



# Global Health and Aging



National Institute on Aging  
National Institutes of Health  
U.S. Department of Health and Human Services

World Health Organization

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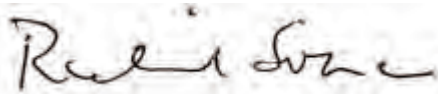
# Preface

The world is facing a situation without precedent: We soon will have more older people than children and more people at extreme old age than ever before. As both the proportion of older people and the length of life increase throughout the world, key questions arise. Will population aging be accompanied by a longer period of good health, a sustained sense of well-being, and extended periods of social engagement and productivity, or will it be associated with more illness, disability, and dependency? How will aging affect health care and social costs? Are these futures inevitable, or can we act to establish a physical and social infrastructure that might foster better health and wellbeing in older age? How will population aging play out differently for low-income countries that will age faster than their counterparts have, but before they become industrialized and wealthy?

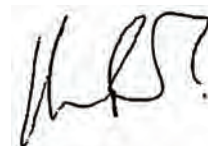
This brief report attempts to address some of these questions. Above all, it emphasizes the central role that health will play moving forward. A better understanding of the changing relationship between health with age is crucial if we are to create a future that takes full advantage of the powerful resource inherent in older populations. To do so, nations must develop appropriate data systems and research capacity to monitor and understand these patterns and relationships, specifically longitudinal studies that incorporate measures of health, economic status, family, and well-being. And research needs to be better coordinated if we are to discover the most cost-effective ways to maintain healthful life styles and everyday functioning in countries at different stages of economic development and with varying resources. Global efforts are required to understand and find cures or ways to prevent such age-related diseases as Alzheimer's and frailty and to implement existing knowledge about the prevention and treatment of heart disease, stroke, diabetes, and cancer.

Managing population aging also requires building needed infrastructure and institutions as soon as possible. The longer we delay, the more costly and less effective the solutions are likely to be.

Population aging is a powerful and transforming demographic force. We are only just beginning to comprehend its impacts at the national and global levels. As we prepare for a new demographic reality, we hope this report raises awareness not only about the critical link between global health and aging, but also about the importance of rigorous and coordinated research to close gaps in our knowledge and the need for action based on evidence-based policies.



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# Overview

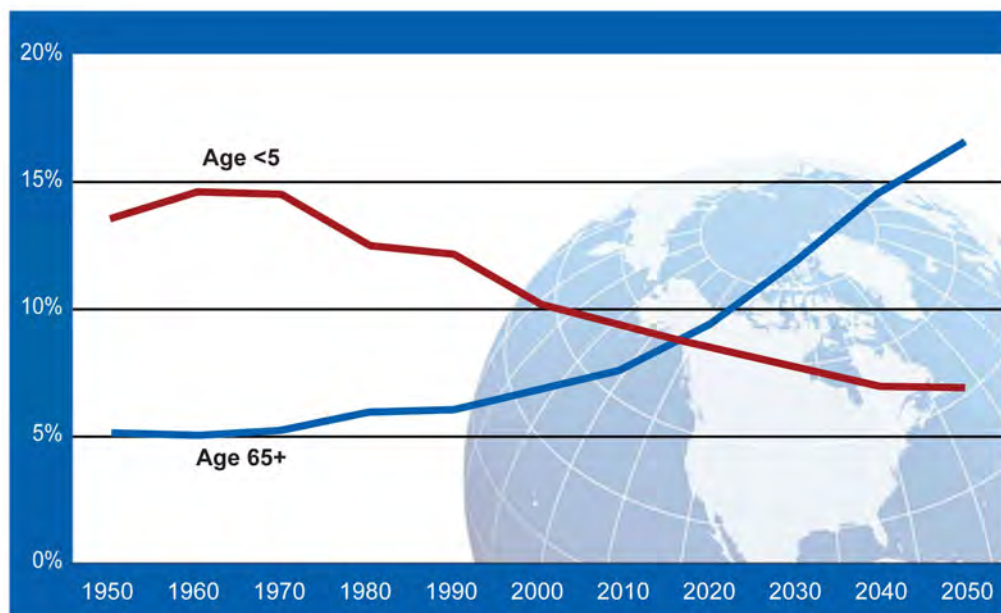
The world is on the brink of a demographic milestone. Since the beginning of recorded history, young children have outnumbered their elders. In about five years' time, however, the number of people aged 65 or older will outnumber children under age 5. Driven by falling fertility rates and remarkable increases in life expectancy, population aging will continue, even accelerate (**Figure 1**). The number of people aged 65 or older is projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050, with most of the increase in developing countries.

The remarkable improvements in life expectancy over the past century were part of a shift in the leading causes of disease and death. At the dawn of the 20th century,

the major health threats were infectious and parasitic diseases that most often claimed the lives of infants and children. Currently, noncommunicable diseases that more commonly affect adults and older people impose the greatest burden on global health.

In today's developing countries, the rise of chronic noncommunicable diseases such as heart disease, cancer, and diabetes reflects changes in lifestyle and diet, as well as aging. The potential economic and societal costs of noncommunicable diseases of this type rise sharply with age and have the ability to affect economic growth. A World Health Organization analysis in 23 low- and middle-income countries estimated the economic losses from three noncommunicable diseases (heart disease,

**Figure 1.**  
**Young Children and Older People as a Percentage of Global Population: 1950-2050**



Source: United Nations. *World Population Prospects: The 2010 Revision*. Available at: <http://esa.un.org/unpd/wpp>.



stroke, and diabetes) in these countries would total US\$83 billion between 2006 and 2015.

Reducing severe disability from disease and health conditions is one key to holding down health and social costs. The health and economic burden of disability also can be reinforced or alleviated by environmental characteristics that can determine whether an older person can remain independent despite physical limitations. The longer people can remain mobile and care for themselves, the lower are the costs for long-term care to families and society.

Because many adult and older-age health problems were rooted in early life experiences and living conditions, ensuring good child health can yield benefits for older people. In the meantime, generations of children and young adults who grew up in poverty and ill health in developing countries will be entering old age in coming decades, potentially increasing the health burden of older populations in those countries.



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With continuing declines in death rates among older people, the proportion aged 80 or older is rising quickly, and more people are living past 100. The limits to life expectancy and lifespan are not as obvious as once thought. And there is mounting evidence from cross-national data that—with appropriate policies and programs—people can remain healthy and independent well into old age and can continue to contribute to their communities and families.

The potential for an active, healthy old age is tempered by one of the most daunting and potentially costly consequences of ever-longer life expectancies: the increase in people with dementia, especially Alzheimer's disease. Most dementia patients eventually need constant care and help with the most basic activities of daily living, creating a heavy economic and social burden. Prevalence of dementia rises sharply with age. An estimated 25-30 percent of people aged 85 or older have dementia. Unless new and more effective interventions are found to treat or prevent Alzheimer's disease, prevalence is expected to rise dramatically with the aging of the population in the United States and worldwide.

Aging is taking place alongside other broad social trends that will affect the lives of older people. Economies are globalizing, people are more likely to live in cities, and technology is evolving rapidly. Demographic and family changes mean there will be fewer older people with families to care for them. People today have fewer children, are less likely to be married, and are less likely to live with older generations. With declining support from families, society will need better information and tools to ensure the well-being of the world's growing number of older citizens.

# Humanity's Aging

In 2010, an estimated 524 million people were aged 65 or older—8 percent of the world's population. By 2050, this number is expected to nearly triple to about 1.5 billion, representing 16 percent of the world's population. Although more developed countries have the oldest population profiles, the vast majority of older people—and the most rapidly aging populations—are in less developed countries. Between 2010 and 2050, the number of older people in less developed countries is projected to increase more than 250 percent, compared with a 71 percent increase in developed countries.

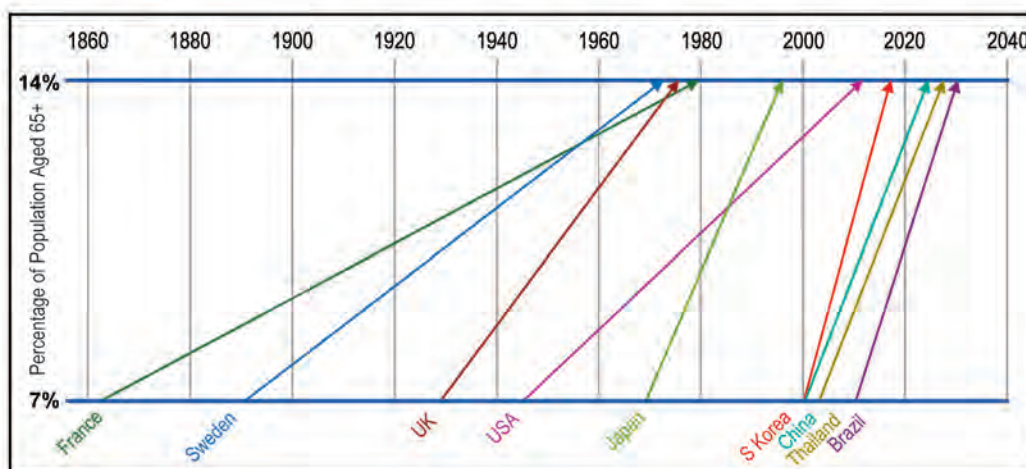
This remarkable phenomenon is being driven by declines in fertility and improvements in longevity. With fewer children entering the population and people living longer, older people are making up an increasing share of the total population. In more developed countries, fertility fell below the replacement rate of two live births per woman by the 1970s, down from

nearly three children per woman around 1950. Even more crucial for population aging, fertility fell with surprising speed in many less developed countries from an average of six children in 1950 to an average of two or three children in 2005. In 2006, fertility was at or below the two-child replacement level in 44 less developed countries.

Most developed nations have had decades to adjust to their changing age structures. It took more than 100 years for the share of France's population aged 65 or older to rise from 7 percent to 14 percent. In contrast, many less developed countries are experiencing a rapid increase in the number and percentage of older people, often within a single generation (**Figure 2**). For example, the same demographic aging that unfolded over more than a century in France will occur in just two decades in Brazil. Developing countries will need to adapt quickly to this new reality. Many less developed nations

**Figure 2.**  
**The Speed of Population Aging**

Time required or expected for percentage of population aged 65 and over to rise from 7 percent to 14 percent



Source: Kinsella K, He W. *An Aging World: 2008*. Washington, DC: National Institute on Aging and U.S. Census Bureau, 2009.



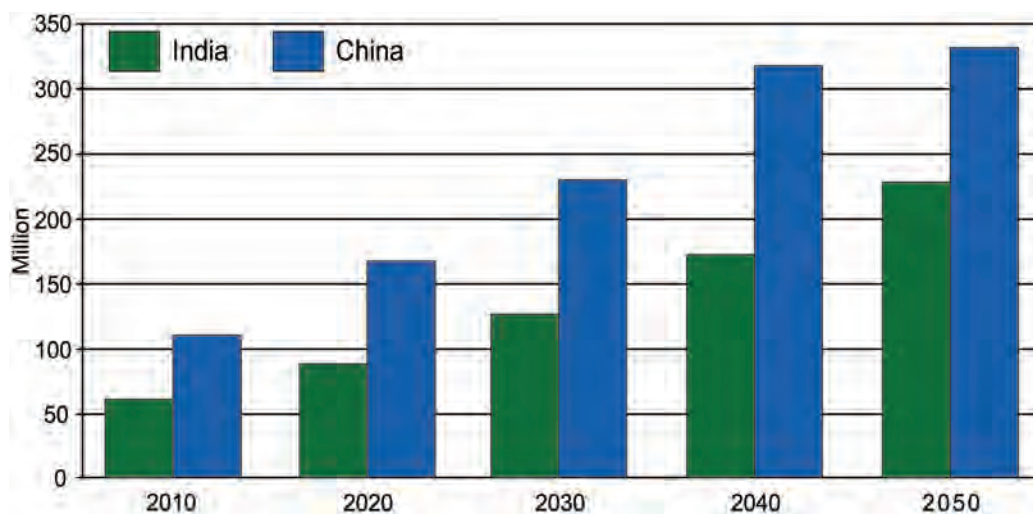


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will need new policies that ensure the financial security of older people, and that provide the health and social care they need, without the same extended period of economic growth experienced by aging societies in the West. In other words, some countries may grow old before they grow rich.

In some countries, the sheer number of people entering older ages will challenge national infrastructures, particularly health systems. This numeric surge in older people is dramatically illustrated in the world's two most populous countries: China and India (**Figure 3**). China's older population – those over age 65 – will likely swell to 330 million by 2050 from 110 million today. India's current older population of 60 million is projected to exceed 227 million in 2050, an increase of nearly 280 percent from today. By the middle of this century, there could be 100 million Chinese over the age of 80. This is an amazing achievement considering that there were fewer than 14 million people this age on the entire planet just a century ago.

**Figure 3.**  
**Growth of the Population Aged 65 and Older in India and China: 2010-2050**



Source: United Nations. *World Population Prospects: The 2010 Revision*.  
Available at: <http://esa.un.org/unpd/wpp>.

# Living Longer

The dramatic increase in average life expectancy during the 20th century ranks as one of society's greatest achievements. Although most babies born in 1900 did not live past age 50, life expectancy at birth now exceeds 83 years in Japan—the current leader—and is at least 81 years in several other countries. Less developed regions of the world have experienced a steady increase in life expectancy since World War II, although not all regions have shared in these improvements. (One notable exception is the fall in life expectancy in many parts of Africa because of deaths caused by the HIV/AIDS epidemic.) The most dramatic and rapid gains have occurred in East Asia, where life expectancy at birth increased from less than 45 years in 1950 to more than 74 years today.

These improvements are part of a major transition in human health spreading around the globe at different rates and along different



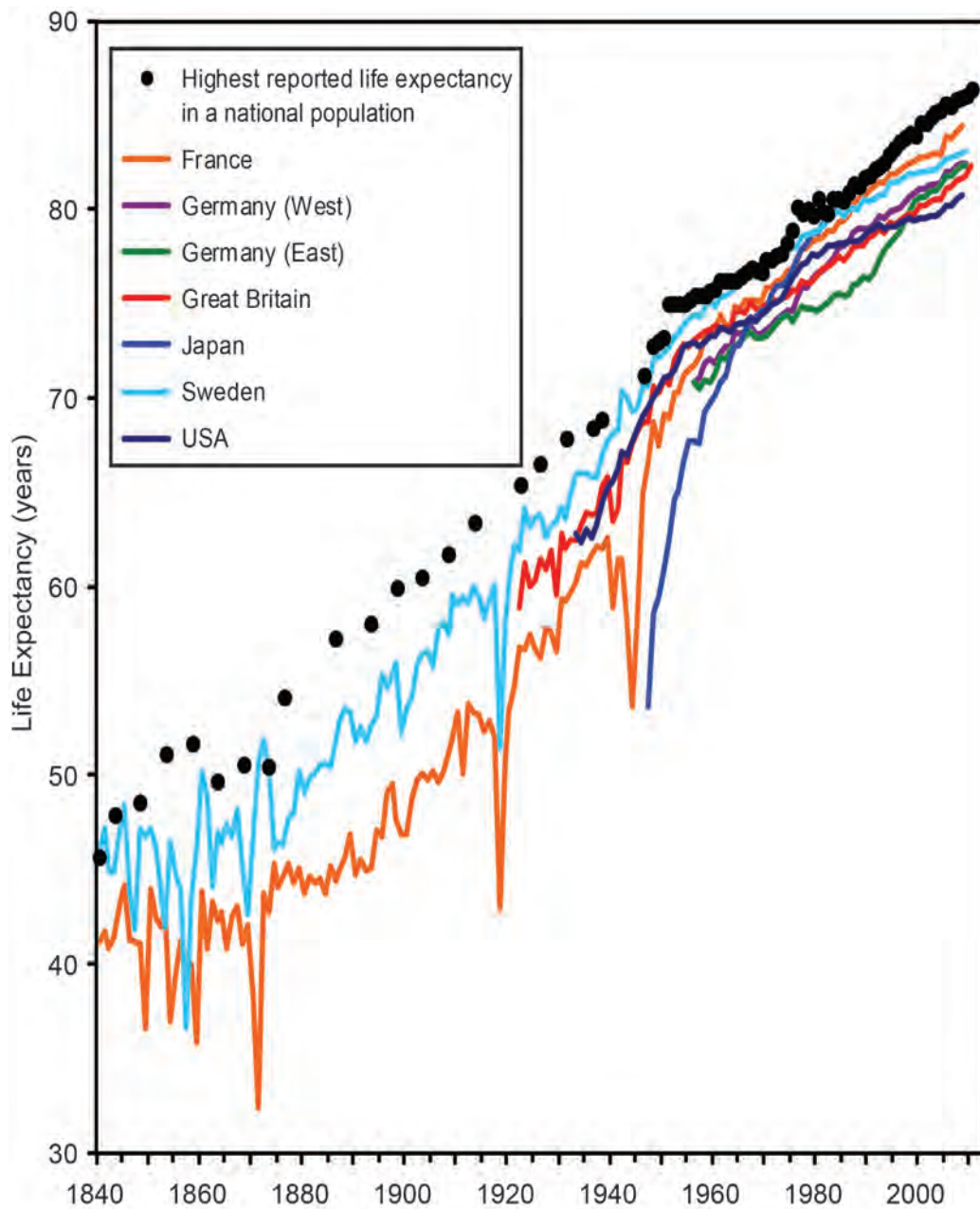
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pathways. This transition encompasses a broad set of changes that include a decline from high to low fertility; a steady increase in life expectancy at birth and at older ages; and a shift in the leading causes of death and illness from infectious and parasitic diseases to noncommunicable diseases and chronic conditions. In early nonindustrial societies, the risk of death was high at every age, and only a small proportion of people reached old age. In modern societies, most people live past middle age, and deaths are highly concentrated at older ages.

The victories against infectious and parasitic diseases are a triumph for public health projects of the 20th century, which immunized millions of people against smallpox, polio, and major childhood killers like measles. Even earlier, better living standards, especially more nutritious diets and cleaner drinking water, began to reduce serious infections and prevent deaths among children. More children were surviving their vulnerable early years and reaching adulthood. In fact, more than 60 percent of the improvement in female life expectancy at birth in developed countries between 1850 and 1900 occurred because more children were living to age 15, not because more adults were reaching old age. It wasn't until the 20th century that mortality rates began to decline within the older ages. Research for more recent periods shows a surprising and continuing improvement in life expectancy among those aged 80 or above.

The progressive increase in survival in these oldest age groups was not anticipated by demographers, and it raises questions about how high the average life expectancy can realistically rise and about the potential length of the human lifespan. While some experts assume that life expectancy must be approaching an upper limit,

**Figure 4.**  
**Female Life Expectancy in Developed Countries: 1840-2009**



Source: Highest reported life expectancy for the years 1840 to 2000 from online supplementary material to Oeppen J, Vaupel JW. Broken limits to life expectancy. *Science* 2002; 296:1029-1031. All other data points from the Human Mortality Database (<http://www.mortality.org>) provided by Roland Rau (University of Rostock). Additional discussion can be found in Christensen K, Doblhammer G, Rau R, Vaupel JW. Aging populations: The challenges ahead. *The Lancet* 2009; 374/9696:1196-1208.



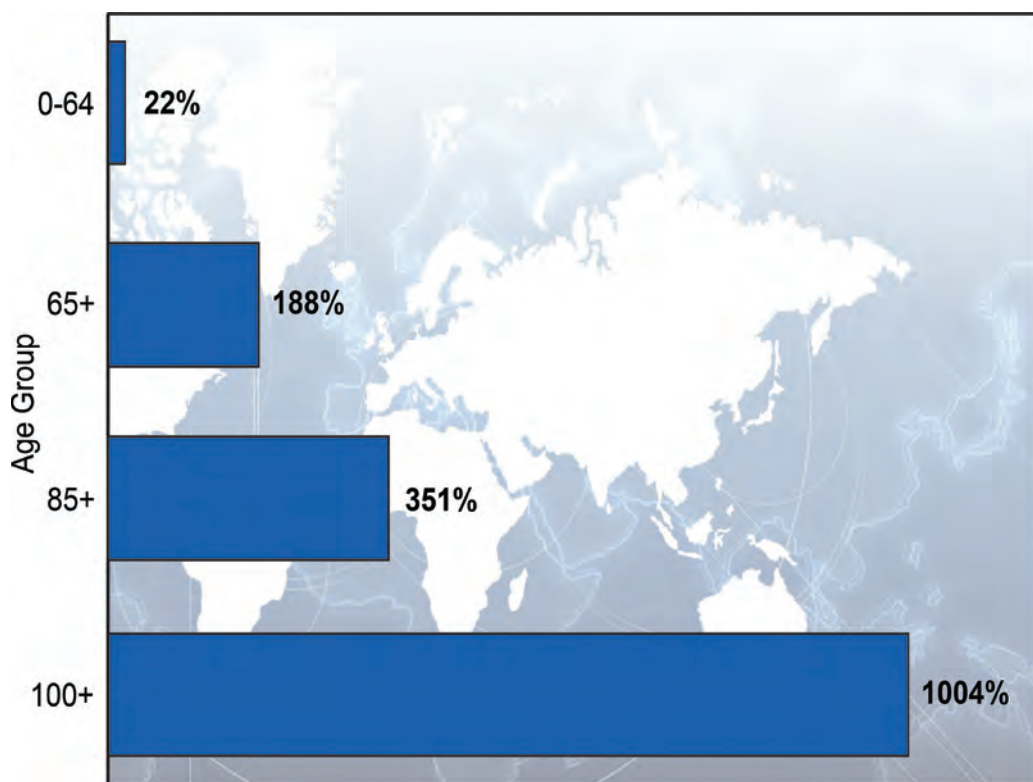
data on life expectancies between 1840 and 2007 show a steady increase averaging about three months of life per year. The country with the highest average life expectancy has varied over time (Figure 4). In 1840 it was Sweden and today it is Japan—but the pattern is strikingly similar. So far there is little evidence that life expectancy has stopped rising even in Japan.

The rising life expectancy within the older population itself is increasing the number and proportion of people at very old ages. The “oldest old” (people aged 85 or older) constitute 8 percent of the world’s 65-and-over population: 12 percent in more developed countries and 6 percent in less developed countries. In many countries, the oldest old are now the fastest growing part of the total population. On a

global level, the 85-and-over population is projected to increase 351 percent between 2010 and 2050, compared to a 188 percent increase for the population aged 65 or older and a 22 percent increase for the population under age 65 (Figure 5).

The global number of centenarians is projected to increase 10-fold between 2010 and 2050. In the mid-1990s, some researchers estimated that, over the course of human history, the odds of living from birth to age 100 may have risen from 1 in 20,000,000 to 1 in 50 for females in low-mortality nations such as Japan and Sweden. This group’s longevity may increase even faster than current projections assume—previous population projections often underestimated decreases in mortality rates among the oldest old.

**Figure 5.**  
**Percentage Change in the World’s Population by Age: 2010-2050**



Source: United Nations, *World Population Prospects: The 2010 Revision*.  
Available at: <http://esa.un.org/unpd/wpp>.

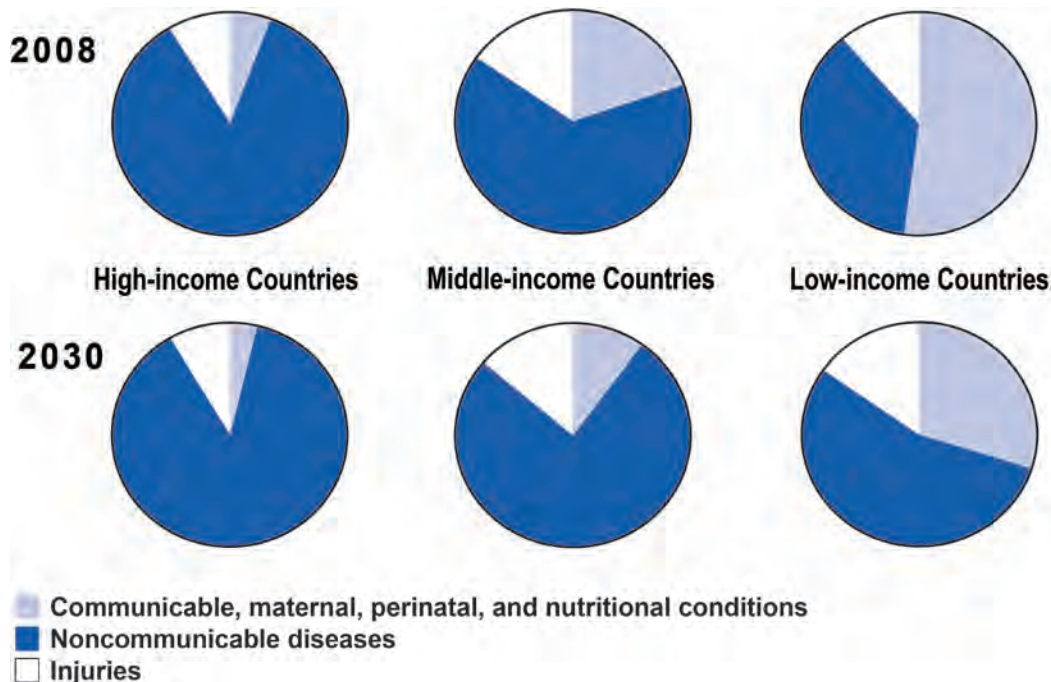
# New Disease Patterns

The transition from high to low mortality and fertility that accompanied socioeconomic development has also meant a shift in the leading causes of disease and death. Demographers and epidemiologists describe this shift as part of an “epidemiologic transition” characterized by the waning of infectious and acute diseases and the emerging importance of chronic and degenerative diseases. High death rates from infectious diseases are commonly associated with the poverty, poor diets, and limited infrastructure found in developing countries. Although many developing countries still experience high child mortality from infectious and parasitic diseases, one of the

major epidemiologic trends of the current century is the rise of chronic and degenerative diseases in countries throughout the world—regardless of income level.

Evidence from the multicountry Global Burden of Disease project and other international epidemiologic research shows that health problems associated with wealthy and aged populations affect a wide and expanding swath of world population. Over the next 10 to 15 years, people in every world region will suffer more death and disability from such noncommunicable diseases as heart disease, cancer, and diabetes than from

**Figure 6.**  
**The Increasing Burden of Chronic Noncommunicable Diseases: 2008 and 2030**



Source: World Health Organization, *Projections of Mortality and Burden of Disease, 2004-2030*. Available at: [http://www.who.int/healthinfo/global\\_burden\\_disease/projections/en/index.html](http://www.who.int/healthinfo/global_burden_disease/projections/en/index.html).

infectious and parasitic diseases. The myth that noncommunicable diseases affect mainly affluent and aged populations was dispelled by the project, which combines information about mortality and morbidity from every world region to assess the total health burden from specific diseases. The burden is measured by estimating the loss of healthy years of life due to a specific cause based on detailed epidemiological information. In 2008, noncommunicable diseases accounted for an estimated 86 percent of the burden of disease in high-income countries, 65 percent in middle-income countries, and a surprising 37 percent in low-income countries.

By 2030, noncommunicable diseases are projected to account for more than one-half of the disease burden in low-income countries and more than three-fourths in middle-income countries. Infectious and parasitic diseases will account for 30 percent and 10 percent, respectively, in low- and middle-income countries (Figure 6). Among the 60-and-over population, noncommunicable diseases already account for more than 87 percent of the burden in low-, middle-, and high-income countries.

But the continuing health threats from communicable diseases for older people cannot be dismissed, either. Older people account for a growing share of the infectious disease burden in low-income countries. Infectious disease programs, including those for HIV/AIDS, often neglect older people and ignore the potential effects of population aging. Yet, antiretroviral therapy is enabling more people with HIV/AIDS to survive to older ages. And, there is growing evidence that older people are particularly susceptible to infectious diseases for a variety of reasons, including immunosenescence (the progressive deterioration of immune function with age) and frailty. Older people already suffering from one chronic or infectious disease are especially vulnerable to additional infectious diseases. For example, type 2 diabetes and tuberculosis are well-known “comorbid risk factors” that have serious health consequences for older people.

## Lasting Importance of Child

A growing body of research finds that many health problems in adulthood and old age stem from infections and health conditions early in life. Some researchers argue that important aspects of adult health are determined before birth, and that nourishment in utero and during infancy has a direct bearing on the development of risk factors for adult diseases—especially cardiovascular diseases. Early malnutrition in Latin America is highly correlated with self-reported diabetes, for example, and childhood rheumatic fever is a frequent cause of adult heart disease in developing countries.

Research also shows that delayed physical growth in childhood reduces physical and cognitive functioning in later years. Data on China’s oldest old show that rarely or never suffering from serious illnesses or receiving adequate medical care during childhood results in a much lower risk of suffering cognitive impairments or physical limitations at ages 80 or older.

Proving links between childhood health conditions and adult development and health is a complicated research challenge. Researchers rarely have the data necessary to separate the health effects of changes in living standards or environmental conditions during a person’s life from health effects related to his or her birth or childhood diseases. However, a Swedish study with excellent historical data concluded that reduced early exposure to infectious diseases was related to increases in life expectancy. A cross-national investigation of data from two surveys of older populations in Latin America and the Caribbean also found links between early conditions and later disability. The older people in the studies were born and grew up during times of generally poor nutrition and higher risk of exposure to infectious diseases. In the Puerto Rican survey, the probability of being disabled was more than 64 percent higher for people growing up in



## hood Health

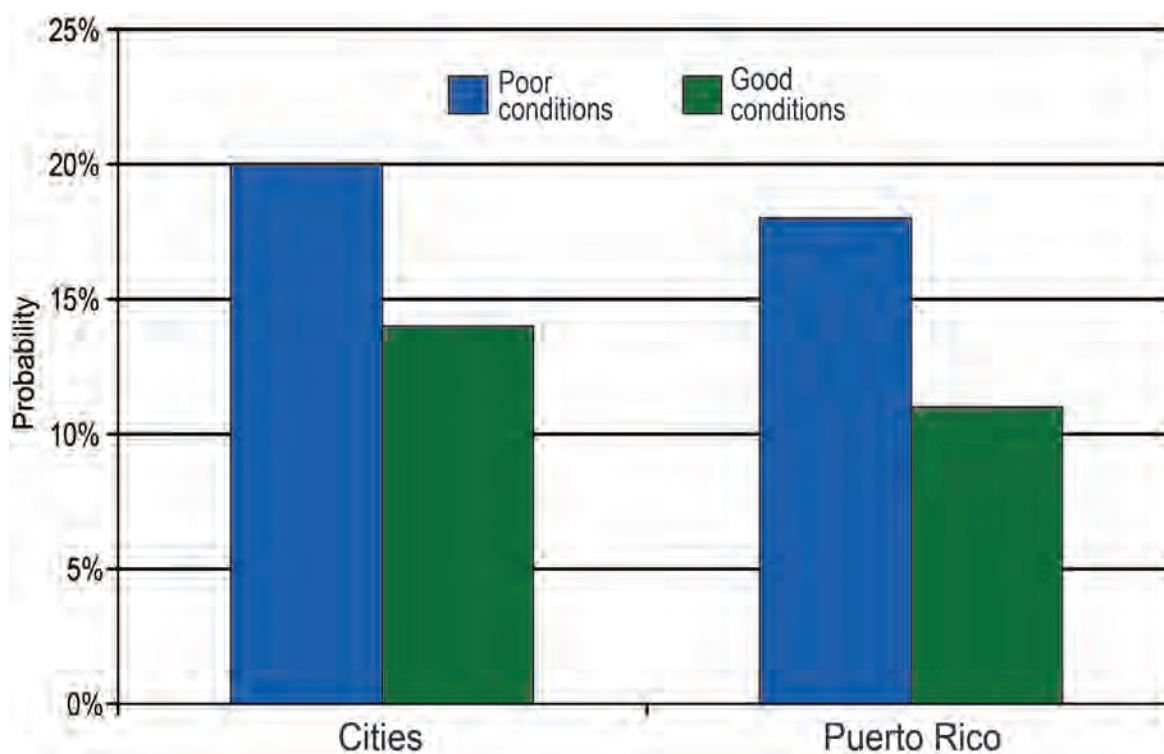
poor conditions than for people growing up in good conditions. A survey of seven urban centers in Latin America and the Caribbean found the probability of disability was 43 percent higher for those from disadvantaged backgrounds than for those from more favorable ones (Figure 7).

If these links between early life and health at older ages can be established more directly, they may have especially significant implications for less developed countries. People now growing old in low- and middle-income countries are likely to have experienced more

distress and disadvantage as children than their counterparts in the developed world, and studies such as those described above suggest that they are at much greater risk of health problems in older age, often from multiple noncommunicable diseases.

Behavior and exposure to health risks during a person's adult life also influence health in older age. Exposure to toxic substances at work or at home, arduous physical work, smoking, alcohol consumption, diet, and physical activity may have long-term health implications.

**Figure 7.**  
**Probability of Being Disabled among Elderly in Seven Cities of Latin America and the Caribbean (2000) and Puerto Rico (2002-2003) by Early Life Conditions**



Source: Monteverde M, Norohna K, Palloni A. 2009. Effect of early conditions on disability among the elderly in Latin-America and the Caribbean. *Population Studies* 2009;63/1: 21-35.

## Longer Lives and Disability

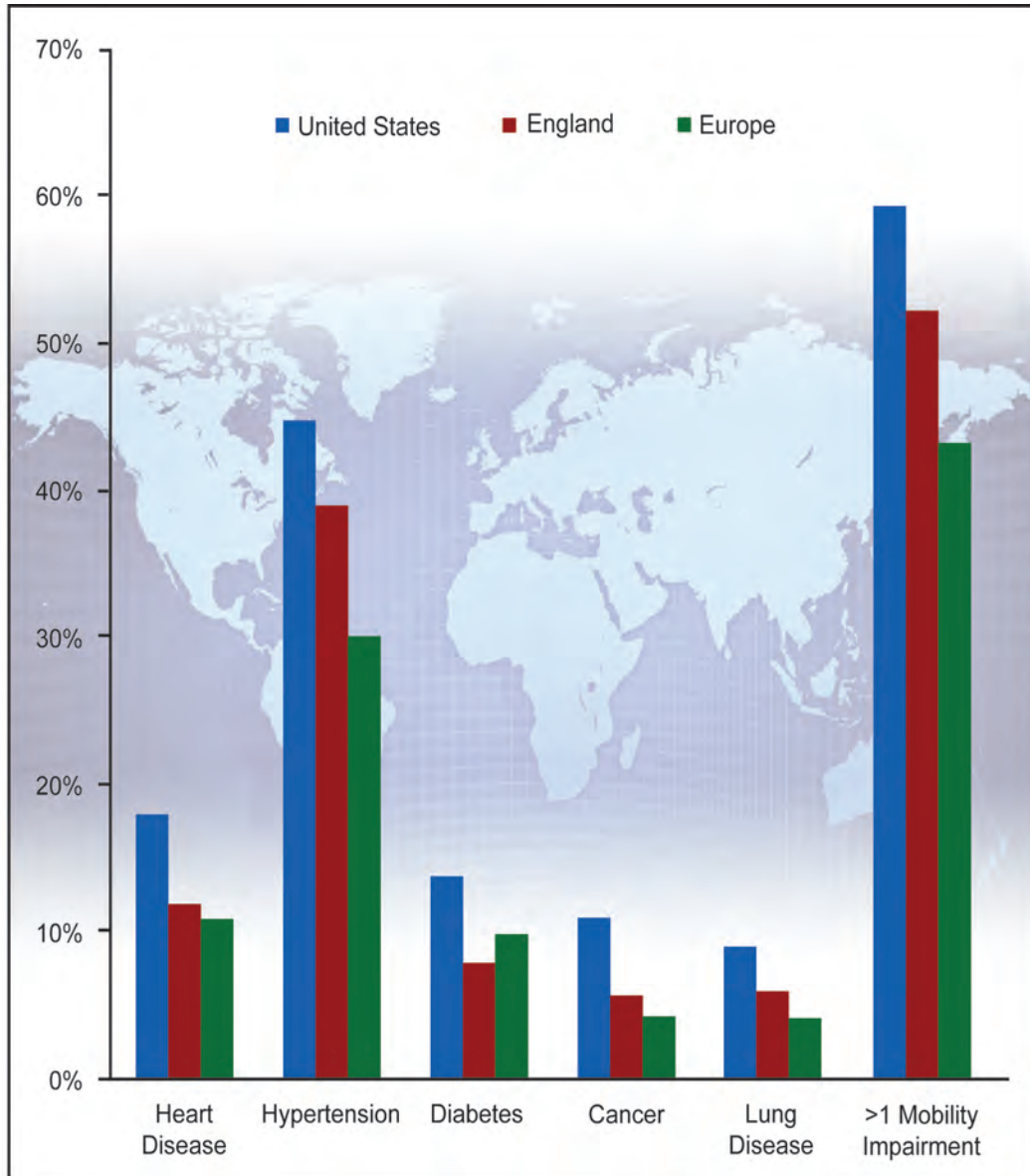
Are we living healthier as well as longer lives, or are our additional years spent in poor health? There is considerable debate about this question among researchers, and the answers have broad implications for the growing number of older people around the world. One way to examine the question is to look at changes in rates of disability, one measure of health and function. Some researchers think there will be a decrease in the prevalence of disability as life expectancy increases, termed a “compression of morbidity.” Others see an “expansion of morbidity”—an increase in the prevalence of disability as life expectancy increases. Yet others argue that, as advances in medicine slow the progression from chronic disease to disability, severe disability will lessen, but milder chronic diseases will increase. In the United States, between 1982 and 2001 severe disability fell about 25 percent among those aged 65 or older even as life expectancy increased. This very positive trend suggests that we can affect not only how long we live, but also how well we can function with advancing age. Unfortunately, this trend may not continue in part because of rising obesity among those now entering older ages. We have less information about disability in middle- and lower-income countries. With the rapid growth of older populations throughout the world—and the high costs of managing people with disabilities—continuing and better assessment of trends in disability in different countries will help researchers discover more about why there are such differences across countries.

Some new international, longitudinal research designed to compare health across countries promises to provide new insights, moving

forward. A 2006 analysis sponsored by the U.S. National Institute on Aging (NIA), part of the U.S. National Institutes of Health, found surprising health differences, for example, between non-Hispanic whites aged 55 to 64 in the United States and England. In general, people in higher socioeconomic levels have better health, but the study found that older adults in the United States were less healthy than their British counterparts at all socioeconomic levels. The health differences among these “young” older people were much greater than the gaps in life expectancy between the two countries. Because the analysis was limited to non-Hispanic whites, the differences did not reflect the generally lower health status of blacks or Latinos. The analysis also found that differences in education and behavioral risk factors (such as smoking, obesity, and alcohol use) explained few of the health differences.

This analysis subsequently included comparable NIA-funded surveys in 10 other European countries and was expanded to adults aged 50 to 74. The findings were similar: American adults reported worse health than did European adults as indicated by the presence of chronic diseases and by measures of disability (**Figure 8**). At all levels of wealth, Americans were less healthy than their European counterparts. Analyses of the same data sources also showed that cognitive functioning declined further between ages 55 and 65 in countries where workers left the labor force at early ages, suggesting that engagement in work might help preserve cognitive functioning. Subsequent analyses of these and other studies should shed more light on these national differences and similarities and should help guide policies to address the problems identified.

**Figure 8.**  
**Prevalence of Chronic Disease and Disability among Men and Women Aged 50-74 Years in the United States, England, and Europe: 2004**



Source: Adapted from Avendano M, Glymour MM, Banks J, Mackenbach JP. Health disadvantage in US adults aged 50 to 74 years: A comparison of the health of rich and poor Americans with that of Europeans. *American Journal of Public Health* 2009; 99/3:540-548, using data from the Health and Retirement Study, the English Longitudinal Study of Ageing, and the Survey of Health, Ageing and Retirement in Europe. Please see original source for additional information.



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