U.S. Department of Health and Human Services
Assistant Secretary for Planning and Evaluation
Office of Disability, Aging and Long-Term Care Policy

# Epidemiological, Demographic, and Social Correlates of Disability Among the Elderly

September 1988

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# EPIDEMIOLOGICAL, DEMOGRAPHIC, AND SOCIAL CORRELATES OF DISABILITY AMONG THE ELDERLY

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# TABLE OF CONTENTS

# LIST OF FIGURES AND TABLES

# INTRODUCTION

In analyzing "disability" or "functional impairment" among subgroups of the U.S. population, the elderly and oldest-old populations require special attention. Special attention is necessary both because, the elderly represent by far the largest numbers of disabled persons, but perhaps more critically, they are the population group for which defining disability and functional impairment is most difficult. This is because, until relatively recently, both popular concepts and the scientific literature have tended to viewed functional loss as a necessary and nearly universal correlate of the aging process.

More recent research on aging has challenged the inevitability of the linkage of severe functional loss and impairment with age. A number of new studies have shown that the age rate of decline of physiological parameters and function with age found in prior studies was, in part, a product of flaws in the design of many of those studies (e.g., Lakatta, 1985). Specifically, in many of the older studies "representative" samples of elderly were selected. Since the prevalence of chronic disease, both manifest and latent, tends to increase with age, a large part of the functional loss with age in the older studies reflected the effects of an increasing prevalence of chronic disease on function--not the "natural concomitants" of aging itself.

Many newer studies are specifically designed to unconfound the effects of chronic disease and aging by carefully screening for the presence of both latent and manifest disease (e.g., Lakatta, 1985). These studies show that many physiological functions can be preserved to greater age's than previously thought. Other studies have shown that there is great individual variation in the trajectory of functional loss with age which depends upon the type of chronic disease affecting the individual. These studies of the so-called "terminal drop" show that the rate of physical and cognitive functional decline before death at advanced is often quite rapid producing, in some groups of elderly individuals, very short periods of impairment (e.g., Manton, Siegler and Woodbury, 1986). In addition other studies have shown that many mechanisms emerge at later ages which compensate for specific types of functional loss, and that there is a much greater potential for rehabilitation and regaining function at advanced ages than previously supposed (World Health Organization, 1982). In sum, the current scientific evidence suggests that though there is certainly a strong correlation of functional loss with age, function can (by appropriate early preventive actions) be preserved to more advanced ages and at higher levels than was previously believed, that individuals show considerable variability in the rate at which functional losses occur, and that interventions can help improve functional status at later ages for many individuals.

This evidence suggests that the past acceptance as "natural" of age-related loss of function and disability among the elderly has been counterproducrive--a type of self-fulfilling prophecy--and that a more active statice should be adopted to attempting to preserve function at later ages. This stance must be reflected in changes both in the

medical and institutional response to disability and chronic disease among the elderly and in the self-concepts accepted by many elderly themselves.

The evidence also suggests the need for more active research into the lifestyle and other risk factors of functional loss (e.g., Manton, 1989). Specifically, much of the past epidemiological investigation of chronic disease risk factors has focused upon the identification and control of risk factors for acute lethal conditions--especially those affecting middle-aged males. Because of this research emphasis medical science has been reasonably successful in identifying risk factors (e.g., blood pressure, serum cholesterol, smoking, obesity) for lethal conditions like coronary heart disease, stroke, and cancer. In addition to identifying the risk factors for these diseases, considerable progress has occurred in the development of medical and pharmacological technologies to control those factors. For example, there are now four major classes of anti-hypertensive agents (i.e., diuretics, beta blockers, ACE inhibitors, calcium channel blockers) which can be used singly, or in specific combinations, for different types of hypertension. By responding to very specific features of the disease mechanisms in different groups, these different classes of drugs have resulted in greater degrees of risk factor control with less adverse side effects.

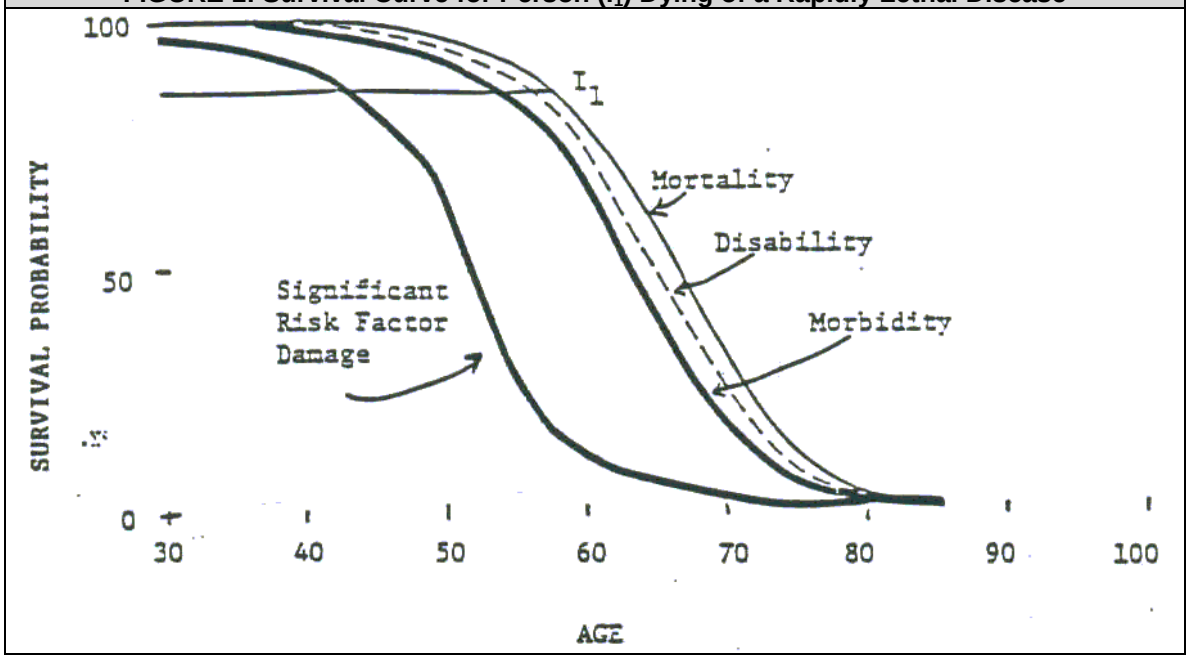
More recently, the potential efficacy of treatment, control and prevention of these acute disease processes and their risk factors at advanced ages, has been demonstrated. For example, while early analyses of the effects of controlling the standard heart disease risk factors suggested little benefit at advanced aces (e.g., Kannel and Gordon, 1980) recent studies which controlled for the general rise of mortality with acre show that many of these factors continue to be as important (or more so) at advanced ages. Studies of a large group of persons with relatively healthy lifestyles (i.e., non-smokers and light drinkers) show significantly higher life expectancy at age 65 (Lew and Garfinkel, 1984). Even after adjusting for other risk factors like smoking, parental longevity and blood pressure, the benefits of physical activity have been demonstrated in significantly enhanced life expectancy up to at least age 80 (Paffenbarger et al., 1986). These recent epidemiological findings have caused the revision of clinical principles about treating persons at more advanced acres and led to the development of randomized controlled intervention trials for such conditions as isolated systolic hypertension (i.e., the SHEPS project).

Because of their characteristic natural history acute, lethal conditions, however, do not generate the largest amount of disability in the elderly population. This can be understood by examining Figure 1, where we present a modification of a World Health Organization (1984) life table model of the impact of chronic disease on disability and mortality of the elderly.

In the figure we see that four lines are presented. The outermost line labelled "Mortality" represents the decline with age of the probability of living to age x. The line labelled "Morbidity" represents the probability of surviving to age x free of a major chronic disease. The area under this line represents "healthy" life expectancy. The intermediate line labelled "Disability" represents the probability of surviving to age x free

of serious disability. The area under this curve represents what has been termed "active" life expectancy (e.g., Wilkins and Adams, 1983; Katz et al., 1983). The line labelled "significant risk factor damage" represents the age by which risk factor exposure has begun to generate latent physiological changes that will lead to the manifestation of the disease.

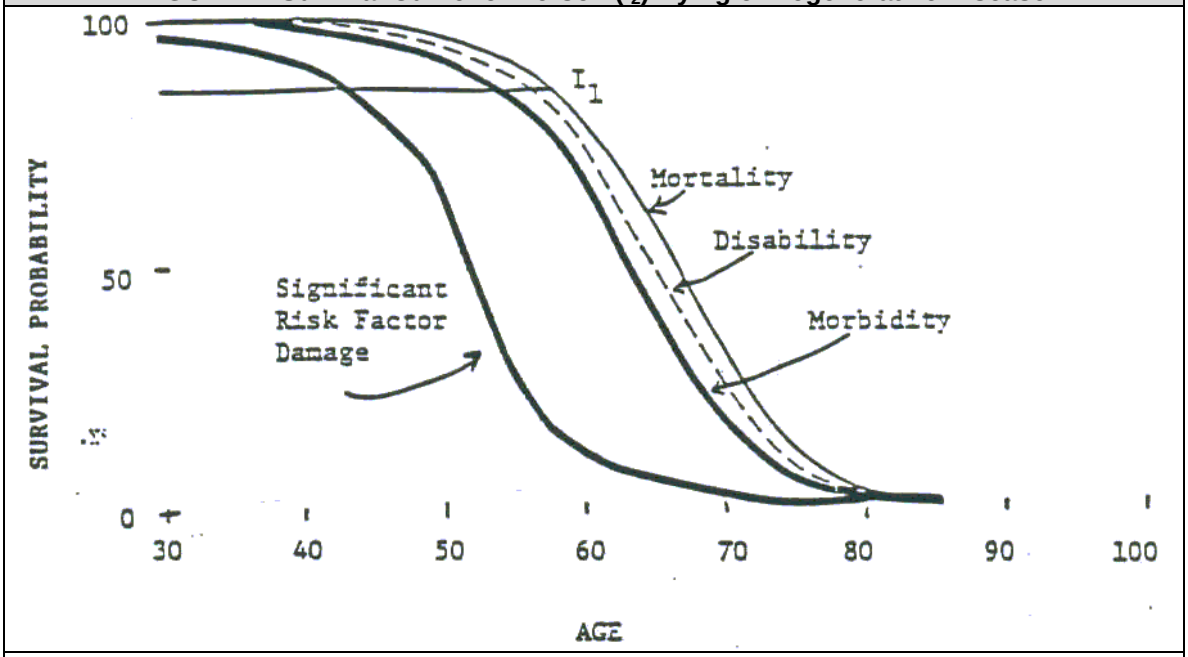
**FIGURE 1: Survival Curve for Person ($I_1$) Dying of a Rapidly Lethal Disease**




The figure has been modified from the model presented in the original World Health Organization (1984) report to reflect the typical impact of acute lethal diseases on healthy and active life expectancy among the elderly. Thus, the areas between the morbidity, disability and mortality curves have been compressed to represent the shorter survival time after an acute lethal condition is expressed. Furthermore, the curve is drawn to reflect the fact that such conditions (e.g., heart attack, cancer) affect mainly persons in late middle-age and in the so-called "young-old" population (Manton, Siealer and Woodbury, 1986). These changes in the WHO model are intended to represent the characteristic natural history or age "kinetics" of such acute lethal disease processes, not indicate that such diseases do not have a lengthy degenerative phase. Indeed, the curve for the age at onset of risk factor damage is intended to represent the initiation of the accumulation of such damage. Rather it is that much of the accumulated damage is "latent" in terms of the gross physical functioning of the individual. The manifest phase of the disease thus represents a rapid "catastrophic" failure of a critical organ system of the individual leading to rapid death (e.g., Manton, Siegler and Woodbury, 1986).

In contrast to Figure 1 we can present a second type of survival curve model modified to represent the morbidity, disability and mortality patterns typically associated with those chronic degenerative conditions (e.g., osteoarthritis, rheumatoid arthritis, osteoporosis, diabetes, Alzheimer's disease) which produce most of the duration-weighted impact of disability in the elderly population.

**FIGURE 2: Survival Curve for Person ($I_2$) Dying of Degenerative Disease**




**SOURCE**: Manton, K.G.: Life Syle Risk Factors. In Annals, Special Issue on "The Quality of Aging: Strategies for Interventions" (Riley M, Riley J, Eds.), 1988, Figure 2.

The natural history or age "kinetics" of this type of disease process is quite different in that the effects on physical functioning become manifest at much earlier ages--long before the "catastrophic" failure of the individual. Consequently, the figure shows that persons affected with such slowly developing conditions will tend to live longer and spend a greater proportion of the life span in a disabled state. It should be noted that, while such diseases become manifest much earlier in the life span, they too will eventually cause catastrophic organ system failure (i.e., death). For example, poor nutrition, high alcohol consumption and smoking may cause a woman to have very low bone density pre-menopausally. As a consequence, post-menopausally, she may rapidly manifest the initial signs of osteoporosis. Typically, the progression of osteoporosis will be lengthy until the skeleton becomes so unstable that there is high risk of serious fracture (e.g., hip fracture). Such catastrophic acute consequences of osteoporosis will often lead to extended bedrest, debilitation, heightened risk of infection and other co-morbidities all of which in the context of poor physiological homeostatic forces at advanced ages can trigger rapid physiological decline leading to death.

A prime factor differentiating the acute, lethal and chronic degenerative disease processes is the different organ systems and physiological functions they primarily impact. For example, many of the chronic conditions producing much of the disability affect the musco-skeletal, immunological and neurological systems. Many acute conditions affect the coronary or pulmonary systems or are produced by neoplastic processes. It must be stressed that the situation for any given individual may be more complex with multiple, interacting chronic diseases often present at advanced ages.

Furthermore, certain chronic degenerative diseases, like diabetes, may heighten the risk of loss of physical function and of acute lethal disease.

While we have been successful in identifying and controlling the risk factors associated with many acute, lethal conditions (Figure 1), medical science to date has been far less successful in identifying and managing the chronic degenerative conditions which most affect active life expectancy. This has been demonstrated in population studies such as in Canada (Wilkins and Adams, 1983) where, of approximately six years of life expectancy gained at age 65 between 1950 and 1978, 80 percent (about 4.7 years) was in an impaired state.

In addition to the problems in defining the biomedical dimensions of disability among the elderly there are additional problems in defining the social and behavioral consequences of disability. That is why WHO has developed a classification system based upon a multidimensional assessment of disability like that presented in Figure 3 (WHO, 1980).

**FIGURE 3. A Comparison of the Logic of the Medical/Epidemiological Model of Disease and the Extension of the Model for Assessing Disease Consequences**

1. Medical/Epidemiological Model
   Etiology --> Pathology --> Manifestation

2. Extension of Medical Model for Disease Consequences
   Disease --> Impairment --> Disability --> Handicap
   where

   *Impairments* are "concerned with abnormalities of body structure and appearance and with organ or system function, resulting from any cause; in principle, impairments represent disturbances at the organ level."

   *Disabilities* are "reflecting the consequences of impairments in terms of functional performance and activity by the individual; disabilities thus represent disturbances at the level of the person."

   *Handicaps* are "concerned with the disadvantages experienced by the individual as a result of impairments and disabilities; handicaps thus reflect interaction with and adaptions to the individual's surroundings."

**SOURCE**: World Health Organization 1980, 14.

In the figure we see that a conceptual distinction is made between impairments, disabilities, and handicaps. Impairments refer to the loss of specific physical functions. Disabilities refer to the incapacity of performing certain basic self-care functions. Handicaps refer to the restrictions that impairments and disability place on the individual's capacity to perform certain basic social roles and to successfully interact with one's environment. Services and care might be directed at any level of the impairment process, i.e., to compensate for impairments, disabilities or handicaps. It is also clear that, for the elderly, the same level of impairment might produce different levels of disability and handicap because of different social expectations about the functional capacity of the elderly (e.g., expectations about the ability of the elderly to fulfill labor force roles). In the following discussion we will not attempt to resolve these

more general issues. We will utilize the term disability to refer to loss of self-care capacity and focus our analysis on the physical dimensions of the process though these definitional problems will re-emerge in later sections where we discuss the service needs of the disabled elderly.

In the remainder of this paper we will explore the quantitative implications of these concepts for the U.S. elderly population--both now and for the future. To do this we will explore the current and future patterns of disability expected in the U.S. elderly population based upon data from several large national surveys. We will then explore how those disability patterns would be affected by altering the risks of various diseases that are reported as causing chronic disability. Finally we will examine the implication of those changes for the service requirements of the disabled elderly population by examining current patterns of "unmet" need for long-term care (LTC) services in the U.S. elderly population.

# PROJECTIONS OF DISABILITY IN THE ELDERLY POPULATION

In this section we present projections of the growth of the disabled and institutionalized elderly population. These projections are based on two recent national surveys. In particular the characteristics of the community-based chronically disabled elderly population are derived from the 1984 National Long Term Care Survey (NLTCS). This survey was designed to describe the characteristics of community-dwelling, elderly (over 65) persons with "chronic" disability, i.e., persons who reported an Activity of Daily Living (ADL) or instrumental Activity of Daily Living (IADL) that had lasted or was expected to last at least 90 days. The survey population was identified by screening for chronic disability a large sample of Medicare eligible persons over age 65 drawn from Health Care Financing Administration records. The sample of disabled persons identified in 1984 was large (approximately 6,000 community-based disabled persons) and included persons who were followed from a similarly constituted survey conducted in 1982 (Manton and Soldo, 1987). An important feature of the NLTCS sample design was its age stratification with an over-sample of about 2,000 persons drawn from the Medicare eligible population over age 85. This is an age group with high prevalence and levels of disability. Thus its importance for studying disability among the elderly is far out of proportion to the numbers of persons over age 85. The NLTCS, however, is one of the few national surveys to over-sample this group to obtain precise estimates of its characteristics.

The characteristics of the institutionalized population are derived from the 1985 National Nursing Home Survey (NNHS). This survey collected detailed information on a large sample of discharges over a preceding 12-month period and a large sample of current residents. The current resident sample was used to calculate the rates employed in this study.

The rates estimated from the 1984 NLTCS and 1985 NNHS were used to project the future growth of the community-based disabled and institutionalized elderly populations using a static component model. Rates of disability, specific to sex, age, marital status and disability level are derived from the 1984 NLTCS. Institutionalization rates specific to age, sex and disability level are derived from the 1985 NNHS. These rates are applied to projections of the growth of the U.S. elderly population (specific to age, sex and marital status) produced by the Social Security Administration (SSA) actuaries for 1987 (Social Security Administration, 1987) in order to project the future growth of the disabled and institutionalized elderly populations. The SSA population projections are adjusted to reflect the U.S. resident population. These projections are updates and extensions of projections reported earlier (Manton and Liu, 1984) based on the 1982 NLTCS, the 1977 NNHS and the SSA projections of the social security entitlement population for 1982.

| TABLE 1. Projections of the Community-Based Disabled, Institutionalized, and Non-Disabled Elderly Population 1985-2060, by Three Age Groups and Disability Levels (number of thousands) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Year | Non-Disabled[1] | Community-Based Disabled[2] | | | | | Institutionalization[3] |
| | | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | |
| **Aged 65-74** | | | | | | | |
| 1985 | 14,137 | 848 | 651 | 319 | 281 | 2,098 | 212 |
| 2000 | 15,972 | 910 | 699 | 344 | 308 | 2,261 | 224 |
| 2020 | 26,983 | 1,567 | 1,173 | 583 | 522 | 3,815 | 393 |
| 2060 | 28,147 | 1,596 | 1,216 | 609 | 548 | 3,970 | 418 |
| **Aged 75-84** | | | | | | | |
| 1985 | 6,280 | 836 | 768 | 336 | 321 | 2,261 | 505 |
| 2000 | 8,693 | 1,147 | 1,033 | 453 | 443 | 3,076 | 669 |
| 2020 | 10,658 | 1,392 | 1,241 | 547 | 543 | 3,724 | 790 |
| 2060 | 16,333 | 2,129 | 1,884 | 824 | 830 | 5,668 | 1,215 |
| **Aged 85+** | | | | | | | |
| 1985 | 1,171 | 282 | 408 | 181 | 236 | 1,106 | 593 |
| 2000 | 1,935 | 465 | 668 | 299 | 393 | 1,826 | 970 |
| 2020 | 1,733 | 663 | 947 | 425 | 558 | 2,593 | 2,412 |
| 2060 | 6,160 | 1,434 | 2,035 | 915 | 1,202 | 5,585 | 2,884 |
| **Aged 65+** | | | | | | | |
| 1985 | 21,588 | 1,965 | 1,826 | 836 | 837 | 5,465 | 1,310 |
| 2000 | 26,600 | 2,522 | 2,401 | 1,096 | 1,144 | 7,163 | 1,863 |
| 2020 | 39,374 | 2,592 | 2,260 | 1,555 | 1,624 | 10,131 | 4,202 |
| 2060 | 50,640 | 5,160 | 5,135 | 2,348 | 2,581 | 15,223 | 4,517 |

1. SOURCE: Social Security Administration, Office of the Actuary: Social Security Area Population Projections: 1987, Actuarial Study No.99. SSA Pub.No.11-11546, 1987.
2. SOURCE: 1984 National Long-Term Care Survey.
3. SOURCE: 1985 National Nursing Home Survey.

Totals may reflect rounding error.

The basic quantities to be projected are the number of elderly persons in specific age, sex, marital status, disability and institutional states for the years 1985,1000, 2010, and 2060. These dates are chosen to reflect critical points in the growth of the U.S. elderly population identified by determining when very large birth cohorts will pass certain critical ages, i.e., 65 and 85. Thus, the post-World War II "baby-boom" cohorts will largely have passed age 65 by 1020 and age 85 by 2060. Thus the selected projection dates capture the most significant points of change in the growth of the U.S. elderly population.

In the projections, disability intensity is coded into five levels: (1) no chronic disability; (2) at least one IADL impairment but no impairment in ADL; (3) 1 or 2 ADL impairments; (4) 3 to 4 ADL impairments; and (5) 5 to 6 ADL impairments. The projected population values at these five disability levels and for the institutionalized population are presented in Table 1 using the SSA projections (adjusted for U.S. residence) based upon the medium variant assumptions about the rate of decline of mortality rates.

In the table we set that the total number of community-based disabled elderly with any level of chronic disability in 1985 was estimated to be 5.465 million, with 2.1 million aged 65 to 74, 2.3 million aged 75 to 84, and 1.1 million aged 85+. The estimate of 5.465 million persons is based upon the acceptance of the criterion of a condition being chronic (i.e., lasting or expected to last 90 days or more at the time the Medicare-eligible population is screened for disability) and the sets of ADL and IADL impairments

used to define disability. Other definitions of disability could be used to give somewhat different estimates and, because the estimates are based on survey data, they are subject to sampling variability. Alternate definitions of disability would not alter the projected rates of growth of the disabled population (only the absolute level) and would probably not significantly affect the conclusions. In particular, persons with significant disability (e.g., with 3or more ADL impairments) would almost certainly emerge as impaired under any reasonable classification. As a consequence changes in the definition of disability primarily affect only the "threshold" level for defining the population.

In addition to the community-based disabled population we have also projected the institutional population which tends to have very high levels of impairment. Indeed, recent changes in Medicare reimbursement for acute care hospitalization seem likely to increase the medical acuity and functional impairment of institutionalized persons. The number of institutionalized persons over age 65 has increased from 1.1 million in 1977 (Manton and Soldo, 1988) to 1.3 million in 1985. Of these 1.3 million, 212,000 were aged 65 to 74, 505,000 were aged 75 to 84, and 593,000 were aged 85+. Thus, the institutional population was proportionately much older than the community-based disabled elderly population. Though there was a significant increase in the risk of institutionalization with age, more persons with 3 or more ADL impairments are estimated to be resident in the community in 1985 (1.67 million) than in institutions (1.31 million).

Assuming constant age, sex and marital status specific disability rates, the size of the elderly chronically disabled and institutionalized populations is projected to increase considerably due to the projected aging of the U.S. population and greater life expectancy at advanced ages. The total number of chronically disabled persons grows by 31 percent to 7.16 million persons by the year 2000. The growth of the most severely disabled persons (i.e., those with 5 to 6 ADL impairments) to the year 2000 is even faster--36.7 percent. The growth of the institutionalized population was faster yet, 42.2 percent. These growth rates may be contrasted with the growth of the non-disabled population which was only 23.2 percent.

By the year 2060, when the baby boom cohorts will have passed age 85, we see that the rapid increase of the disabled and institutional population is projected to have continued. The institutionalized population has grown by 145 percent, the total disabled population has increased 179 percent, the community-based population with 5 to 6 ADL impairments has increased 208 percent while the non-disabled elderly population has gown only 134 percent. As a consequence the ratio of the non-disabled elderly population to the disabled elderly population will decrease from 3.2 to 1 in 1985 to 2.6 to 1 in 2060. Thus, there will be fewer non-disabled elderly to provide informal care to an increasing disabled elderly population. The relative numbers of younger persons available to take care of the disabled elderly population will decline even faster suggesting that the relative availability of informal care resources is likely to decline significantly in the future.

These demographic dynamics not only cause the total number of elderly disabled and institutionalized persons to increase but also have significant effects on the demographic composition of the disabled populations as different age and sex groups with very different levels of disability are projected to grow at very different rates. For example, as described above the most rapidly growing component of the community-based disabled elderly population are those with 5 to 6 ADL limitations, i.e., those with the most severe disability levels (an increase of 208 percent). Those with only IADL impairments, in contrast, increase least rapidly (163 percent). The institutionalized population is projected to grow most rapidly (245 percent). The reason for these differences is the rapid growth of the oldest-old population with their much higher risks of disability and institutionalization. We see that while the community-based disabled elderly population aged 65-74 less than doubled, those aged 85+ are projected to increase fivefold. For persons aged 85+ with 5 to 6 ADL impairments there was a 409 percent increase compared to a 95 percent increase for persons aged 65 to 74 with this level of disability. The growth of the institutional population aged 65 to 74 was 97 percent while for those aged 85+ the growth was 386 percent. Thus, in addition to the rapid growth of the disabled elderly population, the more highly disabled components of that population are growing more rapidly causing the disabled elderly population, on average, to become more disabled.

The projected rate of growth of the disabled population varies strongly by sex as well as acre because of large sex differences in the rate of improvement in mortality among males and females. This is illustrated in Table 2.

We see that the rate of increase of disabled persons in the community is higher both for persons aged 75 to 84 (196 percent vs. 129 percent) and age 85+ (469 percent vs. 380 percent) for males than females. This is due to males' lower initial life expectancy levels in 1985 so that, as mortality declines up to age 85, it has further to decline (and declines more rapidly) for males. Despite the more rapid increases in the size of the older male population in the community, the female groups remain absolutely much larger at all ages and disability levels. As a consequence the problem of disability among the elderly will remain one that disproportionately affects women.

The projections provided above are subject to several sources of uncertainty. Two sources are uncertainty about the rate of future mortality improvement and uncertainty about the future pattern of institutional versus home health care. In Table 3 we consider how much these two sources of uncertainty could affect our projections. An additional source of uncertainty is the possibility of changes in the underlying health status of the population, i.e., the change in the age-specific relation of the curves in Figure 1 and Figure 2. That type of uncertainty will be explored in greater detail in the next section.

| TABLE 2. Projections of the Community-Based Disabled Elderly Population, 1985-2060, by Three Age Groups, Sex and Disability Level (numbers in thousands) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Males | | | | | Females | | | | |
| | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 3-4 ADL Limitations | Total |
| **Aged 65-74** | | | | | | | | | | |
| 1985 | 337 | 228 | 127 | 131 | 822 | 511 | 423 | 191 | 150 | 1,276 |
| 2000 | 376 | 254 | 142 | 146 | 918 | 534 | 445 | 201 | 163 | 1,343 |
| 2020 | 680 | 447 | 254 | 255 | 1,625 | 869 | 726 | 329 | 267 | 2,190 |
| 2060 | 709 | 470 | 272 | 268 | 1,178 | 887 | 746 | 338 | 281 | 2,251 |
| **Aged 75-84** | | | | | | | | | | |
| 1985 | 274 | 218 | 99 | 126 | 717 | 562 | 550 | 237 | 194 | 1,543 |
| 2000 | 394 | 315 | 141 | 181 | 1,031 | 753 | 719 | 312 | 262 | 2,046 |
| 2020 | 500 | 397 | 181 | 232 | 1,310 | 892 | 844 | 366 | 312 | 2,414 |
| 2060 | 813 | 655 | 289 | 369 | 2,126 | 1,317 | 1,229 | 535 | 462 | 3,542 |
| **Aged 85+** | | | | | | | | | | |
| 1985 | 87 | 106 | 48 | 63 | 304 | 195 | 302 | 133 | 172 | 802 |
| 2000 | 142 | 166 | 78 | 106 | 492 | 323 | 502 | 222 | 286 | 1,333 |
| 2020 | 213 | 248 | 116 | 159 | 736 | 450 | 699 | 309 | 399 | 1,857 |
| 2060 | 500 | 587 | 273 | 372 | 1,732 | 934 | 1,448 | 642 | 829 | 3,853 |
| **Aged 65+** | | | | | | | | | | |
| 1985 | 698 | 551 | 274 | 320 | 1,844 | 1,267 | 1,275 | 562 | 517 | 3,621 |
| 2000 | 912 | 735 | 361 | 433 | 2,441 | 1,610 | 1,666 | 735 | 711 | 4,722 |
| 2020 | 1,381 | 1,092 | 551 | 647 | 3,670 | 2,211 | 2,269 | 1,004 | 977 | 6,561 |
| 2060 | 2,021 | 1,712 | 833 | 1,009 | 5,576 | 3,138 | 3,423 | 1,515 | 1,572 | 9,647 |
| SOURCE: 1984 National Long-Term Care Survey<br>Totals may reflect rounding error | | | | | | | | | | |

In Table 3 we present, for the total elderly population and for different age groups, a.) the upper and lower bounds to the growth of the institutional and community-based disabled elderly population based on the high and low mortality assumptions made in the SSA projection series (i.e., where mortality rates are assumed to decline one half as fast and twice as fast as the middle projection series used in Table 1 and Table 2), and b.) the change in the community-based disabled population resulting from a 50 percent reduction in the growth rate of institutionalization (i.e., a reduction from a growth rate of the institutionalized population from 2.1 percent per annum which was observed from 1977 to 1985 to 1.05 percent per annum).

| TABLE 3. Projections of the Community-Based Disabled, Institutionalized, and Non-Disabled Elderly Population, 1985-2060, by Disability Level Assuming Upper and Lower Bounds on Population Growth Rates, and 50 Percent Reduction in Institutionalization Rates (numbers in thousands) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Year | Non-Disabled[1] | Community-Based Disabled[2] | | | | | Institutionalization[3] |
| | | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | |
| **UPPER BOUNDS** | | | | | | | |
| **Aged 65-74** | | | | | | | |
| 1985 | 14,137 | 848 | 651 | 319 | 281 | 2,078 | 212 |
| 2000 | 15,971 | 910 | 701 | 344 | 312 | 2,267 | 219 |
| 2020 | 26,972 | 1,539 | 1,187 | 587 | 545 | 3,857 | 362 |
| 2060 | 28,456 | 1,479 | 1,144 | 571 | 546 | 3,739 | 340 |
| **Aged 75-84** | | | | | | | |
| 1985 | 6,280 | 836 | 768 | 336 | 321 | 2,261 | 505 |
| 2000 | 8,620 | 1,173 | 1,052 | 463 | 455 | 3,143 | 675 |
| 2020 | 10,431 | 1,482 | 1,296 | 579 | 587 | 3,945 | 796 |
| 2060 | 15,565 | 2,549 | 2,040 | 925 | 1,026 | 6,540 | 1,111 |
| **Aged 85+** | | | | | | | |
| 1985 | 1,171 | 282 | 407 | 181 | 236 | 1,106 | 593 |
| 2000 | 1,738 | 500 | 716 | 321 | 422 | 1,958 | 1,035 |
| 2020 | 1,999 | 803 | 1,036 | 513 | 677 | 3,128 | 1,611 |
| 2060 | 3,517 | 2,043 | 2,761 | 1,309 | 1,745 | 7,859 | 3,253 |
| **Aged 65+** | | | | | | | |
| 1985 | 21,588 | 1,965 | 1,826 | 836 | 837 | 5,465 | 1,310 |
| 2000 | 26,329 | 2,583 | 2,468 | 1,128 | 1,189 | 7,368 | 1,929 |
| 2020 | 49,238 | 2,824 | 3,619 | 1,679 | 1,808 | 1,093 | 2,770 |
| 2060 | 47,537 | 6,072 | 5,944 | 2,805 | 3,318 | 18,138 | 4,705 |
| **LOWER BOUNDS** | | | | | | | |
| **Aged 65-74** | | | | | | | |
| 1985 | 14,137 | 848 | 651 | 319 | 281 | 2,098 | 212 |
| 2000 | 15,975 | 909 | 697 | 343 | 304 | 2,253 | 229 |
| 2020 | 26,984 | 1,538 | 1,164 | 581 | 504 | 3,786 | 421 |
| 2060 | 27,845 | 1,712 | 1,278 | 646 | 541 | 4,176 | 514 |
| **Aged 75-84** | | | | | | | |
| 1985 | 6,280 | 836 | 768 | 336 | 321 | 2,261 | 505 |
| 2000 | 8,774 | 1,117 | 1,012 | 442 | 430 | 3,002 | 662 |
| 2020 | 10,854 | 1,317 | 1,181 | 520 | 508 | 3,537 | 781 |
| 2060 | 16,584 | 2,002 | 1,830 | 782 | 762 | 5,376 | 1,256 |
| **Aged 85+** | | | | | | | |
| 1985 | 1,171 | 282 | 407 | 181 | 236 | 1,106 | 593 |
| 2000 | 2,142 | 430 | 619 | 277 | 363 | 1,688 | 901 |
| 2020 | 3,425 | 551 | 792 | 354 | 463 | 2,160 | 1,153 |
| 2060 | 8,128 | 1,085 | 1,559 | 695 | 907 | 4,247 | 2,254 |
| **Aged 65+** | | | | | | | |
| 1985 | 21,588 | 1,965 | 1,826 | 836 | 837 | 5,465 | 1,310 |
| 2000 | 26,891 | 2,457 | 2,328 | 1,062 | 1,097 | 6,943 | 1,792 |
| 2020 | 41,262 | 3,406 | 2,147 | 1,455 | 1,475 | 9,483 | 2,356 |
| 2060 | 52,558 | 4,799 | 4,667 | 2,123 | 2,210 | 13,799 | 4,023 |

| TABLE 3 (continued) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Year | Non-Disabled[1] | Community-Based Disabled[2] | | | | | Institutionalization[3] |
| | | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | |
| **50% REDUCTION IN INSTITUTIONALIZATION RATES** | | | | | | | |
| **Aged 65-74** | | | | | | | |
| 1985 | 14,137 | 848 | 651 | 319 | 281 | 2,098 | 212 |
| 2000 | 15,971 | 912 | 707 | 357 | 325 | 2,301 | 185 |
| 2020 | 26,984 | 1,543 | 1,193 | 617 | 564 | 3,916 | 291 |
| 2060 | 28,146 | 1,605 | 1,246 | 660 | 611 | 4,123 | 266 |
| **Aged 75-84** | | | | | | | |
| 1985 | 6,280 | 836 | 768 | 336 | 321 | 2,261 | 505 |
| 2000 | 8,693 | 1,154 | 1,056 | 493 | 492 | 3,195 | 550 |
| 2020 | 10,658 | 1,405 | 1,280 | 616 | 638 | 3,928 | 586 |
| 2060 | 16,333 | 2,156 | 1,969 | 973 | 1,013 | 6,111 | 772 |
| **Aged 85+** | | | | | | | |
| 1985 | 1,171 | 282 | 407 | 181 | 236 | 1,106 | 593 |
| 2000 | 1,935 | 476 | 701 | 367 | 464 | 1,998 | 798 |
| 2020 | 2,782 | 684 | 1,015 | 543 | 703 | 2,945 | 1,011 |
| 2060 | 6,161 | 1,498 | 2,238 | 1,268 | 1,635 | 6,637 | 1,831 |
| **Aged 65+** | | | | | | | |
| 1985 | 21,588 | 1,965 | 1,826 | 836 | 837 | 5,465 | 1,310 |
| 2000 | 26,599 | 2,542 | 2,464 | 1,207 | 1,280 | 4,794 | 1,533 |
| 2020 | 40,423 | 3,632 | 3,487 | 1,775 | 1,895 | 10,789 | 1,889 |
| 2060 | 50,641 | 5,259 | 5,453 | 2,900 | 3,260 | 16,871 | 2,868 |

1. **SOURCE**: Social Security Administration, Office of the Actuary: Social Security Area Population Projections: 1987, Actuarial Study No.99. SSA Pub.No.11-11546, 1987.
2. **SOURCE**: 1984 National Long-Term Care Survey.
3. **SOURCE**: 1985 National Nursing Home Survey.

Totals may reflect rounding error.

We see that the extreme mortality assumptions, though having large absolute effects, do not significantly alter the basic conclusions about the magnitude of the growth of the disabled and institutionalized elderly populations. By 2060 there is a 41.5 percent difference in the size of the projected disabled and institutionalized populations aged 85+ based upon the high and low mortality assumptions--the group most sensitive to mortality assumptions. For the disabled and institutionalized populations aged 65 to 74 in 2060 the difference due to the extreme mortality assumption is only 15 percent.

Even under the lowest assumed mortality rate decline the total disabled community-based elderly population will increase 153 percent by 2060. This can be compared to 232 percent under the fastest mortality declines. This difference in growth produces a 31 percent difference in the projected size of the total disabled population in 2060. For persons over age 85 the mortality assumptions have an even larger impact. The growth of the disabled population over age 85 is 611 percent under the most optimistic mortality assumptions and 284 percent under the most pessimistic mortality assumptions. Even though the growth rates of various age, sex and disability level specific populations vary significantly in all cases there is significant growth of the disabled population. Furthermore, since most of our discussion is based upon the intermediate (Series II) mortality assumptions, the differences between the projection we evaluate, and those produced under the most extreme assumptions, is only about half of the range of potential variability.

Though having a large effect on the size of the institutional population (by 2060, a 36.5 percent decline from 4.52 million (Table 1) to 2.87 million persons), an assumed

50 percent reduction in the current per annum. rate of increase of the institutionalized population, with those persons being transferred to the community population according to the distribution of disability reported in the 1985 NNHS, has a relatively minor impact on the rate of increase of the community-based disabled population. This is because of the much smaller size of the institutionalized population. Though relatively small (a total of 1.65 million persons versus the 19.7 million persons projected to be disabled or institutionalized by 2060, Table 1) it does tend to be concentrated at advanced acres (e.g., a 18.8 percent increase in the number of disabled persons over age 85) and for the highest disability levels (among those aged 85+ with 5 to 6 ADL limitations, the projected increase would be 36 percent). Thus, the promotion a policy of "deinstitutionalization" of the elderly disabled population could lead to a sharply increased need for home health and other community-based services unless the deinstitutionalization policies were strongly targeted to the least disabled persons in institutions.

Though the projections described above deal with the increase of the disabled elderly in terms of demographic and health service variables alone, it should be kept in mind that even that limited set of variables his considerable qualitative implications for the level and types of care required by the disabled population (Manton and Soldo, 1987). For example, persons with IADL dependencies only will tend to require primarily nonmedical services--needs which may often be met by improved housing, the provision of equipment and other non-medical caregiver services. In contrast, persons with 5 to 6 ADL impairments are largely bed-bound and have high levels of need for formal (trained) caregiver, nursing, and medical services. Likewise, differences in those rates for males and females, are indications of major differences in the availability of informal care services with males typically having more care available from spouses whereas females are at higher risk of not having adequate social resources to keep them out of institutional settings (Manton and Soldo, 1987).

# THE EFFECT OF CHANGES IN HEALTH ON THE FUTURE INCREASE OF THE DISABLED ELDERLY POPULATION

One aspect of the growth of the disabled elderly population that has generally not received adequate attention in health policy and health service research is the potential impact of fundamental changes in health and functioning at later ages--and the strategies by which such changes might be achieved. There has been considerable qualitative debate over whether increases in life expectancy at later acres have been achieved by improving health and function--or achieved simply by delaying the age at death (e.g., Gruenberg, 1977; Fries, 1980; Feldman, 19831). Certain evidence suggests that, acute lethal processes (typified by the health processes represented in Figure 1) may be modified somewhat independently of the chronic degenerative processes (see Figure 2). Other evidence suggests that a.) the improvement of life expectancy to date has been achieved by intervention in the acute lethal processes--thus tending to increase the duration of the life span spent in a disabled state (e.g., Wilkins and Adams, 1983; Nihon University, 1982; Robine et al., 1988), and b.) we do not currently know what risk factors must be modified to alter the risk of chronic degenerative processes.

This does not mean that intervening in the acute lethal processes has **no** affect on the chronic degenerative processes. Reducing obesity at advanced ages and eliminating smoking may reduce the risk of osteoarthritis and osteoporosis while simultaneously reducing the risk of lung cancer and heart disease. Controlling hypertension reduces the risk of both lethal strokes and strokes that can produce significant long-term disability as well as dementia due to multiple cerebrovascular infarcts. However, few population risk factor intervention programs to date have been explicitly targeted at reducing disability. Consequently, most programs; have more efficiently reduced *mortality* than *disability* rates. Though this is what appears to have happened to date this does <u>not</u> prove that a comparable effort at identifying and controlling disability risk factors could not be equally effective.

To explore the potential impact of such programs for the growth of the disabled elderly population we show the projected effect of two types of interventions in population morbidity and disability processes. In Table 4 we present the projections of the disabled elderly population under the assumption that disability rates could be reduced as rapidly as mortality rates. Such projections represent the assumption that an intervention program would affect the <u>general</u> health and functional status of the elderly population and, instead of reducing the incidence of any single disease, delay the age at onset of multiple disease processes. Such general improvements in health have been argued by Brody (1985) to have been responsible for recent increases in life expectancy at advanced ages. Cause-specific mortality changes provide some evidence for this in that the mean age at death from most major acute, lethal and chronic diseases has increased significantly (Manton, 1985). There is also evidence to suggest that early

differences in lifestyle and health factors between birth cohorts may produce persistent differences in health and functioning when those cohorts reach advanced age (e.g., Manton and Myers, 1987).

**TABLE 4. Projections of the Community-Based Disabled Elderly Population, 1985-2060, by Three Age Groups and Disability Level, Assuming Disability Rates Reduce as Mortality Rates (number of thousands)**

| Year | Disability Level | | | | |
|---|---|---|---|---|---|
| | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total |
| **Aged 65-74** | | | | | |
| 1985 | 848 | 651 | 319 | 281 | 2,098 |
| 2000 | 809 | 622 | 305 | 273 | 2,010 |
| 2020 | 1,232 | 942 | 467 | 417 | 3,059 |
| 2060 | | | | | |
| **Aged 75-84** | | | | | |
| 1985 | 836 | 767 | 336 | 321 | 2,261 |
| 2000 | 968 | 870 | 352 | 376 | 2,596 |
| 2020 | 1,057 | 939 | 414 | 415 | 2,825 |
| 2060 | 1,378 | 1,216 | 531 | 542 | 3,666 |
| **Aged 85+** | | | | | |
| 1985 | 252 | 407 | 181 | 236 | 1,156 |
| 2000 | 415 | 596 | 267 | 350 | 1,628 |
| 2020 | 567 | 810 | 363 | 477 | 2,217 |
| 2060 | 1,083 | 1,539 | 690 | 906 | 4,217 |
| **Aged 65+** | | | | | |
| 1985 | 1,965 | 1,826 | 836 | 837 | 5,465 |
| 2000 | 2,192 | 2,089 | 954 | 1,000 | 6,234 |
| 2020 | 2,856 | 2,691 | 1,245 | 1,310 | 8,102 |
| 2060 | 3,563 | 3,594 | 1,641 | 1,825 | 10,623 |

**SOURCE**: 1984 National Long-Term Care Survey.
Totals may reflect rounding error.

We see that this scenario reduces disability by 13 percent in 1000, 20 percent in 2020 and 30 percent in 2060. Thus, if we were to target the reduction of disability among the elderly as a major federal health policy--and if we were as successful as we are projected to be in reducing mortality--we could significantly reduce the disability impact of population aging, though the community-based disabled elderly population would still nearly double.

The above projections were based on two assumptions. First, that the progress in reducing mortality could be produced by actions to reduce disability independently of changes in mortality. Second, that with the requisite research and policy actions we could achieve the same degree of progress in reducing disability at advanced ages that we can achieve in reducing mortality at advanced ages. In order to determine how realistic such assumptions might be we consider two further pieces of evidence.

The first type of evidence represents the two-year transition rates between disability levels among the elderly after those rates have been adjusted for mortality.

These are presented in Table 5 a separately for males and females for two age groups (those age 65 to 74 and those age 85 and over).

**TABLE 5. Transitional Probabilities (%) of 1982 Versus 1984 Disability Status, Adjusted for Mortality, for Males and Females by Two Age Groups**

| 1982 Status | 1984 Status | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Not Disabled | | IADL Limitation | | 1-2 ADL Limitations | | 3-4 ADL Limitations | | 5-6 ADL Limitations | | Institutional | | Deceased | |
| | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| **Not Disabled** | | | | | | | | | | | | | | |
| 65-74 | 91.82 | 92.23 | 2.70 | 3.68 | 1.51 | 2.21 | 0.78 | 0.80 | 0.60 | 0.57 | 0.68 | 0.52 | 8.24 | 3.79 |
| 85+ | 66.15 | 57.57 | 9.07 | 8.97 | 11.88 | 13.52 | 4.26 | 2.95 | 2.78 | 4.41 | 5.86 | 12.58 | 26.27 | 19.25 |
| **IADL Limitation** | | | | | | | | | | | | | | |
| 65-74 | 17.52 | 14.21 | 58.26 | 49.44 | 14.97 | 22.22 | 1.14 | 6.20 | 5.84 | 3.08 | 2.28 | 4.48 | 16.54 | 8.19 |
| 85+ | 2.13 | 0.74 | 50.17 | 36.09 | 23.13 | 34.96 | 9.99 | 6.51 | 6.07 | 7.86 | 8.53 | 13.85 | 33.41 | 19.31 |
| **1-2 ADL Limitations** | | | | | | | | | | | | | | |
| 65-74 | 4.32 | 9.02 | 20.12 | 22.79 | 39.38 | 45.56 | 20.47 | 12.35 | 9.01 | 5.48 | 6.71 | 4.83 | 20.67 | 12.61 |
| 85+ | 0.00 | 0.85 | 9.70 | 11.18 | 30.74 | 41.09 | 16.16 | 20.39 | 20.32 | 10.87 | 23.10 | 15.63 | 32.13 | 21.18 |
| **3-4 ADL Limitations** | | | | | | | | | | | | | | |
| 65-74 | 6.46 | 3.23 | 7.59 | 6.84 | 27.74 | 31.33 | 30.89 | 32.09 | 23.97 | 19.27 | 3.39 | 7.24 | 28.29 | 11.88 |
| 85+ | 0.00 | 0.00 | 3.49 | 2.98 | 10.46 | 10.44 | 23.30 | 28.61 | 38.35 | 34.62 | 24.41 | 23.33 | 47.90 | 24.78 |
| **5-6 ADL Limitations** | | | | | | | | | | | | | | |
| 65-74 | 1.94 | 1.55 | 9.53 | 12.41 | 15.21 | 13.49 | 15.61 | 14.60 | 49.17 | 46.95 | 8.77 | 10.99 | 35.12 | 30.40 |
| 85+ | 0.00 | 0.00 | 0.00 | 1.98 | 9.22 | 11.29 | 18.45 | 11.62 | 58.49 | 49.28 | 13.84 | 25.83 | 53.60 | 44.49 |
| **Institutional as of 4-1-82** | | | | | | | | | | | | | | |
| 65-74 | 2.59 | 2.81 | 1.29 | 0.80 | 3.90 | 1.40 | 1.29 | 3.00 | 2.59 | 1.63 | 88.32 | 90.38 | 35.08 | 23.71 |
| 85+ | 0.00 | 0.00 | 0.00 | 0.91 | 0.00 | 0.00 | 0.00 | 1.51 | 0.00 | 1.20 | 100.00 | 96.40 | 62.46 | 44.97 |
| **'82 Detail Noncompleters** | | | | | | | | | | | | | | |
| 65-74 | 11.90 | 12.65 | 17.20 | 25.30 | 11.90 | 28.69 | 24.19 | 16.61 | 11.47 | 12.65 | 23.34 | 4.01 | 61.10 | 30.91 |
| 85+ | 0.00 | 0.00 | 19.98 | 4.02 | 19.98 | 7.36 | 0.00 | 12.09 | 0.00 | 16.11 | 60.01 | 59.76 | 72.22 | 42.02 |
| **Institutional (after 4-1-82)** | | | | | | | | | | | | | | |
| 65-74 | 12.71 | 9.06 | 6.35 | 9.65 | 0.00 | 8.46 | 12.71 | 4.82 | 4.73 | 0.00 | 63.52 | 67.98 | 38.85 | 35.95 |
| 85+ | 0.00 | 2.39 | 0.00 | 0.00 | 10.00 | 0.00 | 10.00 | 0.00 | 0.00 | 4.79 | 80.00 | 92.84 | 60.00 | 43.85 |

SOURCE: 1982 & 1984 National Long-Term Care Survey.
Includes those not disabled on screener or detailed interview.

We see that at all levels of disability there is a significant probability of regaining function in the long term. For example, at ages 65 to 74, men and women with 5 to 6 ADL impairments, and who survive two years, have similar chances of long-term (two-year) functional improvement (42 percent). At age 85 among survivors, the probability of improving functional level is less--though still significant (about 25 percent for females and 27.7 percent for males). Of course much of the similarity in these transitions is produced by the adjustment for mortality level which varies considerably by age and sex (e.g., a two-year mortality probability for females aged 65 to 74 who are not disabled of 3.8 percent versus 30.4 percent for females of the same acre with 5 to 6 ADL limitations).

For all persons with 5 to 6 ADL impairments there is a 22.2 percent chance of reducing the disability level over a two-year interval if we do not adjust for mortality. With 3 to 4 ADL impairments 23.6 percent manifest a long-term (two-year) improvement in functional status. If we adjust those probabilities for survival (37.2 percent of those with 5 to 6 ADL limitations and 24.0 percent of those with 3 to 4 ADL limitations die in two years) this increases to nearly 35.4 percent, i.e., that among two-year survivors, as in Table 5, with the highest level of disability, nearly 35.4 percent will manifest stable improvements in function. This level of improvement occurs even without a systematic national program for the prevention of disability and rehabilitation among the elderly--and with social norms that tend to accept increasing disability with age.

While the incidence of disability, unadjusted for mortality, is the same for males and females (Manton, 1988), females at all disability levels (and for all ages) have much higher survival rates than males (e.g., two-year mortality for persons aged 65 to 74 with 5 to 6 ADL limitations is 35.1 percent for males and 30.4 percent for females). Thus, though disability occurs at the same rate, females tend to live longer with disability. This is probably because females have higher risks of a number of chronic degenerative conditions like osteoporosis, diabetes and rheumatoid arthritis. Therefore, targeting these chronic degenerative diseases is likely to have a greater effect on females--the group with the highest levels of disability and the fewest social and economic resources to cope with that disability.

To describe the potential quantitative effects of such programs we conducted an alternate set of projections. We examined the conditions that elderly reported as most important in causing their disability in the 1984 NLTCS specific to age, sex, marital status and disability level. Then, both for 1985 and for future years, we estimated the total effect, separately for males and females of selected conditions on disability. To illustrate the different impact of acute and chronic conditions we conducted these projections for four conditions--two which we viewed as acute lethal conditions (cancer, ischemic heart disease) and two which we viewed as chronic degenerative conditions (dementia, and arthritis and other skeletal problems). The results are presented in Table 6.

We see that far more disability is attributed to arthritis and skeletal problems and dementia, with their effects increasing with time as the population ages. For example, the total number of cases of disability attributed to cancer and ischemic heart disease by 2060 is about 600,000 compared to a total community-based disabled elderly population of a little over 15 million. In contrast, the total number of persons with disability attributed to dementia is 1.6 million. About 5.2 million persons report arthritis and skeletal problems as the prime determinant of their disability. Together these two conditions are reported as causing approximately half of the total disability. Furthermore, we see that the effect for these diseases is proportionately greater for females than males. While the effect of cancer and heart disease is relatively greater for males than females, the absolute size of the effect is still much smaller than for the chronic conditions.

| TABLE 6. Projections of the Community-Based Disabled Elderly Population, 1985-2060, by Sex, Age Group and Disability Level, for Four Conditions Reported Most Important in Causing Disability | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Males | | | | | Females | | | | |
| | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 3-4 ADL Limitations | Total |
| **A. CANCER** | | | | | | | | | | |
| **Aged 65-74** | | | | | | | | | | |
| 1985 | 9,994 | 4,178 | 6,490 | 2,316 | 22,974 | 10,784 | 7,648 | 5,610 | 6,334 | 30,376 |
| 2000 | 11,142 | 4,672 | 7,234 | 2,582 | 25,630 | 11,398 | 8,160 | 5,964 | 6,792 | 32,314 |
| 2020 | 18,690 | 8,800 | 12,136 | 4,330 | 43,954 | 18,602 | 13,352 | 9,748 | 11,120 | 52,822 |
| 2060 | 18,784 | 9,816 | 12,194 | 4,350 | 45,144 | 19,192 | 13,888 | 10,106 | 11,612 | 54,798 |
| **Aged 75-84** | | | | | | | | | | |
| 1985 | 4,326 | 2,564 | 4,194 | 1,420 | 12,506 | 2,924 | 5,508 | 5,718 | 7,152 | 21,300 |
| 2000 | 6,224 | 3,796 | 6,102 | 2,058 | 18,180 | 3,982 | 7,472 | 7,648 | 10,742 | 29,848 |
| 2020 | 7,886 | 4,528 | 7,542 | 2,570 | 22,526 | 4,748 | 8,896 | 9,058 | 13,238 | 35,942 |
| 2060 | 12,884 | 8,460 | 13,028 | 4,342 | 38,714 | 7,068 | 13,212 | 13,356 | 20,600 | 54,240 |
| **Aged 85+** | | | | | | | | | | |
| 1985 | --- | 4,460 | 3,682 | 4,026 | 12,168 | 994 | 1,666 | 1,538 | 2,814 | 7,012 |
| 2000 | 2 | 7,108 | 6,056 | 7,780 | 20,946 | 1,662 | 2,786 | 2,566 | 4,602 | 11,616 |
| 2020 | 2 | 10,618 | 9,060 | 11,710 | 31,390 | 2,302 | 3,860 | 3,554 | 6,512 | 16,232 |
| 2060 | 4 | 25,070 | 21,248 | 26,646 | 72,968 | 4,698 | 7,880 | 7,262 | 14,230 | 34,068 |
| **Aged 65+** | | | | | | | | | | |
| 1985 | 14,318 | 11,204 | 14,362 | 7,764 | 47,646 | 14,704 | 14,820 | 12,864 | 16,298 | 58,688 |
| 2000 | 17,370 | 15,576 | 19,392 | 12,420 | 64,756 | 17,042 | 18,420 | 16,180 | 22,136 | 73,778 |
| 2020 | 26,578 | 23,944 | 28,738 | 18,612 | 97,872 | 25,652 | 26,108 | 22,366 | 30,870 | 104,994 |
| 2060 | 31,670 | 43,344 | 46,472 | 35,338 | 156,826 | 30,954 | 35,980 | 30,728 | 46,446 | 143,106 |
| **B. HEART DISEASE** | | | | | | | | | | |
| **Aged 65-74** | | | | | | | | | | |
| 1985 | 19,274 | 5,788 | 1,080 | 4,384 | 30,522 | 10,018 | 7,602 | 1,388 | --- | 18,414 |
| 2000 | 21,492 | 6,458 | 1,208 | 4,886 | 34,048 | 10,430 | 7,926 | 794 | 2 | 19,146 |
| 2020 | 36,346 | 11,186 | 2,482 | 8,196 | 58,208 | 16,964 | 12,900 | 1,278 | --- | 31,136 |
| 2060 | 36,822 | 11,600 | 2,952 | 8,236 | 59,604 | 17,278 | 13,152 | 1,250 | --- | 31,674 |
| **Aged 75-84** | | | | | | | | | | |
| 1985 | 10,274 | 1,976 | 3,574 | 4,126 | 19,950 | 17,564 | 11,374 | 2,842 | 2,456 | 34,236 |
| 2000 | 14,722 | 2,924 | 5,114 | 5,850 | 28,612 | 21,588 | 15,466 | 4,100 | 3,304 | 44,458 |
| 2020 | 18,810 | 3,486 | 6,548 | 7,648 | 36,492 | 24,728 | 18,424 | 4,986 | 3,928 | 52,060 |
| 2060 | 30,152 | 6,516 | 10,444 | 11,612 | 58,722 | 34,706 | 27,392 | 7,624 | 5,801 | 75,524 |
| **Aged 85+** | | | | | | | | | | |
| 1985 | 1,006 | 906 | 1,106 | 2,638 | 5,652 | 756 | 3,312 | 2,458 | 1,492 | 7,018 |
| 2000 | 1,352 | 1,218 | 1,484 | 5,096 | 9,152 | 1,264 | 5,536 | 2,434 | 2,492 | 11,726 |
| 2020 | 2,004 | 1,802 | 2,200 | 7,672 | 13,678 | 1,750 | 7,674 | 3,376 | 3,454 | 16,252 |
| 2060 | 4,912 | 4,424 | 5,398 | 17,456 | 32,190 | 3,572 | 15,660 | 6,890 | 7,048 | 33,170 |
| **Aged 65+** | | | | | | | | | | |
| 1985 | 30,550 | 8,670 | 5,756 | 11,148 | 56,122 | 28,338 | 22,290 | 5,094 | 3,944 | 59,668 |
| 2000 | 37,570 | 10,600 | 7,808 | 15,832 | 71,750 | 33,282 | 28,926 | 7,328 | 5,792 | 75,330 |
| 2020 | 57,158 | 16,476 | 11,230 | 23,516 | 108,378 | 43,444 | 38,994 | 9,638 | 7,370 | 99,444 |
| 2060 | 71,884 | 22,540 | 18,792 | 37,302 | 150,518 | 55,552 | 57,204 | 15,766 | 12,846 | 140,368 |
| **C. DEMENTIA** | | | | | | | | | | |
| **Aged 65-74** | | | | | | | | | | |
| 1985 | 11,892 | 814 | 1,812 | 2,858 | 17,372 | 16,162 | 6,560 | 2,386 | 7,258 | 32,364 |
| 2000 | 13,282 | 908 | 2,018 | 3,192 | 19,400 | 16,410 | 7,016 | 2,558 | 7,658 | 33,660 |
| 2020 | 23,898 | 1,520 | 3,386 | 5,836 | 34,638 | 26,542 | 11,484 | 4,224 | 12,494 | 54,746 |
| 2060 | 25,652 | 1,526 | 3,400 | 6,348 | 36,926 | 26,430 | 11,968 | 4,436 | 12,874 | 55,708 |
| **Aged 75-84** | | | | | | | | | | |
| 1985 | 23,532 | 12,858 | 6,414 | 7,024 | 49,830 | 67,022 | 41,280 | 9,490 | 18,972 | 136,764 |
| 2000 | 33,874 | 18,454 | 9,182 | 10,124 | 71,634 | 85,574 | 53,208 | 11,662 | 24,012 | 174,458 |
| 2020 | 42,868 | 23,508 | 11,758 | 12,782 | 90,916 | 99,538 | 62,126 | 13,356 | 27,834 | 202,858 |
| 2060 | 70,240 | 37,946 | 18,740 | 21,056 | 147,980 | 143,02 | 89,744 | 18,742 | 39,780 | 291,276 |
| **Aged 85+** | | | | | | | | | | |
| 1985 | 14,162 | 18,322 | 5,724 | 13,494 | 51,704 | 43,162 | 50,326 | 28,424 | 43,962 | 165,876 |
| 2000 | 24,118 | 28,026 | 9,138 | 20,054 | 81,336 | 71,848 | 83,872 | 47,722 | 73,148 | 276,290 |
| 2020 | 36,128 | 41,782 | 13,652 | 29,858 | 121,420 | 99,932 | 116,534 | 65,818 | 101,788 | 384,072 |
| 2060 | 84,156 | 119,516 | 32,220 | 71,566 | 287,456 | 206,464 | 239,862 | 134,968 | 210,624 | 791,918 |

| TABLE 6 (*continued*) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Males | | | | | Females | | | | |
| | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 3-4 ADL Limitations | Total |
| **Aged 65+** | | | | | | | | | | |
| 1985 | 49,584 | 31,996 | 13,948 | 23,380 | 118,906 | 126,346 | 98,166 | 40,298 | 70,192 | 335,002 |
| 2000 | 71,274 | 47,388 | 20,338 | 33,372 | 172,370 | 173,832 | 144,098 | 61,660 | 104,816 | 484,410 |
| 2020 | 102,892 | 66,812 | 28,796 | 48,476 | 246,974 | 226,016 | 190,142 | 83,400 | 142,116 | 641,672 |
| 2060 | 180,044 | 138,988 | 54,360 | 98,968 | 472,360 | 375,898 | 341,574 | 158,148 | 263,282 | 1,138,902 |
| **D. ARTHRITIS & OTHER SKELETAL DISEASES** | | | | | | | | | | |
| **Aged 65-74** | | | | | | | | | | |
| 1985 | 80,758 | 100,844 | 48,724 | 24,990 | 255,332 | 208,914 | 214,400 | 77,150 | 42,584 | 543,050 |
| 2000 | 91,288 | 112,610 | 43,320 | 27,906 | 285,126 | 218,122 | 225,746 | 81,862 | 46,420 | 572,150 |
| 2020 | 161,764 | 200,114 | 95,396 | 49,780 | 507,052 | 355,072 | 368,180 | 133,740 | 76,282 | 933,276 |
| 2060 | 171,302 | 212,454 | 101,890 | 53,026 | 538,674 | 362,550 | 378,666 | 138,448 | 80,714 | 960,378 |
| **Aged 75-84** | | | | | | | | | | |
| 1985 | 57,910 | 79,366 | 35,896 | 18,354 | 191,528 | 186,348 | 231,294 | 110,018 | 67,592 | 595,252 |
| 2000 | 83,298 | 114,694 | 51,438 | 46,286 | 275,716 | 251,776 | 303,298 | 144,640 | 92,684 | 792,390 |
| 2020 | 105,586 | 143,940 | 65,724 | 33,632 | 348,880 | 299,252 | 356,450 | 170,164 | 110,746 | 936,592 |
| 2060 | 172,368 | 240,394 | 105,328 | 53,732 | 571,824 | 443,488 | 519,918 | 248,558 | 165,368 | 1,377,332 |
| **Aged 85+** | | | | | | | | | | |
| 1985 | 25,282 | 38,810 | 13,582 | 8,336 | 86,010 | 50,774 | 134,850 | 50,598 | 37,368 | 255,590 |
| 2000 | 43,026 | 61,522 | 21,806 | 15,186 | 141,540 | 84,466 | 193,908 | 84,188 | 62,112 | 424,674 |
| 2020 | 64,452 | 91,874 | 32,582 | 22,808 | 211,714 | 117,558 | 270,520 | 117,148 | 86,514 | 591,740 |
| 2060 | 150,150 | 217,158 | 76,804 | 52,452 | 496,564 | 234,414 | 564,644 | 242,372 | 179,608 | 1,230,040 |
| **Aged 65+** | | | | | | | | | | |
| 1985 | 164,946 | 219,024 | 97,216 | 51,628 | 532,868 | 446,038 | 562,544 | 237,764 | 147,542 | 1,393,896 |
| 2000 | 217,614 | 288,826 | 126,564 | 69,378 | 702,382 | 554,366 | 722,942 | 310,692 | 201,214 | 1,789,214 |
| 2020 | 331,800 | 435,928 | 193,702 | 106,218 | 1,067,648 | 771,866 | 995,148 | 421,052 | 273,542 | 2,461,606 |
| 2060 | 493,820 | 670,006 | 284,026 | 159,210 | 1,607,060 | 1,049,448 | 1,463,228 | 629,380 | 425,694 | 3,567,750 |
| SOURCE: 1984 National Long-Term Care Survey | | | | | | | | | | |

What this suggests is that if effective strategies could be found to eliminate or significantly modify the degenerative processes of arthritis and dementia a significant proportion of the projected increase in the disabled elderly population could be prevented. Furthermore, because persons typically survive with these diseases for a lengthy period of time, the reduction of the risks of these diseases would have a significant effect on the amount of time the individual could expect to spend free of disability. This is significant for the design of health service systems and national health policy because the length of time that a person has a disability could have a significant impact on his exhaustion of economic resources (e.g., a lengthy institutionalization could produce the "Medicaid spenddown" phenomenon--for either the disabled person or a non-institutionalized spouse) and on the capacity of informal caregivers to maintain the person in the community.

The strategies and technologies developed to eliminate or control these diseases might be based upon a generically different logic than are disease prevention programs at younger ages. Thus, instead of eliminating the disease one must consider how to delay the age at onset of significant impairment from the disease. Thus, for the chronic diseases secondary and tertiary prevention strategies are likely to play greater roles. Interestingly, the prevalence of impairment from a number of these degenerative diseases, because they have rapid increases in risk with age, could be significantly reduced by even relatively modest increases in their age at manifestation. For example, Brody (1985) has postulated that a five-year delay in the age at onset of dementia could reduce its prevalence by 50 percent--assuming that there was no concomitant increase in life expectancy. Large reductions could also be achieved if the age-related rise in

disease incidence were slowed by interventions. These alternatives are illustrated in Figure 4.

In the figure there are two panels. The first describes the change in the risk of a chronic, degenerative disease with age. The second describes the age distribution of the cases that would be generated by each of the age specific risk functions in the first panel. Thus, in panel one the two curves labelled "Proportional Delay" represent the effect of the five-year shift in the risk function described by Brody. This corresponds to the two, identically shaped distributions of cases in panel two showing that the shift of the distribution to later ages would result in a similar distribution of the age at onset of the condition--except that more persons would die before manifesting the disease because the average mortality risks are higher for the second curve.

In the second scenario, labelled "Disease Modification" the physiological mechanism of the disease is modified in a way that its dependence on time is altered so that the shape of the age specific disease hazard function is altered, i.e., it is made flatter. This produces a much different distribution of age at onset of the disease in panel two.

Of course, to be effective both types of interventions assume that the correlation between the age at onset of the condition and the distribution of the ages at death is small. If the correlation is positive and large a delay in the average age at onset of the disease will be associated with an upward shift in the distribution of the age at death with possibly little gain in active life expectancy.

To determine how such interventions might be achieved we must a.) understand the mechanisms of the disease, its progression and natural history, b.) identify the risk factors affecting the different stages of disease, and c.) develop intervention strategies and technologies to effectively control those risk factor inputs.

There is now significant scientific evidence on several of the most disabling chronic degenerative diseases to suggest that significant interventions may be developed in the near future. For example, our knowledge of the factors contributing to osteoporosis is becoming much better so that prevention programs for that condition can be developed. We know, for example, that females are at much higher risk of osteoporosis (and associated skeletal problems like hip fracture) and that much of the risk occurs because of hormonal changes at menopause. Prevention programs would presumably involve different pre and post-menopausal strategies. Pre-menopausally one wishes to adopt behaviors that will maximize bone density at menopause. Risk factors decreasing bone density are smoking, alcohol consumption, extreme exercise (and consequential low body weight leadin to low estrogen production) while moderate exercise, good nutrition and adequate calcium intake are protective. Post-menopausally, calcium supplementation, exercise, adequate vitamin D supplementation and, possibly exogenous estrogen can retard the loss of bone density. Exactly how those interventions would alter the distribution of the age at onset is currently unclear. For example, by maximizing bone density at menopause one might shift the incidence

curve to the right while by taking exogenous estrogen the disease process might be altered so that the shape of the incidence curve might be modified. The exact age "kinetics" of these disease processes are currently unknown and are necessary to understand the precise effects of a given intervention on the distribution of disability in the elderly population. Additionally, it is unclear the extent to which such interventions in osteoporosis would affect life expectancy--especially at extreme acres where hip fracture and other major skeletal failures caused by advanced osteoporosis are responsible for a significant number of deaths (Manton, 1986a). Resolution of this problem requires ancillary data and biological insight into the disease processes to be able to effectively model the biological dependency of both multiple disease risks and multiple causes of death.

Such detailed knowledge of the basic disease mechanisms is beginning to be developed for other chronic diseases. For example, our knowledge of the genetic, viral and immunological basis of rheumatoid arthritis is improving. Consequently, for the first time, rheumatologists are discussing medical therapies that are truly disease modifying (e.g., long term, low dose methotrexate, gold salts, cyclosporine). Considerable research is being initiated on the determinants of Alzheimer's disease and possible medical interventions being identified for clinical evaluation (e.g., nerve growth factors). Research on Alzheimer's disease is at a very early stage. However, the absolute numbers of cases that could be affected by effective therapy is so large that even if only a small proportion of the total effect of the disease or disability is realized, such efforts will likely be cost effective.

# SERVICE PATTERNS AMONG THE DISABLED ELDERLY

In the prior sections we illustrated the current and future magnitude of the problem of disability among the elderly and estimated how much of that problem might be resolved by further research on disease mechanisms, the development of disease modifying therapies and effective prevention strategies. Our conclusion, based upon an assessment of the recent rate of scientific progress, was that a significant proportion of the degenerative processes responsible for much of the disability at later acres might be subject to significant control or modification within 10 to 20 years by appropriately targeted biomedical and public health efforts. This is certainly well within the time horizon of our projections. However, even under the most optimistic scenarios a significant increase in the size of the disabled elderly population is likely to occur. This seems particularly likely for the very elderly who tend to have a high prevalence of multiple chronic conditions so that elimination of one condition would still leave individuals with other conditions to cause impairment--though possibly at lower levels.

In this section we turn to the question of assessing not simply the number of disabled elderly, but the number who remain in need of certain types of services. The determination of the need for services is complex because, in addition to ascertaining intrinsic levels of disability, one must evaluate the efficacy of different strategies for responding to those disabilities. For example, one could have needs unfulfilled if one did not have either appropriate equipment or personal care available to respond to specific types of functional impairment. In some cases there may be the possibility of substituting one for the other. The adequacy of the level of services is itself a function of a.) the adequacy of current techniques to resolve the impairment, and b.) current social values and governmental policy regarding the commitment to meet different needs (e.g., we currently would be more likely to publicly provide services to respond to physical impairments than to provide alternate housing services). Furthermore, there is a broad range of daily actions that are affected by functional disability. One could feel that adequate medical care was not available for a number of reasons--including impairments in mobility. Or one could suffer problems because of housing deficiencies or characteristics of residential location.

In Tables 7-10 below, we examine need defined in terms of personal care needs required because of ADL and IADL impairments, lack of equipment or the need for basic health services. It is perhaps this level of current unmet and future service needs which truly defines the magnitude of the nature of national health policy questions raised by the projected growth in the numbers of disabled elderly.

The first dimension of need we will examine is lack of personal care and equipment to deal with each of six possible ADL limitations. These are presented in Table 7.

| TABLE 7. Number and Percent of Community-Based Disabled Elderly Population with ADL Limitation Unmet Needs, by Disability Level and Type of ADL Unmet Need (numbers in thousands) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Disability Level** | **Number of Persons Reporting ADL Unmet Needs** | **ADL Limitation Unmet Need** | | | | | |
| | | **Eating** | **Getting Up** | **Getting Around** | **Dressing** | **Bathing** | **Toileting** |
| 1-2 ADL Limitations | 459<br>(28.08) | 7<br>(0.43) | 10<br>(0.63) | 8<br>(0.48) | 17<br>(1.01) | 130<br>(7.98) | 358<br>(21.91) |
| 3-4 ADL Limitations | 312<br>(42.24) | 6<br>(0.86) | 11<br>(1.47) | 8<br>(1.05) | 26<br>(3.52) | 107<br>(14.49) | 238<br>(32.25) |
| 5-6 ADL Limitations | 441<br>(53.97) | 36<br>(4.39) | 64<br>(7.77) | 53<br>(6.51) | 38<br>(4.68) | 81<br>(9.88) | 379<br>(46.37) |
| Total | 1,212<br>(34.65) | 49<br>(1.40) | 85<br>(2.43) | 69<br>(1.97) | 81<br>(2.31) | 318<br>(9.09) | 976<br>(27.89) |
| Numbers in parentheses are percent of persons at disability level with specific unmet need.<br>**SOURCE**: 1984 National Long-Term Care Survey.<br>Totals may not sum due to rounding error. | | | | | | | |

For the first four basic self-care functions the number of community resident, disabled elderly persons who lack either equipment or personal care is less than 2.5 percent. For either bathing or toileting we see that the limitations are far more prevalent (9.09 percent and 27.89 percent). The 976,000 persons with chronic ADL impairments who report unmet needs with toileting represent the difficulty in defining need. Much of the need arises because persons report "wetting" or "soiling" themselves on a regular basis. Current technology to respond to these problems (e.g., using diapers) may not prevent this. Hence, even if the best current technology were employed, the need may remain. Of course, it could be argued that innovative surgical or other interventions could eliminate the problem in a number of cases. In any case the difficulties in estimating unmet need levels are clear.

Though about 35 percent (about 1.2 million persons) report current need in terms of ADL functions, most of that unrnet need results from two of the ADL impairments--impairments at the low levels in the Katz hierarchy (Katz and Akpom, 1976). This is not surprising since, persons who are not able to satisfactorily perform a function like as eating are probably institutionalized in relatively short order. The level of unmet need resulting from the lack of care to respond to ADL impairments, as shown in the table, is strongly correlated with disability level. The total level of unmet need nearly doubles (28.1 to 54 percent) from persons with 1 or 2 ADL impairments to those with 5 to 6 ADL impairments. It also varies strongly by age (not here reported) with the oldest-old having the highest level (35.3 percent) of unmet need.

We can also examine unmet needs in terms of specific types of IADL impairment. These proportions are presented in Table 8.

**TABLE 8. Number and Percent of Community-Based Disabled Elderly Population with IADL Limitation Unmet Needs, by Disability Level and Type of IADL Unmet Need (numbers in thousands)**

| Disability Level | Number of Persons Reporting Any IADL Unmet Need | IADL Limitation Unmet Need | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Heavy Work | Light Work | Laundry | Preparing Meals | Grocery Shopping | Getting Around Outside | Going Places | Managing Money | Taking Medicine |
| IADL Limitation | 514 (27.32) | 1,343 (71.37) | 115 (6.13) | 107 (5.70) | 58 (3.06) | 184 (9.79) | 189 (10.06) | 115 (6.11) | 57 (3.04) | 27 (1.42) |
| 1-2 ADL Limitations | 690 (38.39) | 1,391 (76.84) | 226 (12.59) | 122 (6.78) | 102 (5.70) | 151 (8.43) | 276 (15.35) | 194 (10.78) | 79 (4.39) | 22 (1.20) |
| 3-4 ADL Limitations | 468 (58.96) | 717 (90.38)) | 282 (35.51) | 36 (4.49) | 52 (6.58) | 68 (8.55) | 173 (21.77) | 145 (18.24) | 43 (5.38) | 20 (2.54) |
| 5-6 ADL Limitations | 671 (77.08) | 764 (87.76) | 592 (67.96) | 18 (2.01) | 31 (3.58) | 25 (2.82) | 312 (35.84) | 258 (29.62) | 24 (2.77) | 14 (1.65) |
| Total | 2,343 (43.86) | 4,206 (78.70) | 1,215 (22.75) | 282 (5.28) | 244 (4.56) | 428 (8.01) | 950 (17.78) | 711 (13.31) | 203 (3.80) | 83 (1.55) |

Numbers in parentheses are percent of persons at disability level with specific unmet need.
**SOURCE**: 1984 National Long-Term Care Survey.
Totals may not sum due to rounding error.

We see that the level of unmet need varies strongly by type of IADL. Not surprisingly most (~79 percent) have unmet needs regarding heavy work. The proportions with cognitively-based tasks unmet (i.e., managing money, taking medicine) is relatively small. Mobility functions have intermediate levels of unmet need. As for ADL unmet needs, the level of need increases with age but the association with impairment level is not as clear. For certain IADLs the estimation of unmet need is made difficult by possible sex bias in the functions. That is, males, at any level of functioning, may be less skilled at laundry, preparing meals and grocery shopping.

Another dimension of need related to functional impairment is the ability to make a doctor's appointment. In Table 9 we present the distribution of reason for not being able to make an appointment with a medical doctor.

Only 3.8 percent of disabled persons were unable to attend a doctor's appointment because of financial problems. Overall about 13.9 percent could not make a doctor's appointment for any reason.

**TABLE 9. Number and Percent of Community-Based Disabled Elderly Population Unable to Make Appointment with Medical Doctor, by Disability Level and Reason (numbers in thousands)**

| Disability Level | Number of Persons Unable to Visit Medical Doctor for Any Reason | Reason Person Unable to Make Medical Doctor Appointment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Lacked Money | Lacked Time | Medical Doctor Not Available | Lacked Transportation | Not Free to Leave Residence | Medical Problem Not Serious Enough | Afraid to Find /Out What is Wrong | Bad Weather | Other Reason |
| IADL Limitation | 265 (14.11) | 84 (4.45) | 9 (0.50) | 30 (1.62) | 53 (2.82) | 2 (0.09) | 34 (1.82) | 11 (0.58) | 5 (0.29) | 91 (4.81) |
| 1-2 ADL Limitations | 288 (16.02) | 73 (4.04) | 13 (0.73) | 37 (2.04) | 46 (2.57) | 4 (0.24) | 47 (2.62) | 12 (0.68) | 2 (0.09) | 121 (6.72) |
| 3-4 ADL Limitations | 123 (15.52) | 29 (3.67) | 7 (0.92) | 17 (2.18) | 32 (4.09) | 4 (0.44) | 15 (1.84) | 7 (0.89) | 2 (0.28) | 53 (6.70) |
| 5-6 ADL Limitations | 67 (7.67) | 18 (2.09) | 2 (0.24) | 10 (1.15) | 14 (1.61) | 0 (0.00) | 5 (0.59) | 2 (0.25) | 0 (0.00) | 28 (3.17) |
| Total | 743 (13.91) | 204 (3.81) | 32 (0.60) | 94 (1.77) | 146 (2.73) | 10 (0.18) | 101 (1.89) | 32 (0.61) | 9 (0.17) | 292 (5.47) |

Numbers in parentheses are percent of persons at disability level unable to make appointment for specific reason.
**SOURCE**: 1984 National Long-Term Care Survey.
Totals may not sum due to rounding error.

A third dimension of need is that for specific equipment. Some persons report having no need for specific equipment (e.g., handrails) and, among those reporting a need, some mav have the equipment. Table 10 presents the numbers of persons who have special equipment versus those who do not but who do report that having the equipment would make them more comfortable or aid them.

**TABLE 10. Number of Community-Based Disabled Elderly Persons Who Have Special Equipment and Those Who Report They Need But Do Not Have Special Equipment, by Disability Level and Type of Equipment**

| Disability Level | Status | Type of Equipment | | | | | |
|---|---|---|---|---|---|---|---|
| | | Pushbars Doors | Handrails | Ramps | Elevators | Extra-Wide Doors | Raised Toilet |
| IADL Limitation | Have | 20,127 | 212,533 | 29,586 | 60,966 | 59,609 | 28,912 |
| | Need | 12,882 | 261,416 | 24,161 | 43,233 | 12,772 | 57,265 |
| 1-2 ADL Limitations | Have | 33,753 | 535,874 | 74,097 | 96,700 | 113,984 | 90,644 |
| | Need | 16,146 | 301,220 | 45,577 | 75,808 | 26,330 | 135,519 |
| 3-4 ADL Limitations | Have | 16,051 | 287,791 | 52,646 | 66,674 | 68,080 | 128,871 |
| | Need | 30,551 | 156,845 | 50,302 | 35,098 | 27,662 | 83,229 |
| 5-6 ADL Limitations | Have | 7,032 | 249,196 | 90,598 | 34,512 | 50,120 | 130,620 |
| | Need | 36,607 | 183,207 | 69,061 | 44,190 | 69,165 | 128,767 |

**SOURCE**: 1984 National Long-Term Care Survey.

We see that there are about 96 thousand persons reporting needing doors with pushbars in contrast to 77 thousand who report having them. About 1.3 million persons report a built environment with handrails while a little more than 900 thousand persons say that they would be useful but do not have them. For example, among persons with 5-6 ADL limitations, we find about 250 thousand persons who have handrails and about 180 thousand who do not. About 380 thousand persons report having raised toilets and about 400 thousand do not have them. Thus there is reported a considerable need for

special equipment in the built environment to help compensate for a number of impairments--roughly half of the equipment needs of the community based population is being met.

An additional component of need involves the demand for acute and LTC health services. This need, current and future, can be represented by two measures. One is the demand for various types of medical and auxiliary health professional manpower. The second is the change in the demand for informal care. In addition one could examine the tradeoff between informal and formal care.

In Table 11 we examine projections for three classes of health care workers to meet future levels of demand for institutional and home health services (Manton, 1986b).

**TABLE 11. Projection of Number of Physicians, Nurses, and Home Health Worker Required to Maintain Current Levels of Service for the Elderly Population**

| | 1985 | 2000 | 2020 | 2040 |
|---|---|---|---|---|
| **1. Physicians** | 110,000 | 137,830 | 206,030 | 267,760 |
| **2. Nurses** | 390,000 | 488,740 | 730,650 | 949,333 |
| **3. Home Health Workers** | | | | |
| a. Aides | 198,900 | 249,258 | 372,640 | 484,059 |
| b. Nurses | 22,100 | 27,695 | 41,404 | 53,797 |

**SOURCE**: Manton, KG: Preliminary Report on Ways of Adjusting Public and Private Reimbursement Mechanisms for Promoting the Training of Geriatric Manpower. Presented at the National Institute on Aging, Dece. 11-12, 1986, Table 11.

We see that the number of physicians required to continue current levels of services for the elderly population increases nearly 150 percent--far more than the increase of the total U.S. population. There are similar increases in the projected future demand for nurses and home health workers. Thus there will have to be a more rapid increase in the requirements for medical manpower than would be expected based on simple population growth. Furthermore, because much of this growth occurs in meeting the needs of an elderly, disabled population there will be a need for special geriatric training of these health professionals.

In Table 12 we present the number of caregivers required, and number of days spent by caregivers to maintain current levels of informal care.

| TABLE 12. Number of Caregivers and Caregiver Days for the Community-Based Disabled Elderly Population, 1985-2060, by Three Age Groups and Disability Level (numbers in thousands) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Caregivers | | | | | Caregiver Days | | | | |
| | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 5-6 ADL Limitations | Total | IADL Limitation | 1-2 ADL Limitations | 3-4 ADL Limitations | 3-4 ADL Limitations | Total |
| **Aged 65-74** | | | | | | | | | | |
| 1985 | 1,297 | 1,142 | 688 | 733 | 3,860 | 3,998 | 3,711 | 2554 | 3,171 | 13,433 |
| 2000 | 1,383 | 1,222 | 737 | 800 | 4,142 | 4,308 | 4,014 | 2,766 | 3,476 | 14,563 |
| 2020 | 2,333 | 2,043 | 1,245 | 1,352 | 6,973 | 7,299 | 6,698 | 4,689 | 5,881 | 24,566 |
| 2060 | 2,416 | 2,113 | 1,300 | 1,416 | 7,245 | 7,588 | 6,927 | 4,916 | 6,176 | 25,607 |
| **Aged 75-84** | | | | | | | | | | |
| 1985 | 1,414 | 1,540 | 797 | 908 | 4,660 | 3,891 | 4,759 | 2,578 | 3,858 | 15,086 |
| 2000 | 1,920 | 2,064 | 1,067 | 1,249 | 6,300 | 5,395 | 6,484 | 3,476 | 5,315 | 20,669 |
| 2020 | 2,317 | 2,468 | 1,282 | 1,528 | 7,595 | 6,605 | 7,820 | 4,202 | 6,496 | 25,124 |
| 2060 | 3,524 | 3,743 | 1,920 | 2,329 | 11,516 | 10,176 | 11,976 | 6,321 | 9,926 | 38,398 |
| **Aged 85+** | | | | | | | | | | |
| 1985 | 521 | 951 | 454 | 703 | 2,629 | 1,575 | 2,857 | 1,627 | 3,096 | 9155 |
| 2000 | 859 | 1,557 | 750 | 1,168 | 4,334 | 2,610 | 4,657 | 2,695 | 5,137 | 15,100 |
| 2020 | 1,219 | 2,210 | 1,066 | 1,663 | 6,158 | 3,737 | 6,629 | 3,837 | 7,317 | 21,520 |
| 2060 | 2,626 | 4,756 | 2,301 | 3,594 | 13,278 | 8,167 | 14,371 | 8,310 | 15,833 | 46,681 |
| **Aged 65+** | | | | | | | | | | |
| 1985 | 3,232 | 3,633 | 1,939 | 2,344 | 11,148 | 9,463 | 11,327 | 6,759 | 10,125 | 37,374 |
| 2000 | 4,162 | 4,844 | 2,553 | 3,218 | 14,776 | 12,313 | 15,155 | 8,937 | 13,927 | 50,331 |
| 2020 | 5,869 | 6,720 | 3,594 | 4,543 | 20,726 | 17,641 | 21,147 | 12,728 | 19,695 | 71,211 |
| 2060 | 8,567 | 10,612 | 5,520 | 7,339 | 32,039 | 25,931 | 33,274 | 19,547 | 31,934 | 110,686 |
| SOURCE: 1984 National Long-Term Care Survey<br>Totals may not sum due to rounding error | | | | | | | | | | |

We again see that the number of caregivers increases much more rapidly than the general growth of the U.S. population. This means that to maintain current levels. the intensity of caregiving will have to increase on a per capita basis and probably implies that, in the future, more of this care will have to be provided by paid caregivers.

What we have not fully explored in the analysis of need above is the issue of "multiple jeopardy", i.e., the fact that certain disabled subpopulations may have multiple needs unfulfilled. This would require a different, multivariate analysis rather than our demographic projections. What is clear is that certain subpopulations do have multiple needs unmet and that these persons have the highest risks of institutionalization. They also represent one of the most critical target populations for innovative LTC systems--although the current evidence suggests that many existing LTC demonstrations did not target, nor were very effective in managing, such populations (Vertrees et al., 1989).

# SUMMARY

In the above we considered the magnitude and quality of the problem of disability for the community resident disabled and institutionalized U.S. elderly populations. An analysis of the impact of disability on this population is more difficult than for other disabled groups in the sense that previously, in both the popular and scientific literature, there was the assumption that the prevalence and severity of disability was a natural consequence of the aging process. Moreso than in other disabled groups, functional loss and impairment is considered a "natural" state for the elderly. Such a perspective has implications not only for initiatives to improve the health and functional states of the elderly population but also for the perception of the level of disability and handicaps associated with it and the types of services that might be provided.

This image of the natural emergence of frailty with age is now undergoing challenge in a number of studies. The extreme heterogeneity of functional status in even the oldest-old (85+) population is evidence that functional impairment among the elderly is not a natural consequence of aging and must be evaluated on an individual basis.

There is also increasing evidence that the physiological processes generating impairment are subject to intervention and in some cases, may even be partly reversed and function regained. Recent research has begun to identify the risk factors for such processes and to explicate the mechanisms of these processes so that more effective interventions can be developed.

Whatever interventions may be introduced, the demographic aging of the population will cause a major increase in the number of disabled elderly. This is a national problem whose magnitude will depend upon the degree to which the broadly defined needs of this population are or not being met. We considered these needs on a number of levels. In terms of basic self-care only bathing and toileting are currently unmet to a considerable degree. Among IADL impairments transportation and mobility were most problematic. An analysis of limits on the access to primary medical care (i.e., physician visits) showed significant proportions (about 14 percent) of disabled elderly persons reporting problems. The most serious deficiencies on a relative basis were noted in needs for physical equipment and changes in the built environment

All of these factors contribute to a general assessment of changes in the size, structure and needs of the disabled elderly population. It is clear that no single response will suffice to meet the likely level of the problems. Thus a multidimensional approach involving the private sector and state and federal programs, and coordination, will be needed to develop responses to the problem. Given the dimensions of the problem, however, it is likely that no response will be satisfactory unless some fundamental changes in the socio-cultural perception of the functioning of elderly people, and the provision of family and other social resources to maintaining that functioning, is

developed. This is because with the likely growth of the problem, and the increase in its intensity, current socio-cultural responses will not be sufficient in the future.

One aspect of the problem that is of particular concern is the relative paucity of nationally representative data to monitor the growth of the problem, to characterize the dimensions of the problem, and to monitor the efficacy of different interventions. Only recently has nationally representative longitudinal data appropriate for this table become available. The existing temporal series of such national data, however, are not yet lengthy enough to either identify major cohort differences or accurately assess whether active or healthy life expectancy has increased or decreased as life expectancy at later ages increases. This will be a serious hinderance to the development of effective policies to meet the problems of a rapidly aging population.

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# CHARACTERISTICS OF THE ELDERLY LONG-TERM CARE POPULATION AND ITS SERVICE USE

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