

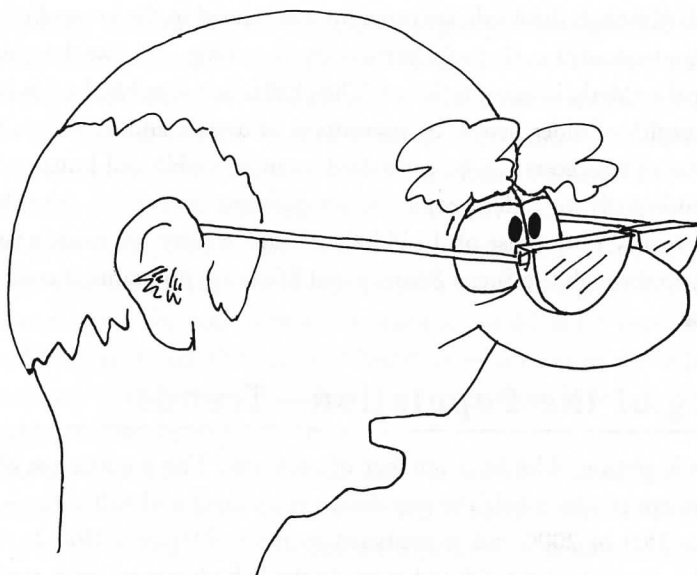
# INTRODUCTION TO Public Health

*Third Edition*



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## Public Health and the Aging Population



Getting Older

The U.S. population is getting older. The “baby-boom” generation, which is approaching 65, is already beginning to retire. The prospect is causing great alarm among health planners because of the increasing pressure it will place on medical costs. Medicare spending has grown dramatically since the program began, both because of growing medical care costs and because of the aging population. Politicians know that they must do something to remedy the situation, but there is no agreement on how or on what should be done. Present trends are unsustainable: if growth in Medicare and Social Security continued at the present rate, together they would consume the entire federal budget by 2070.<sup>1</sup>

Older people tend to be in poorer health than younger ones. They tend to have more chronic illness, and they are more likely to suffer limitations on their ability to participate fully in the activities of their community. These truths have two unhappy consequences: the quality of life of the elderly is, on average, poorer than that for younger people, and their medical costs are higher. Both issues are of great concern for public health.

Quality of life in later years depends significantly on lifestyle in youth and middle age. Therefore, to the extent that public health succeeds in promoting healthy behavior throughout life, there is a payoff in improved health and quality of life for older people. Public health must also address the inevitability that there will be limits to society's willingness to pay the medical costs of the aged. Although the Medicare program was created in the hope of enabling all older people to receive adequate care, financial barriers are increasing and, like the system as a whole, medical care for the elderly is being rationed. The challenge for public health is twofold: first, to improve the health of older people by prevention of disease and disability; and second, to confront the issue of how costs can be controlled in an equitable and humane way. Although these public health goals for older people are no different from those for other age groups, there is special urgency in the case of the elderly because society has made a unique commitment to this group through the Social Security and Medicare programs, a commitment that is now under stress.

## The Aging of the Population—Trends

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The population is getting older by a number of measures. The median age of the American population—the age at which half the population is younger and half older—increased from 22.9 in 1900 to 35.3 in 2000 and is predicted to reach 39.0 by 2030.<sup>2</sup> In 2006, just over 12 percent of the population was 65 and over. As the baby boomers grow rapidly after 2011, the number of people over 65 will double in size, reaching 72 million, or 20 percent of the population by 2030. The increased number of older people was accompanied by an increase in life expectancy at birth, from 47.3 in 1900–1902 to 77.8 in 2005. Centenarians have increased from 37,000 in 1990 to more than 50,000 in 2000.<sup>2</sup>

As people are living longer, most people aged 65—the traditional retirement age—are still relatively vigorous. To reflect this reality, the elderly are categorized into three component groups, which have quite different characteristics and needs: the “young old,” ages 65 to 74; the “aged,” who are 75 to 84; and the “oldest old,” those 85 and older. In 2006 there were 5.3 million oldest-old people in the United States, and this is the fastest growing age group in the population. The Census Bureau predicts that there will be about 9.6 million people age 85 and

older by the year 2030.<sup>3</sup> Obviously these projections have important implications for the Social Security and Medicare systems, because the numbers of working-age people—who will be expected to pay to support the elderly—are growing at much slower rates.

Figure 28-1 shows the age distribution of the population in 2003. The baby-boom generation—those born between 1946 and 1964—is making its way through the age groups like the proverbial pig through a python and will account for an explosive increase in the numbers of elderly beginning in 2011. Predictions of future population size depend both on the birth rate—which is currently fairly stable—and immigration rates, which are somewhat unpredictable and depend on federal policies.

Females increasingly outnumber males in older age groups. Among the oldest old, there are more than twice as many women as men. This is a consequence of the fact that women have a longer life expectancy than men. After the age of 75, most women are widowed and live alone, while most men are married and live with their wives. Racial and ethnic diversity among the elderly is expected to increase: non-Hispanic whites constituted 81 percent of the older population in 2006, but that proportion is projected to shrink to 61 percent in 2050. The proportion of Hispanics will grow to 18 percent; blacks will be 12 percent; and Asians will be 8 percent. As in younger age groups, older whites are in better health than older people of racial and ethnic minorities. Life expectancy for both men and women at age 65 is 1.6 years longer for whites than for blacks. However, racial differences in health grow smaller in the oldest populations, and African Americans who survive to join the oldest-old category have a slightly longer life expectancy than whites of the same age.<sup>4</sup>

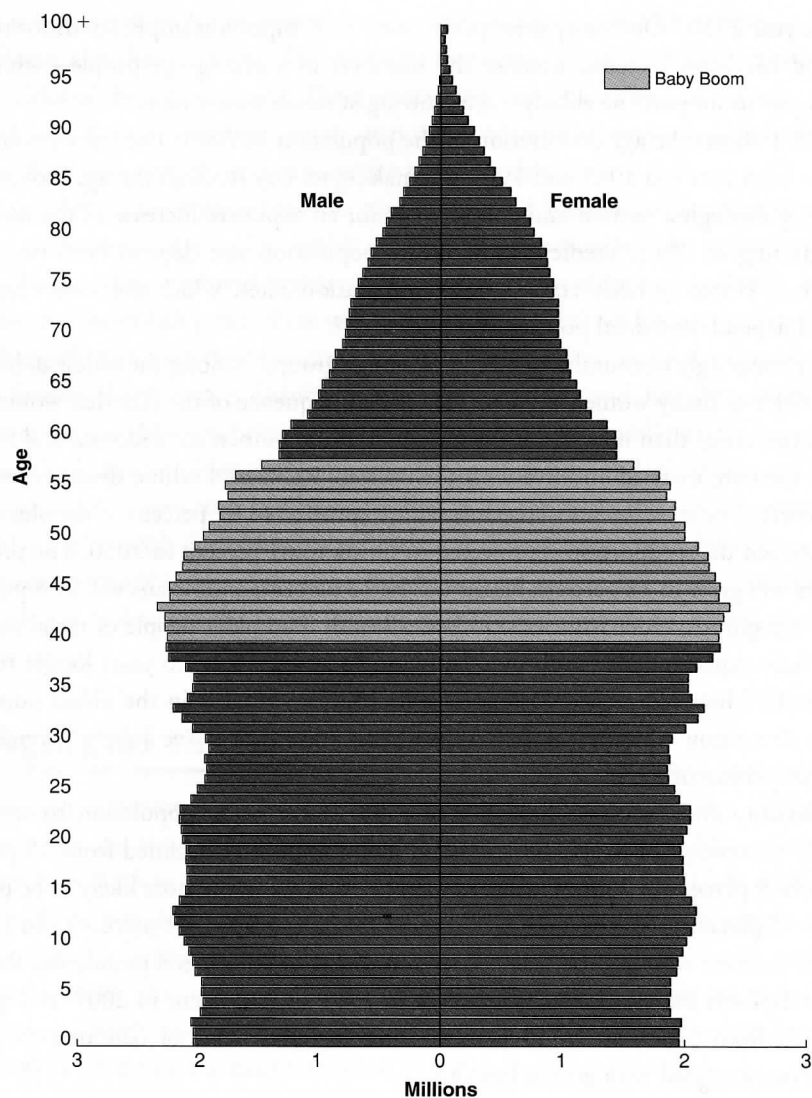
Social Security and Medicare have helped most of the older population to stay out of poverty. The percentage of people 65 and older living in poverty declined from 15 percent in 1974 to about 9 percent in 2006. Elderly women (12 percent) were more likely to be poor than elderly men (7 percent). Poverty rates were higher for older blacks (23 percent) and Hispanics (19 percent) than for whites (7 percent).<sup>4</sup> The percentage of the general population that have a high school diploma increased from 24 percent in 1965 to 76 percent in 2007; college graduates increased from 5 percent to 19 percent. This increased level of education is generally expected to be correlated with greater health.

## Health Status of the Older Population

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The greatest public health concern for Americans over 65 is long-term chronic illness, disability, and dependency. The majority of the older population, especially those in the younger groups, are in good health. In national surveys of noninstitutionalized persons, about 80 percent of the young old who are white consider their health to be good, very good, or excellent, as do about 74 percent of those over 75 and 67 percent of those 85 and over. Blacks and





**FIGURE 28-1** U.S. Population by Age and Sex, 2003. *Source:* U.S. Census Bureau, "65+ in the United States, 2005." Figure 1-1 [www.census.gov/prod/2006pubs/p23-209.pdf](http://www.census.gov/prod/2006pubs/p23-209.pdf). (Accessed November 9, 2009).

Hispanics report poorer health than whites. With more advanced age, many older people have chronic conditions that cause them to require assistance with the activities of daily living. Overall, less than 1 percent of people 65 to 75 live in nursing homes, but that proportion increases to almost 14 percent of the oldest old.<sup>4</sup>

The causes of death of older people are pretty much the same as the causes of death in the overall population, with cardiovascular disease and cancer leading the list (Figure 28-2). Motor vehicle crashes and suicide are also significant causes of death, among older men far more than older women. Men are likely to die at a younger age, whereas older women are more likely to suffer from chronic, disabling diseases. Heart disease, cancer, and stroke, in addition to killing people, can contribute to chronic health problems and dependency. Many of the elderly, especially women, suffer from arthritis, diabetes, osteoporosis, and Alzheimer's disease, conditions that limit their independence and may force them into nursing homes.

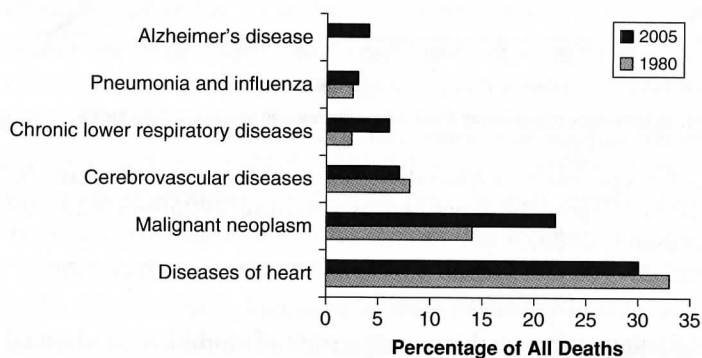
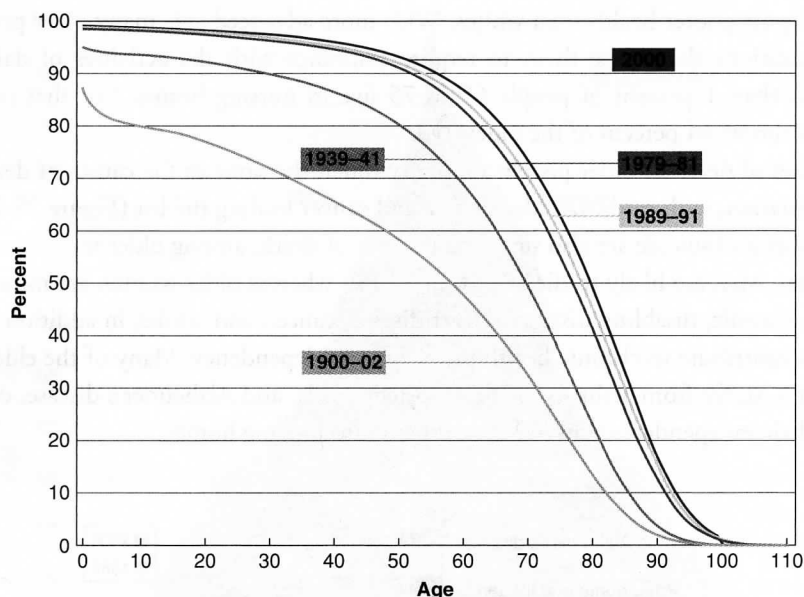


FIGURE 28-2 Leading Causes of Death, Individuals 65 Years and Older. *Source:* Data from National Center for Health Statistics, *Health, United States*, 2008. Table 31.

A still unanswered question with very important implications for public health is whether longer life expectancy means more healthy years for most people or, alternatively, if it leads to longer periods of chronic illness and disability. The financial solvency of the Medicare system will be highly dependent on the answer. Experts on aging agree that the trend of the 20th century has been a “compression of mortality,” shown in Figure 28-3, meaning that deaths are increasingly concentrated in a relatively short age range at about the biological limit of life span. What is less certain is whether the compression of mortality will be accompanied by a compression of morbidity—the rates of chronic disease and disability. Ideally most people would prefer to live a long, healthy life and then suddenly drop dead, like the “wonderful one-hoss shay,” a scenario that would also save massive amounts of Medicare money.



Note: The reference population for these data is the resident population. Data for 1900-1902 and 1939-1941 also include deaths of nonresidents of the United States.

**FIGURE 28-3** Compression of Mortality. *Source:* U.S. Census Bureau, "65+ in the United States, 2005." Figure 3-1 [www.census.gov/prod/2006pubs/p23-209.pdf](http://www.census.gov/prod/2006pubs/p23-209.pdf). (Accessed November 9, 2009).

Evidence is beginning to emerge that a compression of morbidity is indeed taking place.<sup>5</sup> An ongoing national survey of Medicare recipients indicates that disability rates among those over 65 declined steadily, from 26.5 percent in 1982 to 19.0 percent in 2004.<sup>6</sup> Other national surveys have had similar findings. The 2000 census showed that the percentage of older people living in nursing homes has declined. The Framingham Heart Study, which tracked the health of a cohort of original participants and their offspring (see Chapter 4), found that the younger generation had less disability than their parents at the same ages.<sup>7</sup> On the other hand, the prevalence of many diseases has increased in the older population. For example, cardiovascular disease has become more prevalent as deaths from cardiovascular disease have declined. However, having a disease appears to be less disabling than in the past.<sup>8</sup>

## General Approaches to Maximizing Health in Old Age

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There is still a great deal to learn about how public health can continue to achieve a compression of morbidity, improving quality of life for those who benefit from the compression of mortality that has already occurred. Although a variety of factors might influence the risk of disability in old age, health-related behavior is one important variable that would be expected to make a difference. A study that tracked 1741 older alumni of the University of Pennsylvania found that, indeed, a healthy lifestyle reduced not only their risk of dying but also their disability in later years. The study subjects, who had attended the University in 1939 and 1940, were surveyed on their smoking habits, body-mass index (BMI), and exercise patterns and, beginning in 1986, chronic conditions, use of medical services, and extent of disability. The alumni were classified into three risk groups, the highest risk belonging to obese, inactive smokers. Those in the highest risk group had twice the cumulative disability of those with low risks, and the onset of disability was postponed by almost eight years in the low risk group.<sup>5,9</sup>

This evidence indicates that, as in younger age groups, the behaviors that most significantly affect health in older people are smoking, obesity, and physical inactivity.<sup>5</sup> However, the recently observed compression of morbidity cannot entirely be explained by improvements in these factors. The reduced prevalence of smoking over the past several decades, discussed in Chapter 15, is no doubt responsible in part for the fact that the elderly are healthier than they used to be. But the increased prevalence of overweight, obesity, and physical inactivity would be expected to have the opposite effect, leading to increased disability in older people.

Smoking is always a major risk factor for cardiovascular disease and cancer, still the leading causes of death in those over 65. Chronic obstructive pulmonary disease is caused almost entirely by smoking. Osteoporosis and disorders of the mouth are also made worse by smoking. It is significant that prevalence of smoking drops off with increasing age, in part because many older people have succeeded in quitting and in part because many smokers die before they reach old age. In 2005, only about 9 percent of American men aged 65 and over smoked. The rate among older women was only 8 percent.<sup>4</sup>

Nutrition and physical activity are the other most important determinants of health in old age. As seen in Chapter 16, diet and exercise affect the risk of cardiovascular disease and cancer. Overweight and obesity, the result of overnutrition and lack of exercise, increase the risk not only of the leading killers, but also of diabetes and arthritis of the weight-bearing joints. Interestingly, the percentage of the population that is overweight and obese decreases after age 65, as seen in Figure 28-4. The reason for this is not known, but one theory is that, like cigarette smokers, obese people die at an earlier age. This may explain in part the apparent paradox between the obesity epidemic and the trend toward better health in the older population.

Because obese people are more likely to report poor health than people of normal weight, it is likely that the compression of morbidity seen in recent years will be reversed unless the obesity epidemic can be halted.<sup>10</sup> However, some studies suggest that the health effects of obesity in older people may be less harmful.<sup>6</sup>

Obesity is not the only outcome of poor diet and lack of exercise. Elderly individuals need physical activity to maintain muscle strength, balance, and cardiovascular fitness, which protect them against osteoporosis and falls. The special nutritional needs of the elderly are not well understood, but adequate calcium and vitamin D are clearly important for the strength of bones and teeth. There is little evidence about the special effects of other nutrients in protecting against the diseases of the elderly, and the best advice is, as for younger people, to eat a varied diet low in fat and rich in fruits and vegetables.

Through the 1990s more and more evidence appeared suggesting that hormone replacement therapy (HRT) might have broad health advantages for older women in addition to its well-known efficacy in fending off the symptoms of menopause. A number of epidemiologic studies, including the cohort of 60,000 women in the Nurses' Health Study, showed that estrogen therapy was associated with lower rates of heart disease and osteoporosis and perhaps Alzheimer's as well. On the other hand, the hormone increases the risk of breast and uterine cancer. In a 1997 publication, the investigators concluded that HRT reduced women's overall risk of dying as

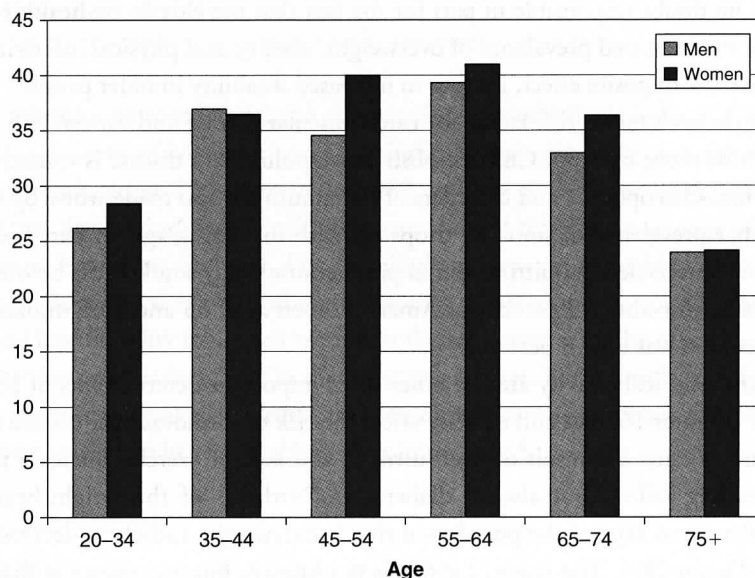


FIGURE 28-4 Percentage of Population Obese by Age and Sex, 2003–2006. *Source:* Data from National Center for Health Statistics, *Health, United States*, 2008. Table 75.



long as they took the hormones.<sup>11</sup> The hopes for estrogen's antiaging effects were crushed, however, with the publication of the clinical trial conducted as part of the Women's Health Initiative, as discussed in Chapter 6. The trial found that although HRT helped to prevent osteoporosis and the symptoms of menopause, it actually increased the risk of heart disease, strokes, and even Alzheimer's disease. It seems that the apparent benefits of estrogen were caused by the confounding factor that women who chose HRT were healthier and more likely to have a healthy lifestyle than those who chose not to use the hormone.<sup>12</sup>

Other aspects of medical care have probably contributed to reductions in disability among the elderly. For example, secondary prevention such as the use of drugs to treat diabetes, high blood pressure, and high cholesterol have undoubtedly reduced morbidity and mortality in many older people. The number of total knee replacements for arthritis and cataract surgeries has doubled over the past two decades, greatly reducing disabilities and improving quality of life. Still, there are concerns about shortages of healthcare workers, especially those with education and training in caring for older adults.<sup>13</sup> According to the Institute of Medicine, older adults, currently 12 percent of the population, account for approximately 26 percent of all physician office visits, 35 percent of hospital stays, 34 percent of prescriptions, and 38 percent of emergency medical service responses. The Institute of Medicine predicts that the current workforce is not large enough to meet the needs of the growing number of elderly.

## Preventing Disease and Disability in Old Age

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Much of the disease and disability common in later life is linked to unhealthy behavior in earlier years. However, there are preventive measures that the elderly and their caregivers can take to improve their quality of life and prospects for independence even after health has begun to fail. Some of these measures are well known and easily available, such as vaccination against pneumonia and influenza. Some are beneficial and appropriate for people of any age, such as smoking cessation and blood pressure control. Others are not widely recognized or well understood. Research is needed on how to prevent many of the debilitating conditions and how to minimize their impact on quality of life for the elderly. In a 1990 report, the Institute of Medicine identified a number of the most common problems of the elderly and made recommendations for combating them.<sup>14</sup> These problems commonly and uniquely afflict the elderly and have a severe impact on their quality of life but are not among the leading causes of death. Despite the passage of twenty years since the Institute of Medicine report, these difficulties are still causing trouble for older people.

### *Medications*

Although chronic conditions that afflict many of the elderly can be helped by prescription drugs, some of these treatments have unwanted side effects that may seriously impair health and quality of life. Little is known about how the body's ability to metabolize drugs changes with age. Kidney and liver function are often impaired in older people, leading to increased sensitivity to drugs. In older bodies, a higher percentage of body weight is fat, which metabolizes drugs less actively, causing an increased risk of overdoses. Moreover, older people often take a number of medications for various chronic conditions. This could lead to unexpected interactions between drugs, including over-the-counter drugs, because patients tend not to inform their doctors about these medications.

Reducing the risks from adverse drug reactions requires education and vigilance by everyone involved. Elderly patients' needs for medications should be reassessed regularly. In some cases, the potential benefit provided by a drug—for example, improved heart function—may not be worth the damage it could cause to other aging organs, for example, the brain. According to the Institute of Medicine, there is an urgent need for more research on risk versus benefit of various types of drugs in the elderly. There is also a need for better coordination and monitoring of medical care, a need that might be better filled by managed care than by fee-for-service care, which currently dominates in serving the Medicare population.

### *Osteoporosis*

Bone loss is common with age, especially in women. This loss leads to osteoporosis—"porous bones," which tend to break easily. Bone loss among women is greatest in the years following menopause. Smoking and alcohol consumption increase the risk of osteoporosis; obesity reduces the risk (one of the few health benefits of being overweight). White women have the greatest risk for the condition; black men have the lowest, and Asians have intermediate risk. A number of medications commonly used by older people cause bone loss. Some diseases also cause bone loss. The degree of osteoporosis depends on bone density earlier in life, which is determined by a number of factors including genetics, diet, and physical activity. Thus, drinking milk and exercising during youth can protect women against osteoporosis in old age. Unfortunately, girls tend to not take the threat seriously when these habits could do them the most good. Surveys have found that the average amount of calcium women obtain in their diet is significantly below the recommended amount.<sup>15</sup>

Osteoporosis itself has no symptoms, and most older people are unaware that they have the problem until they suffer a broken bone. Hip fractures are the most serious consequence of osteoporosis; there is a significant risk that a hip fracture might lead to substantial disability and death. Of those aged 65 or older who suffer a hip fracture, about 20 percent die within a year.<sup>15</sup>

About 20 percent of the survivors end up in nursing homes because they are unable to walk or care for themselves. Wrist fractures are also a frequent result of osteoporosis, but there is little data on their frequency. Fractures of the vertebrae, even more common, might go unrecognized but often lead to progressive loss of height and the curvature of the upper spine called "dowager's hump." Some osteoporotic fractures are untreatable and cause chronic, debilitating pain. A Surgeon General's report on bone health, published in 2004, estimated that about 1.5 million people per year suffer a bone fracture related to osteoporosis, and the cost of caring for these patients is up to \$18 billion per year.<sup>15</sup>

Considerable research has been done on how to prevent osteoporosis. The Framingham Study, among others, found that taking estrogen after menopause can protect women from bone loss and reduce the risk of hip fracture.<sup>16</sup> However, HRT is no longer recommended for older women, as previously discussed. The Surgeon General's report makes a number of recommendations for preventing osteoporosis. These include getting adequate amounts of calcium (1000 milligrams [mg] per day for adults under 50 years and 1200 mg for those over 50) and vitamin D (200 mg per day for everyone up to 50 years, 400 mg for those 51 to 70, and 600 mg for those over 70). Good sources of calcium are milk, leafy green vegetables, soybeans, yogurt, and cheese. Vitamin D is produced in the skin by exposure to the sun and is found in fortified milk and other foods. Other recommendations include being physically active at least thirty minutes per day for adults and sixty minutes per day for children, including weight-bearing activities, which have been shown to increase bone strength.<sup>15</sup>

Bone scan tests can screen for risk of osteoporosis, and the Surgeon General's report recommends that the test be used to screen all women over 65 and younger men and women who have risk factors, including previous fractures. When the test shows bone thinning, drugs are available that help to prevent further loss of bone mass. The drugs have been found to reduce the fracture rate by about 50 percent.

## *Falls*

Most osteoporotic fractures occur when elderly people fall. Thus, in addition to osteoporosis prevention, public health efforts focus on preventing falls. More than one third of people 65 and older fall each year; many of them fall repeatedly. About one fall in ten results in a serious injury, such as a fracture or head injury. Many older people have a high risk of falls because of medical conditions that affect their mobility, such as arthritis, stroke, and Parkinson's disease. Other risk factors include vision impairment, muscular weakness, problems with balance, and the side effects of medications. The use of four or more prescription drugs is considered a risk factor for falls. Psychoactive drugs such as antidepressants, tranquilizers, and sleeping pills are especially dangerous.<sup>16</sup>

The Centers for Disease Control and Prevention recommends five measures older people can take to prevent falls. They should exercise regularly. Muscle strengthening exercises can significantly increase their mobility, strength, and balance. People should have their medications reviewed, as discussed above, to reduce drug interactions and side effects. They should have yearly eye exams. They should improve the lighting in their homes, and they should reduce fall hazards in the home. The environment can be fall-proofed by such means as covering floors with tacked-down carpets, keeping walkways clear of obstacles, equipping bathrooms with grab bars around toilets and tubs, keeping stairways well lit, and using night lights.<sup>17</sup>

Clinical trials have shown that vitamin D supplements can reduce the risk of falls independently of their value in osteoporosis prevention. The vitamin appears to directly improve muscle strength.<sup>18</sup>

### *Impairment of Vision and Hearing*

Loss of vision and hearing are among the most prevalent conditions among elderly Americans. Either condition may be disabling, limiting the individual's ability to interact with the environment and communicate with others. Loss of vision increases the risk of falls and other injuries. It may restrict the individual's ability to drive, a significant handicap in many parts of the country. Impairment of either vision or hearing is likely to lead to social isolation, a risk factor for poor health at any age (see Chapter 14) and an even greater risk factor in the elderly. Sensory loss also is associated with depression and cognitive impairment in the elderly.

The leading causes of visual impairment among the elderly are cataracts, glaucoma, macular degeneration, and diabetic retinopathy. Cataracts—clouding of the lens—are the most prevalent cause of eye disease; by age 80, more than half of Americans either have a cataract or have had cataract surgery. Exposure to sunlight contributes to the lens damage, so wearing sunglasses and hats with brims can help protect the eyes. Smoking increases the risk of cataracts, as does diabetes. Most cataracts can be effectively corrected by surgery in which the clouded lens is removed and replaced with a synthetic lens.<sup>19</sup>

Glaucoma is a gradual increase in pressure within the eye that causes damage to the optic nerve. It is not known why this occurs or how it can be prevented. It is a common cause of blindness, especially in African Americans and Hispanics. People with a family history of the disease have an increased risk. Secondary prevention is the best approach to controlling glaucoma: regular eye checkups can catch the increase in pressure before it causes harm, and the pressure can be reduced with medication in the form of eye drops.<sup>19</sup>

Macular degeneration involves the breakdown of the light-sensing cells in the macula, the central part of the retina. The risk of macular degeneration increases with age. People with a family history have a greater risk. Whites are at greater risk than blacks, and women have a higher risk than men. Smoking may increase the risk. The cause of macular degeneration is

not well understood, and there is no known way to prevent the disease. Progression of some forms of the disease can be slowed by drugs that are injected into the eye. Researchers are studying whether certain vitamins and minerals might help to slow the progress of the disease.<sup>19</sup> There is some evidence that high levels of vitamin D in the blood may protect against macular degeneration.<sup>20</sup>

Diabetic retinopathy is a common complication of diabetes that poses a major risk to vision. The condition occurs when high blood sugar damages the tiny blood vessels in the retina. Strict blood sugar control helps to reduce the extent of this damage, and the condition can be treated with laser surgery.<sup>19</sup>

The most common form of hearing loss among the elderly is characterized by reduced sensitivity to higher frequency tones and, therefore, difficulty in comprehending speech. This pattern is similar to that associated with exposure to excessive noise. In fact, populations living in relatively noise-free environments are less likely to suffer age-related hearing loss. The proportion of Americans affected by hearing impairment ranges from about 30 to 35 percent of individuals 65 to 74 to half of those 85 and older, and that proportion is expected to increase with the aging of generations that thrive on rock concerts and iPods. Many products can help people to hear better, including hearing aids, telephone amplifying devices, and assistive listening devices in public places such as movie theaters, churches and synagogues, and auditoriums.<sup>21</sup>

One barrier that limits the access of many older individuals to services and devices that correct the effects of sensory loss, such as glasses and hearing aids, is that Medicare does not cover them.<sup>14</sup>

### *Oral Health*

As people age, they suffer increasingly from diseases and impairments of the mouth, including tooth loss, dental caries, periodontal disease, salivary dysfunction, cancer and precancerous conditions, and chronic pain. Such problems can have a severe impact on quality of life. They may impair the individual's ability to chew, taste, and swallow, thereby posing a threat to physical health and nutrition far beyond the anatomical parts that are primarily affected. Like sensory impairments, disorders of the mouth may diminish social functioning by affecting speech, facial esthetics, and self-esteem. Oral health in old age, like overall health, depends on healthy behaviors throughout life, but older people can improve their health status by instituting healthier habits at any time. They can quit smoking, use better oral hygiene self-care practices, and use professional dental services. Unfortunately, many of the elderly do not have access to dental services for financial reasons, and Medicare does not cover them.<sup>14</sup>



### *Alzheimer's and Other Dementias*

Alzheimer's disease is one of the most dreaded afflictions of old age. It robs the individual of memory and individuality, and eventually reduces him or her to the helplessness of an infant. Caring for someone with Alzheimer's imposes a crushing emotional, physical, and financial burden on a family. Dementia among the elderly is a major public health problem, currently affecting about five million people in the United States at a cost of more than \$148 billion per year; much of this cost is for long-term care in nursing homes.<sup>22</sup>

Alzheimer's is the most common cause of dementia in the elderly, although there is no definitive diagnostic test for the disease, which can be identified for certain only on autopsy. The risk of dementia increases with age, becoming especially high in the oldest age group. The Alzheimer's Association estimates that 2 percent of Americans aged 65 to 74 have the disease. From age 75 to 84, prevalence is 19 percent, and among those 85 and older, it is 42 percent. With the rapid increase in the oldest-old population, it is estimated that by the middle of the 21st century, between 11 and 16 million Americans could be suffering from Alzheimer's disease unless a way can be found to prevent or effectively treat the disease.<sup>22</sup>

While a few types of dementia are treatable, there is no cure for Alzheimer's. Until recently, virtually nothing was known about its cause or how the disease could be prevented. However, the magnitude of the problem has stimulated a great deal of research. Biomedical scientists have learned a great deal about the changes in the brain that are typical of Alzheimer's disease. These changes include characteristic tangles of fibers within brain cells and deposits of the protein beta-amyloid, called plaques, in extracellular spaces. These changes lead to the loss of connections between nerve cells, which eventually die, and the brain atrophies. Several genes have been identified that influence the risk that an individual will develop Alzheimer's disease. Much of what is known about the disease has come from studies of a rare early-onset form of the disease, which is largely determined by genetics.<sup>23</sup> In some families, this form is inherited as an autosomal dominant mutated gene, causing symptoms to appear between ages thirty and sixty. An animal model of Alzheimer's has been developed by genetically engineering a mouse with a mutant human gene so that it produces amyloid plaques and develops memory loss as it ages. These animals can be used to study methods of preventing plaque formation.<sup>23</sup>

Risk for the more common late-onset form of Alzheimer's is also affected by genes, a few of which have been identified. However, nongenetic factors play a significant role in the development of the late-onset form. This offers hope that it will be possible to prevent, or at least postpone, the onset of the disease. Some experts predict that merely delaying the onset of Alzheimer's by an average of five years could reduce the number of cases by half, because many potential victims are nearing the end of their lives for other reasons. Factors that have been found to increase the risk of Alzheimer's include risk factors for cardiovascular disease.

This suggests that preventive measures against heart disease, such as weight control, physical activity, avoidance of smoking, treatment of high blood pressure and cholesterol, and aspirin, might help against dementia as well.<sup>23</sup> Diabetes increases the risk of Alzheimer's as it does cardiovascular disease.

A number of studies have followed cohorts of people to try to determine what factors might influence their risk of developing Alzheimer's. Several of these studies have found that formal education seems to protect the brain, providing people with "cognitive reserve." According to this theory, when aging begins to cause pathology in the brain, people with a larger reserve would be better able to function normally. This theory is supported by evidence from the Swedish Twin Registry of 109 pairs of identical twins in which one twin had been diagnosed with dementia and the other had not. The twin with the dementia had significantly less education than the healthy one.<sup>24</sup>

However, a different theory comes from the Nun Study of 678 Sisters of Notre Dame, who had similar lifestyles and medical care throughout their lives. The nuns, all born before 1917, had been required to write an autobiographical essay when they entered the convent. It turned out that the nuns who had demonstrated the lowest linguistic skills in their essays, written in their early 20s, were most likely to develop Alzheimer's as they aged. This evidence suggests that the sisters with higher linguistic ability were more resistant to developing brain pathology in the first place.<sup>24</sup>

Other studies have suggested that all forms of mental activity—reading, puzzles, cards, board games, crafts, playing a musical instrument—are protective. On the other hand, watching television is correlated with an increased risk. It is not clear, however, whether less participation in intellectually demanding activities is merely an early symptom rather than a cause of the disease.

Physical exercise has been found in a number of studies to protect against Alzheimer's. The Nurses' Health Study, for example, found that women who got the most exercise showed less cognitive decline over the years than less active women. This is consistent with evidence, discussed above, that the brain is protected by the same factors that protect the heart. Participating in social activities also appears to help protect people's brains.<sup>24</sup>

A number of medical approaches are being tested to treat or prevent Alzheimer's disease. Vaccines against beta-amyloid have been tested in humans with mixed results. Drugs that act on the neurotransmitters—chemicals that carry signals between nerve cells—have been shown to delay progression of some symptoms, and these drugs have been approved by the Food and Drug Administration.<sup>23</sup> There was great hope that HRT would protect against Alzheimer's, as discussed earlier in this chapter, but the Women's Health Initiative found evidence to the contrary.

There is some evidence that taking nonsteroidal anti-inflammatory drugs (NSAIDs) could reduce the risk of Alzheimer's disease. Arthritis patients who take regular doses of these drugs—such as aspirin, ibuprofen, naproxen—to control their pain have been observed to have an unusually low risk of dementia.<sup>25</sup> Inflammation is found in the brains of Alzheimer's patients, further supporting the approach of treating them with NSAIDs. However, in December 2004, the National Institutes of Health halted a major clinical trial testing whether Celebrex—one of a new type of NSAIDs called COX-2 inhibitors—could prevent Alzheimer's. When Vioxx, another COX-2 inhibitor, was pulled from the market for increasing the risk of heart disease, as discussed in Chapter 23, questions were raised about other drugs of the same type. A number of studies testing this group of NSAIDs for cancer prevention were also halted as a result of the new data on risk to the heart. COX-2 inhibitors had been thought safer than the older NSAIDs because they were less likely to cause bleeding in the digestive tract. Now, there is uncertainty about the safety even of some of the older NSAIDs.<sup>26</sup> Since the older people who have the greatest risk for Alzheimer's are also likely to have a greater risk for heart disease, the wisdom of treating them long-term with anti-inflammatory drugs now seems questionable.

## Medical Costs of the Elderly

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Medicare, the federal program that pays medical bills for elderly Americans, is already feeling the strain of the aging population. The number of people enrolled for Medicare coverage has more than doubled since 1966, from 19.1 million then to 45.9 million in 2009, and the numbers will swell much more rapidly as the baby boomers retire.<sup>27</sup> The number of workers whose earnings contribute to the system is growing at a much slower pace. The same problem applies to Social Security, the retirement system for the elderly. In 2008, there were 3.2 workers supporting every retiree; by the year 2034, only 2.1 workers will be expected to support each retiree.<sup>28</sup> The government projects that, at the current rate, the system will go into the red in 2016, but the Social Security trust fund will keep the program solvent until 2037.<sup>28</sup> Medicare's problems are worse than Social Security's, however, because its costs are less predictable. Not only is the number of people enrolled growing, but the cost per enrollee is also rising, even faster than healthcare cost inflation overall. The average annual expenditure for each Medicare enrollee rose from about \$1200 in 1980 to \$7064 in 2005.<sup>29</sup> If present trends continue, Medicare spending is projected to nearly double from \$477 billion in 2009 to \$871 billion in 2018.

Despite the large expenditures that threaten Medicare's solvency, the program pays only 49 percent of the healthcare costs of its enrollees.<sup>29</sup> About one in five beneficiaries purchase "Medigap" insurance policies that help pay for expenses not covered by Medicare. Employer-sponsored retiree health plans provide supplemental coverage for about a third of beneficiaries.

Medicaid, with funding provided jointly by federal and state governments, acts as a Medigap policy for the poor elderly. The Medicaid program, which was intended to serve the poor, and poor children in particular, has increasingly been called on to pay for services for the elderly that Medicare does not provide, especially nursing home care and home health care. Because of the high costs, most nursing home patients rapidly deplete their savings and become poor enough to qualify for Medicaid, which does cover such care. Almost half of all nursing home costs are paid by Medicaid, which like Medicare, has seen its budget mushroom, from \$25.8 billion in 1980 to almost \$351.8 billion in 2008. While the elderly constitute only 9 percent of the persons enrolled in Medicaid, they consume 22.5 percent of the Medicaid budget.<sup>27</sup> This aspect of the crisis in healthcare costs for the elderly has received less attention than the problems of Medicare.

Past efforts to rein in the growth of government expenditures for the elderly's medical bills have meant that these patients bear a higher percentage of the costs through higher premiums and copayments. By 2005, 17 percent of the medical costs of the elderly were paid by the elderly themselves and that does not include premiums for Medicare and private Medigap policies. Nearly half of all elderly households have annual incomes less than 200 percent of the poverty level, or \$28,000 for a couple. Beneficiaries pay an average of 17 percent of their household income on medical expenses.<sup>29</sup> This trend threatens the Medicare population with rationing by ability to pay, a matter of great concern to them.

Another approach to controlling growth of costs has been to reduce reimbursement to medical providers, a strategy that, it is feared, could induce some providers to refuse treatment to Medicare patients. In 1997, Congress tried to control Medicare costs by providing incentives for the elderly to enroll in managed care plans, an approach that had been successful in younger groups. However, over the next few years, there were many problems with the plans, in part because of Congress's efforts to control costs. The plans raised premiums and reduced benefits; providers withdrew from the plans; and a large number of plans withdrew from the Medicare program. In 2003, only 12 percent of Medicare enrollees chose managed care despite incentives to encourage them to do so.<sup>30</sup> Moreover, costs to Medicare were higher for beneficiaries enrolled in the private plans than for those who chose fee-for-service. The 2003 legislation that established prescription drug benefits also contained provisions meant to encourage the use of private managed care plans, now called "Medicare Advantage" plans. Some of these plans offer supplemental benefits, such as vision or hearing or prescription drugs. In 2009, 22 percent of Medicare beneficiaries were in Medicare Advantage plans. These plans have been criticized because they cost the government more money than regular fee-for-service Medicare.<sup>31,32</sup>

The Medicare prescription drug plan, or Medicare Part D, which became effective in 2006, was inspired by news stories of old folks having to choose between drugs and food. The plan has indeed helped many old people to pay for their medicines, but it has many drawbacks and

sources of confusion. In contrast to traditional Medicare, Part D is optional and is offered exclusively through private plans. These vary widely, offering different choices of drugs, with widely varying premiums, a situation that can be very confusing to the elderly. Most bizarre, the benefit structure features the so-called "doughnut hole," which was instituted to prevent the new benefit from costing more than Congress wanted to spend. Each year, beneficiaries must pay for the first \$295 of their drug costs; then the plan covers 75 percent of their costs up to \$2700 in total expenses. At that point individuals must pay 100 percent of their prescription costs until their total expenditures have reached \$3454, at which catastrophic coverage kicks in. When the coverage gap has been reached, the elderly are back in the situation they were in before Part D took effect, and many find it hard to afford the cost of their medicines. By 2009, nearly 60 percent of Medicare beneficiaries were enrolled in Part D; another 30 percent had prescription coverage through employers' retiree health plans or other sources such as the Veterans Administration.<sup>33</sup> The program adds to the growth in Medicare costs, amounting to 11 percent of Medicare spending in 2009.<sup>29</sup>

On the Medicaid side, costs for the program have increased faster than those of Medicare, putting immense strain on state budgets. About 30 percent of Medicaid spending is for long-term care, not only for the elderly, but also for the disabled.<sup>27</sup> Many states set low reimbursement rates for long-term care providers in order to save money. Some states try to control costs through regulations limiting the number of available nursing home beds. In response, nursing homes tend to preferentially admit patients who can pay their own bills, usually at higher rates than allowed by Medicaid. Consequently, there is a large and growing unmet need among the less affluent elderly for nursing home care.

Unless the baby-boom generation turns out to be significantly healthier and more independent than the aged and oldest old of today, their need for nursing homes and other forms of long-term care is likely to reach critical proportions. In the past, and even today, most elderly Americans who need help with the activities of daily living have been cared for by their families, with primary responsibility borne by a daughter or daughter-in-law. A number of trends make these arrangements less feasible in the future. Baby boomers have fewer children to share the burden of caring for them in old age than did previous generations. The increased divorce rate has led to more complicated family arrangements, which may make it more difficult for the younger generation to take their parents into their homes. A more mobile society means that many children live far away from their parents. Moreover, most women work outside the home. Thus, just as the government is reducing social services for the elderly, old people may be less able to depend on their families for the help they need.



## Proposals for Rationing

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As it has become obvious that the growth in healthcare costs for the elderly has become unsustainable, various proposals have been made for controlling the costs through a systematic process that would be fair and equitable, such as rationing. Richard Lamm, a former governor of Colorado, was one of the first to draw attention to the idea by suggesting in 1984 that older persons have a duty to die and get out of the way.<sup>34</sup> His concern was that, as the elderly consume increasing amounts of medical care, society is cutting back on care for children and working people, jeopardizing their future and the productivity of society as a whole. Moreover, as medical costs—largely for the elderly—consume an increasing proportion of the national budget, the government is making cutbacks in other social programs, such as education or food programs targeted for the young, which are important for the future health and prosperity of the country.

Most of the proposals for rationing involve denying expensive life-prolonging technology to people over a set age, which seems unfair because it appears to punish people who have taken care of their health, or denying it to people who are not expected to achieve a substantial improvement in quality of life from the treatment, an approach that has many defenders. In some cases, expensive treatments are denied to people who are seen as causing their own medical problems through unhealthy behavior; for example liver transplants are often denied to alcoholics who cannot or will not stop drinking, justified because the new scarce organ is likely to be similarly destroyed.

Considering how the nation should care for its increasing numbers of elderly citizens requires examination of our ethics and values as a society. The questions raised are difficult to answer and most people would prefer not to think about them. However, refusal to take responsibility for solving the problems that will inevitably face us will lead to desperation among the elderly and those who must care for them, especially people who do not have the resources to pay for needed care.

The current interest in assisted suicide is one consequence of ill and elderly patients' fear that they will not receive humane care as they lose control and independence. Euthanasia is only a step further, and its widespread use would certainly cut the costs of caring for the dying, an incentive feared by its opponents. Desperate families might increasingly resort to "granny dumping"—abandoning in a public place an unidentified elderly person, most often someone with Alzheimer's disease—when they feel they can no longer cope with caring for a difficult dependent.

Although Governor Lamm's statement outraged some, evidence says his suggestion makes sense. He explained his reasoning by saying that he was referring to the terminally ill, that they should not attempt to prolong their lives by artificial means, generating high medical costs and

often adding to their suffering. John Wennberg and the Dartmouth research group, whose work is discussed in Chapter 27, have found that geographical variations in end-of-life care demonstrate that a significant amount of the spending is wasted. The work also shows that more aggressive care is not necessarily better quality care.

The Dartmouth group compared the care of patients dying of chronic diseases, such as cancer and heart failure, in different geographical areas. The studies confirmed that there are wide variations in Medicare spending, determined largely by the aggressiveness of care. Patients in high-spending areas spent more time in the hospital, more time in intensive care, and had more visits to physician specialists. These patients do not have better survival. In fact, there is evidence that the higher-intensity pattern of care may have worse outcomes.<sup>35</sup> Examples of expensive care that could be considered futile are kidney dialysis for frail nursing home residents with end-stage renal disease, which offers little benefit for most of them, and burdensome interventions in Alzheimer's patients last three months of life, when hospice or "comfort" care would have been more appropriate.<sup>36,37</sup> As Dr. Wennberg is quoted as saying, "Some chronically ill and dying Americans are receiving too much care—more than they and their families actually want or benefit from."<sup>38</sup> The Dartmouth researchers note that Medicare costs could be greatly reduced, and end-of-life care might be more humane, if all parts of the country used the same patterns of care as the low-cost areas.

Applying lessons from the study of regional variations is not what is usually considered rationing. It is merely common sense. It requires patients and their families to consider what they want at the end of their lives and discuss it with their families and doctors. The issue is still highly controversial, however. During the 2009 debate over healthcare reform, a proposal calling for Medicare reimbursement for doctors who counseled patients about end-of-life care provoked accusations that President Obama was advocating "death panels."

Perhaps the greatest hope for reducing costs in an aging population is the possibility of improved health for the elderly, the compression of morbidity that most people would wish for as they look forward to longer lives. This is a realistic hope in that the baby-boom generation is relatively well educated as compared to preceding generations, and more education correlates with better health in the elderly as in other age groups. A consortium of opinion leaders has proposed that this goal could be more readily achieved through a conscious policy of integrating public health and medical services with the aim of reducing the need and demand for medical care.<sup>39</sup> The advocates include James F. Fries, author of the University of Pennsylvania alumni study described earlier in this chapter, who has long argued that compression of morbidity is already occurring, and former Surgeon General C. Everett Koop. Fries and Koop propose that the goal of an integrated healthcare system should be to postpone the onset of chronic infirmity—which accounts for the bulk of illness in the population—by reducing risk factors such as smoking, dietary fat intake, lack of exercise, and failure to wear seat belts,

measures that would reduce the need for medical care. In addition, they suggest that demand for medical care could be reduced by educating individuals to assume more responsibility for their own health, including self-management of chronic disease. The Fries–Koop consortium's proposal is in effect an integration of the missions of public health and medicine, a "doubly positive policy goal," they write; "it promises better health for the individual and lowering of the medical costs that now consume a dangerously high share of our nation's productivity."<sup>39</sup>(p.82)

## Conclusion

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The American population is aging. Because older people tend to use medical services more than younger people, there are fears that the reliance of an increasing percentage of the population on Medicare to pay for their medical costs will overwhelm the system.

Factors that increase the risk of chronic disability in the elderly—and thus drive up medical costs—are similar to those that cause premature mortality in younger people. These include smoking, poor diet, physical inactivity, and unsafe driving practices. Public health aims to prevent the major killers, such as cardiovascular disease, cancer, diabetes, and injuries, but it also has a role in secondary and tertiary prevention of a number of problems common in elderly patients that can adversely affect their independence and quality of life. These include overmedication, osteoporosis, falls, impairment of vision and hearing, impairments of the mouth, and Alzheimer's and other dementias.

A key question in planning for the future is whether the compression of mortality—the increasing probability that people will survive until the biological limit of life span—will be accompanied by a compression of morbidity, permitting people to remain healthy until shortly before they die. As medical costs of the elderly have grown, and as the baby-boom generation approaches retirement, it has become clear that current trends would cause the system to be overwhelmed. Various proposals for rationing medical care have been put forward. Evidence on geographical variations on end-of-life care intensity and cost suggests that care could be delivered much more efficiently without sacrificing quality. The best hope for avoiding the need for rationing, and at the same time for improving quality of life for the elderly, would be to devise a way of integrating public health measures with the medical system to prevent chronic disease in the elderly, thereby reducing the need and demand for medical care.

## References

1. M. W. Serafini, "The Real Medicare Crisis Ahead," *National Journal* (June 5, 2004).
2. U.S. Bureau of the Census, "65+ in the United States: 2005," [www.census.gov/prod/2006pubs/p23-209.pdf](http://www.census.gov/prod/2006pubs/p23-209.pdf), December 2005, Accessed October 5, 2009.
3. National Center for Health Statistics, "Health, United States, 2008," [www.cdc.gov/nchs/data/health/us08.pdf#listables](http://www.cdc.gov/nchs/data/health/us08.pdf#listables), Table 26, October 5, 2008.
4. Federal Interagency Forum on Aging-Related Statistics, "Older Americans: 2008: Key Indicators of Well-Being," [www.agingstats.gov/agingstatsdotnet/Main\\_Site/](http://www.agingstats.gov/agingstatsdotnet/Main_Site/), accessed October 5, 2009.
5. J. F. Fries, "Measuring and Monitoring Success in Compressing Morbidity," *Annals of Internal Medicine* 139 (2003): 456–459.
6. K. G. Manton, "Recent Declines in Chronic Disability in the Elderly U.S. Population: Risk Factors and Future Dynamics," *Annual Review of Public Health* 29 (2008): 91–113.
7. S. H. Altaire et al., "Evidence for Decline in Disability and Improved Health among Persons Aged 55 to 70 Years: The Framingham Heart Study," *American Journal of Public Health* 89 (1997): 1678–1683.
8. E. M. Crimmins, "Trends in the Health of the Elderly," *Annual Review of Public Health* 25 (2004): 79–98.
9. A. J. Vita, R. B. Terry, H. B. Hubert, and J. F. Fries, "Aging, Health Risks, and Cumulative Disability," *New England Journal of Medicine* 338 (1998): 1035–1066.
10. R. Sturm, J. S. Ringel, and T. Andreyeva, "Increasing Obesity Rates and Disability Trends," *Health Affairs* 23 (March/April 2004): 199–205.
11. F. Grodstein et al., "Postmenopausal Hormone Therapy and Mortality," *New England Journal of Medicine* 336 (1997): 1769–1775.
12. National Institutes of Health, "Menopausal Hormone Therapy Information," [www.nih.gov/PHTIndex.htm](http://www.nih.gov/PHTIndex.htm), February 11, 2009, accessed October 9, 2009.
13. U.S. Institute of Medicine, *Retooling for an Aging America: Building the Health Care Workforce* (Washington, DC: National Academies Press, 2008).
14. U.S. Institute of Medicine, *The Second 50 Years: Promoting Health and Preventing Disability* (Washington, DC: National Academy Press, 1990).
15. U.S. Department of Health and Human Services, *Bone Health and Osteoporosis: A Report of the Surgeon General* (Washington, DC: Government Printing Office, 2004).
16. M. E. Tinetti, "Preventing Falls in Elderly Persons," *New England Journal of Medicine* 348 (2003): 42–49.
17. Centers for Disease Control and Prevention, "Falls Among Older Adults: An Overview," [www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html](http://www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html), October 6, 2009, accessed October 9, 2009.
18. H. A. Bischoff-Ferrari et al., "Effect of Vitamin D on Falls: A Meta-analysis," *Journal of the American Medical Association* 291 (2004): 1999–2006.
19. National Eye Institute, "Eye Health Information," [www.nei.nih.gov/health/](http://www.nei.nih.gov/health/), October 2009, accessed October 9, 2009.
20. N. Parekh et al., "Association between Vitamin D and Age-Related Macular Degeneration in the Third National Health and Nutrition Examination Survey, 1988 Through 1994," *Archives of Ophthalmology* 125 (2007): 661–669.

21. National Institute on Deafness and Other Communication Disorders, "Hearing, Ear Infections and Deafness," [www.nidcd.nih.gov/health/hearing/](http://www.nidcd.nih.gov/health/hearing/), February 23, 2009, accessed October 9, 2009.
22. Alzheimer's Association, "Alzheimer's Disease Facts and Figures, 2007," [www.alz.org/national/documents/report\\_alzfactsfigures2007.pdf](http://www.alz.org/national/documents/report_alzfactsfigures2007.pdf), accessed October 11, 2009.
23. National Institute on Aging, "Alzheimer's Disease: Unraveling the Mystery," [www.nia.nih.gov/Alzheimers/Publications/Unraveling/](http://www.nia.nih.gov/Alzheimers/Publications/Unraveling/), September 2008, accessed October 11, 2009.
24. J. Marx, "Preventing Alzheimer's: A Lifelong Commitment?" *Science* 309 (2005): 864–866.
25. L. Helmuth, "Protecting the Brain While Killing Pain?" *Science* 297 (2002): 1262–1263.
26. J. Couzin, "FDA Panel Urges Caution on Many Anti-Inflammatory Drugs," *Science* 307 (2005): 1183–1184.
27. U.S. Department of Health and Human Services, "2009 CMS Statistics," [www.cms.hhs.gov/ResearchGenInfo/02\\_CMSStatistics.asp#TopOfPage](http://www.cms.hhs.gov/ResearchGenInfo/02_CMSStatistics.asp#TopOfPage), accessed October 11, 2009.
28. Social Security Administration, "Fast Facts & Figures About Social Security, 2009," [www.ssa.gov/policy/docs/chartbooks/fast\\_facts/](http://www.ssa.gov/policy/docs/chartbooks/fast_facts/), accessed February 23, 2010.
29. Kaiser Family Foundation, Fact Sheet: "Medicare at a Glance," [www.kff.org/medicare/upload/1066\\_11.pdf](http://www.kff.org/medicare/upload/1066_11.pdf), November 2008, accessed October 12, 2009.
30. Kaiser Family Foundation, Fact Sheet: "Medicare Spending and Financing," [www.kff.org/medicare/upload/7305-04-2.pdf](http://www.kff.org/medicare/upload/7305-04-2.pdf), May 2009, accessed October 12, 2009.
31. B. Biles, G. Dallek, and L. H. Nicholas, "Medicare Advantage: Déjà vu All Over Again?" *Health Affairs*, Web exclusive, <http://content.healthaffairs.org/cgi/reprint/hlthaff.w4.586v1>, December 15, 2004.
32. Kaiser Family Foundation, Fact Sheet: "Medicare Advantage," [www.kff.org/medicare/upload/2052-12.pdf](http://www.kff.org/medicare/upload/2052-12.pdf), April 2009, accessed October 12, 2009.
33. P. Neuman and J. Cubanski, "Medicare Part D Update—Lessons Learned and Unfinished Business," *New England Journal of Medicine* 361 (2009): 406–414.
34. Associated Press, "Gov. Lamm Asserts Elderly, If Very Ill, Have 'Duty To Die,'" *The New York Times*, March 29, 1994.
35. J. E. Wennberg et al., "Tracking the Care of Patients with Severe Chronic Illness: The Dartmouth Atlas of Health Care 2008." [www.dartmouthatlas.org/atlas/es.shtm](http://www.dartmouthatlas.org/atlas/es.shtm), accessed October 15, 2009.
36. R. M. Arnold and M. L. Zeidel, "Dialysis in Frail Elders—A Role for Palliative Care," *New England Journal of Medicine* 361 (2009): 1597–1598.
37. G. A. Sachs, "Dying from Dementia," *New England Journal of Medicine* 361 (2009): 1595–1596.
38. R. Pear, "Researchers Find Huge Variations in End-of-Life Treatment," *The New York Times*, April 7, 2008.
39. J. F. Fries et al., "Beyond Health Promotion: Reducing Need and Demand for Medical Care," *Health Affairs* (March/April 1998): 70–84.