, with 0 indicating no pain. Reliability information is not available for this single-item measure.

The measure of disability is the count of the number of days (during the past 30 days) that the patient's activity was restricted to bed for at least half the day.

Disease status is measured by the patient's self-report of suffering from any of 16 chronic conditions or diseases. These included a diagnosis of cancer in the past three years, amputation of arm or leg, asthma, vision problems, arthritis, angina, hypertension, myocardial infarction, congestive heart failure, ulcer, major paralysis, bowel disease, diabetes, back problems, kidney disease, and allergies.

For the chronic-disease sample, different measures of general health and functioning were used. The measure of physical functioning was the same, while additional measures of energy/fatigue and psychophysiological symptoms were added.

The physical functioning measure was described above; it is the same six-item scale that taps the patient's ability to perform simple physical activities necessary for everyday life. In the chronic-disease sample, item variances were also equivalent, and the item-scale correlations ranged from 0.65 to 0.79. The reliability in this sample is adequate for group comparisons, at 0.70.

The energy/fatigue variable is a five-item scale intended to tap the patient's energy level during the past four weeks. The questions ask about the frequency with which the patient feels tired and/or energetic. The items were recoded as necessary so that a higher score indicated more fatigue and then the items (each with a possible 1 to 5 score) were added together and converted into a possible 0 to 100 score, with 100 indicating total fatigue. The item variances were equivalent, and the item-scale correlations ranged from 0.67 to 0.76 in this sample. The reliability was high--0.87.

The variable for psychophysiologic symptoms is an eight-item scale that asks about the frequency of symptoms such as joint pain, backaches, or nausea that could be caused by primarily physical or emotional conditions. The response choices, each with a possible 1 to 5 score, were added and converted to a 0 to 100 scale, with 0 indicating no symptoms. The item-scale correlations were lower than for the other

measures--0.32 to 0.53--as might be expected because the items were chosen to represent a variety of types of symptoms. The reliability coefficient is adequate--0.76.

Additionally, more detailed measures of the severity of the four tracer diseases were available for the chronic-disease sample. The information on disease severity was obtained from both patient self-reports and physician reports. The data from both sources were combined using a probability algorithm to give a measure of the probability that the patient has the disease and a measure of disease severity. Disease severity refers to the degree of pathology directly associated with a particular tracer condition, as well as any iatrogenic conditions arising from treating the tracer condition. A variable measuring the other comorbid conditions was also included. Comorbidity refers to any ailment or symptom other than the tracer condition that may affect the outcome of the patient over the length of the study. Not included in comorbidity are those conditions used to measure severity for a given tracer.

A description of the information used to create the variables for determination of disease severity and comorbidity appears in Appendix C.

Testing the Adequacy of the Current Health Perceptions Scale Across Age Groups

Before analyzing differences in Current Health Perceptions across age groups (that is, the research questions) it is necessary to test the adequacy of the measure for use in different age groups to be sure that any age-related differences observed are not a result of characteristics of the measures themselves. The adequacy of the measure was tested in several ways; first, an analysis of missing data was conducted to see if there were more missing data in older age groups, a possible source of bias. Several characteristics of the measure were tested, including item-scale correlations, measures of reliability, and whether the item variances were roughly equivalent. Validity was tested by examining the relationship between the Current Health Perceptions measure and other acceptable measures of health and functioning, such as the Physical

Functioning Index, psychophysiological symptoms, energy/fatigue, and diseases that vary in their impact on health. Finally, analyses were conducted to determine whether the concept of general health perceptions was different in different age groups.

An analysis of missing data was performed to determine whether the results could be biased by different rates of missing data among the age groups. First, the mean number of missing items (of the five possible Current Health Perceptions items) was calculated for the general patient sample. Large differences in rates of missing data between the younger and older samples were noted, an average of 3.0 percent missing for the 18-44 age group compared to an average of 43.8 percent missing for the group age 85 and older. This increase in missing data with age is consistent with the findings of others (Davies and Ware, 1981; Ware, Davies-Avery, and Donald, 1978), who report a correlation between missing data and both age and health. Because missing data are correlated with poor health, and poor health is correlated with age, it appears possible that the differences in missing data rates between young and old could be due to a second-order effect resulting from differences in health status between younger and older persons. To test this hypothesis, the number of missing items in the current health perceptions scale was regressed on age, controlling for socioeconomic characteristics (sex, race, educational attainment), the existence of 16 chronic conditions, the Physical Functioning Index score, the Pain Index score, and the number of bed days. The number of missing items out of the possible five items and the mean predictions of the missing items based on the regression model for the general patient sample by age group are presented in Table 3.5.

Although there remains some increase in missing data with age, the majority of the difference in missing data with age is eliminated after controlling for disease.

Even though the differences in missing data between younger and older persons are due primarily to differences in disease status and not age, the different rates of missing data could bias the results, especially if the potential effect of the missing scores was different

Table 3.5

MISSING DATA--
GENERAL PATIENT SAMPLE

Age Group	Raw # Missing (SE)	Controlling for Disease (SE)
<45	0.15 (.01)	0.14 (.00)
45-64	0.35 (.02)	0.21 (.00)
65-74	0.67 (.04)	0.25 (.00)
75-84	0.87 (.06)	0.27 (.01)
85+	2.19 (.11)	0.25 (.02)

in younger and older age groups. To explore this possibility further, the single-item EGFP score from those persons with at least one item missing from the 5-item Current Health Perceptions measure was compared to item scores from persons without any missing items by age group. For persons less than 65, the health perception item scores of persons with one or more missing items were significantly lower than for persons who had no missing data. Conversely, for persons over 65, the health perception item scores did not show as large a decrease as for the younger age groups. Thus the bias introduced by the different rates of missing data between age groups is counteracted by the fact that the fewer younger persons with missing data exhibited lower health perceptions scores, while the greater numbers of persons in the older age groups with missing data exhibited smaller decrements in Current Health Perceptions scores (see Table 3.6).

The chronic-disease sample exhibited significantly higher rates of missing data than did the general patient sample. The higher rates of missing data in the chronic-disease sample are most likely due to differences in the health status of the two populations; poor health has been demonstrated to be correlated with missing data (Davies and Ware, 1981; Ware, Davies-Avery, and Donald, 1978). There were no significant differences in the rate of missing data by age group in the chronic-disease sample, as shown in Table 3.7.

Table 3.6

PERSONS WITH MISSING DATA
HAVE WORSE HEALTH PERCEPTIONS

Age	Total General Patient Sample	Persons with Missing Data
Under 65	70.00 (.10)	61.32 (.34)
Over 65	51.63 (.12)	45.50 (.08)

Table 3.7

MISSING DATA--
GENERAL PATIENT AND CHRONIC-DISEASE SAMPLES

Age Group	General Patient (SE)	Chronic Disease (SE)
<45	0.15 (.01)	1.33 (.12)
45-64	0.35 (.02)	1.19 (.07)
65-74	0.67 (.04)	1.17 (.07)
75-84	0.87 (.06)	1.28 (.11)
85+	2.19 (.11)	

As the next step in evaluating the suitability of the Current Health Perceptions measure for use across age groups, several characteristics of the measure were examined. The Current Health Perceptions scale scores were symmetrically distributed, and there was considerable variation in each of the age groups. The discriminant and convergent validity of the scale was examined using item-scale correlations. Discriminant validity measures the extent to which the items correlate more highly with the hypothesized scale than with other scales; convergent validity measures the extent to which each of the items correlate roughly equally with the scale. The range and patterns

of item-score correlations across the age groups did not appear to differ significantly in either the general patient or chronic-disease samples. The reliability of the Current Health Perceptions measure was also examined in each sample. Reliability is a way to determine how well a concept is measured; reliability measures the proportion of the variance that is true score variance rather than random error. Because only one measurement was available with which to test reliability, Cronbach's alpha (or the internal consistency reliability) was examined. Internal consistency reliability is a function of the homogeneity or average correlation of the items within the scale and the number of items in the scale. Reliability ranged from 0.85 to 0.88 across the age groups in both samples, with no differences among age groups.

We examined the validity of the Current Health Perceptions measure in the different age groups by looking at the correlation between Current Health Perceptions and other measures of health and functioning across age groups. The correlations between Current Health Perceptions and physical functioning and the measure of energy/fatigue were high, and did not appear to differ for age groups under 75; the correlations declined for age groups over 75, although they remained relatively high. The correlation between the measure of psychophysiological symptoms and Current Health Perceptions was also high overall; it declined until age 75, then increased. Next, the relationship between Current Health Perceptions score and disease was examined. If health perceptions is a global measure of health, it was hypothesized that scores should be lower in persons suffering from chronic diseases than in persons who report no chronic health conditions; this was observed across all age groups, as shown in Table 3.8. Additionally, scores for persons with hypertension, a condition with relatively minor symptoms, should be higher than scores for persons with congestive heart failure; this was true across age groups as well, as shown in Table 3.9.

As an additional test of whether the Current Health Perceptions measure was measuring the same concept across all age groups, Current Health was regressed on sociodemographic, disease, and other health and functioning variables. Separate regression models were constructed for

Table 3.8

CURRENT HEALTH PERCEPTIONS IN GENERAL PATIENT
AND NO-CHRONIC-DISEASE SAMPLE

Age Group	General Patient (SE)	No Chronic Disease (SE)
18-44	69.73 (0.34)	75.37 (0.44)
45-64	57.92 (0.55)	71.23 (1.07)
65-74	53.67 (0.78)	66.07 (2.18)
75-84	51.46 (1.21)	62.44 (4.00)
85+	50.84 (1.59)	66.13 (2.96)

Table 3.9

CURRENT HEALTH PERCEPTIONS IN PERSONS WITH
HYPERTENSION AND CONGESTIVE HEART FAILURE

Age Group	Hypertension (SE)	CHF (SE)
18-44	61.12 (2.75)	42.02 (6.26)
45-64	54.61 (1.72)	35.75 (2.55)
65-74	55.17 (1.79)	43.98 (3.63)
75+	59.29 (2.84)	48.31 (6.50)

three age groups: 18-64, 65-74, and 75 and older. Although the coefficients on the independent variables were significantly different in the models for each age group, the relative importance of the independent variables (that is, the relative magnitude of the coefficients) remained the same. This contrasts with the results reported by Jylha, who found that physical fitness best explained health perceptions in thirty-year olds, psychic well-being best explained health perceptions in fifty-year olds, and chronic disease best explained health perceptions in seventy-year olds (Jylha et al., 1986). These disparate results may be caused by different samples; in the Jylha

study, subjects were randomly selected community residents in Finland, whereas the MOS selected patients as they were visiting their physicians.

From these brief tests, it was concluded that the Current Health Perceptions score did measure a global aspect of health, and that it measured the same concept across all age groups.

METHODS

This section describes the methods used in this study. It first, briefly describes the statistical methods. It then provides a more detailed explanation of the analytic methods used in this study. These include the methodology for weighting the general patient sample, a description of the cross-sectional analyses for analyzing differences in Current Health Perceptions, and the longitudinal analyses of the chronic-disease sample.

Statistical Methods

This study used multivariate regression methods. (The software used was the regression function available in the SAS statistical analysis package, version 5.) The dependent variable in the equations was the measure of Current Health Perceptions. The independent variables included the sociodemographic variables and the variables measuring diagnosed and undiagnosed conditions, which have been described above. Age was defined as both a single continuous variable and a series of categorical variables in parallel models; the analyses reported used models in which age was defined categorically because it is easier to see differences between age groups. An F-test was used to determine whether the age variables as a group were significant. Linear regression methods were used to calculate adjusted means for each of the age groups; adjusted means for each age group were calculated by taking the mean score of the sample, adding the residual for each observation, and adding the coefficient of the applicable age group, according to the equation shown below:

$$\text{Adjusted Mean} = \text{Sample Mean} + \text{Residual} + \text{Age Dummy} \\ \text{Variable} * \text{Coefficient for Age Dummy}$$

$$= \text{Actual Value} - \text{Adjustment for other variables} \\ \text{from their means}$$

This adjustment was performed so that the results from the different model specifications could be compared directly. For each of the regression models, the mean predicted values for each pair of age groups was compared using a t-test to determine whether differences between pairs of age groups were statistically significant.

The potential existence of a nonlinear relationship between age and general health perceptions was tested in each of the samples. Additionally, interaction terms between age and the other independent variables were added to the model to test for statistical significance. The interaction terms of age x disease were not significant as a whole; individual interaction terms were significant in some cases, but their contribution to the model was small. There was no consistency with which interaction terms were significant, and they followed no theoretical logic. Consequently, it was decided to eliminate the interaction terms from the models used to calculate the adjusted means. This was acceptable because the regression model was to be used as an adjustment method rather than for accurate estimates of the coefficients for each variable.

An additional specification of the preceding regression methods was tried in which the age variables were omitted from the regression equations. In the models that include both disease and age variables, age and disease compete equally to explain the variation in Current Health Perceptions between age groups. In the specification without the age variables, the disease variables are left to explain the full extent of the variation in Current Health Perceptions between age groups. The adjusted means obtained from the two methods were essentially identical, lending additional support to the results.

Weighting the Sample

The general patient sample is in many ways comparable to the general population; however, significant biases must be considered. First, the sample is biased toward users of the health care system, which is dependent on the probability that a person will visit a physician at all, and the frequency with which the person visits that physician. The probability that a person will visit a physician effectively determines whether the person is in the population from which the sample was drawn; the frequency with which the person visits his or her physician determines the likelihood of being selected. These biases are likely to be age-related; for example, if more elderly persons visit their physician, older people as a group have a higher probability of being selected.

The majority of adults in the United States are health care users. A recent estimate by the National Center for Health Statistics suggests that 73.3 percent of adults see a health care provider within a year; the estimate of the proportion of persons over 65 who see a health care provider is even greater--80.3 percent (U.S. DHHS, 1987). Additionally, older persons visit their physicians more frequently than do younger persons, an average difference of three visits a year in 1983 (U.S. Bureau of the Census, 1986).

Visiting the physician is not a random event; persons who are sicker are more likely to visit a physician. Therefore, it is possible that the younger persons in the sample represent a sicker segment of the population than do the older persons in the sample. Comparisons with data from the RAND Health Insurance Experiment (HIE) suggest that this sample is sicker; the mean score of 63 points on the Current Health Perceptions scale is lower than the general population sample studied in the HIE, where the mean score was reported as 77 (Davies and Ware, 1981). In fact, the mean score for the subsample of the general patient sample with no chronic disease reports their health as slightly lower than the HIE sample, possibly because of the timing of the question (when the patient was visiting the physician).

Significant demographic differences exist between the cross-sectional sample of the MOS and the general population. As shown in Table 3.10, the MOS cross-sectional sample is older, there are more women and more minorities, and the average income is higher than in a general population sample.

To minimize some of the bias inherent in sampling health care users as they visit their physician, a weighting scheme was developed to control for the frequency of physician visits. Although this does not eliminate all bias, it does minimize the bias introduced by more frequent users having a higher probability of being selected.

The sample was weighted according to a variable created from the response to a question in the screener questionnaire that asked how much time had passed since the patient last visited the physician. The response choices to this question were: less than one month; between one and three months; between three and six months; between six and twelve months; and more than twelve months. A time was established for each response category as the mean number of months in the category, with 0.5 months being the assignment for the first choice (less than one month) and 15 months being the assignment for the last choice (more than twelve months).

The weighting of the screener sample proceeded in two steps. First, the average time since the last visit was calculated for all patients for a given provider. This was done to account for individual physician variation in seeing patients. Then each patient's time since the last physician visit was divided by the average time since the last visit for all patients visiting that provider. This number was used to weight the sample; patients whose last visit to the physician was exactly equal to the mean of all patients visiting that physician were given a weight of one. Patients whose last visit to the physician was more recent than the average for all patients visiting that physician were given a lesser weight, and patients whose last visit was greater than the average were given a greater weight.

This adjustment was performed to minimize the bias inherent in taking a sample of medical care users: more frequent users are more likely to be selected into the population. Presumably, more frequent users are sicker and older. To test whether this adjustment was successful, demographic information from the general patient sample was compared to the general population, presented in Table 3.10. The age distribution of the weighted sample is more similar to that of a true general population sample. However, the weighting did not significantly affect the distribution of other demographic variables, such as income, education, and race. This is most likely due to the selection criteria, where persons were selected by virtue of their association with a physician or medical plan, and where the selection of physicians and medical plans was not completely random. While some of the bias in the general patient sample analyzed in this study was reduced by the weighting technique, caution must be used in extrapolations of the results to the general population as a whole because of the sex, race, and income differences of this select sample.

Analyzing Differences in Health Perceptions Across Age Groups

This next section describes analyses conducted to determine whether differences in health perceptions among age groups exist and whether their differences remain after controlling for disease.

Analyses were conducted on the general patient sample and on the subsample with no disease to allow for the examination of age differences in a general sample and one that appears healthy and free from chronic disease. Similar analyses were conducted on the chronic-disease sample and disease-specific subgroups of the chronic-disease sample to determine whether age differences were constant across disease.

To determine whether observed age differences were due to a difference in reference groups, analyses were conducted to examine age differences in health "compared to others."

Table 3.10
A COMPARISON OF THE SCREENER SAMPLE
AND THE U.S. POPULATION

	MOS Screener Sample		U.S. Population, 1985 ^a
	Unweighted	Weighted	
Age: 18-44	52.8%	55.4%	56.3%
45-64	25.8	25.3	26.7
65-74	11.8	10.8	10.1
75-84	5.4	4.6	6.9
85+	3.0	2.8	
Sex: % male	38.6	41.8	48.7
Race: % nonwhite	22.1	22.8	12.1
Average income (\$ 1,000)	34.9	36.9	25.4
Education: % high school grads	59.4	62.2	71.8 (1983)

^a U.S. Bureau of the Census, *Statistical Abstract of the U.S.: 1987* (107th ed.), Washington, D.C. 1986.

Longitudinal analyses were conducted on the chronic-disease sample to examine possible further differences between age groups. Each of these analyses are described more fully below.

The dependent variable in these analyses is the Current Health Perception scale, a measure of general health perceptions. The independent variables used in these analyses are of three types: sociodemographic characteristics, diagnosed disease, and undiagnosed disease. Table 3.11 lists each of the variables, provides a brief definition, and gives the mean and standard deviation for the variable in the general patient sample. Table 3.12 provides comparable information for the chronic-disease sample.

General Patient Sample

There are generally significant sociodemographic differences in younger and older persons. These may be caused by differences in health, but they are also due to differences in social factors, such as societal expectations regarding education and work. Many of the persons in the oldest age groups are likely to have lower educational attainment, which in turn has been linked with lower perceptions of health. Women predominate in the older age groups because of differential mortality between the sexes. Women have been reported to have poorer health than men; not controlling for the sex distribution between the age groups could bias the results by showing older persons to have poorer health perceptions when, in fact, the higher proportion of women in the sample is the cause rather than the age factors. Race has also been shown to be correlated with perceptions of health; nonwhite persons report their health as poorer than white persons.

The sociodemographic variables used in this sample include sex, race, and educational attainment. The first two are dichotomous variables to indicate whether the subject was male and nonwhite; educational attainment was represented by a continuous variable indicating years of schooling. Variables for income and employment status were tried in earlier specifications, but they were dropped because they were believed to be too dependent on age and health status.

Categorical variables to indicate the presence or absence of 16 chronic conditions were used to represent diagnosed disease. Three variables were used to measure undiagnosed conditions; these were intended to pick up subtle changes in health and disease status that would not be identified by diagnosis. These included a measure of restricted activity--the number of days the subject was not able to get out of bed for at least half of the day. A measure of physical functioning and a measure of pain were also used.

Both continuous and categorical variables were used to measure age. Five age groups were specified for the categorical variable: 18 to 44, 45 to 64, 65 to 74, 75 to 84, and 85 and older.

Table 3.11

MAJOR STUDY VARIABLES--GENERAL PATIENT SAMPLE

Variable	Definition	Mean (or %)	Std Dev.
<i>Dependent Variable</i>			
Current Health Perceptions	0 to 100 scale; positively scored	62.68	26.98
<i>Independent Variables--sociodemographics</i>			
AGELT45	1=age 18 to 44 0=not age 18 to 44	49.9	
AGE4565	1=age 45 to 64 0=not age 45 to 64	26.5	
AGE6575	1=age 65 to 74 0=not age 65 to 74	13.2	
AGE7585	1=age 75 to 84 0=not age 75 to 84	5.9	
AGEGT85	1=age 85 and older 0=not age 85 and older	3.2	
Sex	1=male 0=female	38.61	
Race	1=nonwhite 0=white	22.07	
Education	Years of schooling completed	13.59	2.99
<i>Diagnosed disease</i>			
Cancer	1=yes 0=no	3.03	
Arthritis	1=yes 0=no	29.35	
Major paralysis	1=yes 0=no	2.48	
Amputation	1=yes 0=no	1.48	

Table 3.11 (continued)

Variable	Definition	Mean (or %)	Std Dev.
Angina	1=yes 0=no	13.24	
Asthma	1=yes 0=no	10.81	
Back problems	1=yes 0=no	7.20	
Ulcer	1=yes 0=no	7.18	
Bowel disease	1=yes 0=no	4.26	
Allergies	1=yes 0=no	30.09	
Kidney disease	1=yes 0=no	2.07	
Trouble seeing	1=yes 0=no	10.50	
Hypertension	1=yes 0=no	26.95	
Diabetes	1=yes 0=no	8.17	
Congestive heart failure	1=yes 0=no	6.18	
Recent MI	1=yes 0=no	1.33	
<i>Undiagnosed conditions</i>			
Physical Functioning Index	0=100 scale; positively scored	78.00	31.05
Global Pain Index	0 to 100 scale; positively scored	31.77	27.76
Bed days	# restricted activity days in past 30 days	0.96	3.30

The first step in analyzing differences in health perceptions across age groups was to look at differences without controlling for other factors. Mean values of Current Health Perceptions by age groups were tabulated. Differences between each pair of age groups were evaluated using t-tests.

Next, health perceptions across age groups was examined using a regression equation and controlling for sociodemographic factors (sex, race, and education). Age was defined as a series of dummy variables referring to the age groups; an F-test was used to evaluate the contribution of the age variables as a group to the regression model. Mean values of Current Health Perceptions across groups were compared and differences between pairs of groups were tested using t-tests.

Regression equations using Current Health Perceptions as the dependent variable and the sociodemographic variables and indicator variables for the 16 chronic conditions were created to look at the variation in health perceptions across age groups once disease was controlled for. Disease variables included a dummy variable for each of the 16 conditions. An F-test was used to evaluate the contribution of the age variables as a group to the regression model; differences between the health perceptions score for pairs of age groups were tested using t-tests.

A final set of regression equations was created that included both measures of diagnosed and undiagnosed conditions. This regression equation included the sociodemographic variables, the indicator variables for the 16 chronic conditions listed above, and variables for physical functioning, pain, and bed days. An F-test was used to evaluate the contribution of the age variables as a group to the regression model, and differences between pairs of groups were tested using a t-test.

The preceding regression equations were developed for the entire general patient sample and a subset of the sample. A "no-chronic-disease" subset of the general patient sample was defined by taking all subjects who reported none of the 16 chronic conditions. This sample provided the cleanest look at differences in Current Health Perceptions in the absence of disease; by selecting only persons who report no chronic disease, the interactions between age and disease do not affect the results.

Chronic-Disease Sample

The sociodemographic variables used in the chronic-disease sample are the same as those used in the general patient sample. They include dichotomous variables for sex (male) and race (nonwhite), and a continuous variable for number of years of school completed.

The chronic-disease sample was limited to persons with one or more of the four tracer conditions (hypertension, diabetes, recent myocardial infarction, and congestive heart failure). Information from the patient and physician was combined using an algorithm to create a severity score for each of the conditions. (See Appendix C for a more detailed description of the creation of these variables.) One variable for each of the conditions was used; these variables ranged from a 0 to 2 scale for congestive heart failure to a 0 to 6 scale for diabetes. A score of 0 indicates that the patient did not have the condition.

Three measures of undiagnosed conditions were used; these were intended to capture subtle changes in health and disease status that would not be picked up in disease-specific measures. These included the Physical Functioning Index, a measure of energy and fatigue, and a measure of psychophysiological symptoms.

Both continuous and categorical variables were used to measure age. Four age groups were specified for the categorical variables: aged 18 to 44; 45 to 64; 65 to 74; and 75 and older.

Analyses for this sample paralleled those for the general patient sample. Mean Current Health Perceptions scores were compared across pairs of age groups using t-tests. Controlling for sociodemographic factors, differences between age groups were evaluated with a multivariate regression equation, in which sociodemographic variables (sex, race, educational attainment) were used as the independent variables and Current Health Perceptions was the dependent variable. Age was defined as a series of dummy variables, which represented the age groups listed above. The contribution of the age variables was evaluated using an F-test. Adjusted mean Current Health Perceptions scores for each age group were then calculated. Differences in Current Health Perceptions between pairs of age groups were tested using t-tests.

Table 3.12

MAJOR STUDY VARIABLES--CHRONIC-DISEASE SAMPLE

Variable	Definition	Mean (or %)	Std Dev.
<i>Dependent Variable</i>			
Current Health Perceptions	0 to 100 scale; positively scored	56.20	24.47
<i>Independent Variables</i>			
AGELT45	1=age 18 to 44 0=not age 18 to 44	14.4	
AGE4565	1=age 45 to 64 0=not age 45 to 64	35.4	
AGE6575	1=age 65 to 74 0=not age 65 to 74	33.7	
AGEGT75	1=age 75 and older 0=not age 75 and older	16.4	
Sex	1=male 0=female	46.10	
Race	1=nonwhite 0=white	21.10	
Education	# years of schooling	13.03	3.13
Hypertension	0-5 scale; 0=no disease 5=most severe	1.44	0.90
MI	0-4 scale; 0=no disease 4=most severe	1.03	0.20
Diabetes	0-6 scale; 0=no disease 6=most severe	1.54	1.15
CHF	0-2 scale; 0=no disease 2=most severe	1.04	0.20

Table 3.12 (Continued)

Variable	Definition	Mean (or %)	Std Dev.
Physical Functioning Index	0 to 100 scale; positively scored	69.56	26.98
Energy/fatigue	0 to 100 scale; positively scored	58.17	21.24
Psychophysiologic Symptoms	0 to 100 scale; positively scored	22.35	16.61
		22.35	16.61

The next set of regression equations included variables to indicate disease status. Disease severity variables for the four tracer conditions were added to the regression equations, along with a variable to measure comorbidity. Information used to create the variables for disease severity and comorbidities was obtained from patient self-report and physician report; these variables are described in Appendix C. A "0" for the variable indicates no disease; severity increases as the value of the variable increases. The cumulative contribution of the age variables was evaluated using an F-test. Adjusted mean Current Health Perceptions scores for each age group were calculated, and differences in Current Health Perceptions between pairs of age groups were tested using t-tests.

Finally, regression equations were constructed to capture undiagnosed conditions. The added variables included a physical functioning measure, a measure of energy and fatigue, and a measure of psychophysiologic symptoms. Age was defined as a series of dummy variables. The cumulative contribution of the age variables was evaluated using an F-test. Differences in adjusted mean Current Health Perceptions scores between pairs of age groups were tested using t-tests.

To determine whether observed differences between age groups were due to different reference groups, a regression equation was constructed with the item from the Current Health Perceptions Scale that asks about health "compared to others" as the dependent variable. Independent

variables included age and other sociodemographic factors and disease severity. In other health and functioning measures, the cumulative distribution of the age variables was tested using an F-test.

Differences in pairs of adjusted means were compared using t-tests.

The chronic-disease sample was also further divided according to tracer condition; for example, all subjects who had hypertension were included in the hypertension subset. A subject could be in more than one of the disease subsets if he or she had more than one of the tracer conditions. Regression equations run on the samples with hypertension and diabetes (the two tracer conditions with sufficient numbers of persons at each age group to calculate adjusted means) allowed the determination of whether each of the diseases had different profiles with respect to age-related differences. Age-disease severity interaction terms were tested in each of the samples.

Longitudinal Analyses

Longitudinal analyses were conducted only on the chronic-disease sample. The dependent variable was specified as the change in current health perceptions, or the difference between the Current Health Perceptions score at enrollment in the study and 12 months later. Independent variables were specified as either the enrollment variable or the change in the variable after one year (that is, the difference between the 12-month score and the score at enrollment), depending on data availability. Initial enrollment variables were available only for sociodemographic variables and those indicating disease severity. Twelve-month change variables were available for those variables measuring undiagnosed disease: physical functioning, psychophysiological symptom index, and energy/fatigue. Aside from the differences in specifying the dependent variable and the variables measuring undiagnosed disease, the analyses proceeded in the same fashion as for the cross-sectional analyses of the chronic-disease sample. Raw mean differences in one-year health perceptions score by age group were calculated, and differences between pairs were evaluated using t-tests. Regression models controlling for sociodemographic variables,

sociodemographic variables plus disease severity and comorbidity at admission, and sociodemographic variables plus diagnosed and undiagnosed disease variables were created. Age was defined as a series of dummy variables representing the following age groups: 18 to 44, 45 to 64, 65 to 74, and 75 and older. The contribution of the age variables in each of the regression models was evaluated using an F-test. Adjusted mean differences in the one-year health-perceptions score by age group were calculated from each of the regression models, and differences between pairs of age groups were tested using t-tests.

SUMMARY

This section provided a description of the study design, sampling methods, and analytic strategy for the study of the differences in Current Health Perceptions among age groups. Three samples were used in the analysis: a general patient sample, a subset of the general patient sample who reported no chronic disease, and a chronic-disease sample. The general patient samples (the total sample and the subset with no chronic disease) and the chronic-disease sample differ in terms of their selection criteria, the measures available, and the timing of data collection. The general patient sample was selected from patients visiting their physicians; it contained 9,807 persons, of whom 28 percent reported no chronic disease. The chronic-disease sample is a subsample of the general patient sample containing 1,735 persons with the following chronic diseases: hypertension, congestive heart failure, recent myocardial infarction, and diabetes. Longitudinal data are available for two points in time, one year apart, for this sample.

This section also described the variables used in the study. Sociodemographic variables included age, sex, race, and education. Measured disease variables included whether the patient had any of 16 chronic conditions for the general patient sample, and detailed severity and comorbidity measures for the chronic-disease sample. The dependent variable is a measure of Current Health Perceptions. An analysis of the suitability of this measure for use across age groups was provided. Reliability (measured by Cronbach's alpha) was high at 0.85 to 0.88, and

it did not differ significantly among age groups. Missing data were observed to increase significantly with age; however, further analysis indicated that missing data are related primarily to disease status. Although more older than younger persons had missing data, younger persons with missing data had poorer levels of health than older persons with missing data; these two trends appeared to cancel each other out. Validity was tested in several ways: by comparing correlations between Current Health Perceptions and other measures of health and functioning among age groups; by comparing Current Health Perceptions across age groups for persons with different disease severity; and by examining regression equations specified separately for different age groups. These tests indicate that validity is high, and there are no significant differences in validity among age groups.

Finally, this section described the analytic methods used in this study. Multivariate regression methods were used to calculate adjusted means for each age group being studied. The contribution of age to the model was tested using an F-test. Differences in the mean Current Health Perceptions scores between pairs of age groups were tested using t-tests.

IV. MAJOR STUDY RESULTS

INTRODUCTION

This section presents the results for analyses examining differences in current health perceptions across age groups. These analyses were conducted in an attempt to determine whether the differences in current health perceptions across age groups are due solely to differences in disease status among age groups, or whether there are measurable differences in current health perceptions separate from differences in disease status among age groups.

Three different samples are used in these analyses. The first is a general patient sample, selected from persons visiting their physicians. A subset of this sample reported no chronic diseases; this is the no-chronic-disease sample. The third sample of persons with chronic disease is also a subset of the general patient sample; the chronic disease sample contains persons with at least one of the following conditions: hypertension, diabetes, congestive heart failure, and recent myocardial infarction. For a more detailed description of the samples and the sampling methods, see Section III.

Although these samples were selected for the same study and all are subsets of the general patient sample, it will not be possible to compare the results from the general patient sample and the subsample with no chronic disease directly to the chronic-disease sample in this study. In addition to differences in the way individual samples were selected (as detailed in Appendix A), the data were obtained at different times. The general patient sample was administered a questionnaire at the time they visited their physician, whereas the chronic-disease sample provided data in response to a mailed questionnaire several months later. So, in practice, for the persons who were in both the general patient and the chronic disease-sample, data were collected at two points in time; the data used in the analyses of the general patient sample were obtained an average of three months before the data used in the analyses of the chronic-disease sample. Finally, different measures were used in the different samples.

RESULTS

General Patient Sample

Table 4.1 shows the mean differences in Current Health Perceptions across age groups for the general patient sample, without controlling for any other variables. There is a considerable decline in Current Health Perceptions with age, from a mean score of almost 70 in the youngest age group to a mean score of just over 50 in the oldest age group--a difference of 19 points on a 100-point scale. The differences are statistically significant between each age group except for the two groups over age 75. Although there is a large increase in the standard errors associated with the means in the older age groups, this increase can be explained in terms of the difference in sample sizes between the groups.

Results obtained from multivariate regression analysis of health perceptions, controlling for sociodemographic variables, supported the findings of previous studies regarding the relationship between sociodemographic variables and health perceptions. Educational attainment has a significant positive effect on health perceptions; there was an increase of almost 2 points on a 100-point scale observed for each additional year of schooling. Nonwhite respondents reported significantly poorer health perceptions than did whites; a difference of more than 7 points was observed in this model. Sex did not appear to

Table 4.1

CURRENT HEALTH PERCEPTIONS BY AGE GROUP--
GENERAL PATIENT SAMPLE

	Mean	Std Err.	N
18 to 44	69.73	0.34	4,893
45 to 64	57.92	0.55	2,594
65 to 74	53.67	0.78	1,291
75 to 84	51.46	1.21	569
85+	50.84	1.59	305

have a significant effect on health perceptions in this specification. This model explains only a small proportion of the variance in health perceptions--less than 9 percent. Even after sociodemographic differences (sex, race, and educational attainment) were controlled for, age remained a significant predictor of Current Health Perceptions, as indicated by an F statistic of 95. Table 4.2 shows that the difference in Current Health Perceptions between the oldest and the youngest age groups declined from 19 points to 18 points--a nonsignificant decline--after sociodemographic variables were added into the model. However, once sociodemographic differences were controlled for, differences in Current Health Perceptions in the groups age 65-74 and 75-84 became nonsignificant. Significant differences remain between all other age groups.

In the next model, indicator variables for the 16 chronic conditions were added to control for disease status. The addition of the disease variables decreased slightly the effects of race and education on health perceptions; no effect was observed for sex. Diabetes, congestive heart failure, angina, asthma, ulcer, and bowel disease all had large significant negative effects on health perceptions. Hypertension, paralysis, myocardial infarction, arthritis,

Table 4.2

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHIC DIFFERENCES--
GENERAL PATIENT SAMPLE

	Mean	Std Err.	N
18 to 44	64.55	0.33	4,701
45 to 64	54.16	0.54	2,449
65 to 74	51.92	0.82	1,165
75 to 84	51.04	1.31	480
85+	46.64	2.18	151

F(age) = 95.02

vision problems, and allergies had significant but smaller negative effects. Inexplicably, the conditions of back pain and amputation were associated with significantly better health perceptions. Age remained a significant predictor of Current Health Perceptions after disease variables were added into the model, with an F statistic of about 10. This model explains about one-fourth of the variance in health perceptions. By controlling for disease, the differences between the youngest and oldest age groups decreased significantly, to only an 8-point difference. Also interesting is the fact that the three middle age groups (ages 45 to 64, 65 to 74, and 75 to 84) show no significant differences in Current Health Perceptions once disease and sociodemographic variables are controlled for. The youngest group has significantly better health perceptions, and the oldest group has significantly worse health perceptions, than do the middle age groups, as shown in Table 4.3.

In the final model, other health and functioning variables were added to control for the severity of disease and other undiagnosed conditions. These variables include a measure of acute disability (bed days), a measure of physical functioning, and a measure of global bodily pain. This model explains considerably more (44 percent) of the

Table 4.3

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS AND DISEASE--
GENERAL PATIENT SAMPLE

	Mean	Std Err.	N
18 to 44	65.45	0.37	3,220
45 to 64	61.18	0.57	1,680
65 to 74	62.43	0.90	819
75 to 84	61.69	1.47	331
85+	57.41	2.32	108

F(age) = 9.95

variance in health perceptions. In this specification, the effect of educational attainment and race decreased, although their effect remains significant and in the same direction. The effect of sex remains nonsignificant. Pain and bed days show a significant negative association with Current Health Perceptions; for every three additional bed days, we observe a decrease of two points on the Health Perceptions Scale, and for every four-point increase in the pain scale, a one-point decrease in health perceptions is observed. Physical functioning is positively associated with perceptions of health; for an increase of four points on the Physical Functioning Index, the health perceptions score increases by one point on average. The addition of these other health and functioning variables to the model decreases the negative effects of congestive heart failure and asthma on health perceptions and eliminated the effect of arthritis. Age remains a significant predictor, with an F statistic of 11.49. Table 4.4 shows the age differences obtained from the complete model, with sociodemographic variables, measured disease, and unmeasured disease variables added. The results appear similar to the previous specification, which included sociodemographic and measured disease variables only. The difference in Current Health Perceptions between the youngest and oldest age groups drops to six points. There are no significant differences in health perceptions between pairs of age groups between 45 and 84. The youngest age group reports their health as significantly better and the oldest age group reports their health as significantly worse than the middle age groups.

Subsample with No Chronic Disease

The next set of results replicates the analyses just reported, with a different sample: a subset of the general patient sample (2,730, or approximately 28 percent of the general patient sample) who reported no chronic conditions. This sample provides an excellent opportunity to examine differences in health perceptions across age groups in the absence of disease.

Table 4.4

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS,
DIAGNOSED, AND OTHER UNDIAGNOSED DISEASE--
GENERAL PATIENT SAMPLE

	Mean	Std Err.	N
18 to 44	67.36	0.33	3,121
45 to 64	64.84	0.51	1,551
65 to 74	65.31	0.83	684
75 to 84	66.25	1.37	275
85+	61.07	2.00	92

F(age) = 11.49

Table 4.5 presents the mean differences between age groups of the sample with no reported disease. We observe a nine-point difference in Current Health Perceptions between the youngest and oldest age groups. This difference is significantly smaller than the 19-point difference observed in the total general patient sample.

Table 4.5

CURRENT HEALTH PERCEPTIONS BY AGE GROUP--
SUBSAMPLE WITH NO CHRONIC DISEASE

	Mean	Std Err.	N
18 to 44	75.37	0.44	2,148
45 to 64	71.23	1.07	479
65 to 74	66.07	2.18	151
75 to 84	62.44	4.00	46
85+	66.13	2.96	64

The regression results for health perceptions controlling for sociodemographic variables in the subsample with no chronic disease are similar to the results obtained for the full general patient sample; educational attainment has a significant positive effect on assessment of health, and nonwhite persons rate their health significantly worse than whites. Age is not a significant predictor in this specification; the F statistic for the age groups as a whole is less than 1.0. Table 4.6 presents mean differences in perceptions of health between age groups controlling for sociodemographic variables. The youngest age group reports significantly better health than do the older age groups; there are no significant differences between perceptions of health in pairs of age groups over age 45. However, because of the small sample size, standard errors are large, and precision is lost; small differences, such as those observed in the total sample, would not be detectable in this subsample. Almost 7 percent of the variance in health perceptions is explained by this model.

In the next model, measures of health and functioning are added to control for subtle differences in health or disease status that would not be picked up by a diagnosis. All three variables exert significant effects on health perceptions. Pain exerts a negative effect identical

Table 4.6

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS--
SUBSAMPLE WITH NO CHRONIC DISEASE

	Mean	Std Err.	N
18 to 44	73.98	0.44	2,059
45 to 64	70.48	1.07	459
65 to 74	67.47	2.18	142
75 to 84	68.83	4.51	38
85+	64.12	4.88	23

F(age) = 0.75

to that observed in the total general patient sample; for every four-point increase in the pain measure, a one-point decrease in health perceptions is observed. Bed days exerts an effect twice as strong as that observed in the total sample; for every additional day confined to bed, a decrease of 1.5 points in the Current Health Perceptions measure is observed. Physical functioning exerts a smaller positive effect in this sample; it requires an increase of almost six points on the Physical Functioning Index to observe a one-point increase in health perceptions. Age is not a significant predictor in this model either; the F statistic remains less than one. This model explains more than one-fourth of the variation in health perceptions. There are no significant differences in perceptions of health in pairs of age groups over 45. However, small differences could not be detected because of the small sample size.

Table 4.7

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS AND OTHER
UNDIAGNOSED DISEASE--SUBSAMPLE WITH NO CHRONIC DISEASE

	Mean	Std Err.	N
18 to 44	75.94	0.40	1,971
45 to 64	72.48	0.95	409
65 to 74	73.59	1.92	107
75 to 84	72.07	3.60	30
85+	70.06	4.39	20

F(age) = 0.78

Chronic-Disease Sample

The next series of results focuses on the chronic-disease sample. This sample is composed of persons with one or more of four chronic conditions: hypertension, congestive heart failure, recent myocardial infarction, and diabetes. While these analyses are conducted on a very select sample that does not allow direct extrapolation to a general population, the detailed information on disease staging will allow for comparison of health perceptions controlling not only for the existence of disease but also for disease severity.

In Table 4.8, the mean score of the Current Health Perceptions Scale is presented for each age group. It is interesting to compare the scores between the general patient and chronic-disease samples. The scores in the general patient sample ranged from 50 to 70, whereas the range of scores in this chronic-disease sample is much narrower--56 to 59--and lower, reflecting the poor health of the persons in this sample. While one might expect larger differences in Current Health Perceptions between the general patient sample and the chronic-disease sample, remember that the general patient sample was derived from persons visiting their physician; therefore, the general patient sample is likely to be sicker than the general population. (This was demonstrated by comparing the average Current Health Perceptions score in the general patient sample to the average score in the RAND HIE sample.) The standard errors for each age group's mean Current Health Perceptions score in this sample are significantly larger due to the smaller sample size. Interestingly, there are no significant differences between any of the groups except the 45-to-64 group. This difference--in which the 45-to-64 age group reports significantly worse health than other groups--holds across all analyses and could be a factor of the sampling procedure (in which a limited number of persons from the screening sample with the chronic tracer conditions could be selected into the MOS longitudinal panel) or a statistical fluke. It is fascinating that this sample of persons with chronic disease is so homogeneous in their perceptions of health, regardless of age.

Table 4.8

CURRENT HEALTH PERCEPTIONS BY AGE GROUP--
CHRONIC-DISEASE SAMPLE

	Mean	Std Err.	N
18 to 44	59.52	1.63	210
45 to 64	53.72	1.07	528
65 to 74	57.34	1.06	506
75+	56.34	1.70	230

The first regression model on the chronic-disease sample was Current Health Perceptions, controlling for sociodemographic variables. Education was significantly related to health perceptions; for every additional year of schooling, the health perceptions score increased by almost one point. Males rate their health significantly better than females by almost three points. The effect of race was not statistically significant. Age is a significant predictor in this model, with an F statistic of 3.76; however, this significant result appears to be due to the lower values observed in the 45-to-64 age group. An examination of the differences between pairs of age groups (excluding the 45-to-64 age group) indicates no such differences. This model explains only 3 percent of the variance in Current Health Perceptions. Once sociodemographic variables, such as sex, race, and educational attainment, were controlled for, the differences between the age groups became even smaller. Differences only marginally nonsignificant before become even more similar now, as shown in Table 4.9.

In the next model, disease severity and comorbidity variables were added into the regression equation. As expected, disease severity had a negative effect on health perceptions; congestive heart failure exerted the strongest negative effect, while hypertension exerted the weakest. Probably because of the small sample size, the effect of a recent

Table 4.9

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHIC VARIABLES--
CHRONIC-DISEASE SAMPLE

	Mean	Std Err.	N
18 to 44	56.20	1.59	198
45 to 64	50.85	1.09	499
65 to 74	55.36	1.09	475
75+	54.68	1.95	176

F(age) = 3.76

myocardial infarction on health perceptions was not significant. Adding in the disease severity and comorbidity variables did not affect the significance or direction of the sociodemographic variables on health perceptions. Age remains a significant predictor, as evidenced by an F statistic of 2.3. However, this model does not explain much of the variance in Current Health Perceptions--only about 9 percent.

The health perceptions scores did not change much once the disease severity variables were added into the model, as shown in Table 4.10. The Current Health Perceptions scores, which were not significantly different before, are essentially identical in all age groups but the 45-to-64 age group. As before, the difference in the 45-to-64 age group probably accounts for the significant F statistic.

In the final specification, other health and functioning variables were added into the model. These variables include measures of physical functioning, energy/fatigue, and psychophysiological symptoms, and are intended to tap subtle differences in health that may not be reflected in a diagnosis. As expected, these variables were highly statistically significant. For every four-point increase in the Physical Functioning Index, a one-point increase in Current Health Perceptions was observed. Every four-point increase in the symptoms index resulted in a one-point decrease in perceptions of health. The effect of energy and fatigue was

Table 4.10

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS AND DISEASE SEVERITY--
CHRONIC-DISEASE SAMPLE

	Mean	Std Err.	N
18 to 44	56.20	1.54	198
45 to 64	52.94	1.04	499
65 to 74	56.61	1.06	475
75+	56.47	1.91	176

F(age) = 2.31

even stronger; for every two-point increase in the energy scale, a one-point increase in health perceptions was observed. When the other health and functioning measures were added to the equation, only diabetes severity exerted a significant effect on health perceptions; the effects of disease severity for the other three conditions became nonsignificant. Additionally, the effect of sex on health perceptions was altered; in this specification, men reported significantly lower health perceptions than did women. The sex difference in Current Health Perceptions scores can be translated into more than a 3.5-point difference, all other things being equal.

Age is a significant predictor of Current Health Perceptions in this model, as evidenced by an F statistic of 8.9. When these other health and functioning variables are added into the model specification, health perceptions appear to increase with age group, holding disease and functioning constant, as seen in Table 4.11. One likely explanation for this increase in health perceptions is that people perceive their health in comparison with some reference group, most likely their peers; this hypothesis has been suggested before and is supported by the results of others (Cockerham, Sharp, and Wilcox, 1983).

Table 4.11

CURRENT HEALTH PERCEPTIONS BY AGE GROUP
CONTROLLING FOR SOCIODEMOGRAPHICS, DIAGNOSED,
AND UNDIAGNOSED DISEASE--CHRONIC-DISEASE SAMPLE

	Mean	Std Err.	N
18 to 44	56.20	1.08	185
45 to 64	56.65	0.74	468
65 to 74	60.39	0.75	425
75+	64.05	1.46	150

F(age) = 8.93

To test the hypothesis that people perceive their health in comparison to that of their peers, a series of regression equations was constructed with the dependent variable being the response to the item in the Current Health Perceptions Index that asks the patient whether he or she feels "as healthy as anybody." Results were the same as those reported previously for regression models that included sociodemographic or disease severity and comorbidity variables. However, when the other health and functioning variables were added into the regression equation, very small and statistically nonsignificant differences in the age group predictions were observed; persons age 65 and older produced responses 0.04 (of a possible 0 to 5 score) higher than persons under 65; this difference translates to a difference of 1.5 points on a 0 to 100 scale such as the Current Health Perceptions Scale. Because the difference observed between Current Health Perceptions in the youngest and oldest groups was almost eight points, it does not appear that the total difference could be explained by differences in the reference group used to evaluate health.

Differences by Disease Group

Identical analyses were run on disease-specific subsamples of the chronic-disease sample, and these results are presented in Tables 4.12 and 4.13. The results were similar to those obtained in the total sample: no difference was observed in unadjusted mean Current Health Perceptions scores among age groups, and no differences were observed after controlling for sociodemographic variables. Once disease severity and other health and functioning variables representing unmeasured disease were controlled for, however, older age groups perceived their health as better than younger age groups in the hypertension subsample; there were no differences in the diabetes subsample. The increase in health perceptions in the hypertension subsample was not statistically significant because of the loss of precision associated with the smaller sample sizes.

It is interesting to note that the Current Health Perceptions scores are considerably higher in the hypertension subsample than in the diabetes subsample, as expected. This demonstrates that persons with hypertension are generally healthier than persons with diabetes. Persons with hypertension are generally compared to a general population sample. Although, in this sample, Current Health Perceptions scores of persons with hypertension are significantly lower than the scores of the general patient sample, they are significantly higher than the scores of persons with diabetes, lending support to the claim that they are healthier relative to persons with other types of chronic diseases.

Longitudinal Results

Although the difference in Current Health Perceptions across age groups in the chronic-disease sample does not appear to be due to differences in reference groups, there are two other possible explanations for this difference. The first is that cohort differences exist between younger and older age groups. These could reflect differences in experience or attitude that cause the age groups to view their health differently. A second possible explanation is that, as

Table 4.12

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS, DIAGNOSED,
AND UNDIAGNOSED DISEASE--PERSONS WITH HYPERTENSION

Age Group	Controlling for Socio-demographics	Controlling for Disease
<45	56.69 (2.70)	56.69 (2.59)
45 to 64	51.20 (1.73)	55.81 (1.60)
65 to 74	52.39 (1.88)	53.82 (1.77)
75+	56.13 (3.40)	59.68 (3.16)

Table 4.13

CURRENT HEALTH PERCEPTIONS BY AGE GROUP,
CONTROLLING FOR SOCIODEMOGRAPHICS, DIAGNOSED,
AND UNDIAGNOSED DISEASE--PERSONS WITH DIABETES

Age Group	Controlling for Socio-demographics	Controlling for Disease
<45	49.86 (3.14)	49.86 (2.95)
45 to 64	42.32 (1.86)	45.21 (1.75)
65 to 74	48.39 (2.33)	50.14 (2.22)
75+	41.23 (4.47)	45.04 (4.31)

people age, they lower their expectations for health. Thus an older person with the same objective health status as a younger person but with lower expectations might evaluate his or her health as better than the younger person because the older person expects less.

Both of these hypotheses may be tested with the longitudinal data available. The longitudinal data allow for an examination of a one-year change in Current Health Perceptions, controlling for

sociodemographic variables, disease status at admission, and changes in other health and functioning variables over the one-year period. If the first hypothesis were correct, and the differences between age groups were due to cohort differences, no change in health perceptions controlling for disease between age groups would be observed. If the second hypothesis were correct, and older persons have lower expectations for health than do younger persons, one would expect to see a difference in the health perceptions one year later. This change may be constant by age, or it may increase. If one assumes that the observed eight-point difference between age groups is due to 30 years of constant increase in health perceptions, the change expected in a single year would be approximately 0.26 points. One may also assume a different rate of change for different age groups.

The raw difference in Current Health Perceptions after one year across the total sample was an average increase of 1.62 points (on a 100-point scale). A regression model was constructed for the one-year difference in Current Health Perceptions, controlling for sociodemographics, disease, and the change in other health and functioning variables (that is, physical functioning, psychophysiological symptoms, and energy/fatigue) between the value measured at enrollment and 12 months later. Controlling for the change in other health and functioning measures allows for the estimation of changes in health perceptions after taking into account changes in health status. This model explained one-third of the variance in the one-year change in Current Health Perceptions. Age was not a significant predictor in the model; however, the changes in other health and functioning measures were significant predictors. For every four-point increase in the Physical Functioning scale, a corresponding one-point increase in Current Health Perceptions was observed. For every four-point decrease in the Psychophysiological Symptoms scale, a one-point increase in Current Health Perceptions was observed. And for every three-point increase in the Energy/Fatigue scale, a one-point increase in current Health Perceptions was observed. Using regression methods to obtain adjusted mean values by age group--and controlling for

sociodemographic variables, disease severity, and other health and functioning variables--provided the results shown in Table 4.14. The differences between each pair of age groups were not significant.

SUMMARY

This study examined differences in Current Health Perceptions among age groups. Three samples were used: a general patient sample of persons visiting their physicians, a subset who reported no chronic disease, and a sample of persons with chronic disease.

In the general patient sample, a large difference in Current Health Perceptions between the youngest and oldest age groups was observed; this difference translated into 19 points on a 100-point scale. No decrease in the difference between the youngest and oldest age groups was observed in the adjusted means, controlling for socioeconomic differences. Significantly smaller differences were observed in adjusted means, controlling for the presence of 16 chronic conditions, and in adjusted means, controlling for both diagnosed and undiagnosed conditions. The addition of diagnosed and undiagnosed conditions decreased the difference between the youngest and oldest age groups to a nine-point difference, with the oldest age group (those 85 and older) reporting significantly worse health perceptions than younger age groups. It is not clear whether this remaining difference in Current Health Perceptions between those younger than 85 and those over 85 is due to actual age-related differences or to residual disease that remains uncontrolled for in the regression equation. Table 4.15 shows these differences.

The lack of an observed relationship between age and health perceptions may also be due to the potential influence of perceptions in the self-report measures intended to reflect undiagnosed disease. If these self-report measures tap a large degree of perception, the relationship between age and health perceptions would be biased toward zero.

Table 4.14

ONE-YEAR DIFFERENCE IN CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SOCIODEMOGRAPHICS,
DIAGNOSED, AND UNDIAGNOSED DISEASE

	Mean	Std Err.	N
18 to 44	1.52	1.11	148
45 to 64	1.56	0.78	375
65 to 74	-1.10	0.90	325
75+	0.57	1.40	109

F(age) = 0.92

Table 4.15

GENERAL PATIENT SAMPLE

Age Group	Raw Mean	Controlling for Socio-demographics	Controlling for Disease	Controlling for Undiagnosed Disease
<45	69.73	64.55	65.45	67.36
45 to 64	57.92	54.16	61.18	64.84
65 to 74	53.67	51.92	62.43	65.31
75 to 84	51.46	51.04	61.69	66.25
85+	50.84	46.64	57.41	61.07

Differences in Current Health Perceptions across age groups in the subsample of the general patient sample with no chronic disease were also examined. Significantly smaller differences were observed between young and old in this sample than in the general patient sample, as shown in Table 4.16. The differences observed among age groups remained significant, even after controlling for sociodemographic variables and variables to measure undiagnosed disease.

Table 4.16

SAMPLE WITH NO CHRONIC DISEASE

Age Group	Raw Mean	Controlling for Socio-demographics	Controlling for Undiagnosed Disease
<45	75.37	75.94	75.94
45 to 64	71.23	72.48	72.48
65 to 74	66.07	73.59	73.59
75 to 84	62.44	72.07	72.07
85+	66.13	70.06	70.06

In the chronic-disease sample, there were no significant differences in Current Health Perceptions among age groups. However, when controlling for disease severity and other health and functioning measures, older persons (those 65 and older) reported their health as significantly better than younger persons. Persons 75 and older reported their health as significantly better than those aged 65 to 74. The observed difference in Current Health Perceptions between the oldest and the youngest age groups was eight points on a 100-point scale, as shown in Table 4.17. Similar trends were observed for the hypertension subgroup of the sample, although differences were nonsignificant because of the smaller sample size.

Analyses were conducted to determine how those in the chronic-disease sample rated their health "compared to others." Very small and statistically nonsignificant differences between age groups were observed--on the order of 1.5 points on a 100-point scale. This difference is not sufficient to explain the total increase observed with age, indicating that different reference groups between young and older persons are unlikely to be a factor in explaining the difference in Current Health Perceptions among age groups.

Longitudinal analyses of the one-year difference in the Current Health Perceptions score were also conducted. An increase in the Current Health Perceptions score after one year, controlling for

Table 4.17

CHRONIC-DISEASE SAMPLE

Age Group	Raw Mean	Controlling for Socio-demographics	Controlling for Disease	Controlling for Undiagnosed Disease
<45	59.52	56.20	56.20	56.20
45 to 64	53.72	50.85	52.94	56.65
65 to 74	57.34	55.36	56.61	50.39
75 to 84	56.34	54.68	56.47	64.05

disease, was observed. This difference was equivalent to a 1.6-point increase in the raw sample, which decreased to a 0.53-point difference after controlling for disease. This longitudinal difference is statistically significant and is larger than would be expected if the observed cross-sectional difference of eight points was averaged over the 30 years that separates the youngest from the oldest age groups.

V. CONCLUSIONS AND POLICY IMPLICATIONS

This study examined differences in Current Health Perceptions among age groups. Three samples were used: a general patient sample of persons visiting their physicians, a subset who reported no chronic disease, and a sample of persons with chronic disease.

In the general patient samples, large differences in Current Health Perceptions between the youngest and oldest age groups were observed. These differences are consistent with the common knowledge that health declines as disease and disability accumulate with age. However, after controlling for disease (both diagnosed and undiagnosed disease), no differences in Current Health Perceptions for age groups under 85 were observed. Persons aged 85 and older reported significantly lower Current Health Perceptions even after controlling for disease. Thus, for persons under 85 years of age, most if not all of the age-related decrease in Current Health Perceptions is due to disease. It is not clear whether the decline in Current Health Perceptions in persons over 85 is due to actual age-related differences, or to residual disease that remains uncontrolled for in the regression equation. In the subset with no chronic disease, there was a small but not statistically significant decrease in Current Health Perceptions with increasing age. However, we cannot rule out the possibility that the small sample sizes in the older age groups (those 75 and older) may have masked the statistical significance of any meaningful differences.

In the chronic-disease sample, no significant differences in raw Current Health Perceptions scores among age groups were observed. However, when controlling for disease severity and other health and functioning measures, older persons reported their health to be significantly better than younger persons.

The evidence from the three samples indicates that the observed differences among age groups in the general patient and chronic-disease samples may be due to better control for disease status (both disease severity and other unmeasured disease). In the general patient sample

and the no-chronic-disease subsample, which provided limited opportunity to control for disease status, essentially no differences between age groups were observed. It is possible that this is due to the bias introduced by relying on self-report measures of disease and health, where some of the effect of perceptions is picked up in the independent variables. Thus the relationship between age and health perceptions would tend to be biased toward zero.

In the chronic-disease sample, which provided more sophisticated control for disease, including additional objective measures of disease severity, Current Health Perceptions was better in the older age groups than the younger. If better control for disease status (including disease severity) was available for the general patient sample, it is likely that one would see an increase in Current Health Perceptions in the older age groups. An additional possibility--that persons with chronic diseases rate their health differently than persons with no disease--cannot be ruled out; however, it is unlikely in view of the similar age patterns observed in the disease-specific analyses. Although a similar pattern of increase in health perceptions with age was observed in the hypertension group, no such increase was observed in those with diabetes.

The increase in Current Health Perceptions with age that was observed in the chronic-disease sample provoked further examination. A number of hypotheses can be proposed for this increase with age:

1. Older, sicker persons are more likely to have missing data. Thus higher rates of missing data among older age groups would tend to increase the mean Current Health Perceptions score of those remaining, overestimating differences between age groups.
2. People perceive their health in comparison with a reference group, most likely their peers. Because older persons have a peer group that is considerably sicker than younger persons, they are likely to perceive their health as better.

3. With age, persons have different expectations regarding their health. This difference in expectations may be caused by the internalization of cultural stereotypes that equate age with disease, so that, for a given level of disease, older persons would tend to report their health as better than younger persons because of lowered expectations.
4. There are potential cohort differences between the age groups that explain differences in Current Health Perceptions because of different beliefs or experiences that have no direct relationship to age.
5. The older age groups in this study represent survivors, who have relatively few chronic conditions and who perceive their health as better because of objective differences that the measures used do not pick up. In a sense, this is a selection effect; as members of a cohort die off, the remaining members may be different from their former peers.

Each of these hypotheses was explored in turn. The missing data analysis presented in Section III implied that two competing biases exist: older persons are more likely to have missing data, however the younger persons with missing data are sicker relative to others in their age group than older persons. Thus, while the first bias would tend to make the oldest age groups appear to have better health perceptions than they actually did, the second bias would do the same for the younger age groups.

Analyses presented in Section IV show how those in the chronic-disease sample rate their health "compared to others." Small but statistically nonsignificant differences between age groups were observed; however, the magnitude of these differences was not sufficient to explain the observed increase with age, indicating that the theory of different reference groups does not appear to be a factor in explaining the difference in Current Health Perceptions among age groups.

Longitudinal analyses of the one-year difference in the Current Health Perceptions score were conducted to test the third and fourth hypotheses, and the results were presented in Section IV. If cohort differences were responsible for the difference in Current Health Perceptions by age groups, no difference in Current Health Perceptions score after one year, after controlling for disease status, would be expected. If persons lower their expectations of health as they age, then one might expect to see an increase in the Current Health Perceptions score after one year.

An increase in the Current Health Perceptions score after one year, after controlling for disease, was observed; however, the difference was larger than expected, given the cross-sectional difference observed between age groups. No significant differences between age groups in the rate of change was observed, suggesting that the increase may be linear with age.

An additional hypothesis, that older persons learn to cope with chronic disease better, may be a possible explanation for the increase in Current Health Perceptions observed with age. This hypothesis derives some support from the reported general increase in mental health with age (Cassileth et al., 1984). However, an examination of this hypothesis was beyond the scope of this study, and it was not tested. An exploration of that hypothesis is being conducted by others.

Although the results from the longitudinal analyses imply that the higher level of health perceptions in older age groups is not due to cohort differences, it is not clear whether the increase in health perceptions with age is due to decreased expectations of health, a better ability to cope with disease and disability, or some combination of both. There is some evidence that both factors may be responsible for the increase in health perceptions with age; the documented inattention to certain symptoms by the elderly that are thought to be caused by aging (for example, fatigue or memory loss) provides support for the theory that expectations regarding health may be lower in older persons. The increase in mental health status observed in older persons may indicate a better ability to cope with life's troubles, including

disease. There is no evidence at present to indicate that older persons do in fact cope better with chronic disease; theories such as the vulnerability hypothesis imply that when the aged experience a potentially negative event, this event is likely to have even more negative outcomes than in younger individuals because of the interrelatedness of various aspects of functioning in the elderly.

While the longitudinal analyses provide support for the hypothesis discussed above, the large one-year difference (twice what would have been consistent with the observed cross-sectional differences) remains puzzling. One explanation that appears feasible is that one year of data is not adequate to observe reliable differences. An additional explanation is the possibility that persons enrolled in the study reported improved health perceptions by virtue of being in the study. This effect, called the Hawthorne effect, is due to the increased attention received by the subjects, rather than any objective increase in health status or any normative change in health perceptions. Unfortunately, it is not possible to test the possibility that some or all of this one-year increase in health perceptions is due to the Hawthorne effect with the data available.

The relatively short one-year time frame did not allow an examination of the hypothesis that the observed increase in Current Health Perceptions with age is due to a selection effect caused by the fact that the older persons in the sample are "survivors," who may be significantly different from those in their age cohort who have died. The rates of disease across the age groups shown in Table 3.1 indicate that the oldest age group has significantly fewer chronic conditions than the 75-to-84 age group, providing some evidence of a survivor effect.

The analyses conducted suggest that, independent of reference group, Current Health Perceptions increase with age after controlling for disease. The data available do not allow us to determine whether that increase is due to a decrease in expectations of health or to a better ability to cope. If older persons expect a lesser level of health, they will tend to rate their health as better than a younger

person who expects a much greater level of health. If older persons have better coping skills, chronic disease may not have as negative an impact on health perceptions.

While these hypotheses were derived from and supported by analyses conducted using data from the sample of persons with chronic disease, it is plausible that the same results would have been obtained, provided that adequate data were available on the general patient sample. With more detailed disease information, including measures of severity, analyses may indicate that older persons perceive their health significantly better than younger persons. This is likely considering that large numbers of the population, especially the elderly, suffer from at least one chronic condition; in the general patient sample used in this study, almost 75 percent of the sample reported having at least one of 16 common chronic conditions. Providing additional support to this hypothesis is the fact that the hypertension subsample of the chronic-disease sample showed an increase in Current Health Perceptions with age, controlling for disease; hypertension is generally considered to be relatively symptom-free and persons with hypertension are often compared with the general population.

In spite of the potential limits to the generalizability of the findings that people may decrease their expectations from health as they age, the fact that this does occur in a sample with chronic disease is in itself significant. Large numbers of older persons suffer from at least one chronic condition, so that this finding may be policy relevant even if only restricted to persons with chronic disease.

The finding that most, if not all, of the observed decline in Current Health Perceptions with age is due to disease, rather than aging per se, is also important in a methodological sense. This implies that other studies, which claim to study differences between age groups, may in fact be studying the effects of disease rather than age. This also underscores the need for better control for disease in any study of the elderly. Reidenberg and Lowenthal (1968) documented the occurrence of symptoms that are often listed as medication side effects, pointing out the need for control groups. This study has demonstrated an analogous

problem; perhaps studies of the aged (many of whom suffer from chronic disease) should include control groups of younger persons that have similar rates of chronic disease.

The finding that lowered expectations of health may exist in the elderly poses interesting dilemmas. On the one hand, these expectations may be appropriate because many elderly persons do suffer from chronic disease and functional decline. However, for those elderly persons who do not suffer from ill health, these lowered expectations may serve to decrease their quality of life. To the extent that erroneous negative stereotypes influence the expectations of individuals, the potential of these elderly individuals may be unnecessarily limited.

The elderly are frequently denied treatment solely on the basis of their age. Diagnostic and routine cancer screening tests are performed less frequently on persons aged 75 and older (Radecki et al., 1988). Cancer therapies are offered less frequently to older persons, even in the absence of comorbid factors (Greenfield et al., 1987). The tendency of physicians to be more negative in their prognostications than would be warranted by the patient's actual medical condition has been described as the "hanging of crepe" (Siegler, 1975). Many have believed this to be a "no-lose" situation; if the patient dies, the physician was correct, and if the patient survives, the physician has performed a miracle. However, as Siegler points out, the management of the patient may be compromised because of the inherent relationship between diagnosis, prognosis, and therapy. Negative stereotypes that equate age and chronic disease and disability may have the same effect as the hanging of crepe--physicians and other care providers who are influenced by the stereotypes may form more negative prognoses than the patient's condition warrants, and these more negative prognoses have negative effects on patient care.

The individual patient is also subject to negative influence by the stereotypes that equate age and disease. These stereotypes may affect patients' decisions to report symptoms and practice appropriate health behaviors; studies have demonstrated that the elderly do not report potentially serious symptoms because they view these symptoms as an

inevitable part of aging (Brody, Kleban and Moles, 1983; Leventhal and Prohaska, 1986).

The conclusions reached in this study--that the observed decline in health perceptions with age is due to disease, and that the elderly may decrease their expectations regarding their health--should be viewed as an impetus for increased education at several levels.

At the highest level, this information can be used by policy makers when deciding on rationing policies. For example, the rationing of certain health care services on the basis of age has been proposed (Callahan, 1987; Daniels, 1988). The results from this study would indicate that disease status, not age, may be a more appropriate rationing tool. Current Health Perceptions, an important aspect of health that has been shown to predict utilization and mortality, has been shown to be unrelated to age after controlling for disease.

At the next level, health care providers can use the information provided in this and other studies as an impetus to make care decisions on the basis of disease status, rather than solely on age. As pointed out previously, the negative stereotypes held by care providers can affect the prognosis, which in turn may affect care provision.

The decreased expectations of health among elderly persons may be turned around by developing education programs that would assist people in retaining high expectations from health, even as they age. This could be coupled with information that symptoms such as fatigue and memory loss are not necessarily part of the "normal" aging process, and should be medically evaluated.

This study has shown that, after controlling for disease, the observed decline in health perceptions with age is eliminated. In fact, the elderly have higher health perceptions than younger persons, possibly because of a decrease in expectations of their health. It is likely that the decrease in expectations results from the stereotypes equating age with disease, which are so prevalent.

Appendix A

SAMPLING METHODS FOR THE MEDICAL OUTCOMES STUDY (MOS)

The basic sample design for the MOS involved a three-step process: (1) identification of appropriate geographic sites in which to conduct the study; (2) selection of HMOs, group practices, and solo practices within those sites; and (3) selection of providers and patients within those practices.

SITE AND SYSTEM SELECTION

The sampling unit for sites was Standard Metropolitan Statistical Areas (SMSAs) because they are designed to represent economic market areas. Initially, SMSAs with mature forms of the three systems of care were identified. The InterStudy HMO Census and the Membership Directory of the Medical Group Management Association (MGMA) were used to identify sites with the systems of care of interest. Initially, 60 sites were considered, 30 were evaluated, and 12 were judged acceptable. The major criteria for site selection were:

1. Geographic diversity (three of four census regions represented);
2. Presence of an HMO of sufficient size (minimum 100,000 enrollees) and maturity (at least three years old);
3. Presence of multispecialty groups (MSGs) of sufficient size (at least 10 physicians), maturity (at least three years old), and with a mixture of prepayment and fee-for-service; and
4. Willingness of HMOs and MSGs to participate in the study.

SELECTION OF CLINICIANS

The process of identifying and enrolling providers differed slightly with the system of care to ensure that each system was adequately represented.

First, the provider specialties that treat the five tracer conditions under study (hypertension, diabetes, recent myocardial infarction, congestive heart failure, and depression) were identified. Clinicians in the specialties of family practice, general internal medicine, cardiology, endocrinology, psychiatry, and clinical psychology were selected. Within these specialties, it was required that the clinicians be: (1) between the ages of 31 and 55; (2) board-certified, board-eligible, or licensed for independent practice in their specialty; (3) primarily involved in patient care; and (4) practice primarily in nongovernmental, office-based, direct patient care. The major purpose of these eligibility criteria was to ensure that comparable providers who were very likely to be treating patients with the chronic tracer conditions were selected, and to facilitate meaningful specialty comparisons in the fee-for-service system.

Solo Practitioners

Three sources of information were used to identify solo providers in each of the three sites: (1) a sample of physicians who appeared to meet these criteria from the AMA Masterfile; (2) a list of board-certified family practitioners from the American Academy of Family Practice; and (3) a list of licensed clinical psychologists from the American Psychological Association.

Providers were initially screened by telephone. Eligible clinicians were subsequently encouraged to participate in the study by designated representatives of the specialty societies that endorse the study. Enrollment of providers was then accomplished by MOS field representatives.

Health Maintenance Organizations (HMOs)

In the HMOs, upper-level management were initially contacted to assess their interest in participating in the study. Approval at the upper management level was followed by meetings with providers in the specialties to be included in the study. Once agreement was obtained from the organization as a whole, the HMO liaison person was asked to

provide MOS staff with a list of providers who met the eligibility criteria. These providers were contacted and enrolled individually by MOS field representatives.

A major difference between the providers enrolled in the HMOs and those enrolled in the solo practices is the inclusion of mid-level providers in the HMO sample. In particular, nurse practitioners and masters-level mental health providers were included in the HMO sample. HMOs rely heavily on such providers. To exclude them would offer a misleading picture of the providers actually seen by HMO patients, and it would lead to a biased sample of patients.

Multispecialty Group Practices

Initially, two key MSG dimensions were identified: number of providers and percentage of prepayment. Of interest were MSGs with mixed FFS and prepayment, and of moderate to large size (the minimum size considered was ten physicians). The MGMA membership directory and information obtained by the study on other MSGs in each of the sites to identify appropriate groups were used to provide this information. MSGs were approached and providers were enrolled in a manner analogous to that used for HMOs.

SELECTION OF PATIENTS

Cross-Sectional Sample

Patients were selected for the study via a two-stage process. In the first stage, all adult patients visiting one of the providers enrolled in the study during a specified period (nine days on average) were asked to complete a form (Initial Screening Form by Patient). Patients who were under age 18 or who could not read English were excluded. The form requested information about their medical history, demographic characteristics, satisfaction with care, general health status, and their providers' style of practice. Providers seeing these patients were also asked to complete a brief form (Initial Screening Form by Physician) to determine diagnosis and to obtain cross-sectional data on style of practice.

The patient completed one of two versions of the Initial Screening Form by Patient (SP), depending on the serial number of the form. Both versions had demographic information and some key questions in several areas. Only one version of the screening questionnaires included the information on general health status measures; the other half had information on utilization, style of care, and patient satisfaction.

Longitudinal Sample

In the second stage, information obtained from both the Patient and the Physician Initial Screening Forms was used to identify patients who appeared to have at least one of the four tracer conditions selected for study.

This subset of patients received a telephone-administered Tracer Condition Interview designed to obtain more details about the tracer condition and to enroll these patients in the longitudinal study. Case-finding for each of the tracer conditions is explained in detail below.

Diabetes. Case finding consists of screening for Type II (adult onset or non-insulin-dependent) diabetes cases. Patients who developed their diabetes *after* the age of 30 are considered to have Type II diabetes, even if they are presently insulin-dependent. The diagnosis of diabetes is obtained at screening from the MOS physicians and patients and confirmed by laboratory testing at the health examination given at the outset of the longitudinal study.

Hypertension. Hypertension is easily diagnosed using systolic and diastolic blood pressure. Patients with hypertension are identified using data from physician reports and a blood pressure reading and data on hypertensive medications obtained at the clinical assessment.

Heart Disease. Case finding consists of screening for patients with recent myocardial infarctions and congestive heart failure as identified by the physician on the screening form. For recent MI, confirmation will be made using the hospital medical record, while for CHF, confirmation will be made at the health examination.

Depression. Case finding for the depression tracer proved to be a more difficult task. We began with the well-documented assumption that general medical providers cannot be relied on for such diagnoses. However, simple self-assessment of depressive symptoms is not a definitive diagnosis of major depression. In order to reduce study costs and respondent burden, a two-stage procedure for identifying patients with major depression was designed based on previous work. The first stage uses a self-assessment measure of depressive symptoms to identify patients with a high likelihood of major depression and/or dysthymia. The second stage uses a structured interview to confirm a current major depressive episode or dysthymic disorder. A two-stage process has also been used by Schulberg et al. (1985) and others.

The first-stage screener is based on the CES-D scale (Radloff, 1977) modified as described in Burnam et al. (1988). The second stage screener was a telephone-administered version of the depression section of the Diagnostic Interview Schedule (DIS) of the NIMH (Robins et al., 1981). Using the DIS, diagnoses can be assigned by DSM-III or other diagnostic criteria.

GENERAL MOS PATIENT EXCLUSION CRITERIA FOR LONGITUDINAL SAMPLE

After screening, some patients were excluded from the longitudinal sample. The exclusions were intended to identify persons who do not have a stable relationship with the MOS clinician or who have conditions other than MOS tracer conditions that are associated with severe limitations in functional status. Data are obtained from the screening forms administered to the patient and/or the provider. The criteria, which are applied separately for each tracer, are defined below.

1. *Cancer:* Diagnosed within the past three years, except skin cancer.
2. *Mental Deficit:* Provider indicates that the patient has a mental deficit that would interfere with completing a self-administered questionnaire.

3. *Unstable Treatment Relationship:* At least two of three conditions are met: (a) visit is for a consultation only; (b) provider does not treat most of the patient's medical and/or personal problems; (c) this is the first time the patient has seen the provider.
4. *Heart Attack:* Provider says that the patient has had an MI in the past 12 months, but that another physician provides the majority of care for that condition.
5. *In Bed:* Patient indicates that he/she has spent 20 or more days in bed in the past month.
6. *Insulin:* Patient is now taking insulin injections or is a diabetic who was diagnosed before age 30.
7. *Pacemaker:* Patient says he or she has a pacemaker.
8. *Paralysis:* Patient says he or she has major paralysis or neurologic problems, including stroke, multiple sclerosis, or muscular dystrophy.
9. *Specialty:* (a) Provider is a diabetologist or endocrinologist and the patient does not have diabetes, depression, or CHF; (b) provider is a cardiologist, and the patient does not have hypertension or MI; (c) provider is a mental health provider, and the patient does not have depression.
10. *Stroke:* Provider says patient has a post-stroke residual neurologic deficit.
11. *Surgery:* Provider says patient has had major surgery (for example, colectomy, pneumonectomy) in the past six months, except ACAD patients who have had CABG or angioplasty.
12. *Untreated Condition:* Patient or provider indicates that patient has high blood pressure but is not being treated for it.
13. *Unmatched Screener:* Only the patient screener is available.
14. *Youth:* Under age 18.

Appendix B

**QUESTIONNAIRE ITEMS
USED IN CONSTRUCTING THE MAJOR STUDY VARIABLES**

Current Health Perceptions

2. In general, would you say your health is:

- ☐ Excellent
- ☐ Very Good
- ☐ Good
- ☐ Fair
- ☐ Poor

26. Please mark the circle that best describes whether each of the following statements is true or false for you.

(Mark One Circle on Each Line)

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
a. I am somewhat ill	☐	☐	☐	☐	☐
b. I am as healthy as anybody I know	☐	☐	☐	☐	☐
c. My health is excellent.	☐	☐	☐	☐	☐
d. I have been feeling bad lately	☐	☐	☐	☐	☐

Physical Functioning Index

16. For how long (if at all) has your health limited you in each of the following activities?

(Mark One Circle on Each Line)

	Limited for more than 3 months	Limited for 3 months or less	Not limited at all
a. The kinds or amounts of <u>vigorous</u> activities you can do, like <u>lifting</u> heavy objects, running or participating in strenuous sports	☐	☐	☐
b. The kinds or amounts of <u>moderate</u> activities you can do, like moving a table, carrying groceries or bowling	☐	☐	☐
c. Walking uphill or climbing a few flights of stairs.	☐	☐	☐
d. Bending, lifting or stooping	☐	☐	☐
e. Walking one block	☐	☐	☐
f. Eating, dressing, bathing, or using the toilet	☐	☐	☐

Psychophysiological Symptoms

6. How often have you had any of the following symptoms during the past 4 weeks?

(Circle One Number on Each Line)

	<u>Never</u>	<u>Once or Twice</u>	<u>A Few Times</u>	<u>Fairly Often</u>	<u>Very Often</u>
a. Stiffness, pain, swelling, or soreness of muscles or joints	1	2	3	4	5
b. Coughing that produced sputum	1	2	3	4	5
c. Backaches or lower back pains	1	2	3	4	5
d. Nausea (upset stomach)	1	2	3	4	5
e. Acid indigestion, heartburn, or feeling bloated after meals	1	2	3	4	5
f. Heavy feelings in arms and legs	1	2	3	4	5
g. Headaches or head pains	1	2	3	4	5
h. Lump in throat	1	2	3	4	5

Energy/Fatigue

11. How often during the past 4 weeks...

(Circle One Number on Each Line)

	<u>All of the Time</u>	<u>Most of the Time</u>	<u>A Good Bit of the Time</u>	<u>Some of the Time</u>	<u>A Little of the Time</u>	<u>None of the Time</u>
a. Did you feel worn out?	1	2	3	4	5	6
c. Did you have a lot of energy?	1	2	3	4	5	6
e. Did you feel full of pep?	1	2	3	4	5	6
g. Did you have enough energy to do the things you wanted to do?	1	2	3	4	5	6
i. Did you feel tired?	1	2	3	4	5	6

Pain

17. How much bodily pain have you had
during the past 4 weeks?

- ☐ None
- ☐ Very mild
- ☐ Mild
- ☐ Moderate
- ☐ Severe
- ☐ Very Severe

Restricted Activity Days

12. During the past 30 days, how many days has your health kept you in bed all day or most of the day? (If none, write in "00".)

- Write in the number of days → in bed

- Fill in the matching circle below

0	0
1	1
2	2
3	3
	4
	5
	6
	7
	8
	9

Appendix C

DETERMINATION OF DISEASE SEVERITY AND COMORBIDITY VARIABLES FOR CHRONIC-DISEASE SAMPLE

CONGESTIVE HEART FAILURE (CHF)

For the CHF tracer, the determination of whether the patient has the disease depends on the following pieces of information: physician report of CHF, patient reports history of heart failure or enlarged heart, patient reports symptoms of dyspnea or orthopnea, and patient free of confounders that could obscure the meaning of these symptoms (for example, smoking, obesity, or history of lung disease). Patients with orthopnea (shortness of breath lying flat) and/or dyspnea are assigned the highest severity level--2; patients with no symptoms are assigned a severity level of 1.

DIABETES

Determinations of whether the patient has diabetes depends on patient and physician report of the diagnosis and patient reported insulin use. Severity indications for the diabetes tracer take into account the extent of other organ complications, the use of insulin, and the duration of the diabetes. Patients assigned to the most severe category, 6, have heart and kidney disease; severity level 5 indicates patients who have either heart or kidney disease and are on insulin; severity level 4 indicates patients who have heart or kidney disease but are not on insulin; severity level 3 indicates patients without heart or kidney disease who are either on insulin or have complications of foot or eye; severity level 2 indicates patients who are uncomplicated non-insulin dependent, but have had the disease for at least 10 years; the least severe level, 1, indicates patients who are non-insulin dependent, do not suffer complications, and have had their disease for less than 10 years.

HYPERTENSION

The determination of whether the patient has hypertension depends on patient and physician report of the diagnosis, patient report of hypertension medications, and physician report of patient's last recorded blood pressure reading as greater than 90mm Hg. Hypertension severity depends on the presence of CHF as reported by the physician, blood pressure elevation, and the number of doctor-reported hypertension medications. The most severe disease is indicated by a severity level of 5; these patients have doctor-reported and treated CHF in possible combination with elevated blood pressure and anti-hypertensive drugs. A severity level of 4 indicates that the patient has either CHF or elevated blood pressure and is taking anti-hypertensive drugs. Level 3 indicates patients who do not have CHF or have CHF that is being treated by another physician, and have some supporting evidence of high blood pressure or are taking anti-hypertensive medication. Level 2 indicates patients who have either high blood pressure or are taking anti-hypertensive medication, and level 1 indicates persons with either no apparent disease or the disease is being treated by another physician.

MYOCARDIAL INFARCTION (MI)

The existence of a recent MI is dependent on both the patient and physician report. Severity levels are dependent on the presence of CHF, angina, and premature ventricular contractions (pvc's). The most severe category, 4, indicates patients who have CHF and angina; patients who have only CHF and pvc's or angina and pvc's or only CHF are in level 3; patients who have only angina or pvc's are placed in severity level 2; and patients with no symptoms are placed in severity level 1.

COMORBIDITIES

The comorbidity variable is defined as the sum of 15 chronic diseases or conditions, other than the tracer chronic disease from which the patient suffers. Information for this variable is obtained from patient self-report. The 15 chronic conditions used to create this variable are: (1) cancer diagnosed within past three years; (2)

arthritis; (3) major paralysis or neurologic problems, including stroke, multiple sclerosis, muscular dystrophy; (4) uses a cardiac pacemaker; (5) Amputation of arm or leg; (6) heart failure or enlarged heart; (7) angina; (8) asthma or other severe lung problems such as chronic bronchitis or emphysema; (9) back problems including disc or spine; (10) duodenal, stomach or peptic ulcer; (11) chronic inflamed bowel or enteritis; (12) Hay fever, chronic sinus trouble, or other allergies; (13) kidney disease; (14) trouble seeing, even with glasses or contact lenses; (15) other major problems. Chronic conditions pertaining to the patient's primary tracer condition are not included in the comorbidity variable (for example, heart failure or enlarged heart for CHF tracer). The number of tracer conditions not identified as the primary tracer are added to the sum of other chronic conditions making up the comorbidity variable.

Appendix D

REGRESSION COEFFICIENTS, STANDARD ERRORS, AND T-STATISTICS FOR ANALYSES OF DIFFERENCES IN HEALTH PERCEPTIONS ACROSS AGE GROUPS

Table D.1

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SOCIODEMOGRAPHIC VARIABLES--
GENERAL PATIENT SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	50.39	1.36	37.07
AGE4565	-8.59	0.58	-14.79
AGE6575	-10.54	0.84	-12.52
AGE7585	-12.96	1.26	-10.28
AGEGT85	-17.02	2.17	-7.85
Sex (male)	0.73	0.49	1.49
Education	1.76	0.09	19.70
Race (nonwhite)	-7.32	0.59	-12.51
F Value	184.23		
R square	0.1256		
DF	7		

Table D.2

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SES AND DISEASE VARIABLES--
GENERAL PATIENT SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	58.53	1.53	38.36
AGE4565	-3.69	0.70	-5.26
AGE6575	-1.84	1.02	-1.82
AGE7585	-2.64	1.50	-1.77
AGEGT85	-9.79	2.33	-4.20
Sex (male)	0.52	0.55	0.94
Education	1.30	0.10	13.03
Race (nonwhite)	-6.10	0.67	-9.14
Hypertension	-2.41	0.72	-3.33
Myocardial infarction	-5.96	2.82	-2.11
Congestive heart failure	-10.75	1.24	-8.69
Diabetes	-11.72	1.21	-9.70
Cancer within 3 years	1.70	2.53	0.67
Arthritis	-6.16	0.79	-7.78
Paralysis	-5.43	2.48	-2.19
Amputation	6.84	0.73	9.31
Kidney disease	-3.68	2.89	-1.23
Vision problems	-8.11	1.22	-6.64
Angina	-15.22	1.50	-10.15
Asthma	-11.56	1.17	-9.89
Back problems	54.13	6.07	8.92
Ulcer	-9.57	1.43	-6.68
Bowel disease	-13.23	1.86	-7.10
Allergies	-2.69	0.67	-4.03

F Value 92.81
R square 0.2573
DF 23

Table D.3

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SES, DIAGNOSED, AND UNDIAGNOSED DISEASE--
GENERAL PATIENT SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	50.75	1.75	29.03
AGE4565	-1.95	0.62	-3.14
AGE6575	0.31	0.94	0.33
AGE7585	-0.80	1.41	-0.57
AGEGT85	-7.51	2.11	-3.57
Sex (male)	-0.46	0.49	-0.94
Education	0.93	0.09	10.10
Race (nonwhite)	-5.08	0.60	-8.49
Hypertension	-3.96	0.65	-6.06
Myocardial infarction	0.92	2.58	0.36
Congestive heart failure	-4.12	1.15	-3.59
Diabetes	-12.08	1.11	-10.92
Cancer within 3 years	2.97	2.31	1.28
Arthritis	0.29	0.73	-0.39
Paralysis	-0.44	2.20	-0.20
Amputation	4.39	0.64	6.81
Kidney disease	-3.14	2.62	-1.20
Vision problems	-4.18	1.10	-3.80
Angina	-11.24	1.38	-8.14
Asthma	-7.59	1.05	-7.20
Back problems	33.78	5.73	5.90
Ulcer	-5.94	1.28	-4.23
Bowel disease	-8.54	1.67	-5.13
Allergies	-1.89	0.59	-3.23
Pain	-0.28	0.01	-26.62
Physical functioning	0.23	0.01	21.10
Bed days	-0.68	0.10	-6.63
F Value	172.95		
R square	0.4402		
DF	26		

Table D.4

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SOCIODEMOGRAPHIC VARIABLES--
GENERAL PATIENT SUBSAMPLE WITH NO CHRONIC DISEASE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	57.96	2.16	26.85
AGE4565	-3.26	0.99	-3.28
AGE6575	-3.90	1.72	-2.27
AGE7585	-0.75	3.25	-0.23
AGEGT85	-10.54	4.33	-2.44
Sex (male)	-0.23	0.75	-0.31
Education	1.48	0.14	10.46
Race (nonwhite)	-4.65	0.87	-5.37
F Value	27.41		
R square	0.0656		
DF	7		

Table D.5

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SES AND UNDIAGNOSED DISEASE VARIABLES--
GENERAL PATIENT SUBSAMPLE WITH NO CHRONIC DISEASE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	53.85	2.56	21.05
AGE4565	-2.40	0.88	-2.74
AGE6575	0.36	1.63	0.22
AGE7585	-2.68	2.94	-0.91
AGEGT85	-6.06	3.76	-1.61
Sex (male)	-0.80	0.66	-1.22
Education	1.17	0.13	9.15
Race (nonwhite)	-3.40	0.77	-4.23
Pain	-0.28	0.01	-19.55
Physical functioning	0.17	0.02	9.68
Bed days	-1.53	0.19	-7.91
F Value	95.92		
R square	0.2736		
DF	10		

Table D.6

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SOCIODEMOGRAPHIC VARIABLES--
CHRONIC-DISEASE SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	45.56	3.71	12.54
AGE4565	-5.35	2.03	-2.63
AGE6575	-0.84	2.09	-0.40
AGEGT75	-1.52	2.59	-0.59
Sex (male)	2.84	1.34	2.12
Education	0.86	0.22	3.85
Race (nonwhite)	-1.92	1.71	-1.12
F Value	5.88		
R-squared	0.0256		
DF	6		

Table D.7

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SES AND DISEASE SEVERITY VARIABLES--
CHRONIC-DISEASE SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	74.50	6.33	11.77
AGE4565	-3.26	1.98	-1.65
AGE6575	0.42	2.06	0.20
AGEGT75	0.27	2.54	0.11
Sex (male)	2.80	1.30	2.15
Education	0.72	0.22	3.30
Race (nonwhite)	-1.70	1.66	-1.01
Hypertension severity	-2.06	0.84	-2.46
MI severity	-4.27	3.81	-1.21
CHF severity	-10.40	3.85	-2.70
Diabetes severity	-4.51	0.58	-7.73
Comorbidities	-3.73	0.94	-3.97
F Value	12.58		
R-squared	0.0939		
DF	11		

Table D.8

CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SES, DIAGNOSED, AND UNDIAGNOSED DISEASE VARIABLES--
CHRONIC-DISEASE SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	24.95	5.30	4.71
AGE4565	0.46	1.42	0.32
AGE6575	4.19	1.54	2.73
AGEGT75	7.85	1.92	4.08
Sex (male)	-3.63	0.95	-3.81
Education	0.00	0.16	0.01
Race (nonwhite)	-2.40	1.20	-2.00
Hypertension severity	-0.66	0.60	-1.09
MI severity	-3.99	2.66	-1.50
CHF severity	-1.49	2.83	-0.53
Diabetes severity	-2.45	0.42	-5.73
Comorbidities	0.82	0.70	1.18
Physical functioning	0.25	0.02	10.27
Energy/fatigue	0.49	0.03	16.82
Symptoms	-0.26	0.04	-7.25
F Value	116.87		
R squared	0.5746		
DF	14		

Table D.9

ONE-YEAR DIFFERENCE IN CURRENT HEALTH PERCEPTIONS,
CONTROLLING FOR SES, DIAGNOSED, AND UNDIAGNOSED DISEASE VARIABLES--
CHRONIC-DISEASE SAMPLE

Independent Variable	Coefficient	Standard Error	t-Statistics
Intercept	1.78	4.20	0.42
AGE4565	0.04	1.52	0.03
AGE6575	-2.62	1.60	-1.64
AGEGT75	-0.95	2.09	-0.46
Sex (male)	-0.34	1.02	-0.33
Education	0.32	0.17	1.86
Race (nonwhite)	-0.96	1.35	-0.71
Hypertension severity	1.09	0.65	1.68
MI severity	-0.38	2.28	-0.17
CHF severity	-3.23	5.29	0.61
Diabetes severity	-0.29	0.51	0.57
Comorbidities	0.39	0.74	0.53
Change in physical functioning	0.28	0.03	8.77
Change in energy/fatigue	0.38	0.03	11.17
Change in symptoms	-0.25	0.04	-5.90
F Value	32.841		
R squared	0.3280		
DF	14		

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