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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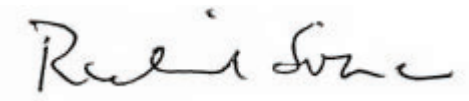
Preface

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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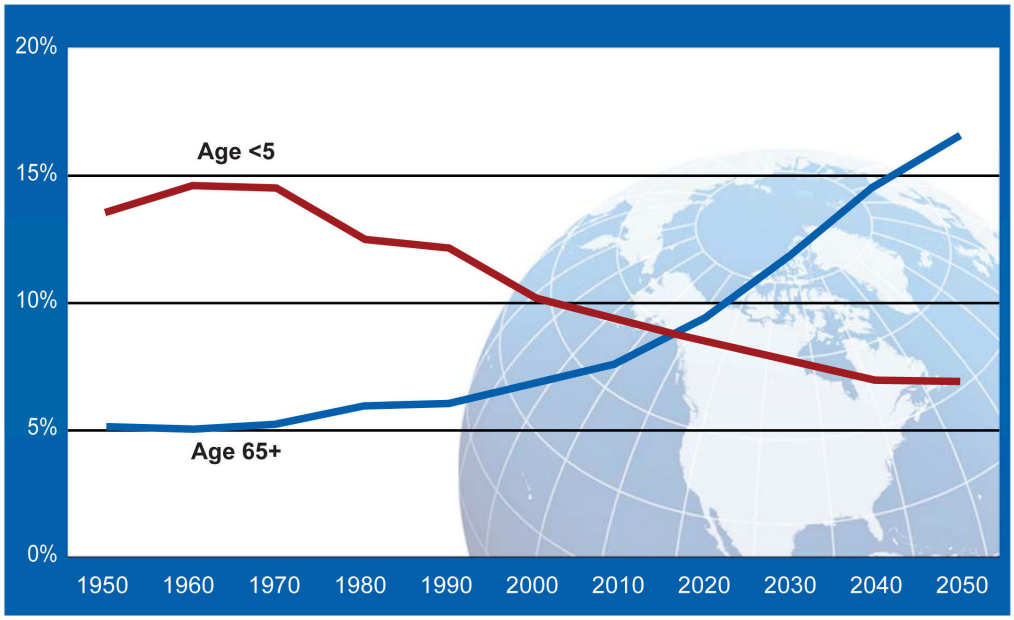
Overview

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.

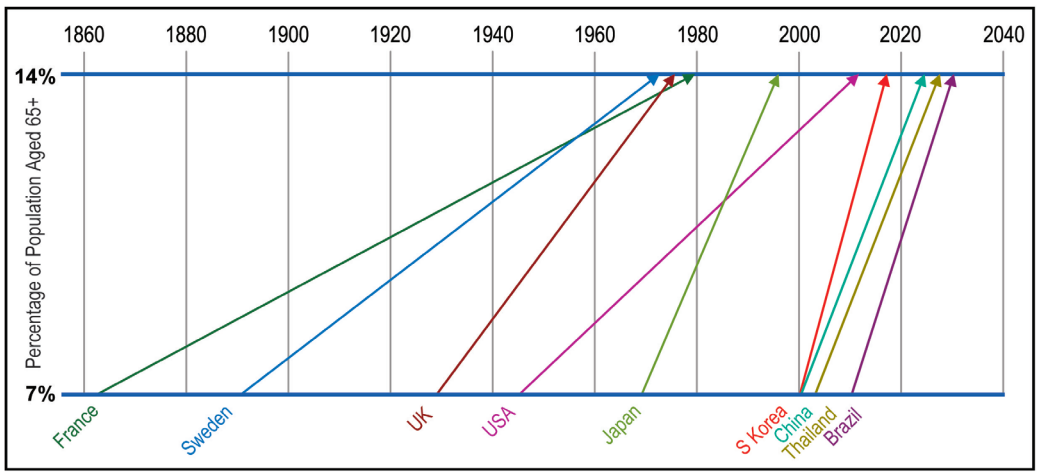
This remarkable phenomenon is being driven by declines in fertility and improvements in longevity. With fewer children entering the population and people living longer, older people are making up an increasing share of the total population. In more developed countries, fertility fell below the replacement 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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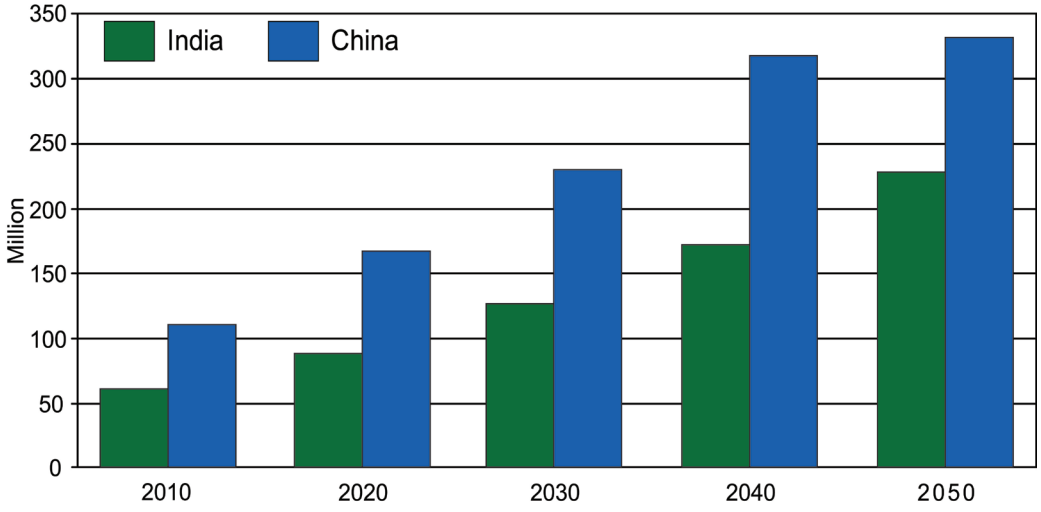
will need new policies that ensure the financial security of older people, and that provide the health and social care they need, without the same extended period of economic growth experienced by aging societies in the West. In other words, some countries may grow old before they grow rich.

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 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.

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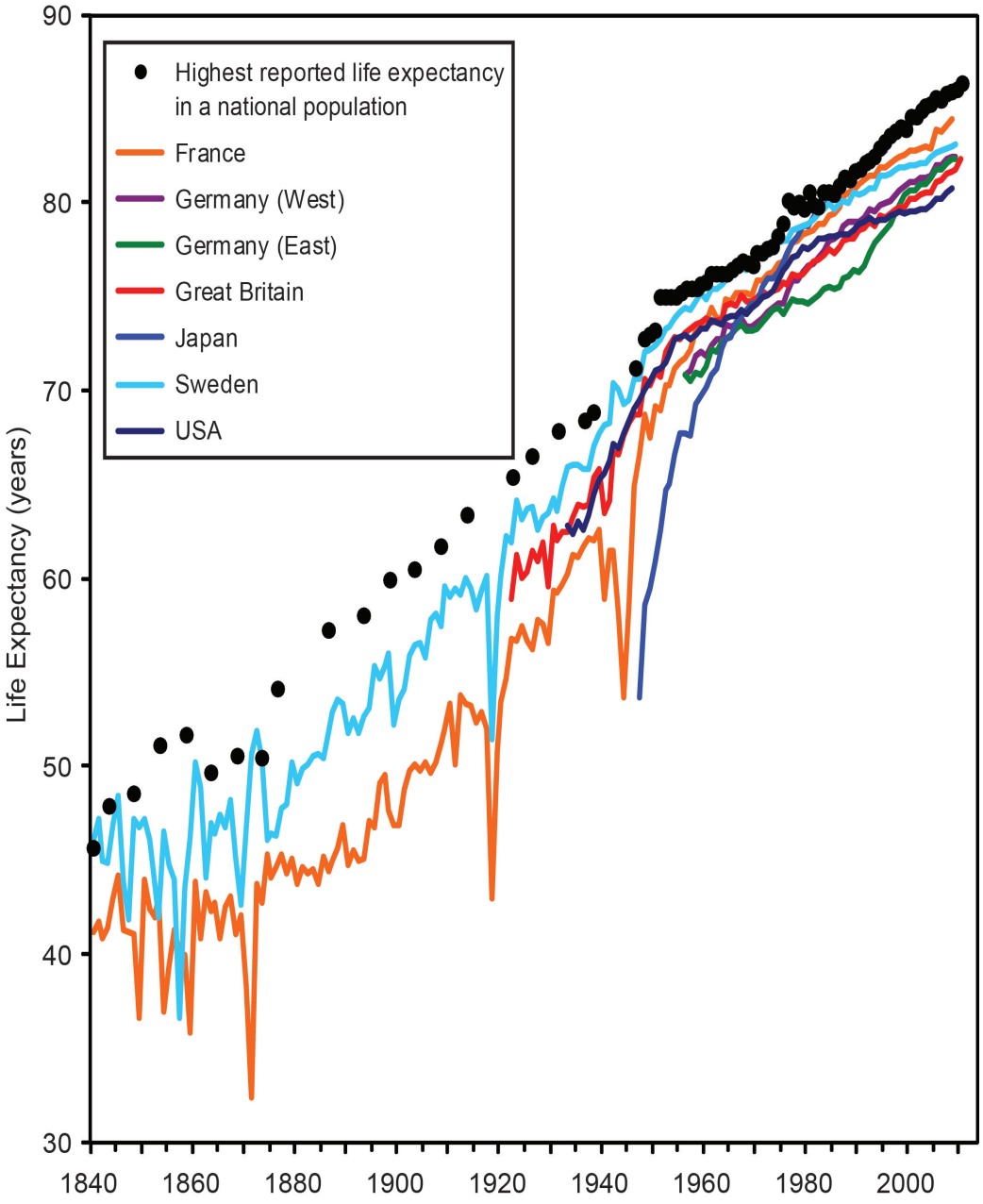
The victories against infectious and parasitic diseases are a triumph for public health projects of the 20th century, which immunized millions of people against smallpox, polio, and major childhood killers like measles. Even earlier, better living standards, especially more nutritious diets and cleaner 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



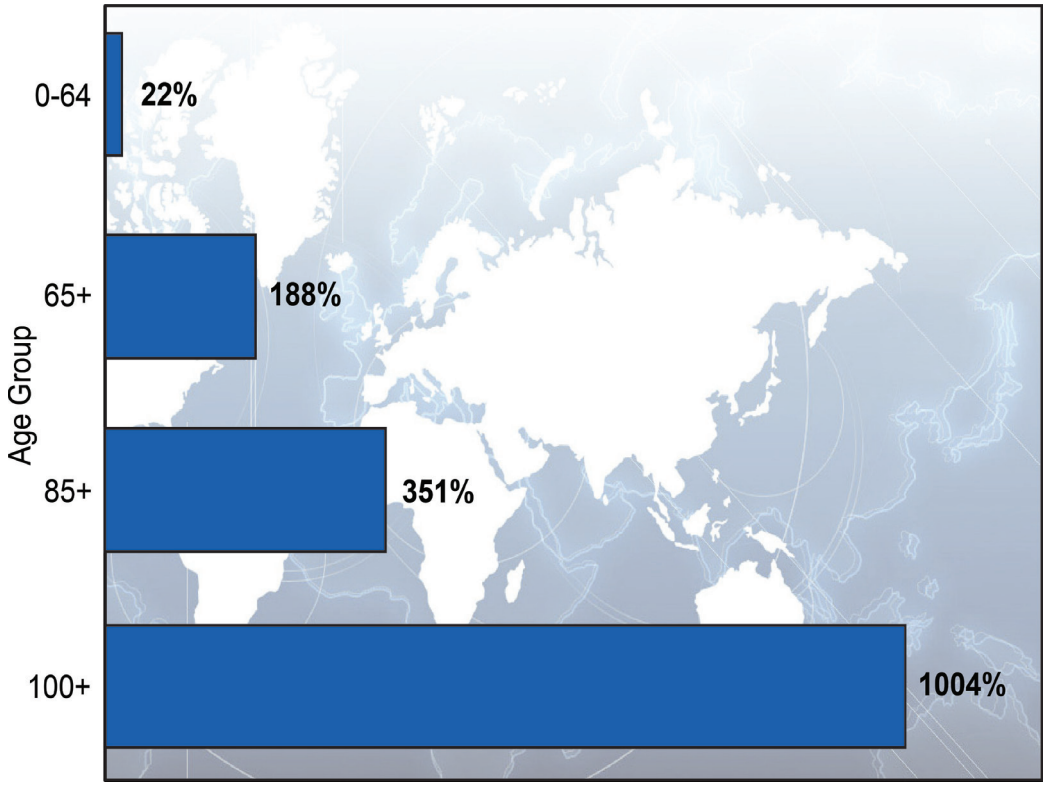
Source: Highest reported life expectancy for the years 1840 to 2000 from online supplementary material to Oeppen J, Vaupel JW. Broken limits to life expectancy. *Science* 2002; 296:1029-1031. All other data points from the Human Mortality Database (http://www.mortality.org) provided by Roland Rau (University 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.

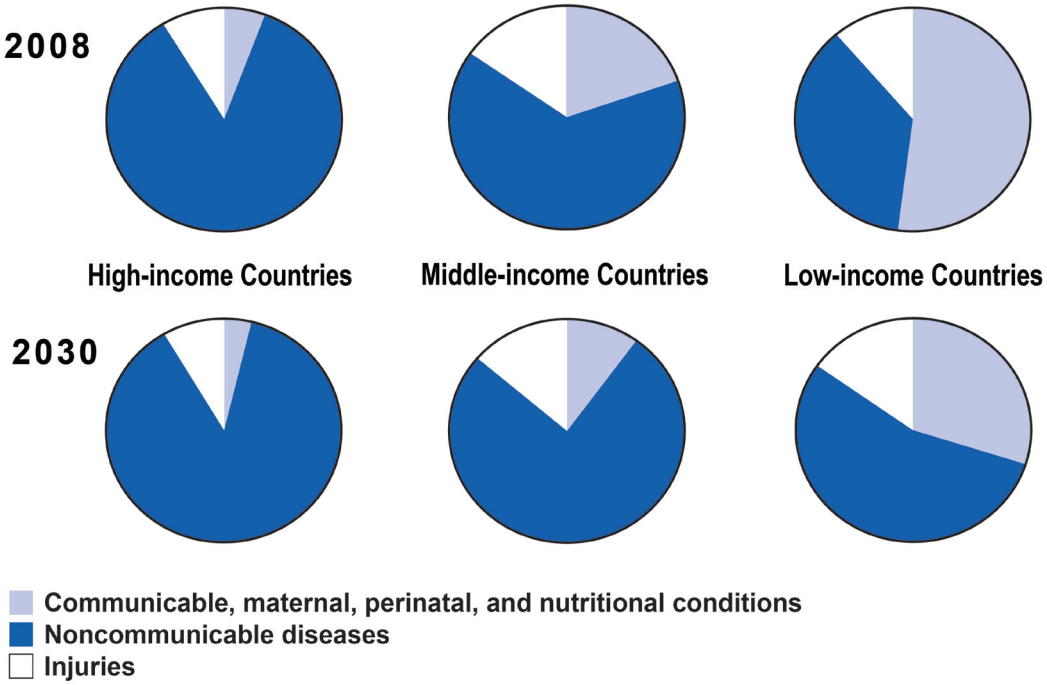
New Disease Patterns

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.

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

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.

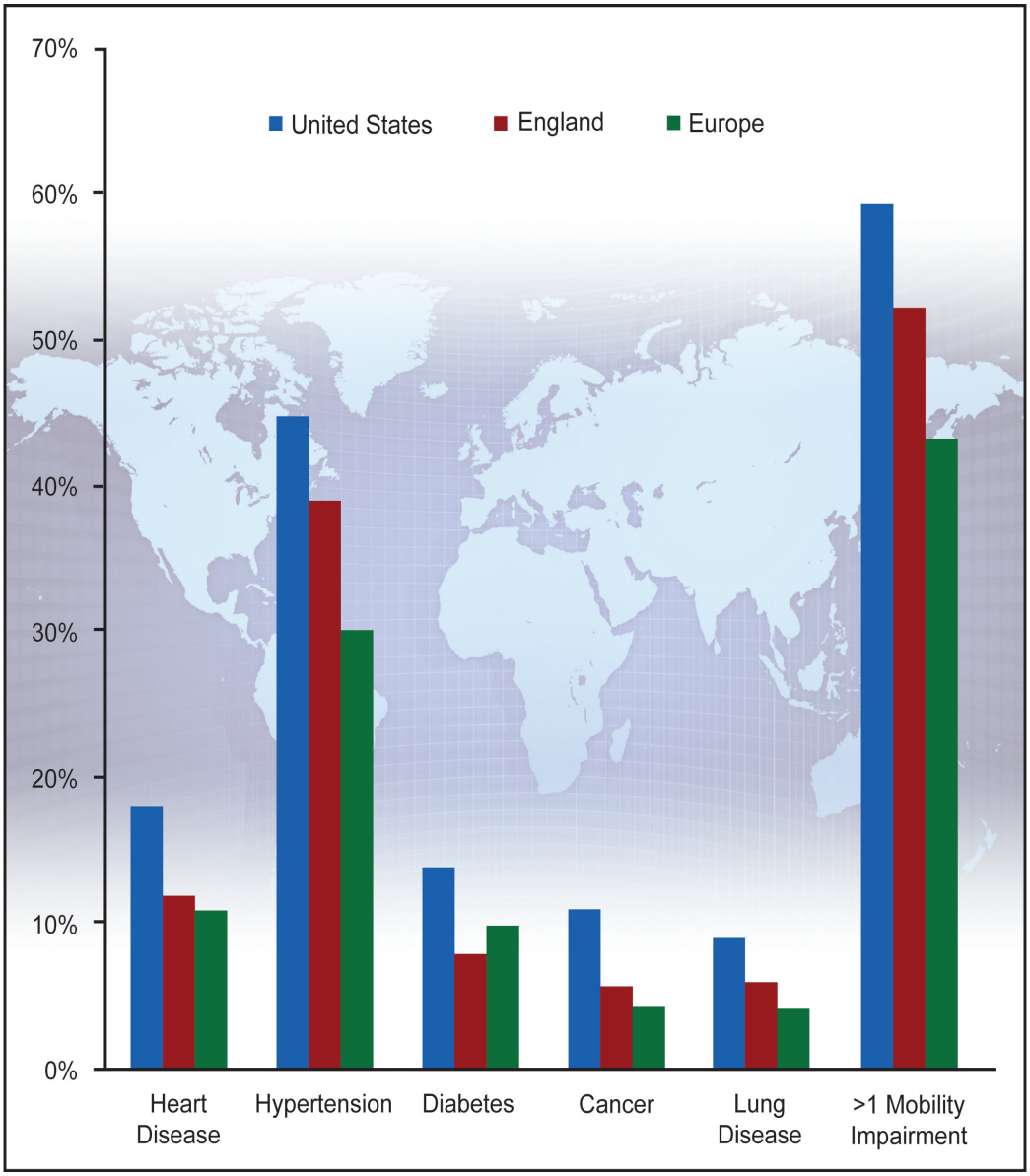
We have less information about disability in middle- and lower-income countries. With the rapid growth of older populations throughout the world—and the high costs of managing people with disabilities—continuing and better assessment of trends in disability in different countries will help researchers 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.

The Burden of Dementia

The cause of most dementia is unknown, but the final stages of this disease usually means a loss of memory, reasoning, speech, and other cognitive functions. The risk of dementia increases sharply with age and, unless new strategies for prevention and management are developed, this syndrome is expected to place growing demands on health and long-term care providers as the world's population ages. Dementia prevalence estimates vary considerably internationally, in part because diagnoses and reporting systems are not standardized. The disease is not easy to diagnose, especially in its early stages. The memory problems, misunderstandings, and behavior common in the early and intermediate stages are often attributed to normal effects of aging, accepted as personality traits, or simply ignored. Many cases remain undiagnosed even in the intermediate, more serious stages. A cross-national assessment conducted by the Organization for Economic Cooperation and Development (OECD) estimated that dementia affected about 10 million people in OECD member countries around 2000, just under 7 percent of people aged 65 or older.

Alzheimer's disease (AD) is the most common form of dementia and accounted for between two-fifths and four-fifths of all dementia cases cited in the OECD report. More recent analyses have estimated the worldwide number of people living with AD/dementia at between 27 million and 36 million. The prevalence of AD and other dementias is very low at younger ages, then nearly doubles with every five years of age after age 65. In the OECD review, for example, dementia affected fewer than 3 percent of those aged 65 to 69, but almost 30 percent of those aged 85 to 89. More than one-half of women aged 90 or older had dementia in France and Germany, as did about 40 percent in the United States, and just under 30 percent in Spain.

The projected costs of caring for the growing numbers of people with dementia are daunting. The 2010 World Alzheimer Report by Alzheimer's

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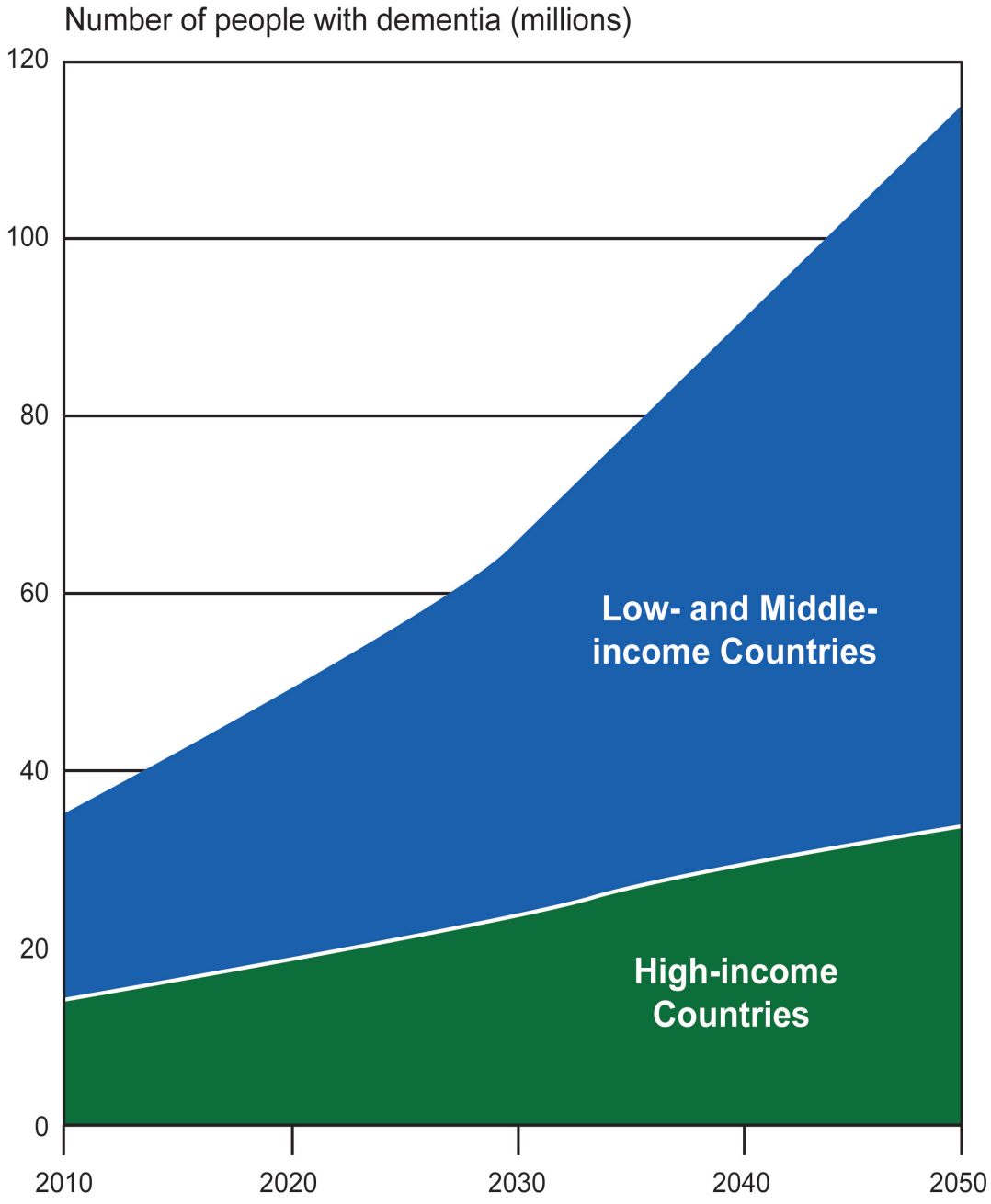
Disease International estimates that the total worldwide cost of dementia exceeded US$600 billion in 2010, including informal care provided by family and others, social care provided by community care professionals, and direct costs of medical care. Family members often play a key caregiving role, especially in the initial stages of what is typically a slow decline. Ten years ago, U.S. researchers estimated that the annual cost of informal caregiving for dementia in the United States was US$18 billion.

The complexity of the disease and the wide variety of living arrangements can be difficult for people and families dealing with dementia, and countries must cope with the mounting financial and social impact. The challenge is even greater in the less developed world, where an estimated two-thirds or more of dementia sufferers live but where few coping resources are available. Projections by Alzheimer's Disease International suggest that 115 million people worldwide will be living with AD/dementia in 2050, with a markedly increasing proportion of this total in less developed countries (**Figure 9**). Global efforts are underway to understand and find cures or ways of preventing such age-related diseases as Alzheimer's.

Figure 9.

The Growth of Numbers of People with Dementia in High- income Countries and Low- and Middle-income Countries: 2010-2050



Source: Alzheimer's Disease International, *World Alzheimer Report, 2010*. Available at: http://www.alz.co.uk/research/files/WorldAlzheimerReport2010.pdf.

New Data on Aging and Health

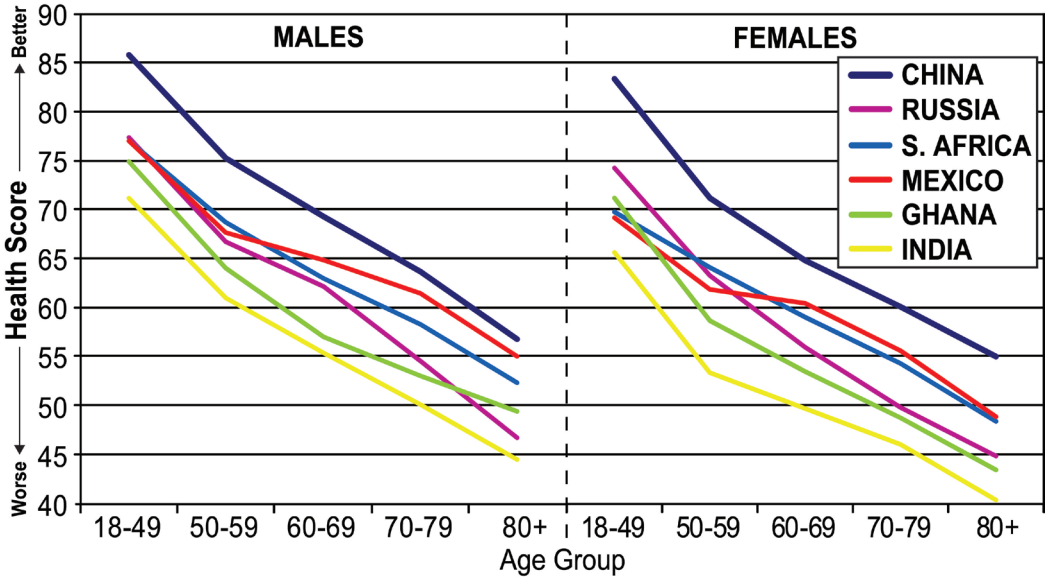
The transition from high to low mortality and fertility—and the shift from communicable to noncommunicable diseases—occurred fairly recently in much of the world. Still, according to the World Health Organization (WHO), most countries have been slow to generate and use evidence to develop an effective health response to new disease patterns and aging populations. In light of this, the organization mounted a multicountry longitudinal study designed to simultaneously generate data, raise awareness of the health issues of older people, and inform public policies.

The WHO Study on Global Ageing and Adult Health (SAGE) involves nationally representative cohorts of respondents aged 50 and over in six countries (China, Ghana, India, Mexico, Russia, and South Africa), who will be followed as they age. A cohort of respondents aged 18 to 49 also will be followed over time in each country for comparison. The first wave of SAGE data collection (2007-2010) has been completed, with future waves planned for 2012 and 2014.

In addition to myriad demographic and socioeconomic characteristics, the study collects data on risk factors, health exams, and biomarkers. Biomarkers such as blood pressure and pulse rate, height and weight, hip and waist circumference, and blood spots from finger pricks, are valuable and objective measures that improve the precision of self-reported health in the survey. SAGE also collects data on grip strength and lung capacity

Figure 10.

Overall Health Status Score in Six Countries for Males and Females: Circa 2009



Notes: Health score ranges from 0 (worst health) to 100 (best health) and is a composite measure derived from 16 functioning questions using item response theory. National data collections conducted during the period 2007-2010.
Source: Tabulations provided by the World Health Organization Multi-Country Studies Unit, Geneva, based on data from the Study on global AGEing and adult health (SAGE).

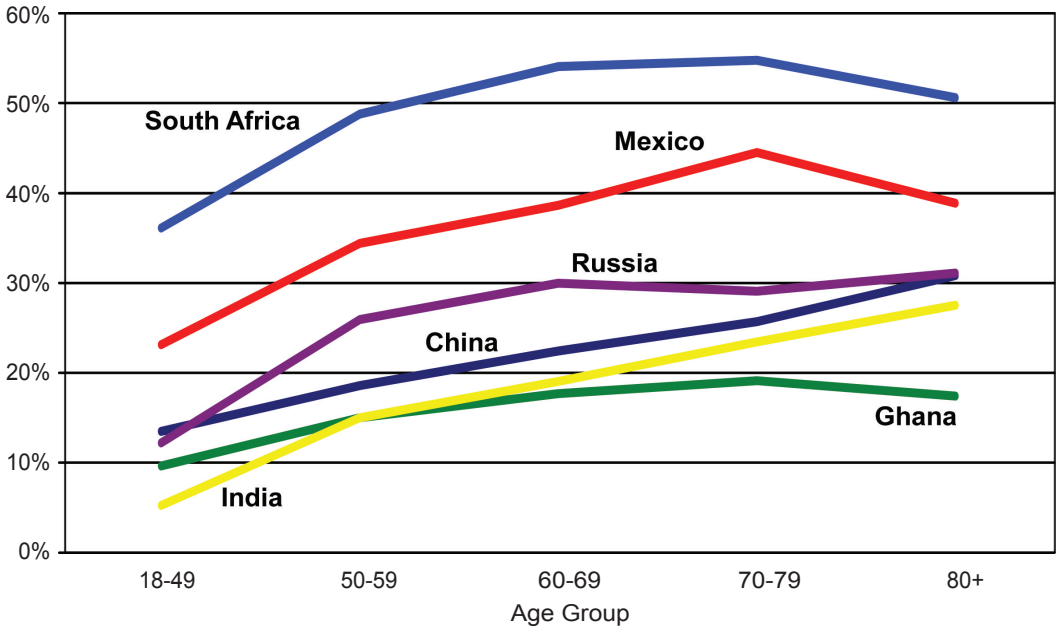
and administers tests of cognition, vision, and mobility to produce objective indicators of respondents' health and ability to carry out basic activities of daily living. As additional waves of data are collected during these respondents' later years, the study will seek to monitor health interventions and address changes in respondents' well-being.

A primary objective of SAGE is to obtain reliable and valid data that allow for international comparisons. Researchers derive a composite measure from responses to 16 questions about health and physical limitations. This health score ranges from 0 (worst health) to 100 (best health) and is shown for men and women in each of the six SAGE countries in **Figure 10**. In each country, the health status score declines with age, as expected. And at each age in each country, the score for males is higher than for females. Women live longer than men on average, but have poorer health status.

The number of disabled people in most developing countries seems certain to increase as the number of older people continues to rise. Health systems need better data to understand the health risks faced by older people and to target appropriate prevention and intervention services. The SAGE data show that the percentage of people with at least three of six health risk factors (physical inactivity, current tobacco use, heavy alcohol consumption, a high-risk waist-hip ratio, hypertension, or obesity) rises with age, but the patterns and the percentages vary by country (**Figure 11**). One of SAGE's important contributions will be to assess how these risk-factor profiles affect current and future disability. Smaller family size and declining prevalence of co-residence by multiple generations likely will introduce further challenges for families in developing countries in caring for older relatives.

Figure 11.

Percentage of Adults with Three or More Major Risk Factors: Circa 2009



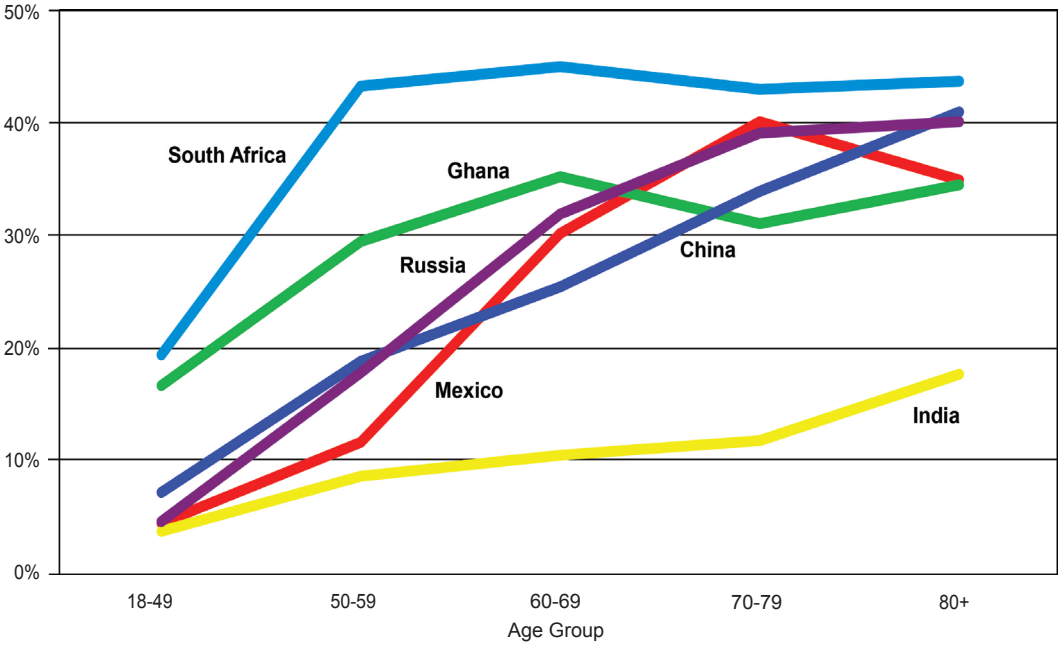
Notes: Major risk factors include physical inactivity, current tobacco use, heavy alcohol consumption, a high-risk waist-hip ratio, hypertension, and obesity. National data collections conducted during the period 2007-2010.
Source: Tabulations provided by the World Health Organization Multi-Country Studies Unit, Geneva, based on data from the Study on global AGEing and adult health (SAGE).

Assessing the Costs of Aging and Health Care

Population aging is likely to influence patterns of health care spending in both developed and developing countries in the decades to come. In developed countries, where acute care and institutional long-term care services are widely available, the use of medical care services by adults rises with age, and per capita expenditures on health care are relatively high among older age groups. Accordingly, the rising proportion of older people is placing upward pressure on overall health care spending in the developed world, although other factors such as income growth and advances in the technological capabilities of medicine generally play a much larger role.

Relatively little is known about aging and health care costs in the developing world. Many developing nations are just now establishing baseline estimates of the prevalence and incidence of various diseases and conditions. Initial findings from the WHO SAGE project, which provides data on blood pressure among women in six developing countries, show an upward trend by age in the percentage of women with moderate or severe hypertension (see **Figure 12**), although the patterns and age-specific levels of hypertension vary among the countries. If rising hypertension rates in those populations are not adequately addressed, the resulting high rates of cerebrovascular and

Figure 12.
Percentage of Women with Moderate or Severe Hypertension in Six Countries: Circa 2009



Note: National data collections conducted during the period 2007-2010.
Source: Tabulations provided by the World Health Organization Multi-Country Studies Unit, Geneva, based on data from the Study on global AGEing and adult health (SAGE).

cardiovascular disease are likely to require costly medical treatments that might have been avoided with antihypertensive therapies costing just a few cents per day per patient. Early detection and effective management of risk factors such as hypertension—and other important conditions such as diabetes, which can greatly complicate the treatment of cardiovascular disease—in developing countries can be inexpensive and effective ways of controlling future health care costs. An important future payoff for data collection projects such as SAGE will be the ability to link changes in health status with health expenditures and other relevant variables for individuals and households. This will provide crucial evidence for policymakers designing health interventions.

A large proportion of health care costs associated with advancing age are incurred in the year or so before death. As more people survive to increasingly older ages, the high cost of prolonging life is shifted to ever-older ages. In many societies, the nature and extent of medical treatment at very old ages is a contentious issue. However, data from the United States suggest that health care spending at the end of life is not increasing any more rapidly than health care spending in general. At the same time, governments and international organizations are stressing the need for cost-of-illness studies on age-related diseases, in part to anticipate the likely burden of increasingly prevalent and expensive chronic conditions—Alzheimer's disease in particular. Also needed are studies of comparative performance or comparative effectiveness in low-income countries of various treatments and interventions.

The Costs of Cardiovascular Disease and Cancer

In high-income countries, heart disease, stroke, and cancer have long been the leading contributors to the overall disease burden. The burden from these and other chronic and noncommunicable diseases is increasing in middle- and low-income countries as well (Figure 6).

To gauge the economic impact of shifting disease profiles in developing countries, the World Health Organization (WHO) estimated the loss of economic output associated with chronic disease in 23 low- and middle-income nations, which together account for about 80 percent of the total chronic disease mortality in the developing world.

The WHO analysis focused on a subset of leading chronic diseases: heart disease, stroke, and diabetes. In 2006, this subset of diseases incurred estimated economic losses ranging from US$20 million to US$30 million in Vietnam and Ethiopia, and up to nearly US$1 billion in China and India. Short-term projections (to 2015) indicate that losses will nearly double in most of the countries if no preventive actions are taken. The potential estimated loss in economic output for the 23 nations as a whole between 2006 and 2015 totaled US$84 billion.

A recent analysis of global cancer trends by the Economist Intelligence Unit (EIU) estimated that there were 13 million new cancer cases in 2009. The cost associated with these new cases was at least US$286 billion. These costs could escalate because of the silent epidemic of cancer in less well-off, resource-scarce regions as people live longer and adopt Western diets and lifestyles. The EIU analysis estimated that less developed countries accounted for 61 percent of the new cases in 2009.

Largely because of global aging, the incidence of cancer is expected to accelerate in coming decades. The annual number of new cancer cases is projected to rise to 17 million by 2020, and reach 27 million by 2030. A growing proportion of the global total will be found in the less developed world, and by 2020, almost half of the world's new cases will occur in Asia.

Health and Work

In the developed world, older people often leave the formal workforce in their later years, although they may continue to contribute to society in many ways, including participating in the informal workforce, volunteering, or providing crucial help for their families. There is no physiologic reason that many older people cannot participate in the formal workforce, but the expectation that people will cease working when they reach a certain age has gained credence over the past century. Rising incomes, along with public and private pension systems, have allowed people to retire based on their age rather than any health-related problem.

It is ironic that the age at retirement from the workforce has been dropping at the same time that life expectancy has been increasing. Older people today spend many years in retirement. In OECD countries, in 2007, the average man left the labor force before age 64 and could expect 18 years of retirement (**Figure 13**). The average woman stopped working at age 63 and looked forward to more than 22 years of retirement if they adopt similar concepts of retirement.

Many high-income countries now want people to work for more years to slow escalating costs of pensions and health care for retirees, especially given smaller cohorts entering the labor force. Most middle- and low-income countries will face similar challenges.

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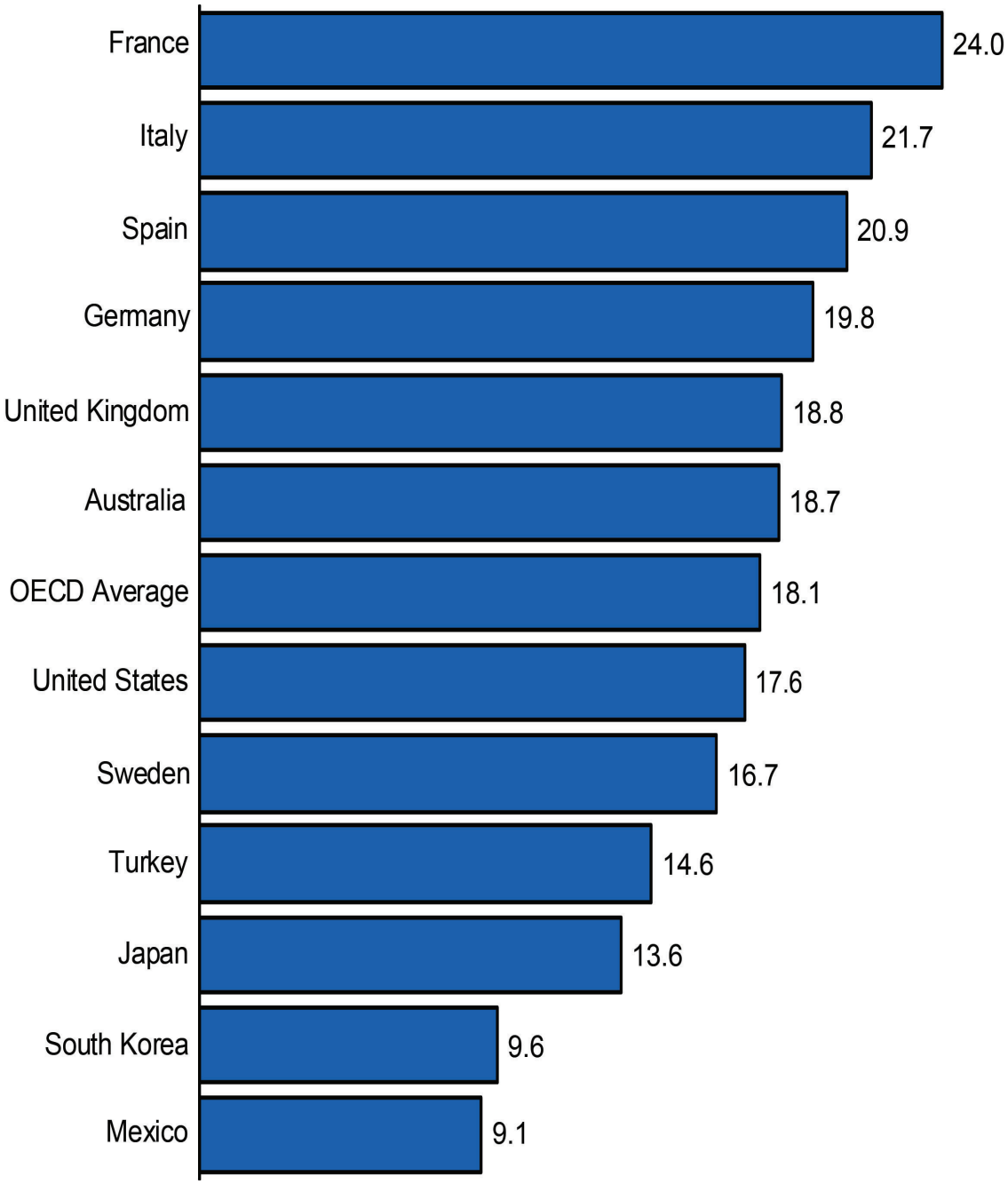
Other than the economic incentives of pensions, what would make people stay in the workforce longer? To start, misconceptions about older workers abound and perceptions may need to change. In addition to having acquired more knowledge and job skills through experience than younger workers, most older adults show intact learning and thinking, although there are some declines in cognitive function, most notably in the speed of information processing. Moreover, there is some evidence that staying in the labor force after age 55 is associated with slower loss of cognitive function, perhaps because of the stimulation of the workplace and related social engagement.

Even physical abilities may not deteriorate as quickly as commonly assumed. Although relatively little is known about the relationship between age and productivity (which takes wages into account), one study of German assembly line workers in an automotive plant found that the average age-productivity profile of workers increased until age 65.

Whether older people spend more years in the labor market also will depend on the types of jobs available to them. Many jobs in industrialized countries do not require physical exertion that might be difficult for an older worker, but they may necessitate acquiring new skills and retraining to adjust to changing work environments. Evidence is needed on the capacity of older workers, especially those with low education levels, to profit from retraining. Older people with limited mobility or other health problems may require more flexible schedules or adapted work environments. Considerations may need to be given to the value of building new approaches at work or institutions that will increase the ease with which older people can contribute outside of their families.

Figure 13.

Expected Years of Retirement for Men in Selected OECD Countries: 2007



Note: OECD average is for 30 OECD member nations.
Source: Organization for Economic Cooperation and Development. *OECD Society at a Glance 2009*. Available at: http://public.tableausoftware.com/views/Retirement/LFEA.

Changing Role of the Family

Familial support and caregiving among generations typically run in both directions. Older people often provide care for a variety of others (spouses, older parents, children, grandchildren, and nonfamily members), while families, and especially adult children, are the primary source of support and care for their older relatives. Most older people today have children, and many have grandchildren and living siblings. However, in countries with very low birth rates, future generations will have few if any siblings. The global trend toward having fewer children assures that there will be less potential care and support for older people from their families in the future.

As life expectancy increases in most nations, so do the odds that several generations are alive at the same time. In more developed countries, this is manifested as a "beanpole family," a vertical extension of family structure characterized by more but smaller generations. As mortality rates continue to improve, more people in their 50s and 60s are likely to have surviving parents, aunts, and uncles. Consequently, more children will know their grandparents and even their great-grandparents, especially their great-grandmothers. There is no historical precedent for a majority of middle-aged and older adults having living parents.

However, while the number of surviving generations in a family may have increased, today these generations are more likely to live separately. In many countries, the shape of the family unit reflects changing social norms; economic security; rising rates of migration, divorce, and remarriage; and blended and stepfamily relations. In addition, more adults are choosing not to marry or have children at all. In parts of sub-Saharan Africa, the skipped-generation family household—in which an older person or couple resides with at least one grandchild but no middle-generation family members—has become increasingly common because of high mortality from HIV/AIDS. In Zambia, for example, 30 percent of older women head such households. In developed countries, couples and single mothers often delay childbearing until their 30s and 40s, households increasingly have both adults working, and more children are being raised in single-parent households.

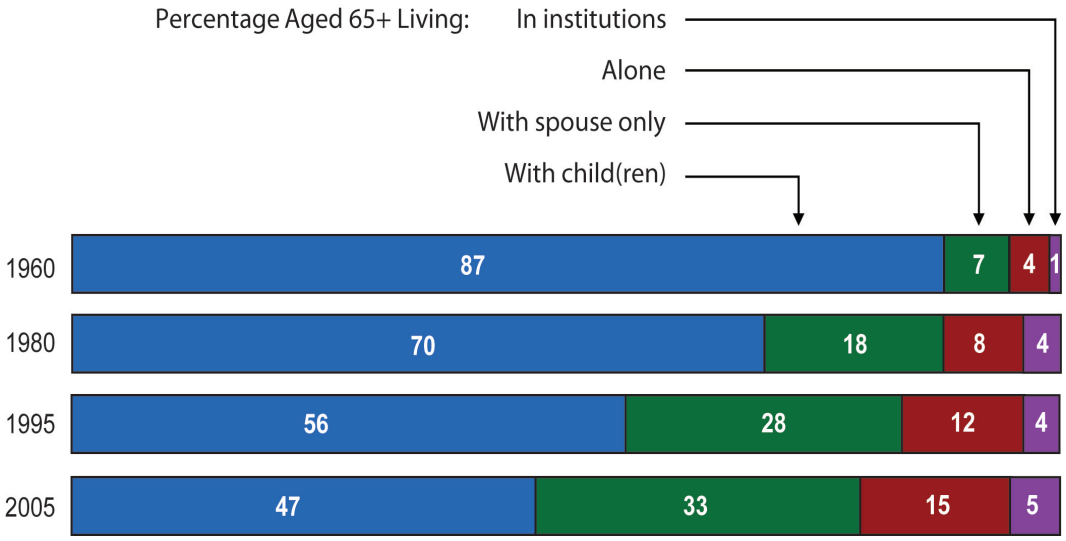
The number, and often the percentage, of older people living alone is rising in most countries. In some European countries, more than 40 percent of women aged 65 or older live alone. Even in societies with strong traditions of older parents living with children, such as in Japan, traditional living arrangements are becoming less common (**Figure 14**).

In the past, living alone in older age often was equated with social isolation or family abandonment. However, research in many cultural settings shows that older people prefer to be in their own homes and communities, even if that means living alone. This preference is reinforced by greater longevity, expanded social benefits, increased home ownership, elder-friendly housing, and an emphasis in many nations on community care.

The ultimate impact of these changing family patterns on health is unknown. Older people who live alone are less likely to benefit from sharing goods that might be available in a larger family, and the risk of falling into poverty in older age may increase as family size falls. On the other hand, older people are also a resource for younger generations, and their absence may create an additional burden for younger family members.

Figure 14.

Living Arrangements of People Aged 65 and Over in Japan: 1960 to 2005



Note: Percentages living with child(ren) include small numbers of people living in unspecified arrangements.
Sources: Japan National Institute of Population and Social Security Research. *Population Statistics of Japan 2008*.
Available at: http://www.ipss.go.jp/p-info/e/psj2008/PSJ2008-07.xls.

Long-Term Care

Many of the oldest-old lose their ability to live independently because of limited mobility, frailty, or other declines in physical or cognitive functioning. Many require some form of long-term care, which can include home nursing, community care and assisted living, residential care, and long-stay hospitals. The significant costs associated with providing this support may need to be borne by families and society. In less developed countries that do not have an established and affordable long-term care infrastructure, this cost may take the form of other family members withdrawing from employment or school to care for older relatives. And, as more developing country residents seek jobs in cities or other areas, their older relatives back home will have less access to informal family care.

The future need for long-term care services (both formal and informal) will largely be determined by changes in the absolute number of people in the oldest age groups coupled with trends in disability rates. Given the increases in life expectancy and the sheer numeric growth of older populations, demographic momentum will likely raise the demand for care. This growth could, however, be alleviated by declines in disability among older people. Further, the narrowing gap between female and male life expectancy reduces widowhood and could mean a higher potential supply of informal care by older spouses. The great opportunity for public health programs in the first half of the 21st century is to keep older people healthy longer, delaying or avoiding disability and dependence.

A Note About the Data Behind This Report

The findings highlighted throughout this booklet underscore the value of cross-national data for research and policy. International and multi-country data help governments and policymakers better understand the broader implications and consequences of aging, learn from the experiences in other countries, including those with different health care systems and at a different point along the aging and development continuum, and facilitate the crafting of appropriate policies, especially in the developing world.

Valuable new information is coming from nationally representative surveys, often panel studies that follow the same group of people as they age. The U.S. Health and Retirement Study (HRS), begun in 1990, has painted a detailed picture of older adults' health, work, retirement, income and wealth, and family characteristics and intergenerational transfers. In recent years, other nations have used the HRS – a biennial survey of more than 20,000 Americans over age 50 – as a model for planning similar large-scale, longitudinal studies of their own populations. Several parallel studies have been established throughout the world, including in China, England, India, Ireland, Japan, Korea, and Mexico, with more planned in other countries such as Thailand and Brazil. In addition, coordinated multi-country panel studies are effectively building an infrastructure of comprehensive and comparable data on households and individuals to understand individual and societal aging. The Survey of Health, Ageing and Retirement in Europe (SHARE) – involving 15 countries as of 2010 (Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Israel, Italy, the Netherlands, Poland, Spain, Sweden, Switzerland) – and the World Health Organization (WHO) Study on global AGEing and adult health (SAGE) in six countries (China, Ghana, India, Mexico, Russian Federation, and South Africa) greatly expand the number of countries by which informative comparisons can be made of the impact of policies and interventions on trends in aging, health, and retirement. A key aspect of this new international community of researchers is that data are shared very soon after collected with all researchers in all countries.

Many other cross-national aging-related datasets and initiatives offer comparable demographic indicators that reveal historical trends and offer projections to help international organizations and governments, planners, and businesses make informed decisions. These sources include, for example, the International Database on Aging, involving 227 countries; the International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH), involving 19 developing nations; the Human Mortality Database, involving 28 countries; and the 2006 Global Burden of Disease and Risk Factors initiative, which is strengthening the methodological and empirical basis for undertaking comparative assessments of health problems and their determinants and consequences in aging population worldwide.

Suggested Resources

Readings

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Web Resources

English Longitudinal Study of Ageing
http://www.ifs.org.uk/elsa/

European Statistical System (EUROSTAT)
http://epp.eurostat.ec.europa.eu

Health and Retirement Study
http://hrsonline.isr.umich.edu/

Human Mortality Database
http://www.mortality.org/

International Network on Health Expectancy and the Disability Process
http://reves.site.ined.fr/en

Organization for Economic Cooperation and Development Health Data 2010: Statistics and Indicators
http://www.oecd.org/health/healthdata (may require a fee)

Survey of Health, Ageing and Retirement in Europe
http://www.share-project.org/

United Nations. *World Population Prospects: The 2010 Revision.*
http://esa.un.org/unpd/wpp

U.S. Census Bureau International Data Base
http://www.census.gov/ipc/www/idb/

U.S. National Institute on Aging
http://www.nia.nih.gov/

World Alzheimer's Report
http://www.alz.co.uk/research/worldreport/

World Health Organization. *Projections of Mortality and Burden of Disease, 2004-2030.*
http://www.who.int/healthinfo/global_burden_disease/projections/en/index.html.

World Health Organization Study on global AGEing and adult health (SAGE)
http://www.who.int/healthinfo/systems/sage/en/

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