

# Public Health and the Second 50 Years of Life

Aging is the maturation and senescence of biological systems. With each additional decade of life, adults will see a number of changes, for example, a slowing 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, of course, greater mortality. They will also see declines in addictive behaviors and crime; a reduction in severe psychiatric disorders; 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 wealth, leisure time, and altruistic behaviors, among many other changes. The popular understanding of aging mostly stresses negative changes that result in disability, but a more complete

understanding should stress both kinds of change, for both are relevant to a public health perspective on aging.

These changes may be more prevalent in older people because they are, in fact, true expressions of senescence. Or they 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. More than likely, 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 age, suggesting that this change is a senescent feature of the auditory system. But it is also likely that long years of occupa-

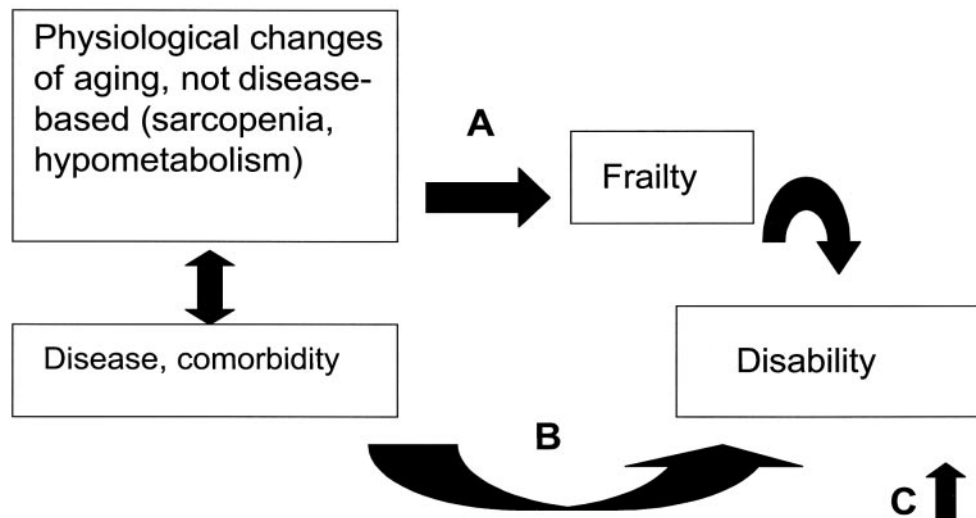
tional exposure to noise, untreated ear infections during childhood, neurological conditions, and an accumulation of minor injuries might contribute to loss of hearing in old age. What happens in the first half of life must surely matter to health in the second half.

### PATHWAYS TO DISABILITY

Disease and senescent changes can each produce disability, disease directly and senescent changes indirectly through a period of “frailty” that represents a preclinical state of disability. One way to distinguish between the effects of senescent changes and those of disease is shown in Figure 1.

Pathway A involves the direct effect of senescent changes. The signature of senescent changes (defined here as physiological





**FIGURE 1—Three pathways to disability: senescence leading to frailty; disease; and environmental, psychological, and social factors (A, B, and C).**

changes of aging, not disease-based) in later life is frailty, which is evidenced by weakness, slowness, and poor endurance. Older people can be frail even in the absence of any identifiable disease process.<sup>1</sup> Progressive weakness, slowness, and poor endurance eventually make it difficult for older people to prepare meals, travel, or get in and out of the bathtub. At this point, older people drop below the threshold of physical and cognitive capacity required for completion of daily tasks. Thus, frailty itself puts older people at risk for disability, which is typically defined as difficulty with household and personal self-maintenance activities severe enough to threaten independent living.

Pathway B involves the direct effect of disease on disability. Cognitive changes in Alzheimer disease, joint tenderness in osteoarthritis, neuropathy and kidney failure in diabetes, and macular degeneration all directly

cause disability by reducing stamina, strength, sensibility, and dexterity and producing pain and balance difficulties. Accumulation of morbid conditions increases the likelihood of severe disability and early mortality. Notably, senescent changes can be accelerated in the presence of disease and can also predispose older people to develop frank disease; hence the double arrow connecting senescent change and disease. Older adults develop reductions in glucose tolerance, for example, which may lead to frank diabetes under certain conditions.<sup>2</sup>

Note, however, that senescence and disease do not exhaust the causes of disability. Pathway C identifies an additional cause of disability, which is also important in a public health approach to aging. This is the effect of environmental factors, such as the degree to which daily living conditions serve to underchallenge or overwhelm people,<sup>3</sup> inadequate

access to assistive and prosthetic technologies, and weak social and psychological resources. These factors can produce disability in older people who are otherwise similar in frailty or medical status.

What is the role of each of these pathways to disability? Fried and colleagues<sup>1</sup> report that in a sample of 363 older people with self-reported disability, 28% met criteria for frailty (defined as 3 or more of the following: unintentional weight loss, weakness, poor endurance, slowness, and low activity). Another 54% had medical conditions without meeting criteria for frailty. Some (18%) did not meet criteria for frailty and did not have comorbid disease; their disability was the result of unmeasured frailty or disease or, more likely, resulted from the complex of environmental, psychological, and social factors that make up the third, independent pathway to disability shown in Figure 1.

These are important findings. The majority of self-reported disability appears to be due to disease and not to the inevitable slowing, weakening, and shrinking typical of aging. If so, optimal disease management and primary prevention of disease will likely continue to reduce disability to lower levels. Disability in later life in the United States has already declined from 26.2% in 1984 to 24.4% in 1989, 22.5% in 1994, and 19.7% in 1999.<sup>4</sup> These trends represent a continuation of disability reduction in late life evident over the last 100 years.<sup>5</sup>

### MODIFYING THE PATHWAYS

What should be the focus of public health for the second 50 years of life? Our model suggests that each of the 3 pathways to disability can be modified through appropriate public health efforts.

Pathway A, the effect of senescent changes and frailty on disability, has been least explored. What public health strategies would prevent or forestall frailty? It is likely that many of the primary prevention strategies proposed for healthy aging—cognitive engagement, physical exercise, healthy diet, moderate alcohol use, avoidance of smoking, use of cancer screening—may help forestall frailty or delay onset of frank states of disability. But one can imagine more direct interventions directed toward senescence: bone mineral supplementation to counter osteoporosis, statins to reduce cholesterol and heart disease, amyloid clearance to reduce the risk of Alzheimer disease. Basic science may allow some measure of control over the genetic basis of senescence. The potential for enhancing primary prevention of

disability in late life is great, but so are the ethical challenges of such an approach.<sup>6</sup>

Pathway B is perhaps the major focus of current efforts, as it should be, given that the majority of disability in late life is the result of chronic disease. Public health efforts continue to focus on lifestyle changes that reduce the risk of dementia, stroke, cardiovascular disease, and cancer; screening to detect preclinical states of disease and guide treatment; and effective disease management to minimize disability in people with disease. Thus, primary, secondary, and tertiary prevention are as applicable here as in any other public health effort. One difference, well established in geriatric research, is that health in late life is not well captured by the traditional approach to discrete physiological systems. Impairments in vision, hearing, lower extremity strength, and affect, for example, increase the risk of falls, incontinence, and dependency in everyday self-maintenance tasks, suggesting that many geriatric syndromes cut across different physiological systems.<sup>7</sup>

Pathway C deserves special emphasis. A key finding from gerontological research in recent years is that disability is also a matter of social and psychological environments. Older people with physical and cognitive impairments alter their environments in ways that allow them to maintain independence; this is part of a broader compensatory process that remains to be fully investigated. Prosthetic technologies—from the kneeling bus to assistive communication devices—are an important component of tertiary prevention.

This third pathway highlights the critical importance of the social context of aging. In studying

older adults, we can identify psychological, social, and environmental characteristics that have allowed individuals to survive to late ages. For example, given the excess mortality they face across the life span, African Americans who reach old ages may be especially hardy and resilient; their experience of aging may be valuable for identifying what it takes to age well. Similarly, the experience of older people reflects the cumulated effects of health promotion and disease prevention efforts across the life span. Perhaps the most compelling argument for health promotion activities at all stages of the life cycle is that they will enable us to look at the cumulative impact of such activities on the older adult. A focus on the elderly will likely enhance public health at all stages of the life cycle.

### RESEARCH ON AGING

Given this picture, and the pressing need to promote public health among the 1.5 billion people who will be 65 years old or older in 2050,<sup>8</sup> how are we doing? To what extent has the public health community turned its attention to the second 50 years? The Journal is a good place to start. We randomly selected 9 of the 12 issues of the Journal published in 2001. Among 174 original research contributions, we counted 39, or 22%, that included people over the age of 50 years. Note that the age 50 criterion is a generous approach to the second 50 years, since many of the studies went no further than age 60 or 65 years in their samples. Most covered screening, health behaviors, and mortality (nearly 70% of the 39 articles); disability was a focus in only 4 articles, or 10%.

We conclude that the public health research community could profitably pay more regard to the second 50 years of life. Certainly, more attention could be directed to primary prevention of frailty and disability and the social context of successful aging. Let us join together to do research in this vital area and in this way move the field, and the Journal, in this direction. ■

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