

Public Health and Aging

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Public Health and Aging

*Maximizing Function and
Well-Being*
Second Edition

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*To our cherished teachers: our mentors,
students, and beloved older members
of our families and communities.*

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Preface

Cultural conceptions of the aging experience are many and often recognize a long arc of development followed by decline in later life. Consider Shakespeare's "seven ages of man" (*As You Like It*, II, 7). "One man in his time plays many parts, his acts being seven ages." The seven stages include infancy, "whining schoolboy . . . creeping unwillingly to school," lover, soldier ("seeking the bubble reputation even in the cannon's mouth"), judge or administrator, retirement based on frailty ("his big manly voice, turning again towards childish treble"), and finally "second childishness and mere oblivion . . . sans teeth, sans eyes, sans taste, sans everything."

Religious traditions also provide guidance on approaches to old age. Through a series of anecdotes, for example, the Talmud (i.e., Jewish law) teaches the obligation of honoring elderly parents. Stories feature parents who are physically frail and in some cases senile. Honoring parents involves what is now recognized as help with activities of daily living: offering food, helping with dressing, and assistance in getting around (*Bavli, Kiddushin* 31b). This obligation is traced back to an unusual source: the treatment of the first tablets of commandments, which were broken by Moses in anger upon seeing the Golden Calf. The fragments of the broken tablets were not discarded but rather kept alongside the new tablets that replaced them. Both were carried by the Israelites as they wandered through the desert (*Berakhot* 8b). The old shattered tablets were considered valuable by the community, not only in their own right, but also because they were linked to the newer tablets.

When the first edition of this book appeared in 2004, it noted that age is a dominating factor in health, as it is in so many social, psychological, and economic spheres. To see the centrality of age, consider these comments from our university alumni magazine (Cornell University, Spring, 2002). The 1995 graduate (age 30 or so) exhorts his classmates in this way: "May all your weddings be perfect, babies brilliant, exams easy,

jobs fun, and friends true.” The 1945 graduate (age 77 or so) makes this report: “Nothing to do and not enough time to do it.” The 1938 graduate (age 84 or so) reports, “Angina in April, pacemaker in July, angioplasty in August. Otherwise, fine.” And the 1934 graduate reports this: “My theme song now at 94 is ‘Don’t get around much any more!’” The same issue reports on the oldest living graduate of the college, a man from the class of 1916, aged 108. This long-time gardening columnist resides in an assisted living facility. Four generations of descendents attended his birthday party, which he remarked was “just a lot of fuss over me.” This man’s age puts him near the oldest-oldest old; the 2000 U.S. Census reported just 1,400 people over age 110 (of some 285,000,000).

Today aging poses a number of challenges for both individuals and the societies in which they live. The biomedical challenge is to develop ways to delay, prevent, or remediate much of the frailty and dementia that we observe in late life. The epidemiologic challenge is to identify risk factors that affect the incidence and progression of the chronic conditions that characterize old age, and that accordingly increase the prevalence of disability. The sociological challenge is to understand why different segments of populations experience old age and aging so differently, with groups defined by socioeconomic status or race already entering old age with very different resources, including cognitive and physical resiliency and social capital. The ethical challenge is to understand when to shift the goals of medical treatment from maximizing care to minimizing suffering.

These challenges have taken on a new urgency in the face of the imminent demographic change facing the United States and countries around the world. Over the next few decades older adults will reach numbers—and proportions—never before seen in human history. As we discuss in Chapter 5, longer life does not necessarily mean worse health and functioning. But the shift toward older ages is not simply a temporary phenomenon, but likely a permanent structural change with which public health must grapple.

Indeed, these different approaches to the challenges of aging come together in the public health approach to aging, the focus of this book. Unlike in Shakespearean or Biblical times, today, public health and aging must address a much more heterogeneous aging experience. Rather than only focusing on the prevention of disease and its debilitating effects, we argue in this volume that a broader lens is needed to address the many faces of aging, whether robust, physically frail, living with dementia, approaching death, or compensating and adapting to changes in capacity.

The public health challenge is to promote the development and maintenance of optimal physical, mental, and social function, irrespective of acquired disease and with due recognition of the senescent changes that accompany late life. In the case of public health and aging we argue that “health promotion and disease prevention,” the mantra of public health, needs to be broadened to stress *maximizing function and well-being*. Hence, the subtitle of this book.

We also call for greater appreciation of the earlier-life origins of many features of health in old age. What happens in the first 50 years of life matters a great deal for the second 50 years. For this reason we prefer “public health and aging” over “public health gerontology” to describe the field.

In the first edition of this book, we sought to define the field of public health and aging and to identify the research tools and designs most fruitful in this area. We noted that public health and aging was still a developing field that lacked a unified treatment or overarching framework. The first edition of the book applied such a framework to a series of large questions that are still with us: How can we ensure a healthy old age? Why are some segments of society able to enter old age with greater physical and cognitive resources than others? To what extent can physical and cognitive disability be prevented? To what extent can they be remediated? Does it make sense to speak of the prevention of frailty or other forms of primary prevention in late life? These issues have become more pressing with population aging. By 2050, we can expect to see 15–20% of the world’s population over age 65, in both more and less developed economies, and in some countries (such as Japan) as many as a third.

But in the half decade or so that separates the two editions of this book, the field of public health and aging has also changed. The Administration on Aging (AoA), state health departments, the CDC, the Centers for Medicare and Medicaid Services (CMS), as well as managed care organizations, corporate employers, and advocacy organizations, have all started, in their own ways, to *practice* public health and aging. For example, in collaboration with CDC and AoA, state health departments are developing community-wide health promotion and disease prevention efforts in the areas of chronic disease self-management, care management, physical activity, nutrition, environmental modification, and falls prevention. CMS has added a preventive health care visit and additional screening to Medicare’s basic package of services. Many state governments now have integrated blueprints for healthy aging, and

communities increasingly seek “elder-friendly” impact assessments for planning and development.

These developments, we would argue, make this new edition even more valuable. It is still unclear how best to link current public health efforts for seniors to the many other services they may require, such as medical care, pharmacy management, long-term and end-of-life care, allied health services, and supportive aging services. Too narrow a focus on promoting health may miss opportunities for promoting function. As we argue in Chapter 1, in the real world of imperfect screening tests, invasive diagnostic technologies, and difficult decisions about treatment in the context of declining health and the approach of death, promoting health and promoting function may not always correspond. In public health and aging, supportive care and services are often as important as medical treatment once we recognize that function and disability, rather than diagnosis, should guide population-focused policies. For this insight, we thank M. Powell Lawton, who came to this realization in the 1960s, long before either of us considered research on aging as a possible career.

The second edition of this book expands the first considerably, with fully a third more pages. We have added new chapters on the aging services network and public health (Chapter 3), chronic disease (Chapter 4), long-term care (Chapter 9), and ethical issues in public health and aging (Chapter 11). Other chapters have been substantially revised to reflect advances in thinking about population aging (Chapter 2), physical functioning and disability (Chapter 5), and cognitive disability (Chapter 6). We have updated the remaining chapters to reflect the explosion of knowledge and interest in the years between the editions and provide updates on demographic and epidemiologic perspectives (Chapter 2), affective and social function (Chapter 7), quality of life (Chapter 8), and mortality (Chapter 10). Our overall perspective begins with the “compensating, adaptive elder,” who alters daily tasks, relies on spared abilities to compensate for deficits, and selectively invests physical, cognitive, and affective effort to maximize the likelihood of social participation and activity despite health-limiting conditions (Chapter 1).

The current volume reflects our understanding of public health and aging as a field today. Inevitably, important topics have been omitted, and, in places, classic references have been retained in place of newer studies. These choices reflect our desire to present a balance of breadth and depth.

We crafted this new edition with reviews of the first edition in mind. These reviews were favorable, but suggested that our focus on the tools of public health and aging should include, as well, discussion of how public health efforts are actually delivered to older people. We have tried to address this earlier gap in several chapters, which now examine development of “healthy aging networks” (Chapter 3), the growing preventive services emphasis of Medicare (Chapter 4), national efforts to reduce falls and make communities elder-friendly (Chapter 5), interventions to support family caregivers (Chapter 6), evidence-based depression management programs (Chapter 7), and efforts enhancing long-term care (Chapter 9).

We have designed this book to serve as the main text for an undergraduate or graduate class in aging as it relates to the core fields of public health: epidemiology, population studies, health systems and policy, and health behaviors. It may also be used as a supplementary text in gerontology and geriatrics, population studies, the allied health sciences, and sociology. An accompanying teaching guide is available for use of the book in the classroom. Beyond the classroom, this book represents an integrated treatment of one of the greatest challenges of our time, how to maximize functioning in later life, which we hope will be of interest to researchers across the clinical, behavioral, and population sciences.

We thank Sheri W. Sussman of Springer Publishing for her encouragement and patience, as well as the many colleagues who have helped us think through these issues. To our families, young and old, we add special thanks, for this revised edition would not have been possible without their support.

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1

Introducing Public Health and Aging

What is public health and aging? Although we understand each component reasonably well, this burgeoning interdisciplinary field is clearly more than the sum of its parts. Thus, the field of public health *and* aging has not been well defined. It draws on the more well-known population sciences of epidemiology and demography but often focuses on sub-populations, such as frail elders, healthy elders at risk for disability, or elders whose health is surprisingly robust. It requires an understanding of health behaviors and prevention, health systems and policy, research methods and statistical analysis, and social and environmental risk factors, but favors no single disciplinary approach. It not only draws on geriatric medicine to promote health outside the clinic and beyond the clinician-patient encounter, but also shares an affinity with gerontology more generally as a multidisciplinary study of aging. Nevertheless, it is distinct from these disciplines in its focus on populations rather than patients and its proactive recognition that health and functioning in later life are rooted in much earlier experiences.

To better demarcate the domains of this emerging field, we first provide an overview of what constitutes public health. We then provide a primer on aging, highlighting the most common archetypes of later life. Next, we introduce the life course perspective, providing examples particularly germane to public health and aging. We end the chapter with a

discussion of healthy aging as a key goal and the corresponding domains of public health and aging.

ESSENTIAL SERVICES OF PUBLIC HEALTH

Open any introductory textbook on public health and you will inevitably find lists of what public health does, how public health serves, and what tools public health uses. In the mid-1990s, the Public Health Service, the U.S. agency responsible for public health at a national level, developed a consensus document in collaboration with other major public health organizations that outlined what constitutes public health practice. The lists have been adopted as a framework for identifying the responsibilities of local public health systems and evaluating public health efforts.

As shown in Box 1.1 public health has responsibilities in six distinct areas, summarized broadly as health promotion and disease prevention. What you will not see on this list is explicit mention of older adults, aging, or aging communities. In part, this reflects the tradition in public health of being concerned with communities at large without respect to age. Although any of these functions could easily be extended to an older population (e.g., from preventing epidemics and the spread of disease among older adults to assuring the quality and accessibility of health services for seniors), no explicit aim in this list of what public health does speaks directly to aging.

Box 1.1

WHAT PUBLIC HEALTH DOES

1. Prevents epidemics and the spread of disease
2. Protects against environmental hazards
3. Prevents injuries
4. Promotes and encourages healthy behaviors and mental health
5. Responds to disasters and assists communities in recovery
6. Ensures the quality and accessibility of health services

Source: <http://www.health.gov/phfunctions/public.htm>

A second common “to do” list explicitly addresses how public health serves communities. These 10 bullets constitute the essential services of public health (Box 1.2). The list includes critical tasks such as monitoring and investigating health, educating and mobilizing communities, developing policies and plans, evaluating services and programs, ensuring safety, linking people to services, assuring a competent workforce, and conducting research to solve public health problems. Together these essential services support public health’s overarching goal: “assuring conditions in which people can be healthy” (Institute of Medicine [IOM], 1998).

Box 1.2

THE 10 ESSENTIAL SERVICES OF PUBLIC HEALTH

1. Monitor health status to identify and solve community health problems.
2. Diagnose and investigate health problems and health hazards in the community.
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships and action to identify and solve health problems.
5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and ensure the provision of health care when otherwise unavailable.
8. Ensure a competent public and personal health care workforce.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Research for new insights and innovative solutions to health problems.

Source: <http://www.health.gov/phfunctions/public.htm>

Again, although there is no explicit mention of aging, certainly each of these services can be readily applied to an older population. For example, “monitor the health status of *older adults*” would clearly fall within the first essential service and “inform, educate, and empower *older* people about health issues” fits squarely within the third function. But public health and aging is clearly more than the application of these essential services to older people.

The distinctive yet varied tools of public health stem from the core areas of study found within schools of public health. The names and scope of these core areas may vary slightly across teaching institutions, but each offers methods and materials for investigating populations, prevention, and policy.

- *Population sciences* provide demographic and epidemiologic tools to study population dynamics and the health of populations. These tools help describe population-level phenomena and identify risk factors for disease and disability.
- *Behavioral sciences* (also health education and community health programs) emphasize methods to design and implement programs to influence health and health behaviors. Essential tools from this subspecialty include evidence-based health behavior modification programs and community participatory research.
- *Environmental health sciences* are concerned with measuring and manipulating factors in the environment to influence health. Understanding the environment is critical to disease prevention, but it is also key for tertiary prevention of disability. That is, people with physical or cognitive deficits may remain above the threshold of disability in supportive environments. Environment is thus a malleable component of disability.
- *Health systems and policy* draws on policy analysis and economics to understand and improve health service delivery, including health planning, organization, and policy formulation. This subspecialty recognizes that public health programs do not operate in isolation but require linkage to existing systems and policies if they are to be sustained.
- *Biostatistics* draws on statistical tools and research methodology to characterize or investigate health problems and programs.
- *Public health genomics, infectious disease microbiology, global health, public health informatics, public health law, and emergency preparedness* represent emerging areas of public health

that will likely grow in importance as the field matures and adopts methods from adjacent fields.

As we will discuss in this chapter, researchers and practitioners in public health and aging bring to bear these varied and powerful toolkits to promote what we will call “healthy aging.” *The aim of public health and aging is healthy aging: to balance prevention of disease and injury with promotion of behaviors and environments in a way that maximizes functioning and well-being across the life span.* The emphasis is decidedly population based rather than patient focused and recognizes that early and midlife status have implications for health in later life. Just how are the tools of public health implemented to achieve these ends? To answer this question requires a deeper understanding of the phenomenon that we call aging and a basic understanding of changes that individuals encounter as they age.

WHAT IS AGING?

All individuals, whether young or old, are aging. Annual birthday celebrations mark the passage of chronological age. But aging also occurs at the cellular level according to a biological clock. Changes that occur because of cellular aging are often difficult to discern from those caused by disease processes. Here, we discuss the distinctions between chronological and biological aging and between senescence and disease.

Chronological vs. Biological Aging

Aging is the maturation and senescence of biological systems. “Maturation” and “senescence” imply time-dependent changes: with time, our minds and bodies change in a variety of ways, and these changes are what we mean by “aging.” With each additional decade of life, adults will see a decrease in reaction time, psychomotor speed, and verbal memory; declines in strength and walking speed; a decreased rate of urine flow; loss of skeletal muscle; and greater mortality, among many other changes. They will also see declines in addictive behaviors and crime, reduction in severe psychiatric disorders, and stability in psychological well-being; continuing increases in vocabulary; greater selectivity in friendship and increased contact with close family; less need for novel stimuli; and increases in leisure time and altruistic behaviors, among many other changes. The

popular understanding of aging mostly stresses the first set, the negative changes; but a more complete and accurate understanding would more profitably stress both kinds of change, because both are relevant to a public health perspective on aging.

These changes, positive and negative, occur with the longer life or greater age of the organism. It would be useful to distinguish the two meanings of “aging.” The first is simply the number of years an organism has survived, that is, chronological aging. Chronological age is marked solely by the passage of time since birth. Hence, two persons born on the same day, by definition, are the same chronological age, although one may live to an older age. The second definition involves the ticking of some kind of mechanism that governs the “maturation and senescence” of biological systems, and may vary from person to person. One 84-year-old may be biologically vigorous, whereas another born on the same day may lack vitality; hence, despite identical chronological ages, their biological aging, the rate of maturation of their biological systems, may be quite different.

Declines in health may be more prevalent in later life because they are, in fact, expressions of senescence and maturation. Or these declines may be more prevalent simply because of the greater length of time older people have lived, and hence the greater opportunity they have had to experience the risks or exposures that produce these effects. This is a key distinction. It is more than likely that some combination of true senescence and greater exposure to risk factors is likely to be responsible for the changes we consider “aging.” For example, the highest audible pitch people can hear declines with greater age, suggesting that this change is a senescent feature of the auditory system. But it is also likely that long years of occupational exposure to noise, untreated ear infections during childhood, neurological conditions, and an accumulation of minor injuries might also contribute to loss of hearing in old age. Senescent changes, long periods of exposure to disease risk factors, and the interaction between the two are confounded in the lay understanding of aging, but a successful public health approach to aging must distinguish between them.

Senescence vs. Disease

Senescence is the progressive, cumulative deterioration in function or loss of physiological capacity associated with greater chronological age. Current thinking suggests that senescence is a biological feature of

many physiological systems and that it is best measured as decreased reserve and reduced resistance to stressors. It is evident in a “diminished availability of redundant systems necessary for physical and social well-being” (Crews, 1990). For example, research suggests that sarcopenia, loss of skeletal muscle and lean body mass (and greater infiltration of fat cells in muscle), is a universal, involuntary change that is distinct from pathological wasting syndromes (such as those common in cancer) and cachexia (seen in patients with rheumatoid arthritis, congestive heart failure, or end-stage renal disease). Nonetheless, these senescent changes put older people at risk for pathological changes and, in this sense, can be considered “the backdrop against which the drama of disease is played out” (Roubenoff & Castaneda, 2001). A senescent change, such as sarcopenia, puts the body at risk for disease and poor recovery from disease; for example, “a body already depleted of protein because of aging is less able to withstand the protein catabolism that comes with acute illness or inadequate protein intake” (Roubenoff & Castaneda, 2001).

Hence, senescence and disease are related but distinct. We only see senescence in organisms that have lived a long time, but a longer time alive also means a greater opportunity to develop disease or suffer health insults that are actually distinct from these senescent changes.

Consider cancer. It is often said to be a disease of aging. This presumption is probably based on the higher death rate from malignant neoplasms evident among older adults. Indeed, the mortality rate from cancer among adults aged 85 and older in 2005 was 1,637.7 per 100,000, much higher than the rates of 118.6 among people aged 45–54 and 326.9 among people aged 55–64 (Arias, 2007, Table 38). Of the 512,894 deaths due to cancer in the United States in 2005, 388,322, or 69.4%, involved older adults (Arias, 2007, Appendix Table 32). But the larger number of cancer deaths in older adults does not mean that cancer is a feature of aging. In fact, cause-specific mortality from cancer is actually higher in the 45–64 age group; 32.6% of deaths in this group were due to cancer, compared with 21.7% of deaths in the older age group. Cancer incidence is also lower in the 7th and 8th decade of life, compared with the 5th and 6th decades (Hadley, 1992). Here again, we see confounding between old age as a time for longer exposure to disease agents that may lead to cancer, and old age as an expression of senescent changes that may lead to cancer directly (i.e., dysregulation of cellular processes, such as apoptosis), or that put one at risk for cancer (such as slower bowel motility, development of polyps, and onset of colorectal cancer).

This combination of disease- and senescence-determined factors complicates public health efforts for older adults. In the setting of late-life declines in physiological reserve, what is “normal” senescence and what is disease? Put another way, what is an age-determined relationship (senescence) and what are age-related phenomena (disease)? Wallace (1997) describes some of the different ways disease and senescence may be related. First, the pathogenesis of some diseases is likely to be altered with age. Declines in immune response, for example, a feature of aging, may turn a viral infection into pneumonia rather than a less complicated respiratory tract infection. Second, an age-determined change in one physiological system (which may not cause overt disease in that system) may increase susceptibility to disease in another system. An example mentioned by Wallace is an increase in stroke related to age-determined hypotension. Third, age-determined changes can make older people more susceptible to disease when exposed to environmental challenges. Older adults develop reductions in glucose tolerance, for example, that may lead to frank diabetes under certain conditions. Wallace also points out that some age-determined changes may actually retard development of disease. Lactose intolerance, an age-determined change to the extent that it increases with age, may lead to less fat intake and reduced risk of atherogenesis.

Why make the distinction between age-determined and age-related phenomena? Whether age-determined or age-associated, if changes in later life lead to loss of reserve and put one at risk for disease, are they not appropriate targets for intervention? They may be, but distinguishing changes that are due to senescence from those that are due to external risk factors may help sharpen the appropriate intervention strategy. Moreover, science has made great strides in understanding the risk factors for many of the common diseases of later life, but has yet to identify the specific biological mechanisms responsible for senescence.

Aging and “Social Age”

When people think of old age, they first think of years or some other indicator of the passage of time (for example, in societies where people do not use year-based calendars, these indicators might include the number of harvests completed, the number of ritual cycles conducted, or the number of relocations of dwellings). But even in contemporary American culture, “old age” is not simply a matter of chronological age or the biological expression of senescence. Fry (1980) used a technique

drawn from cognitive anthropology to show that cultural dimensions, such as productivity, vulnerability, and reproductive potential, underlie judgments of “young,” “middle-aged,” and “old.” In her pile-sort study, respondents were asked to group hypothetical age-linked social statuses according to similarity. Multidimensional scaling analyses revealed a clear chronological age dimension, but also second- and third-order dimensions, showing, for example, that respondents also grouped older people and children together as opposed to people of middle age. This finding is consistent with research on the “infantilization” of older people (Albert & Brody, 1996; Ryan, Bourhis, & Knops, 1991). “Baby talk” is often applied to older people with cognitive impairment or other disabilities, and terms typically reserved for children are often applied to older people. For example, older people are often spoken of as “cute” and elicit a protective urge seen with infants, such as a desire to hug or comfort.

The reverse is also true. Younger adults who are not active, not interested in new experiences or travel, not willing to switch careers, or who are slow, deliberate, or narrow-minded, are often called “old.” They are said to be “old before their time.” These negative features of aging—negative, at any rate, when applied to younger people—are meant to criticize or embarrass young people. This use of language also suggests a social component in our understanding of aging. People are old not only because of their age, but also because of their behavior, their health, their attitudes, their choices, and even their politics.

More generally, evidence from cross-cultural studies suggests that the defining characteristics of old age include chronological age, as well as many other criteria, such as achieved social status, having grandchildren, holding political office, oratorical skill, and physical changes. In societies with high mortality and short life expectancy, having children reach adulthood is associated with a change in status to “elder” and associated honorific terms (Albert & Cattell, 1994). Again, the other side to social age needs to be mentioned. In American society, adults can refuse to “grow up,” and people can insist on “not acting their age.” This can take a variety of forms: not leaving a parent’s home, not marrying at an appropriate age, refusing to establish clear career goals, marrying someone much younger than you are, and even buying consumer products associated with a different age stratum.

Thus, old age has a social dimension. For public health efforts, this social component is most relevant in its bearing on expectations for health and function in later life. Even this brief discussion of the use

of age criteria to label behaviors suggests that attitudes toward aging and old age are mostly negative. Old age is seen as a time of decline, withdrawal, and vulnerability. In this view, aging is not welcome, and little should be expected of older people; instead, we are expected to ease their decline, provide care, and protect them from exploitation or danger related to their increased vulnerability. These are the elements of “ageism” (Butler, 1969; Palmore, 1999): assumptions of disability, lack of ability, or vulnerability (and, hence, need for protection) based on age, rather than on actual competencies.

The pervasiveness of ageism should not be underestimated. Older persons who miss a word because of a hearing problem are considered too old for conversation and patronized with simplified language. Words may be put in their mouths and their opinions ignored. Older people who forget a name are called “senile,” dissatisfaction with illness-related activity restrictions is called “crankiness,” and expressions of sexual interest make one a “dirty old man or woman.” Even medical personnel are not above recourse to ageist stereotypes.

This sort of ageist thinking has consequences for public health. If missing a word is considered a feature of “getting old,” families (and older people themselves) may not take advantage of tertiary treatments available to manage hearing loss, such as hearing aids. Losing track of names may indicate mild cognitive impairment, not just aging; and people with mild cognitive impairment may benefit from cognitive prostheses, environmental modification, antidementia drugs, or increased supervision by family members. “Crankiness” may be depression, or genuine dissatisfaction with unpalatable symptoms, a complaint against undesirable housing, or simply a bad mood, any of which would otherwise be understood as features of daily life for people of any age. From a public health perspective, these expressions of ageism are doubly damaging. They falsely label potentially treatable medical conditions (such as memory or hearing loss) as “aging,” and also turn everyday complaints, dissatisfactions, interests, and behaviors into pseudomedical aging syndromes (“crankiness,” “childishness,” “the dirty old man”).

Ageist thinking is revealed for what it is when one compares preconceptions about older people with the facts at hand. For example, younger people mostly imagine old age as a time of sickness, disability, and loss of autonomy. In fact, nearly 80% of people aged 65 and older have no disability of any sort and less than 5% reside in nursing homes. For all our fears of cognitive decline and Alzheimer’s disease as invariant features of aging, it is mainly a disease of the very old; most surveys find

an Alzheimer's disease prevalence of 6% for people aged 75–84 and 20% for people aged 85 and older (Brookmeyer, Gray, & Kawas, 1998; GAO, 1998). A recent prevalence survey for a nationally representative sample of Americans aged 71+ puts the prevalence of Alzheimer's disease at 9.7% and any dementia at 13.9% (Plassman et al., 2007). Evidence also suggests that the prevalence and incidence of both physical and cognitive limitations in later life may be declining (Schoeni, Freedman, & Martin, 2008). Clinical depression is also not more common in older people (see Chapter 9); it is often a comorbid feature of physical illness and bereavement and, for this reason, seems more common among older people.

Myths About Aging

Many of these ageist attitudes have been elicited by use of questionnaires, such as “What Is Your Aging IQ?” (Special Committee on Aging, 1991). The questions present typical preconceptions about aging and in this way highlight ageist thinking. One version of the questions is shown here, with suggested correct answers:

True or False?

1. Baby boomers are the fastest growing segment of the population. *False.*
2. Families don't bother with their older relatives. *False.*
3. Everyone becomes confused or forgetful if they live long enough. *False.*
4. You can be too old to exercise. *False.*
5. Heart disease is a much bigger problem for older men than for older women. *False.*
6. The older you get, the less you sleep. *False.*
7. People should watch their weight as they age. *True.*
8. Most older people are depressed. Why shouldn't they be? *False.*
9. There's no point in screening older people for cancer because they can't be treated. *False.*
10. Older people take more medications than younger people. *True.*
11. People begin to lose interest in sex around age 55. *False.*
12. If your parents had Alzheimer's disease, you will inevitably get it. *False.*

13. Diet and exercise reduce the risk of osteoporosis. *True.*
14. As your body changes with age, so does your personality. *False.*
15. Older people might as well accept urinary accidents as a fact of life. *False.*
16. Suicide is mainly a problem for teenagers. *False.*
17. Falls and injuries “just happen” to older people. *False.*
18. Everybody gets cataracts. *False.*
19. Extremes of heat and cold can be especially dangerous for older people. *True.*
20. You can’t teach an old dog new tricks. *False.*

These questions elicit ageist stereotypes well. They reflect unrealistic fatalism and therapeutic nihilism (“everybody gets cataracts,” “falls and injuries just happen to older people,” “there’s no reason to treat older persons with cancer,” and “most older people are depressed”), false assumptions about the aging process (“you can’t teach an old dog new tricks,” “people begin to lose interest in sex after age 55,” and “the older you get, the less you sleep”), overestimates of the heritability of late-life disease (“If your parents had Alzheimer’s disease, you will inevitably get it”), sociological naïveté (“American families have by and large abandoned their older members”), and underrecognition of the truly negative aspects of aging, such as the increased risk of suicide among older White men and the greater use of prescribed medicines. Sometimes the problem is a misplaced recognition of a problem, such as the claim of less sleep with greater age. It is true that older people sleep for shorter durations, and this is related to poorer quality of sleep. However, older people also nap more during the day, resulting, in fact, in greater amounts of sleep overall than younger people have.

Together, these prejudices suggest that aging is mostly misunderstood. Overall, the negative features are exaggerated and the positive features ignored. This social or cultural component of aging should be recognized as a potential obstacle to successful public health interventions for older people.

When Does Old Age Begin?

So far, we have examined aging and older persons without specifying when someone is old. From what we have said already, we see that the question is unreasonable. There is no single age at which we can say that

people cross the threshold into “old age.” People age at different rates; hence, for any given age, there will be great variation in all proposed biomarkers of aging or phenotypes of healthy aging. “Old age” does not have a biological definition, only a social one. For example, in the United States, establishment of the Social Security system linked old age to age 65. This definition of old age was more a product of social perceptions and economic necessity than anything else.

But people do have an idea of when people become old. A number of surveys have asked at what age someone is old. The start of “old age” can be assigned to a wide range of chronological ages. This assigned age may reflect attitudes toward aging and older persons. For example, assigning the start of old age to increasingly older ages means that many aspects of aging, once considered hallmarks of old age, now fall short of making someone old. It also stands to reason that many of the characteristics of the respondents, such as age and social status, are likely to be related to judgments regarding the start of old age. One may imagine that minority groups with a shorter life expectancy might date the onset of old age to earlier ages than other more advantaged groups.

Someone who reports that old age begins at age 55 clearly has a different attitude toward aging than someone who asserts that it begins at age 75. In the one case, a larger portion of the life span is considered the period of “old age,” with the physical and psychological changes of the 5th and 6th decade already considered signs of senescence. In the other, only changes typical of the 7th decade and beyond qualify as “old age,” and senescence is pushed ahead to a point closer to death and the maximum biological life span. Respondent choices of an age for “old age” tell us the decade when people are expected to slow down, retire, and focus on self-maintenance rather than new careers or goals.

Figure 1.1 shows the age at which respondents consider women to be old. These data are drawn from the National Council on Aging *Myths and Realities of Aging* survey, conducted in 2000 in a national probability sample of the United States. The data are weighted to reflect the sampling scheme and overrepresentation of older people and minorities. The figure plots the mean age that “the average woman” is said to be old by respondent’s age and sex.

Note the strong relationship between a respondent’s age and his or her report of when women are old. Young people clearly consider the start of old age to be much earlier than older people do. For people at about age 20, women are old at age 45. By the time people reach the

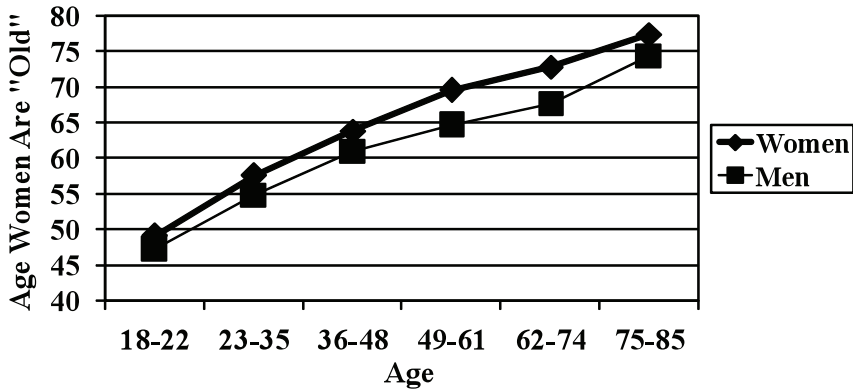


Figure 1.1 Age at which women are “old,” by respondent age and sex (United States).

Source: From National Council on Aging (NCOA), 2001; weighted data.

6th and 7th decade, old age is pushed back to the late sixties and early seventies. Note too that women date the start of old age to a later age than men do, whatever the respondent’s age. Women consider old age to begin 2–4 years later than men do. They push old age further back than men do, not only for themselves, but also in their reports of the start of old age for men (Albert, O’Neil, Muller, & Butler, 2002d). Moreover, the age at which old age is said to begin now seems to be far more correlated with one’s own age than in earlier surveys.

FIVE FACES OF AGING

The experience of late life is varied and complex. To better understand the aims of public health and aging, it is useful to delve into some of the most common experiences of aging. Gillick (1994), a clinical geriatrician, has provided an excellent account of the most common faces of aging. As a geriatrician with a primary care focus, one of the few physicians who still make home visits, her experience offers important guidance on what it is like to be old, ill, and in need of medical care. She begins her account with an overriding principle: “Only if we start with a deep understanding of what being sick is like can we hope to reach a consensus on what kind of health policy is appropriate for the elderly” (Gillick, 1994, p. 10). In her account, Gillick identifies four types of elder and has provided clinical vignettes of the particular challenges and opportunities specific to each type.

The Robust Elder

The robust older persons are “physically vigorous, mentally acute, a fount of wisdom and experience for their families, [and] busy accomplishing all the things they never previously had the time to undertake.” However, as Gillick reminds us, they typically have accumulated at least some chronic conditions in their 70 or 80 years of life, such as arthritis, hypertension, diabetes, hearing loss, glaucoma or macular degeneration, essential tremor, and other treatable but only minimally impairing conditions. Hence, “their date books are sprinkled with doctor’s appointments; they carry a packet of their medicines in their pockets; their night tables are lined with containers for hearing-aids, glasses, and dentures.” A defining feature of this type of elder is increases in health care use, but lack of disability.

An example of a robust elder described by Gillick was Mrs. Landsman (a pseudonym), who at age 96 was quite active until she developed anemia, which led to detection of an advanced colorectal cancer. As a competent adult, she had to choose between surgery (and a risk of immediate death) and symptomatic treatment, where the progression of the cancer would ultimately lead to increasing morbidity and disability and later death. Gillick (1994, pp. 55–56) describes Mrs. Landsman’s response in this way:

Mrs. Landsman thought long and hard about the various options. She had no illusions about her own mortality, and in fact was quite ready to depart from this world. But there was one thing she was quite clear about: she did not wish to be a burden to others, nor did she wish to be dependent on others, which she regarded as equivalent. The prospect of repeated visits to the hospital for transfusions or treatment for chest pain or fractures was dismal. The prospect of fading away over an extended period of time, becoming increasingly dependent, was even more unappealing.

Mrs. Landsman opted for surgery. Ironically, an operation that would probably prove to be curative was performed because it provided the best palliation available. The simplest, most humane, and cheapest way to provide comfort for this very elderly woman was to perform major surgery.

Studies suggest that the robust senior is not an uncommon experience. Indeed, 20%–33% of older adults are robust without any chronic disease (Strawbridge, Wallhagan, & Cohen, 2002). An even greater proportion of older adults—perhaps as much as 40%—experience minimal interruption of usual activities and maintain social participation in the face of

disease. Seventy-five to 80% of Americans over age 65 report no disability in personal self-maintenance activities, such as bathing or dressing.

The Frail Elder

Gillick (1994, p. 105) describes frail older people as “hav[ing] no one overriding health problem. Instead they suffer from impairments in multiple domains . . . that collectively render them vulnerable to the slightest perturbation.”

She describes Mr. Schaeffer, age 83, who had diabetes, hypertension, congestive heart failure, psoriasis, and emphysema. Fatigue and weakness led him to live an increasingly less active life. He was unable to babysit for his grandchild on his own, could not go out unless he had a ride from someone, could not read the newspaper through without falling asleep, and employed a homemaker to do grocery shopping, cooking, laundry, and cleaning. He then developed repeated bouts of pneumonia, which led to repeated hospitalizations. At the hospital he was diagnosed with aortic stenosis, which was treated with a valvuloplasty, but he subsequently developed delirium, lost weight, acquired a nosocomial infection, and became increasingly less mobile. His family then recognized that he could not safely live independently and would not be able to return to his apartment. He became a candidate for the nursing home. He had a cardiac arrest, however, while still in the hospital, which led to the last of his three intubations. This time, however, he could not be revived and died.

These are the prosaic but important details of medical care for the frail elder. They are not glamorous. As Gillick writes, “autobiographical and fictional accounts of aging focus on the drama, but seldom on the prosaic details that make all the difference to the frail older person. I have yet to read a story in which the elderly protagonist describes his intense embarrassment upon suddenly developing incontinence, only to be rescued by a geriatric consultant who determines that his problem has been caused by the new blood pressure medicine he has been taking” (1994, p. 106).

Efforts to establish frailty as a phenotype have resulted in an explosion of research on this topic in recent years. One proposed operationalization consists of the following components: shrinking (unintentional loss of 10 lbs or more), weakness (scores in the lowest 20% of the distribution of grip-strength values), poor endurance (reports of exhaustion

when performing daily activities), slowness (scores in the lowest 20% of the distribution of timed gait speeds), and low activity (scores in the lowest 20% of activity profiles, as determined by estimated expenditure of calories). Older adults with three or more of these characteristics are considered to be frail (Fried et al., 2001). This concept overlaps with, but is distinct from the notion of disability, more generally defined as a gap between an individual's capacity and the challenges of his or her environment. Estimates of frailty in clinically based samples have ranged from about 12% to 16% (Rockwood, Andrew, & Mitnitski, 2007).

The Elder With Dementia

Dementing disease is one of the central challenges of public health and aging. Although many diseases cause the global, progressive, irreversible impairment in cognitive function that we call "dementia," the most prevalent sources are vascular disease and Alzheimer's disease. These diseases of later life, for the most part, pose extreme challenges to caregiving families and medical providers. As Gillick remarks,

The dilemma of when to stop treating, or when to provide less than maximally intensive care, is never more poignant than with the elderly person who has Alzheimer's disease or one of several types of dementia. Dementia, the gradual loss of multiple facets of the mind such as memory, language, and judgment, robs people of their ability to understand what is happening to them when they get sick. Illness becomes as incomprehensible to these patients as its treatment. Moreover, the future they are vouchsafed if they are successfully cured of pneumonia or appendicitis is one of relentless decline. If they live long enough, they will likely pass from a state of mild forgetfulness to apathy and incontinence, and ultimately to a bed-bound existence. (1994, p. 17)

Older adults with dementia have varied symptoms, which may include memory loss, difficulty understanding or using words, inability to carry out motor activities (despite physical ability to do so), and failure to identify or recognize objects. Dementia is often accompanied by behavioral disturbances (e.g., wandering, pacing, and repetitive questions). Although approximately 10% of adults aged 71 and older have frank dementia, as many as 22.2% in addition may have cognitive impairment short of dementia (Plassman et al., 2008; see Chapter 8). Most seniors who meet criteria for dementia are cared for in the home by relatives or

paid caregivers and the remainder live in residential care settings (e.g., nursing homes, assisted living facilities).

The Dying Elder

“Late life,” as the term implies, is the period of life closest to death. Although it is not always clear when the dying process starts (and, as a result, when medical care goals should shift further toward palliation), care of the dying elder is a key component of geriatric care and an important consideration in public health and aging.

One challenge in meeting the needs of the dying elder is the lack of realistic appraisal of the risk of dying by patients and their families, which, in some cases, unfortunately is encouraged by clinicians. These unrealistic appraisals may lead to poor choices in medical care, such as recourse to invasive procedures that have little or no chance of success. Clinicians may be as uncomfortable with end-of-life choices as patients, but with proper communication of risk, this situation can change. As Gillick (1994, p. 80) writes, “if instead of being told that they had a 10% or 20% chance of survival with ICU care, patients were told they had an 80% to 90% chance of dying with ICU treatment, and a 99% chance of dying without it . . . how many in fact would choose the ICU?” This is an interesting question worth a study in itself (see Chapter 10).

A second challenge for this type of elder is the issue of control and autonomy at the end of life, which may be complicated further by mental health issues. Gillick describes Mrs. Renan, who is dying of cancer. Mrs. Renan sought physician-assisted suicide and would not accept reasonable medical management of her condition, which included blood transfusions and easily available palliative treatments. “She accused me of abandoning her because I said I would not and could not give her a lethal injection.” Gillick distinguishes reasonable medical care goals, such as strategies to reduce disability and relieve symptoms, and inappropriate goals, such as elimination of existential suffering.

Was I a failure as a doctor if I could not cure . . . her overwhelming sadness and rage over aging? My role was supportive. I could try to make Claire as functional as possible during her final months or years. This entailed such things as blood transfusions to improve her strength and prescrib-

ing a wheelchair to help her maintain some degree of mobility. I could try to make her as comfortable as possible by treating her arthritic pain with medication and trying to regulate her bowels with a judiciously selected combination of stool softeners and cathartics. I could provide relief by simply being there, by acknowledging her misery and promising not to abandon her. But [I do not] think that physicians must at all costs obliterate suffering, if necessary by causing death. (Gillick, 1994, p. 90)

Nearly 2 million older adults die each year. So, liberally, 5%–7% of the older population faces end-of-life issues in a given year. Trajectories to death also vary widely. Lynn and Adamson (2003) describe three prototypical descents experienced by Medicare beneficiaries: a short period of decline, typical of many cancers; a longer period of limitations with multiple exacerbations and sudden death, typical of organ system failure; and a slow, prolonged decline typical of dementia, disabling stroke, and frailty. Lunney, Lynn, and Hogan (2002) have found that about one fifth of deaths in a given year occur in a manner consistent with the first trajectory, another one fifth follow the second profile, and as many as two fifths follow the prolonged trajectory.

Trajectories of dying are an active area of research. Could the type of trajectory influence the kind of dying one faces (such as death at home or in the hospital, or perhaps the likelihood of transitions between health care settings)? Or could the type of trajectory influence expectations for dying and decision making at the end of life? Both questions fall within a growing subdomain of public health and aging, namely, the public health impact of the end of life (Anderson & Smith, 2005; GAO, 1998).

The Compensating, Adaptive Elder

Cutting across these archetypes of aging is the reality of being old, the need to maintain function and accomplish daily goals in the face of declining abilities, often pressing symptoms of chronic disease, and awareness in some cases of impending death. As in people with disabilities or younger people facing life-limiting illness, older people alter daily tasks, rely on spared abilities to compensate for deficits, and selectively invest physical, cognitive, and affective effort to maximize the likelihood of social participation and activity. The psychological analog to such modification of daily life in the face of declining abilities is “selective optimization with compensation” (Baltes & Baltes, 1990).

Research in compensation is still in its infancy. Baltes and colleagues have shown for psychological processes that even quite frail older people are active in the management of dependency. They may accept personal self-maintenance care to allow them the physical strength or energy to accomplish more valued activities, such as social activity or leisure pursuits. Unable to go outside or even ambulate indoors, the elder with mobility limitation may seek a strategic position in a home, perhaps a chair with a commanding view. This too can be considered a selective investment of resources to compensate for a deficit and in this way optimize experience in the face of disability. Recourse to personal assistance equipment is a similar accommodation. The essence of selective optimization with compensation is development of strategies that allow older adults to retain control or accomplish some goal in the setting of declining ability.

Researchers are just beginning to generalize this paradigm to physical function (Agree & Freedman, 2000; Verbrugge & Sevak, 2002; Weiss, Hoenig, & Fried, 2007). For example, it stands to reason that the elder with lower extremity disability may rely more heavily on preserved upper body function to accomplish daily tasks. The elder able to do so will likely report less disability and perhaps better mental health, signs of effective adaptation. At the microscopic ergonomic level, people make such accommodations all the time, changing the way in which they reach or grasp in the face of arthritic pain, making lists or using elaborate mnemonics in the case of memory impairment, or avoiding hills or simply slowing down in the case of dyspnea. Compensatory processes may also cross physiological domains. In our experience, elders with severe physical deficits but preserved cognition manage to figure out ways to complete physical activities.

Studying compensation would probably be valuable, because it may be possible to teach such optimization strategies. In fact, Clark and colleagues have completed a series of occupational therapy interventions designed to do just this and have shown benefit in mental health, self-efficacy, quality of life, and range of activities accomplished. They have taken the research further to examine the physical and neuroendocrine effects (Clark et al., 1997) of such compensatory efforts.

Table 1.1 summarizes these types of aging experience and goals of medical care and public health. We will return to these issues in later chapters.

Table 1.1

**TYPES OF AGING EXPERIENCE AND GOALS
OF MEDICAL CARE AND PUBLIC HEALTH**

TYPE OF ELDER	GOAL OF MEDICAL CARE	GOAL OF PUBLIC HEALTH
Robust	Life prolongation, cure	Prevention of frailty and disability
Demented	Maximization of function, palliation	Prevention of excess morbidity; excellent custodial care
Dying	Palliation (“upstreamed”)	Reduction of isolation, maximization of choice
Frail	Upper bound: maximum medically tolerable intervention Lower bound: medical care based on best interest of patient	Environmental modification to reduce task demand; rehabilitation to increase capacity by developing spared abilities
Compensating	Occupational, physical, speech therapy; rehabilitation; cognitive remediation	Provision of appropriate aging services; promotion of maximally integrated setting

HEALTHY VS. SUCCESSFUL VS. OPTIMAL AGING

It is salutary to try and explain the functions of public health and aging to the audience for our efforts, the people who have experienced old age and who confront the risk of frailty and chronic disease. One case will speak for many. Hannah is a 92-year-old Israeli. She has lived on a kibbutz, a collective settlement, for over 50 years, a hard but supportive environment for older persons that has been shown to confer important health advantages (Walter-Ginzburg, Blumstein, & Guralnik, 2004). At age 92, she was quite frail and required 24-hour personal care assistance, which was provided by the kibbutz. She used a walker for indoor mobility, left her small home to go outside only rarely, and required help with dressing, toileting, and meal preparation. She had given up housework,

shopping, and travel. In contrast, she took medications and used the telephone independently, kept track of her affairs quite efficiently, and, despite pain from osteoporosis and some dyspnea from a heart condition, appeared to be active within her home.

She asked one of us (SA) what public health could do for her and whether she was an example of healthy aging. Put on the spot, I first asked her about her health. She explained that she suffered from many chronic conditions: heart disease, hypertension, osteoporosis, osteoarthritis, kyphoscoliosis, diabetes, and hearing and vision loss. She needed to take 10 different medicines daily, from digoxin to diuretics. What could I do for her, she wanted to know, and what could she do to promote healthy aging? I then asked if she found her days more or less satisfying and interesting. "Oh yes," she said, "I am always reading, I hear from my daughter and grandchildren on the telephone everyday, I make sure I check off medicines and meals on my chart throughout the day, and people come and visit all the time. I enjoy some of the shows on television, especially basketball, and make sure I watch the news everyday."

"You mean you find each day satisfying despite your poor health?"

"Of course."

"Well, then," I said, "I would say you are a very good example of healthy aging. Public health could learn from you. How is it that your days are so full and satisfying despite all the illness and pills?"

"My mind is clear, I have the help I need, and I still can appreciate books, friends and neighbors, and my children and grandchildren. But are you sure there is nothing else I should be doing?"

I demurred. Aside from checking for adverse effects from polypharmacy and perhaps some minor environmental modifications of the home, this 92-year-old serves as an excellent illustration of one kind of healthy aging: high risk of poor health and disability typical of very old age, but also engagement in daily projects, expert in self-care and disease management, maximally supported to promote independence in the face of frailty, well-connected to family and community, funny and feisty.

Indeed it is useful to contrast the notion of "healthy aging" with the perhaps more popularized notion of "successful aging." Rowe and Kahn (1987) define the latter as consisting of three elements: absence of disease and the risk factors for disease, maintenance of physical and cognitive abilities, and engagement in productive activities. They viewed the three elements as roughly hierarchical: absence of disease allows

maintenance of physical and cognitive skill, and preservation of these skills in turn allows engagement in productive activity. Their key insight was recognition of variation in aging, which allows us to raise the bar for goals and expectations about health in old age. If successful aging is possible, then we can aim higher than “usual aging.” They stress that aging is more than disease and disability, and that there is more to successful aging than avoiding disease and disability. In their view, successful aging includes avoiding disease and disability, which may involve interventions that enhance cognitive and physical function. This may also require that we develop a society that provides individuals opportunities of continuing engagement in life.

Rowe and Kahn (1987) did not specify what proportion of older people met this definition of successful aging, or, more critically, what proportion, given any particular age stratum, would be a reasonable goal for public health. Nor did they try to operationalize the three criteria. Attempts to use existing measures to partition the older population in this way (and relaxing criteria to stress minimal rather than absence of disease or disability) show that only 20%–33% of community-resident older Americans meet the criteria for successful aging (Strawbridge et al., 2002).

Other working definitions of successful aging have been proposed that are closer to the notion of healthy aging. An alternative approach stresses minimal interruption of usual activities and maintenance of social participation in the face of disease. By this criterion a majority of older adults, including the 92-year-old described earlier, could be considered successful agers. As we have seen, one mechanism for this preservation of activity and social participation is “selective optimization with compensation,” that is, doing well with remaining strengths by recruiting preserved abilities to compensate, when possible, for areas of weakness (Baltes & Carstenson, 1996).

Most recently, researchers have recognized that neither “successful aging” nor “healthy aging” are the right terms. Elders who reach old age with chronic conditions or who develop disabilities would be considered examples of “failed” aging by using the first term. Likewise, because most seniors have some declines in function and chronic disease (or ultimately will develop them), the focus on “healthy aging” narrowly construed misses the point of maintenance of function and well-being despite these common features of old age. Perhaps the better term is “optimal aging,” defined as a range of values for clinical indicators that we would expect more in people of younger ages. Thus, a 90-year-old

with a gait speed typical of a 75-year-old can be said to have met the optimal aging criterion in this one key phenotype.

The focus on optimal aging is superior to prior approaches because it is norm-driven and uses chronological age as a criterion. It also allows an individual to age optimally in one area but perhaps not in another (although in practice these will be highly correlated). An elder at age 85 can have memory performance 1.5 *SD* above the norm for her age and education, making her equivalent in this domain to a 75-year-old. This is optimal aging in a cognitive domain. The same may be true for grip strength, light-touch pressure sensation, visual contrast sensitivity, insulin or glucose chemistries, bone mineral density, systolic blood pressure, or wound healing. We prefer this approach because it opens the door to more reasonable endpoints in clinical trials and better characterization of the health of older populations.

Such notions of optimal or healthy aging are important to keep in mind in articulating the boundaries of public health and aging. Assuring conditions for health promotion in late life must be considered along with conditions to foster successful adaptation to states of ill health. Both are reasonable goals for public health promotion, and the mix of emphasis on the two may change with age. That is, while assurance of the conditions for health should be the goal at all ages, with very old age the more critical goal may be assuring conditions to promote successful compensation in the face of disease and disability. Our 92-year-old *kibbutz*nik failed all three of the Kahn and Rowe criteria but had successfully optimized her remaining abilities to live well.

HOW THE FIRST 50 YEARS MATTER FOR HEALTH RISKS IN THE SECOND 50 YEARS: THREE ILLUSTRATIONS

Gillick's portraits provide rich and varied snapshots of later life. Yet, as we explained earlier in this chapter, aging begins at birth and continues throughout the life course. How these earlier life experiences influence outcomes in later life is a growing area of interest. Hayward and Gorman (2004), for example, have referred to this phenomenon as the "long arm of childhood" in their study demonstrating important childhood influences on male mortality in later life.

It is challenging to study the ways in which health and risk behaviors in the first half of life may affect health in the second 50 years and even more difficult to generalize public health applications from such

studies. Imagine the definitive cohort study that follows prospectively an entire birth cohort until each and every member dies or reaches very old age. Such a study would lend itself to precise measurement of risk factors in early life and allow researchers to relate them to outcomes in later life. Despite decades of gerontological research, we still do not have a prospective cohort study that has observed people from birth to death. Even if we did have such a cohort, what we could learn from studying such a cohort that would apply to today's public health system is unclear, because the members of the cohort would have been born over 100 years ago.

In practice, most gerontological research cohorts usually begin at age 65, or perhaps at preretirement, at age 50 or 55. Therefore, we often do not have direct evidence of health at earlier ages. As a result, we are forced to use proxy measures, or sometimes retrospective measures, to summarize health and risk experience in the first half of life. These proxy measures typically include such factors as:

- Occupation, to assess environmental exposures during work years
- Education and literacy, to assess cognitive engagement over the life span
- Parent occupation and education, to assess perinatal and childhood conditions
- Recollections of childhood health and experiences
- Household income, to assess access to health services over the life span
- Birthplace, to assess environment and access to health care in migrating populations
- Birth weight and stature, to assess pre- and postnatal nutritional status
- Race and ethnicity, to assess the effects of culture and potentially restricted access to health services

Recent progress in molecular genetics, environmental health, and imaging technologies now allows derivation of biological indicators, in some cases, for these lifelong factors. For example, some genes, such as APOE, are more common in particular racial or ethnic groups. If a sociocultural group is more at risk of a disease associated with this gene, such as a cardiovascular condition or Alzheimer's disease, we can now begin to separate sociocultural and genetic factors. Likewise, long-term environmental exposures leave a DNA signature, just as long-term

cognitive engagement, evident in educational attainment and literacy, may be visible in functional magnetic resonance images.

We turn now to case studies that illustrate well the different legacies from the first 50 years that affect the health resources older adults have when they enter later life. These examples also show some of the difficulties involved in public health research, where biological and clinical factors are often confounded with socioeconomic status. The first two focus on relationships over the life course at the individual level, and the second brings a population-level perspective.

Entry Into Late Life With Lower Cognitive Reserve

African Americans face a higher risk of Alzheimer's disease (AD) than White Americans. This difference remains when we stratify samples by *APOE* e4 status, a well validated risk factor for Alzheimer's disease. Figure 1.2 compares the incidence of AD in Whites, African Americans, and Hispanic Americans living in northern Manhattan, New York City. Only people with the e3/e3 variant of *APOE* (the so-called wild type) are included, thus removing the effect of this genetic risk factor. The cumulative incidence curves in the figure plot the risk by age in the three race-ethnicity groups. As in all incidence studies, people included in the analysis were free of the disease initially, and all were followed up at regular intervals with a common cognitive assessment battery to identify the age at which people first met criteria for AD.

As the figure shows, minorities were significantly more likely to meet criteria for AD. By age 75, 2% of the Whites and 9% of the minorities developed the disease. By age 80, approximately 9% of the Whites and 21% of the minorities met AD criteria. These large differences in incidence persisted even with statistical control for differences between the race-ethnicity groups in a great variety of risk factors for AD, such as years of school, family history of AD, number of comorbid chronic disease conditions, and behaviors such as smoking and head injury. Tang and colleagues (1998) also recalculated incidence by use of a stricter definition of dementia to identify only clear and obvious cases of AD. This strategy eliminated more mild forms of AD as "cases" and, as a result, also should have helped to eliminate subtle diagnostic biases, either from clinicians interpreting cognitive tests or from the tests themselves, and in this way to reduce any differential misclassification. Even with this conservative approach to diagnosis, differences between the race-ethnicity groups persisted.

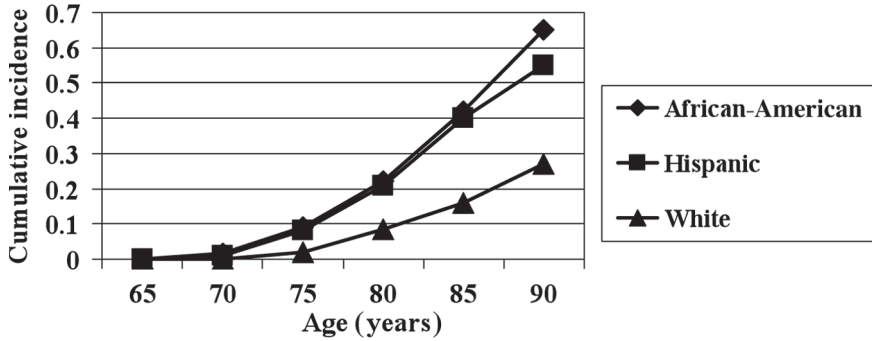


Figure 1.2 Cumulative risk of AD, by race-ethnicity, limited to APOE e3/3.

Source: From “The APOE-Epsilon4 Allele and the Risk of Alzheimer Disease Among African Americans, Whites, and Hispanics,” by M. X. Tang et al., 1998, *Journal of the American Medical Association*, 279, Table 1. Copyright © (1998) American Medical Association. All rights reserved.

These differences in the risk of AD raise important questions. Do we overdiagnose minorities (and if so, why?), or do we underdiagnose Whites (and again, if so, why?). Graphically, is the cumulative incidence curve for the minorities too high, or is the cumulative incidence curve for Whites too low? Why should minorities be at greater risk for developing AD? Is it because they enter later life with previously poorer abilities, so that they start follow-up at age 65 or 70 closer to the threshold of the low cognitive ability used to define AD? Or do they enter late life with abilities similar to Whites, but decline at a faster rate in old age? The first factor suggests an effect in the first 50 years of life; the second implies an effect in the second half of life.

We investigated this issue in a related sample of 871 older adults drawn from the same community and assessed with the same clinical battery and diagnostic paradigm. We selected all people who had at least three cognitive assessments, where the AD diagnosis, if made for a respondent, was made at the last of the series of assessments. Of the 871 people, 138 met criteria for AD at their last assessment, whereas the remainder never met criteria for AD.

To assess whether the race-ethnicity groups entered old age with different cognitive resources, we examined scores on the Selective Reminding Test, a test of memory, at baseline, that is, when no one had yet met criteria for dementia. The test asks respondents to repeat a list of 12 words over six trials, for a maximum score of 72 and minimum of 0. Mean scores at baseline were significantly lower among minorities. If we divide

the distribution into tertiles (upper third, middle third, lower third), the lower third included scores with a range from 8 to 34. Of Whites 16.3% scored in the lowest tertile, but 32.4% of African Americans and 44.4% of Hispanics scored in this range. This difference strongly supports the claim of earlier life events as a predictor of a key later life outcome. Minority elders enter later life with poorer memory scores and, hence, less cognitive reserve.

By contrast, the slope of memory score change over the serial assessments, that is, the mean rate of decline, was not significantly different across the three race-ethnicity groups. Age, education, and initial memory score were all independently associated with rate of decline in memory performance, but in a regression model that included these factors, race-ethnicity was not significantly associated with rate of decline. Thus, cognitive performance in minorities did not decline at a faster rate. Baseline differences, differences that predate old age, seem to be responsible for the higher risk of AD among minorities. Of course, poorer memory performance at baseline very likely reflects an early stage of disease progression, prodromal AD. But this too is consistent with earlier life experience as the source of greater risk of AD in later life.

Entry Into Late Life With Differences in Physical Reserve

Rantanen and colleagues (1999) examined a cohort of men aged 45–68 and found that grip strength at this age was a strong predictor of disability 25 years later. These men, all from the Honolulu Heart Program—Asia Aging Study, were first assessed in 1965–1968 and were reassessed between 1991 and 1993, when participants were 71–93 years old. Grip strength is correlated with strength in other muscle groups and for this reason is considered a good indicator of overall strength. Grip strength performance was assessed with a handheld dynamometer, and hand strength at midlife was categorized into low (<37 kg), middle (37–42 kg), and high (>42 kg) performance tertiles.

Men with low performance in midlife were significantly more likely to report disability in late life. These men reported nearly twice as much disability as men in the upper tertile in doing heavy household work (25% vs. 14%), walking (26% vs. 15%), bathing (8% vs. 3%), as well as a variety of other indicators of disability and functional limitation (i.e., walking speed, ability to rise from a chair). Men in the middle tertile fell between

these two groups in risk of disability in late life. The increased risk of disability in old age associated with low grip strength in midlife persisted in regression models that controlled for age, height, weight, education, occupation, smoking, physical activity, and chronic conditions at the examination in which disability status was established.

This finding is extremely important. “Muscle strength is found to track over the life span: those who had higher grip strength during midlife remained stronger than others in old age” (Rantanen et al., 1999). For this reason, these men entered late life with a greater reserve in strength, and this reserve helped forestall onset of disability. Rantanen and colleagues mention a number of alternative hypotheses for this finding, which are also of note: (1) grip strength may be a marker of physical activity, which may itself prevent disability; (2) low grip strength may reflect early disease processes that later progress and cause disability; and (3) grip strength may be related to motivation to stay fit and through this mechanism lower the risk of disability in late life. Each of these hypotheses merits investigation, but all suggest the critical role of health factors in midlife as predictors of late-life outcomes.

It turns out, as well, that grip strength in midlife is related to birth weight. In the UK Medical Research Council National Survey of Health and Development, 2,815 men and 2,547 women born in 1946 were observed through 1999, when they were 53 years old (Kuh et al., 2002). Men and women in the highest fifth of the distribution of birth weight had 10% greater grip strength at age 53, compared with people in the lowest birth weight group. A 1-kg increase in birth weight was associated with a 1.9-kg increase in grip strength for men and a 1.2-kg increase for women 53 years later. This relationship persisted even with control for weight and height and “suggest[s] the importance of prenatal influences on muscle development that have persisting consequences through to later adulthood.”

Thus, grip strength in middle age is related, at least in part, to prenatal environment. And grip strength in midlife is related to disability in late life. These investigations represent a rare case in which a single important risk factor or health indicator has been investigated across the whole life span and related to outcomes at different points in the life span. They suggest the unity of the life span, where a risk factor acquired at the earliest ages is expressed in different ways across the life span. More research of this type will be required if we are to understand health outcomes in late life.

Early and Midlife Influences on Late-Life Disability Trends

The prevalence of activity limitations in later life has declined in the United States over the past 25 years. Efforts to understand why this is so have been hampered until recently by the inability to sort out factors that occur in the early, intermediate, and late phases of the life course (Schoeni, Freedman, & Martin, 2008). A study analyzing survey data from the 1995–2004 Health and Retirement Study (HRS) sheds light on this question by sorting out the influence of early and midlife factors on recent late-life activity limitation trends (Freedman, Grafova, Schoeni, & Rogowski, 2008).

The HRS is a national study designed to provide both snapshots of the experience of adults aged 50 and older in the United States and dynamic assessments of changes as individuals age. Respondents are selected in such a way (with a known probability of selection) that responses can be weighted to reflect national experience. More than 20,000 individuals aged 50 and older are observed over time, with individuals newly turning 50–55 years of age added every 6 years.

In this analysis, the samples were limited to between 4,500 and 4,700 persons aged 75 and older in 1995, 1998, 2000, 2002, and 2004. Measures of activity limitations included both difficulty with activities of daily living (ADLs, e.g., bathing, dressing, grooming, using toilet) and with instrumental activities of daily living (IADLs, e.g., managing money, using the telephone, light cleaning, managing medications). Early-life measures included self-reported race-ethnicity; recollections of region of birth, mother's education, childhood socioeconomic status, and childhood self-rated health; and an estimate of having lower than average peak stature, obtained by adjusting initial reports of current height. In addition, three indicators of midlife were included: completed education; whether the respondent was a veteran; and lifetime occupation.

Between 1995 and 2004, the profile of the older population changed in many ways. Reports of difficulty with ADLs declined significantly from 30.2% in 1995 to 26.0% in 2004. There were also fewer reports of smoking, increases in reports of many common chronic conditions, including obesity and hearing problems, and improvements in self-rated vision. In addition, more older adults were classified in the highest levels of income and wealth.

The profile of early and midlife factors among those very old adults also shifted during this period. For example, older adults in 2004 reported more years of school completed for themselves and their mothers and bet-

ter health in childhood. In 2004 they were also more likely to have worked in a white-collar or pink-collar occupation, and to be a veteran. The question is whether these shifts in early and midlife factors can account for the changes observed in the prevalence of activity limitations in late life.

With use of multinomial logistic regression techniques our study demonstrated that early-life factors were independent predictors of late-life disability. For example, respondents who rated their childhood health as fair or poor had an increased odds (1.3 times) of reporting limitations in ADLs in later life compared with those who reported excellent childhood health. And respondents who had service sector and secretarial occupations had an increased odds of IADL limitations compared with those in white collar professional and managerial positions. These findings persisted even after controlling for other early-life, midlife, and contemporaneous factors.

Moreover, shifts in the older population with respect to education, mothers' education, health during childhood, and lifetime occupation all contributed to the declines in the prevalence of ADL limitations. Improvements in late-life vision and increases in wealth also appeared to contribute to the declines, but reports of increased chronic conditions in late-life offset these gains. Analysis of changes in ADL onset and recovery over the time period suggested that early and midlife factors contributed, along with late-life factors, to U.S. late-life disability trends, mainly through their influence on the onset of, rather than recovery from, limitation.

As with any study, this analysis had limitations worth reviewing because they highlight the difficulty in conducting research on ways in which the first 50 years of life influence the latter 50 years. Although rich in details about current health and economic status, some of the earlier life measures used were less than ideal. For example, lifetime occupation (based on work histories) could not be ascertained for a significant portion of the sample, and measures of childhood socioeconomic status and health relied on long-term memory. Measures of midlife health were also not available. And because the HRS began in the 1990s, only a decade's worth of trends could be assessed (at least thus far).

What are the public health implications of such findings? One certainly cannot go back and intervene in the early-life circumstances of today's oldest members of society. Rather, the findings are instructive in what they suggest about the persistence of early and midlife effects on late-life activity limitations. The health and economic circumstances of today's children and adults can have a profound influence on the health and functioning of the nation's future elders. In other words, the target

of public health and aging efforts is not just the older adults of today but the children and adults who are the future elders.

THE DOMAINS OF PUBLIC HEALTH AND HEALTHY AGING

We are now ready to address the domains of public health and aging. As mentioned earlier, the majority—although certainly not all—of older adults have already developed chronic disease and many have developed disability, frailty, and cognitive impairment. Hence, the aims of public health in an aging society arguably go well beyond creating circumstances that support health and prevent disease and injury. Instead, the overarching aim of public health and aging is to promote the development and maintenance of optimal physical, mental, and social well-being and function, irrespective of acquired disease. Examples of what public health does to promote healthy aging are provided in Box 1.3.

The true test of this approach to public health and aging is whether it is broad enough to meet the needs of each of the illustrative faces of aging described earlier (see Table 1.1). Recall the robust elder with chronic disease. For those meeting the criteria of robust aging, health promotion and disease prevention may be ample, but those with chronic disease need additional attention to disease management and prevention of disability. For the frail elder, the public health goal is not solely to slow progression of disease but to maximize function and well-being. This typically takes two forms: environmental modification programs to reduce task demands and rehabilitation to increase capacity and adapt spared abilities. For the elder with dementia, the public health goals include excellent supportive care that addresses both quality of care and quality of life, support of informal caregivers, and, when possible, physical and cognitive remediation. For the subset of the population who are dying, public health goals may depend on the nature and course of the trajectory (Lynn & Adamson, 2003), but, in all cases, maximizing well-being and providing the opportunity for patient and family to experience a “good death” are of interest. For all groups, support for compensatory strategies is appropriate. These draw on the allied health and rehabilitation fields (occupational, physical, and speech therapy; physical medicine), nursing, social work care management, and new specialties such as certified driving rehabilitation specialists, doula support for dying, and cognitive remediation for patients with Parkinson’s and stroke.

Box 1.3

EXAMPLES OF WHAT PUBLIC HEALTH DOES TO PROMOTE HEALTHY AGING

1. Prevent epidemics and the spread of disease
 - Influenza immunization
 - Screening for chronic disease
2. Protect against environmental hazards
 - Recognition and reduction of environmental health risks in the homes of older adults
 - Development of aging-friendly communities that promote physical activity in later life
3. Prevent injuries
 - Fall prevention programs
 - Wander prevention programs for dementia care
 - Interventions to reduce motor vehicle crashes among older adults
4. Promote and encourage healthy behaviors and mental health
 - Promotion of later life engagement (senior centers, life-long learning, volunteerism)
 - Enhancement of self-management of chronic disease
5. Respond to disasters and assist communities in recovery
 - Development and implementation response strategies that address unique concerns of older adults
6. Ensure the quality and accessibility of health services
 - Development of quality indicators for aging experiences (home care, assisted living, end-of-life care, nursing home care, etc.)
 - Training of medical professionals about aging experiences.

How does all this differ from current approaches? How does the field of public health and aging, as we envision it, differ from clinical geriatrics and gerontology? These differences should now be clear. Clinical geriatrics stresses medical management of chronic disease and rehabilitation in the face of disabilities related to these conditions (and now, increasingly, “prehabilitation” to delay the onset of disability due to disease and frailty) (Gill et al., 2002). Wallace and Gutierrez (2005) explain that, unlike clinical geriatrics, public health and aging places emphasis on prevention, proactive measures to preserve and promote health, rather than on the reactive treatment of disease. Moreover, public health focuses on the population rather than on the individual, and its programs and policies therefore address the community as a whole.

Public health and aging also overlaps with social and clinical gerontology. Like public health and aging, gerontology is concerned with the study of human aging, and involves attention not just to health, but also to the social and policy context of aging. Like geriatrics, gerontology mostly focuses on individuals rather than the experience of populations. Moreover, public health and aging is explicit in its use of population-based public health tools to address primary and secondary prevention of frailty, disease, and disability in later life. For these reasons, public health and aging represents an emerging field with a distinct focus, along with developing tools and study designs that we describe in later chapters.

POPULATION AGING AND THE GOALS OF PUBLIC HEALTH: BEYOND DISEASE PREVENTION AND HEALTH PROMOTION

As we have discussed, the goal of public health is to create circumstances under which a population is likely to achieve health. More commonly, this aim is referred to as “health promotion and disease prevention.” Here, we review this goal and take up a question that is implicit in our approach to public health and aging. In an aging society, where an increasing proportion of the population survives into older ages, is the goal of health promotion and disease prevention sufficient? We argue that the focus in some cases should be broader to encompass *promotion of function*. Promoting health and promoting function may not always correspond in the real world of imperfect screening tests, invasive diag-

nostic technologies (whose harm is often underappreciated), otherwise successful treatments that may yet put patients at risk for new medical challenges (such as methicillin-resistant *Staphylococcus aureus* [MRSA] or *Clostridium difficile* infection in the hospital setting), and a variety of other tough calls. These challenges may go in the other direction too, as when an apparently more invasive attempt at preserving health may actually offer greater palliative and functional benefit for the person at the end of life (see Chapter 11). Reframing the challenge as “maximizing function and well-being” broadens the goals of public health but is critical, we would argue, in the case of aging populations.

Another way to frame the question is to ask how well public health’s concern for people with disabilities subsumes the needs of older people. Are current approaches to disability a reasonable model for public health approaches to aging (or for thinking about aging more generally)? In this approach, aging can be seen as an accumulation of disabilities, and public health would accordingly aim to reduce the probability of disability at every age and lessen its impact on the quality of life. As we examine sources of disability in old age (in later chapters devoted to physical, cognitive, and affective function), the relevance of disability will become apparent. The difference between current public health approaches to disability and aging viewed as an accumulation of disabilities may lie in the type and generality of disability in old age (produced, for example, by slowing across multiple physiological domains) and the challenge of separating primary sources of disability and secondary conditions related to such disability among older people.

To think through these issues in light of population aging, it is helpful first to return to the elements of public health. “Health promotion” refers to activities that are not specific to any particular diseases but contribute to lowering the likelihood of disease. For example, maintaining a healthy weight, getting regular physical activity, eating a balanced diet, maintaining cognitive vitality, and managing stress would all be considered health promotion activities. These activities reduce the risk of disease and offer more immediate benefits for function. At the community level, cleaning up toxins in a neighborhood and putting in a park or walking paths would also be considered health promotion activities because they allow health-promoting behaviors, such as physical activity. Mounting evidence suggests that older adults benefit from health promotion activities, just as middle-aged and younger adults do. The gain is in lower risk of future disease and more immediate benefit in function.

“Disease prevention” includes primary, secondary, and tertiary efforts. Primary prevention efforts seek to *arrest disease processes by reducing or eliminating risk factors for disease*. Efforts of this kind include vaccination (for flu and pneumonia and now zoster), drug therapies (statins, anti-inflammatory agents, chemoprophylaxis for heart disease and possibly dementia), smoking cessation, physical therapy “prehabilitation,” and assistive technology (hip protectors, grab bars, and other environmental modifications to prevent falls, for example).

Secondary prevention involves *early detection and treatment of disease to minimize morbidity and risk of disability*. These efforts involve increasing appropriate screening to detect disease at an early, asymptomatic stage. Examples of screening include checks for bone mineral density for osteoporosis, glucose metabolism for diabetes, cognitive assessment for dementia, mental health assessment to detect depression, and hypertension screening.

Tertiary prevention seeks *appropriate disease management to reduce disability*. Examples of tertiary prevention include education to support patient self-care, telemedicine to monitor clinical chemistries or heart rhythm, “lifeline” devices that allow elders to report medical emergencies, podiatry in diabetics, inhalers for pulmonary disease, and perhaps most critically a single medical provider to coordinate care.

These health promotion and disease prevention goals have been extended to people with congenital or degenerative conditions who may already face disease and disability. Here, the public health goal is to minimize the risk of “secondary conditions,” conditions that may come about as the result of disability. For example, the Centers for Disease Control and Prevention (CDC) *Healthy People 2010* states:

The health promotion and disease prevention needs of people with disabilities are not nullified because they are born with an impairing condition or have experienced a disease or injury that has long-term consequences. People with disabilities have increased health concerns and susceptibility to secondary conditions. Having a long-term condition increases the need for health promotion that can be medical, physical, social, emotional, or societal. (CDC, 2009)

How do we apply disease prevention and health promotion goals to the older adult with frailty, dementia, or terminal illness? Promoting function is a major goal of *Healthy People 2010*, which explicitly aims to increase years of healthy life, that is, disability-free years. This emphasis

is carried forward in the draft vision for *Healthy People 2020*, which seeks “a society in which all people live long and healthy lives.” This vision is echoed in the CDC *State of Health and Aging in America 2007*, which adopts the goal of increasing “the numbers . . . who live longer, high-quality, productive, and independent lives.”

Yet, when one looks specifically at elder-specific public health recommendations beyond clinical prevention services, these documents do not say much about promoting function. The *State of Health and Aging in America 2007* offers the following additional calls to action: (a) increase physical activity among older adults by promoting environmental changes, and (b) encourage people to communicate their wishes about end-of-life care. The *Healthy People 2020* Older Adult Workgroup suggests a variety of additional goals and indicators that could be considered:

- Increase the quality of life for those with multiple chronic illnesses
 - ▲ Measure frequency and intensity of community supportive services
 - ▲ Measure participation in self-management programs
 - ▲ Measure use of Medicare prevention benefits and health utilization services
- Increase the percentage of individuals reporting good physical functioning
 - ▲ Measure frequency and type of exercise, including regular physical activity, vigorous physical activity, strength and endurance, flexibility, walking for transportation, bicycling for transportation
- Decrease the rate of pressure ulcers and physical restraints in nursing homes
- Decrease preventable hospitalizations of individuals receiving home health care
 - ▲ Measure efficiency and effectiveness of transition between levels of care

These are extremely important advances in setting goals for public health and aging. They take us beyond the use of clinical prevention services and a narrow focus on disease prevention to health promotion in the fullest sense as maximization of function and well-being. However, they do not fully connect with the supportive services older adults also

need for maximization of function and which, to date, have not made a bridge to public health. We turn to these in Chapter 3.

SUMMARY

Definition of Public Health and Aging. Public health and aging uses the methods and materials of public health to promote healthy aging—that is, to ensure conditions that promote the development and maintenance of optimal physical, cognitive, affective, and social well-being and function in later life. In addition to promoting primary and secondary prevention in old age, and facilitating older adults' adaptation to disease and disability, a central goal for public health and aging is to ensure conditions in the first 50 years of life that will predispose people to live a healthy second 50 years.

Defining Aging. Chronological aging is the passage of time, whereas biological aging or “senescence” involves maturation of cells and physiological systems. Senescence reflects changes that are age dependent, whereas disease represents changes that are age associated because of longer exposures to risks. In practice, senescence and disease are often difficult to distinguish, although public health interventions are currently more readily implemented to address the latter.

Types of Older Adult and Public Health Goals. It is useful to identify different types of “old age.” Prominent types in geriatric care include the robust, frail, demented, and dying elder, as well as the compensating, adaptive elder. Just as the goals of medical care will be different for each type of elder, so too will the goals of public health. In the case of robust elders, the majority of whom have some chronic disease, public health goals include preventing frailty and disability. The public health goal for the frail elder is to maximize function. This typically takes two forms: environmental modification to reduce task demand, and rehabilitation to increase capacity and adapt spared abilities. The public health goals for the elder with dementia include excellent supportive care, support of informal caregivers, and, when possible, physical and cognitive remediation. For the dying patient, public health goals include a good death for both patient and family. To support compensation, the allied health specialties are critical.

How the First 50 Years Matter for Health in the Second 50 Years. It is difficult to study the ways in which health and risk behaviors in the first half of life may affect health in the second 50 years. Grip strength

illustrates well the unity of the life span with respect to risk factors and later health outcomes. This is a measure of general muscle strength, easily obtained with a hand dynamometer. Grip strength in midlife is related to prenatal environment, and grip strength in midlife is related to disability in late life. These investigations represent a rare case in which a single important risk factor or health indicator has been investigated across the whole life span and related to outcomes at different points in the life span.

Successful vs. Healthy Aging. Rowe and Kahn suggested that successful aging consists of three elements: absence of disease and the risk factors for disease; maintenance of physical and cognitive abilities; and engagement in productive activities. About 20%–33% of older adults meet this definition. In contrast, the aim of public health and aging is healthy aging, that is, ensuring the conditions that allow older adults to develop and maintain optimal physical, mental, and social well-being and function across disease states and across the life span.

The Domains of Public Health and Aging. In practice, the field of public health and aging encompasses a wide variety of programs, services, and research activities. Some are aimed at health promotion and disease prevention in later life and others at self-management among those who have already developed chronic disease. Behavioral interventions that complement clinical care are of interest as are enhancements of the social context of older adults, including those geared to people living in residential or skilled nursing care settings. Development of quality indicators for particular kinds of aging experiences and settings, such as dementia care, nursing home residence, assisted living, home care, and end-of-life care, are important contributions. Programs to promote independence, through use of assistive technologies, and to maximize functioning and well-being more generally also fall in the purview of public health and aging.

Aims of Public Health in an Aging Society. In an aging society, where an increasing share of the population survives into older ages, traditional public health goals may be too narrow to meet the needs of the aged population. Instead, the aim of public health in an aging population is to maximize function and well-being of older adults irrespective of the level of disease or disability.