An Aging World: 2015

International Population Reports

By Wan He, Daniel Goodkind, and Paul Kowal

Issued March 2016

P95/16-1

United States™ Census Bureau

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov

U.S. Department of Health and Human Services
National Institutes of Health
NATIONAL INSTITUTE ON AGING

Acknowledgments

In Memory of Dr. Richard M. Suzman

The Population Division of the U.S. Census Bureau wishes to express our deep gratitude and pay tribute to **Dr. Richard M. Suzman**, director of Division of Behavioral and Social Research, National Institute on Aging, who passed away on April 16, 2015. A pioneer and champion for the science of population aging, Dr. Suzman played a critical role in developing the aging research program in the Population Division. For over three decades he steadfastly supported numerous Census Bureau publications focused on population aging trends and demographic, socioeconomic, and health characteristics of the older populations in the United States and the world. Enormously popular report series such as *65+ in the United States* and *An Aging World* are a remarkable testimony to Dr. Suzman's dedication to research on population aging which, in his words, is reshaping our world.

This report was prepared by **Wan He** and **Daniel Goodkind** of the U.S. Census Bureau, and **Paul Kowal** of the World Health Organization's (WHO) SAGE, under the direction of **Loraine A. West**, Chief, Demographic and Economic Studies Branch, and general direction of **Glenn Ferri**, Assistant Division Chief, International Programs and **James D. Fitzsimmons**, former Acting Assistant Division Chief, International Programs Center for Demographic and Economic Studies, Population Division. **Karen Humes**, Chief, Population Division provided overall direction.

The authors wish to give special acknowledgment to the following researchers who graciously contributed to text boxes that focus on special and frontier research topics in population aging: **Martina Brandt**, TU Dortmund University; **Robert Cumming**, University of Sydney; **Christian Deindl**, University of Cologne; **Karen I. Fredriksen-Goldsen**, University of Washington; **Mary C. McEniry**, University of Wisconsin-Madison; **Joel Negin**, University of Sydney; and **Kirstin N. Sterner**, University of Oregon.

Research for and production of this report were supported under an interagency agreement with the Division of Behavioral and Social Research, National Institute on Aging (NIA).

The authors are grateful to many people within the Census Bureau who made this publication possible by providing literature and data search, table and graph production, verification, and other general report preparation: **Samantha Sterns Cole**, **Laura M. Heaton**, **Mary Beth Kennedy**, **Robert M. Leddy, Jr.**, **Lisa R. Lollock**, **Andrea Miles**, **Iris Poe**, and **David Zaslow**.

The authors give special thanks to **Joshua Comenetz**, Population Division, for his thorough review. Reviewers from NIA provided valuable comments and constructive suggestions, including: **David Bloom**, Harvard University; **David Canning**, Harvard University; **Somnath Chatterji**, World Health Organization; **Eileen Crimmins**, University of Southern California; **Ronald D. Lee**, University of California, Los Angeles, Berkeley; **Alyssa Lubet**, Harvard University; **Angela M. O'Rand**, Duke University; **John Romley**, University of Southern California; **Amanda Sonnega**, University of Michigan; and anonymous reviewers from NIA.

Statistical testing review was conducted by **James Farber**, Demographic Statistical Methods Division. For cartographic work, the authors thank **Steven G. Wilson** and **John T. Fitzwater**, Population Division.

Christine E. Geter of the Census Bureau's Public Information Office and **Linda Chen** and **Faye Brock** of the Center for New Media and Promotion provided publication management, graphics design and composition, and editorial review for print and electronic media. **George E. Williams** of the Census Bureau's Administrative and Customer Services Division provided printing management.

An Aging World: 2015

Issued March 2016

P95/16-1

U.S. Department of Commerce
Penny Pritzker,
Secretary

Bruce H. Andrews,
Deputy Secretary

Economics and Statistics Administration
Justin Antonipillai,
Counselor, Delegated Duties of
Under Secretary for Economic Affairs

U.S. CENSUS BUREAU
John H. Thompson,
Director

Suggested Citation

Wan He, Daniel Goodkind, and Paul Kowal
U.S. Census Bureau,
International Population Reports, P95/16-1,
An Aging World: 2015,
U.S. Government Publishing Office,
Washington, DC,
2016.

ECONOMICS
AND STATISTICS
ADMINISTRATION

Economics and Statistics Administration
Justin Antonipillai,
Counselor, Delegated Duties of
Under Secretary for Economic Affairs

U.S. CENSUS BUREAU
John H. Thompson,
Director

Nancy A. Potok,
Deputy Director and Chief Operating Officer

Enrique Lamas,
Associate Director for Demographic Programs

Karen Humes,
Chief, Population Division

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll-free 866-512-1800; DC area 202-512-1800
Fax: 202-512-2250 Mail: Stop SSOP, Washington, DC 20402-0001

Contents

FIGURES

TABLES

BOXES

APPENDIX TABLES

CHAPTER 1.

Introduction

The world population continues to grow older rapidly as fertility rates have fallen to very low levels in most world regions and people tend to live longer. When the global population reached 7 billion in 2012, 562 million (or 8.0 percent) were aged 65 and over. In 2015, 3 years later, the older population rose by 55 million and the proportion of the older population reached 8.5 percent of the total population.[1] With the post World War II baby boom generation in the United States and Europe joining the older ranks in recent years and with the accelerated growth of older populations in Asia and Latin America, the next 10 years will witness an increase of about 236 million people aged 65 and older throughout the world. Thereafter, from 2025 to 2050, the older population is projected to almost double to 1.6 billion globally, whereas the total population will grow by just 34 percent over the same period.

Yet the pace of aging has not been uniform. A distinct feature of global population aging is its uneven speed across world regions and development levels. Most of the more developed countries in Europe have been aging for decades, some for over a century. In 2015, 1 in 6 people in the world live in a more developed country, but more than a third of the world population aged 65 and older and over half of the world population aged 85 and older live in these countries. The older populations in more developed countries are projected to continue to grow in size, but at a much slower pace than those in less developed countries, particularly in Asia and Latin America. By 2050, less than one-fifth of the world's older population will reside in more developed countries.

There are great variations within the less developed world as well. Asia stands out as the population giant, given both the size of its older population (617.1 million in 2015) and its current share of the world older population (more than half). By 2050, almost two-thirds of the world's older people will live in Asia. Even countries experiencing slower aging will see a large increase in their older populations. Africa, for instance, is projected to still have a young population in 2050 (with those at older ages projected to be less than 7 percent of the total regional population), yet the projected 150.5 million older Africans would be almost quadruple the 40.6 million in 2015.

Population aging, while due primarily to lower fertility, also reflects a human success story of increased longevity. Today, living to age 70 or age 80 is no longer a rarity in many parts of the world. However, increasing longevity has led to new challenges: How many years can older people expect to live in good health? What are the chronic diseases that they may have to deal with? How long can they live independently? How many of them are still working? Will they have sufficient economic resources to last their lifetimes? Can they afford health care costs? The world is facing these and many more questions as population aging continues.

This report covers the demographic, health, and economic aspects of global population aging. After an examination of past and projected growth of the older population and dynamics of population aging (chapters 2 and 3), the report then covers health, mortality, and health care of the older population (chapters 4 and 5). Finally, work, pensions, and other economic characteristics of older people (chapters 6 and 7) are addressed. Compared to previous versions of the report *An Aging World*, this edition is unique for expanding the analysis of aging trends to all countries and areas, with an emphasis on the differences among world regions.[2] Where data are available, it also updates the latest statistics and trends for health and economic indicators. This edition also includes an assessment of the impact of the recent global recession on older people's economic well-being. Moreover, it includes some frontier research on special topics of population aging in the form of text boxes contributed by non-Census Bureau researchers with expertise in those fields.

More specifically, Chapter 2, "Aging Trends," opens the report and examines the continuing global aging trend and projected growth of the population aged 65 and over. It also discusses the variations in population aging among world regions and countries. Chapter 3, "The Dynamics of Population Aging," analyzes fertility decline, the main propeller of population aging, for regions and countries. It also examines aging indicators, including

[1] Definitions of the older population, youth, and working age vary across the world because of differences in age distribution. For the purpose of this report, unless specified otherwise, "older population" refers to those aged 65 and over, "youth" refers to those under age 20, and "working-age population" refers to ages 20 to 64.

[2] Population projections data encompass all countries and areas of the world, while health and economic data are more limited in coverage across countries and regions. In this report, the term "countries" includes countries and areas.

dependency ratios, median age, and sex ratios. Chapters 4 and 5 cover health and health care related areas, with Chapter 4, "Life Expectancy, Health, and Mortality," reporting on extended life expectancy at birth and at older ages, with emphasis on healthy life expectancy. Chapter 4 also discusses leading causes of death and health conditions and well-being for the older population. Chapter 5, "Health Care Systems and Population Aging," covers health systems' response to population aging, including universal health care. It also examines cost and affordability of health care, long-term care, and informal care for the older population. The last two chapters examine the economic well-being of the older population. Chapter 6, "Work and Retirement," updates international trends in labor force participation, with special attention to broad economic dynamics, such as the second demographic dividend of changing aging structure. Chapter 7, "Pensions and Old Age Poverty," reviews recent trends in international pension systems, such as their coverage of the older population and their sustainability.

Box 1-1.
Geographic Terms in This Report

World regions in this report follow United Nations categories—Africa, Asia, Europe, Latin America and the Caribbean, Northern America, and Oceania—unless otherwise noted. See Appendix A for a list of countries and areas in each region.

The "more developed" and "less developed" country categories used in this report correspond to the classification employed by the United Nations. The "more developed" countries include all of Northern America and Europe plus Japan, Australia, and New Zealand. The "less developed" countries include all of Africa, all of Asia except Japan, the Transcaucasian and Central Asian republics, all of Latin America and the Caribbean, and all of Oceania except Australia and New Zealand.

Chapter 7 also presents poverty levels for the older population and the crucial role of pensions. The data used in this report draw heavily from the U.S. Census Bureau's International Data Base, as well as databases developed and maintained by organizations such as the United Nations, the World Health Organization, the Organisation for Economic Co-operation and Development, and the International Labour Organization. The report also incorporates data and findings from the literature.

An Aging World: 2015 is the fifth report in the Census Bureau's *An Aging World* series—prior reports were published in 1987, 1993, 2001, and 2008. The Census Bureau has produced other cross-national reports covering aging trends and the characteristics of the older population, including *Aging in the Third World* (1988), *Aging in Eastern Europe and the Former Soviet Union* (1993), and *Population Aging in Sub-Saharan Africa: Demographic Dimensions 2006*. This report and all previously released international aging reports were commissioned by the National Institute on Aging, Division of Behavioral and Social Research.

Box 1-2.
Population Projections Data in This Report

Throughout this report, projections of population size and composition come from the Population Division of the Census Bureau, unless otherwise indicated. As discussed further in Appendix C, these projections are based on demographic analysis for each nation, including their population age and sex structures, components of population change (rates of fertility, mortality, and net migration), and assumptions about the future trajectories of population change.

Projections for countries are updated periodically as new data become available. Therefore, the data in this report are not the latest available for every country and, by extension, for groups of countries aggregated into regions. The impact of projection updates on indicators of population aging is generally modest and has little effect on the overall trends described in this report.

Population projections for the United States in this report come from the Census Bureau *National Projections Data*, current as of December 2014. Users may find the latest population figures for the United States at <www.census.gov/population/projections/data/national/2014.html>. The population projections for all other countries were current as of December 2013 and were drawn from the Census Bureau's International Data Base. The latest projections for countries of the world are available at <www.census.gov/population/international/data/idb/informationGateway.php>.

CHAPTER 2.

Aging Trends

The world population is aging rapidly. Today the older population (aged 65 and over) represents 7 percent or more of the total population in many parts of the world—one notable exception is Africa and parts of Asia, and Latin America and the Caribbean (Figure 2-1). By 2050, only 33 countries are projected to have an older population comprising less than 7 percent of their total population, a substantial reduction from 115 such countries in 2015. At the same time, the share of the older population will exceed 21 percent in 94 countries, including 39 countries with 28 percent or more of their total population being older.

The demographic phenomenon of population aging is known to many, although the variation and diversity might surprise some. How fast will the older populations in the world grow in the next few decades? What are the similarities and differences among world regions? Which regions or countries are projected to age the fastest? Conversely, which regions or countries will not experience population-aging pressure in the near future?

GROWTH OF WORLD'S OLDER POPULATION WILL CONTINUE TO OUTPACE THAT OF YOUNGER POPULATION OVER THE NEXT 35 YEARS

Among the 7.3 billion people worldwide in 2015, an estimated 8.5 percent, or 617.1 million, are aged 65 and older (Table 2-1). The number of older people is projected to increase more than 60 percent in just 15 years—in 2030, there will be about 1 billion older people globally, equivalent to 12.0 percent of the total population. The share of older population will continue to grow in the following 20 years—by 2050, there will be 1.6 billion older people worldwide, representing 16.7 percent of the total world population of 9.4 billion. This is equivalent to an average annual increase of 27.1 million older people from 2015 to 2050.

In contrast to the 150 percent expansion of the population aged 65 and over in the next 35 years, the youth population (under age 20) is projected to remain almost flat, 2.5 billion in 2015 and 2.6 billion in 2050 (Figure 2-2). Over the same period, the working-age population (aged 20 to 64) will increase only moderately, 25.6 percent. The working-age population share of total population will shrink slightly in the decades to come, largely due to the impact of low fertility and increasing life expectancy.

Perhaps an even more telling illustration of the sharply different growth trajectories of the older and younger populations is the converging, crossing, and then diverging of the percentages of older people and children under age 5 from 1950 to 2050 (Figure 2-3).[1] For the first time in human history, people aged 65 and over will outnumber children under age 5. This crossing is just around the corner, before 2020. These two age groups will then continue to grow in opposite directions. By 2050, the proportion of the population aged 65 and older (15.6 percent) will be more than double that of children under age 5 (7.2 percent). This unique demographic phenomenon of the "crossing" is unprecedented.

[1] Data for population shares aged 65 and over and under age 5 for 1950 to 2050 come from the United Nations, 2013.

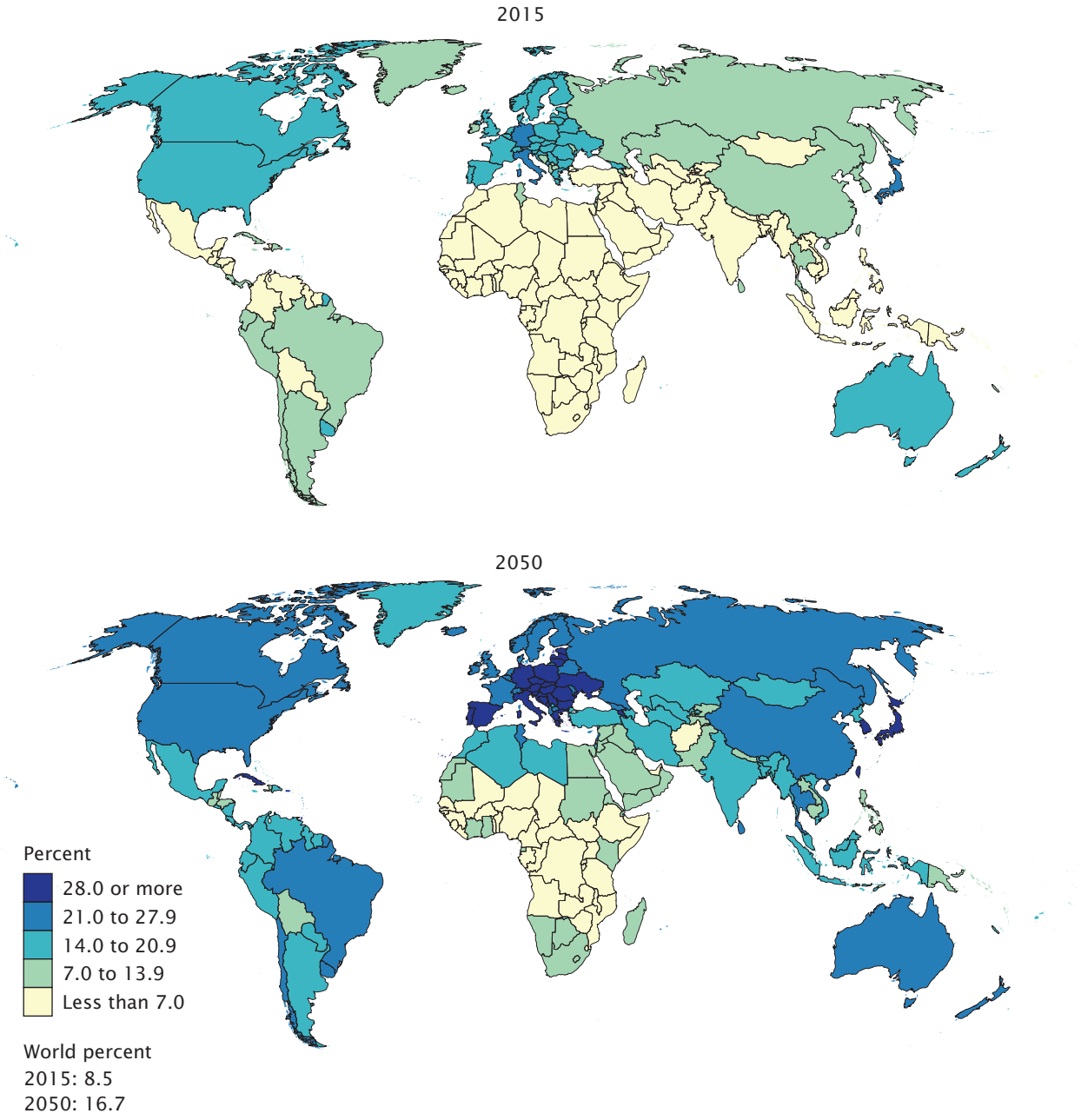
Table 2-1.
World Total Population and Population Aged 65 and Over by Sex: 2015, 2030, and 2050
(Numbers in millions)

Year	Total population			Population aged 65 and over			Percentage aged 65 and over		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
2015	7,253.3	3,652.0	3,601.3	617.1	274.9	342.2	8.5	7.5	9.5
2030	8,315.8	4,176.7	4,139.1	998.7	445.2	553.4	12.0	10.7	13.4
2050	9,376.4	4,681.7	4,694.7	1,565.8	698.5	867.3	16.7	14.9	18.5

Source: U.S. Census Bureau, 2013; International Data Base.

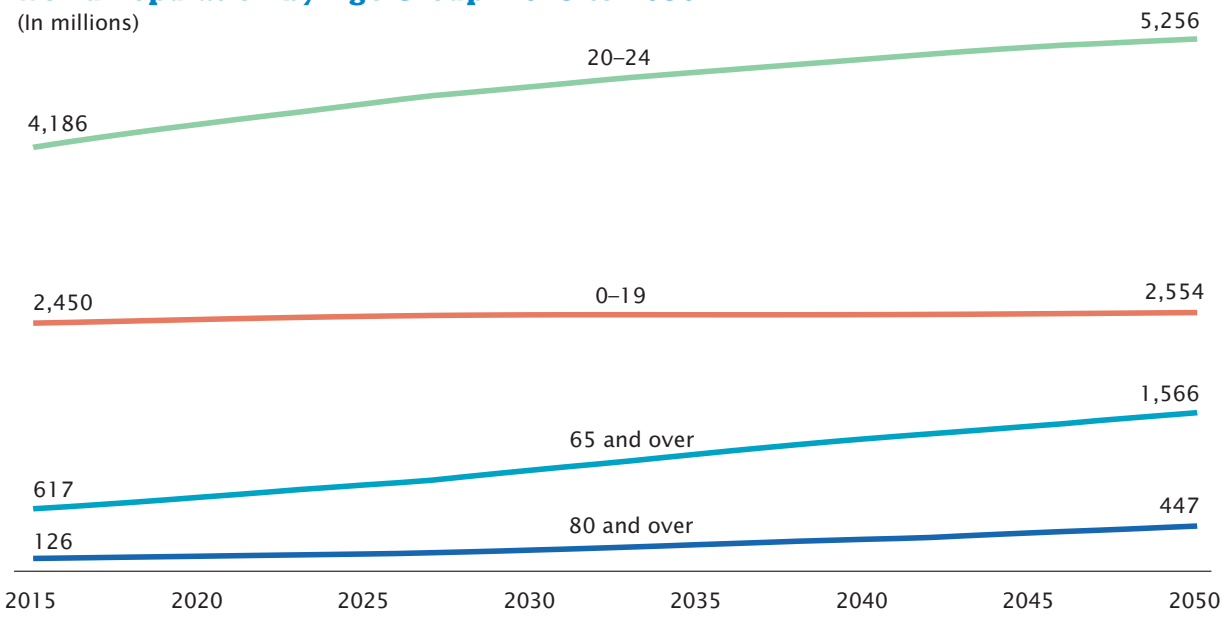
Figure 2-1.

Percentage of Population Aged 65 and Over: 2015 and 2050



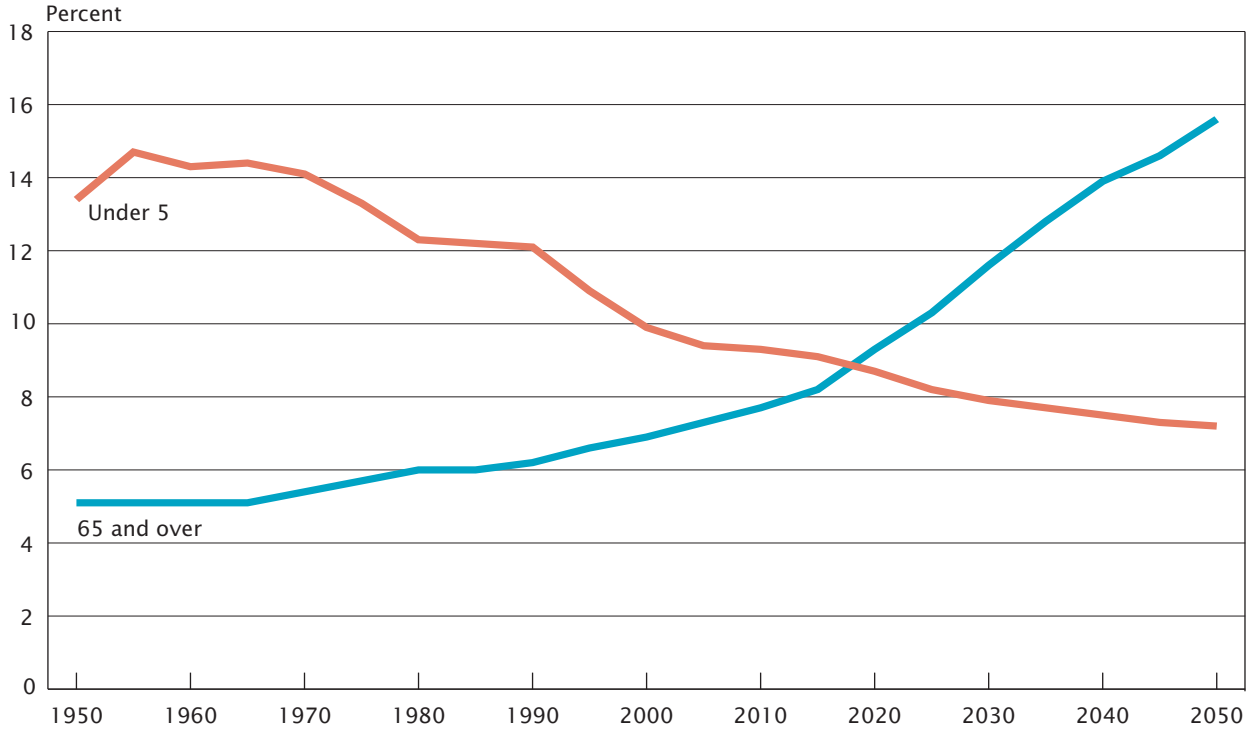
Sources: U.S. Census Bureau, 2013, 2014a, 2014b; International Data Base, U.S. population estimates, and U.S. population projections.

Figure 2-2.
World Population by Age Group: 2015 to 2050
(In millions)



Source: U.S. Census Bureau, 2013; International Data Base.

Figure 2-3.
Young Children and Older People as a Percentage of Global Population: 1950 to 2050



Source: United Nations, 2013.

ASIA LEADS WORLD REGIONS IN SPEED OF AGING AND SIZE OF OLDER POPULATION

World regions vary in their particular phase of the demographic transition and differ in their speed of aging. Using the share of the older population as an indicator for aging, Europe historically has been the oldest region. However, Asia and Latin America are rapidly progressing through the demographic transition and population aging.[2]

Less than 8 percent of Asians are aged 65 and older in 2015 (Table 2-2), but this regional average masks sharp variations within Asia. While about half of the Asian countries currently have less than a 5 percent share for the older population, some countries in Asia are among the oldest in the world. The young countries mostly are located in South-Central Asia (e.g., Afghanistan, 2.5 percent), South-Eastern Asia (e.g., Laos, 3.8 percent), and Western Asia (e.g., Kuwait, 2.3; Yemen, 2.7 percent; and Saudi Arabia, 3.2 percent). In contrast, East Asia is one of the oldest sub-regions globally, including the oldest major country in the world—Japan (26.6 percent). The share of the older population in Asia is expected to reach 12.1 percent in 2030 and 18.8 percent in 2050.

By comparison, Europe is further along in the demographic transition and will remain the oldest region through 2050, even though the pace of aging will slow drastically. In 2015, 17.4 percent of Europeans are aged 65 or older. In most European countries, the share of the older population already exceeds 14 percent. By 2050, more than a quarter of Europeans will be aged 65 and over, and in all but two European countries (Faroe Islands and Kosovo) the older population will represent at least 20 percent of the total population.

What warrants attention is that while population aging in Asia currently is not as advanced as in Europe or Northern America, its huge population size simply cannot be ignored (Figure 2-4). Home to China and India—countries with total populations exceeding 1 billion each currently—Asia's modest 7.9 percent share of older population translates into 341.4 million people aged 65 and over. They represent 55.3 percent of the world's total older population (Figure 2-5). By 2050, 975.3 million older people are projected to be living in Asia, accounting for nearly two-thirds (62.3 percent) of the world's total older population. In addition, while the projected speed of aging for Asia and Latin America are similar, there are seven times as many older people in Asia as in Latin America in 2015, and thus this ratio will be maintained in 2050.

Some South-Eastern and South-Central Asian countries are still young in 2015 (percentage of older population less than 7), but the size of their older population has already surpassed 5 million—Indonesia, 16.9 million; Bangladesh, 8.7 million; Pakistan, 8.7 million; and Vietnam, 5.5 million. By 2050, the population aged 65 and over in these countries will more than triple to 57.2 million, 36.6 million, 32.8 million, and 23.0 million, respectively.

AFRICA IS EXCEPTIONALLY YOUNG IN 2015 AND WILL REMAIN SO IN THE FORESEEABLE FUTURE

Unlike all other regions, Africa, the youngest region, is still largely in the early stages of the demographic transition with high fertility rates and a young age structure, especially in Western, Middle, and some Eastern African countries. The vast majority of African countries today have less than 5 percent of the total population aged 65 and over, and in 21 countries the share is 3 percent or less (e.g., Ethiopia, 2.9 percent and Uganda, 2.0 percent).

[2] In this report, "Latin America" and "Latin America and the Caribbean" are used interchangeably.

Table 2-2.
Population Aged 65 and Over by Region: 2015, 2030, and 2050

Region	Population (in millions)			Percentage of regional total population		
	2015	2030	2050	2015	2030	2050
Africa	40.6	70.3	150.5	3.5	4.4	6.7
Asia	341.4	587.3	975.3	7.9	12.1	18.8
Europe	129.6	169.1	196.8	17.4	22.8	27.8
Latin America and the Caribbean	47.0	82.5	139.2	7.6	11.8	18.6
Northern America	53.9	82.4	94.6	15.1	20.7	21.4
Oceania	4.6	7.0	9.5	12.5	16.2	19.5

Source: U.S. Census Bureau, 2013; International Data Base.

Box 2-1.

Demographic Transition and Population Aging

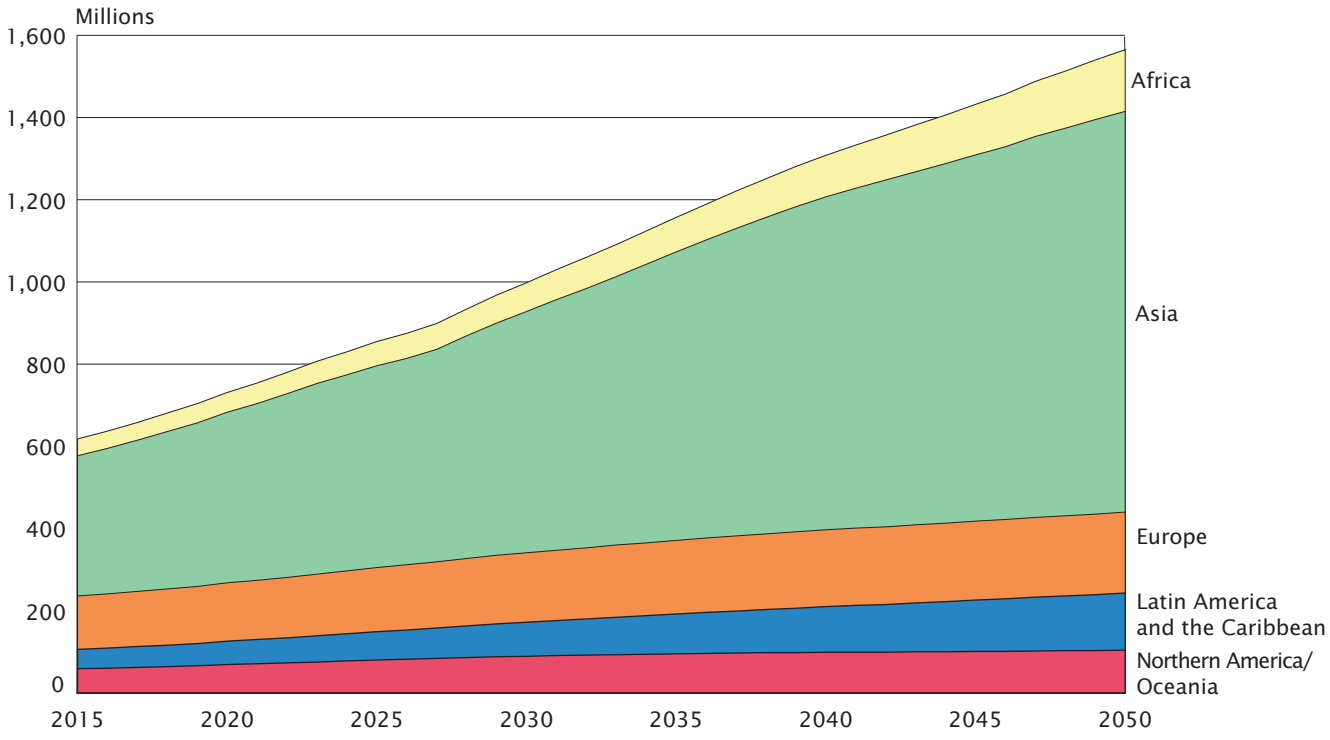
The classical model of demographic transition refers to the process where a society starts with extremely high levels of both fertility and mortality and transitions to a point where both rates are low and stable. The demographic transition impacts both the population growth rate and the age structure of a country.

The demographic transition consists of four stages. At the start—Stage 1, both birth rates and death rates are high. The natural increase (births minus deaths) is low, the population increases very slowly, and the country's age structure is young with a pyramid shape of a large number of children at the base and very few older people at the top. In Stage 2, mortality, especially infant and child mortality, declines rapidly while fertility lags and remains high. In this stage, population increases rapidly and the age structure becomes younger. However, the proportion of the older population starts to grow as mortality rates decrease and people live longer. In Stage 3, a fertility transition occurs as fertility declines rapidly, accompanied by continued yet slower declines in infant and child mortality, but accelerated mortality decline at older ages. The population continues to grow; however, the age structure becomes even older as life expectancy continues to improve. In Stage 4, both mortality and fertility are low and remain relatively stable, population growth flattens, and the age structure becomes old. No longer is there a wide base of young children and a small tip at the top for the older population; the shape of the age structure becomes almost rectangular.

Many factors contribute to this process, but it is generally agreed that the initial momentum starts with improvement in public health, including basic sanitation and advancements in medicine. The increased child survival rates, along with general improvements in socioeconomic conditions, then affect fertility behavior through a reduction in the desired number of children. Economic explanations for a lower desired number of children include mechanization of agriculture and expansion of the nonagrarian economy; the quantity-quality tradeoff, that parents switch their resources from raising many offspring to a smaller number of "quality" children; and the opportunity cost for women to have children versus their own labor force participation (Canning, 2011; Galor, 2012).

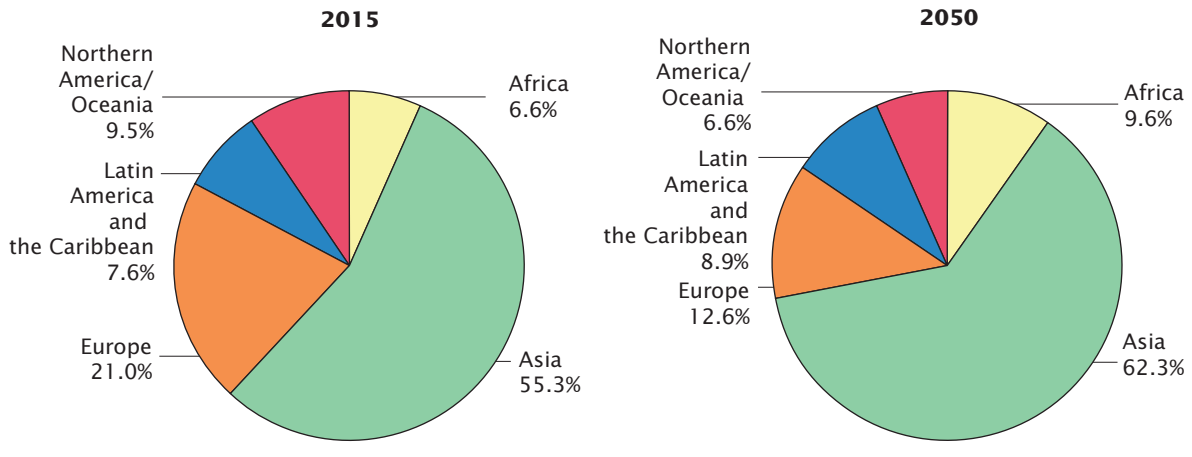
Countries vary in the timing of the onset and duration of the stages of the demographic transition. The more developed countries, especially those in Western and Northern Europe, started the demographic transition more than a century ago and most took many decades to complete this process. Less developed countries in Asia and Latin America started this process only in recent decades, and for most of these countries, the transition is proceeding more quickly. A number of countries in Sub-Saharan Africa are proceeding slowly through the fertility transition or in some cases experiencing a stall in fertility decline (Bongaarts, 2008). Researchers point to several possible explanations for the delays in fertility decline in parts of Africa, including slow economic development, limited improvement in female access to education, and increases in mortality due to the AIDS epidemic (Bongaarts, 2008; Ezeh, Mberu, and Emina, 2009). On the other hand, Bangladesh serves as an example of a country achieving major reductions in fertility from the mid-1970s to the mid-1990s despite low levels of economic development (Cleland, et al., 1994; Khuda and Hossain, 1996).

Figure 2-4.
Population Aged 65 and Over by Region: 2015 to 2050



Source: U.S. Census Bureau, 2013; International Data Base.

Figure 2-5.
Percentage Distribution of Population Aged 65 and Over by Region: 2015 and 2050



Source: U.S. Census Bureau, 2013; International Data Base.

Africa, as a region, is exceptional not only for being young in 2015, but also for being projected to remain young over the next few decades, largely because of sustained high fertility levels leading to a young age structure in most Sub-Saharan countries. By 2050, the older population share is projected to continue below 7 percent in Africa. For example, Malawi's older population represents 2.7 percent of the total population in 2015, and its share is projected to increase to only 4.2 percent by 2050. Similarly, Mozambique's share of the older population is projected to reach 3.3 percent in 2050, up from 2.9 percent in 2015.

It should be noted that most of Northern Africa departs from the African regional pattern—in Tunisia, the older population share is projected to rise from 8.0 percent in 2015 to 24.3 percent in 2050; and Morocco, from 6.4 percent in 2015 to 18.6 percent in 2050. A number of Eastern African countries will also age relatively rapidly in the next 35 years; for example, the older population share in Kenya is projected to triple from 2015 (2.9 percent) to 2050 (9.2 percent).

While Africa is a young region, some African countries already have a large number of older people. In 2015, the older population exceeds 1 million in 11 African countries, including Nigeria, 5.6 million; Egypt, 4.6 million; and South Africa, 3.1 million. By 2050, more than half of all African countries are projected to have more than 1 million older people, including 3 countries that will exceed 10 million (Nigeria, 18.8 million; Egypt, 18.1 million; and Ethiopia, 11.5 million) and another 6 countries with more than 5 million.

WORLD'S OLDEST COUNTRIES MOSTLY IN EUROPE TODAY, BUT SOME ASIAN AND LATIN AMERICAN COUNTRIES ARE QUICKLY CATCHING UP

The percentage of the population aged 65 and over in 2015 ranged from a high of 26.6 percent for Japan to a low of around 1 percent for Qatar and United Arab Emirates. Of the world's 25 oldest countries and areas in 2015, 22 are in Europe, with Germany or Italy leading the ranks of European countries for many years (Kinsella and He, 2009), including currently (Figure 2-6).[3] In 2050, Slovenia and Bulgaria are projected to be the oldest European countries.

Japan, however, is currently the oldest nation in the world and is projected to retain this position through at least 2050. With the rapid aging taking place in Asia, South Korea, Hong Kong, and Taiwan will join Japan at the top of the list of oldest countries and areas by 2050, when more than one-third of these Asian countries' total populations are projected to be aged 65 and over. The oft-mentioned European countries, such as Germany and Italy, while still among the oldest countries in 2050, will move down the list; and Sweden, previously near the top, will be passed by many fast-aging countries and areas and drop to 84th in 2050.

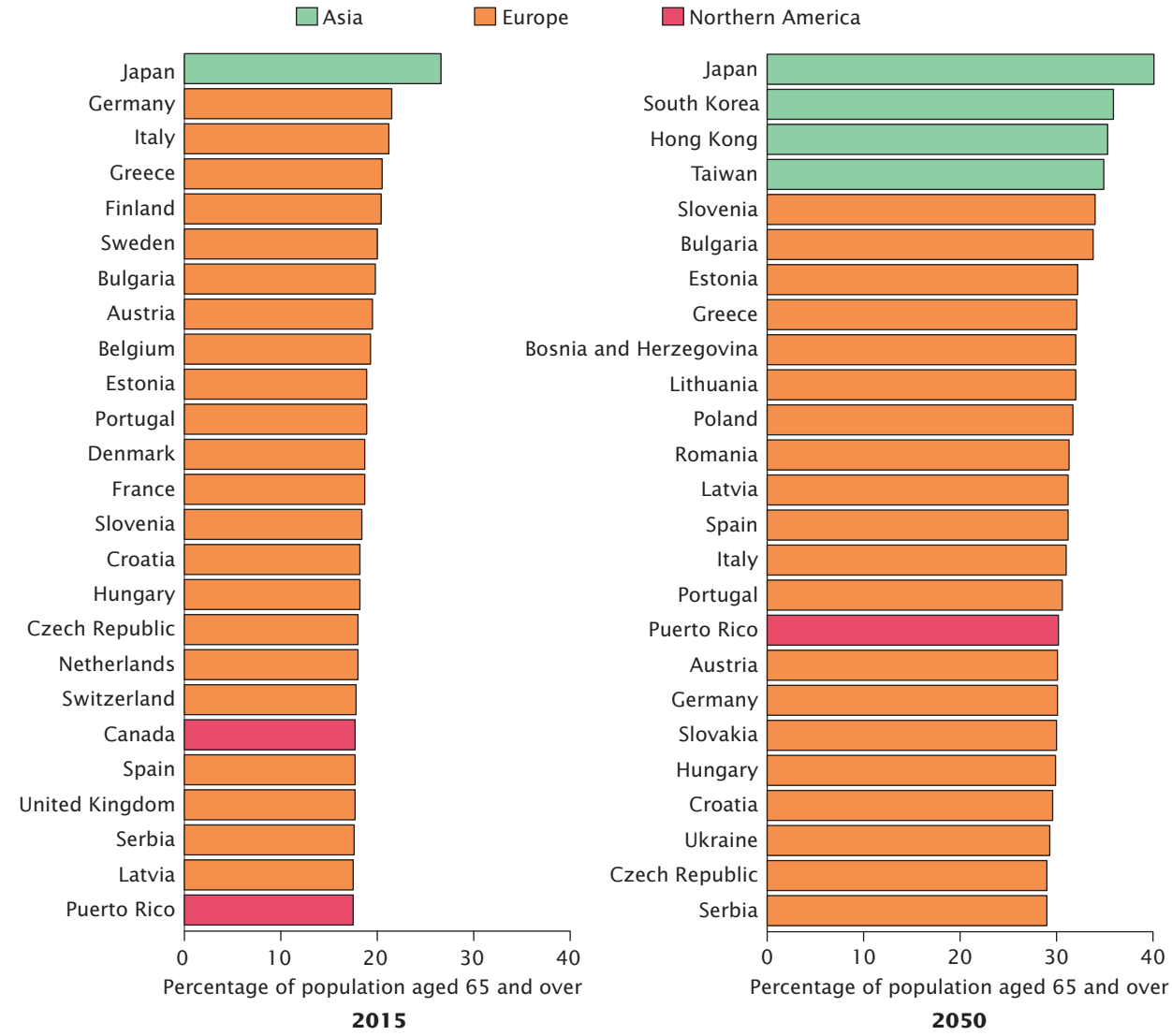
The United States, with an older proportion of 14.9 percent in 2015 and ranked 48th among the oldest countries of the world, is rather young among more developed countries. Immigration may play a role, as foreign-born mothers have higher fertility levels than native women and the foreign-born share of births is disproportionately higher than their share in the total population (Livingston and Cohn, 2012).[4] Even with the large infusion of older people from the post-WWII Baby Boom cohort (people born between mid-1946 and 1964) that began in 2011, the older share of total population in 2050 (projected to be 22.1 percent) will push the United States down to 85th position, in the middle range among all countries in the world. Because of their rapid aging, Asian countries such as South Korea (35.9 percent), Taiwan (34.9 percent), and Thailand (27.4 percent), and Latin American countries such as Cuba (28.3 percent) and Chile (23.2 percent) are projected to be older than the United States in 2050, even though they are younger than the United States in 2015. Tunisia stands out as an African country that will rank 69th in the world in 2050 with 24.3 percent aged 65 and over (older than the United States), up from a 97th ranking in 2015.

[3] The list of 25 oldest countries and areas includes countries and areas with a total population of at least 1 million in 2015. Some small areas/jurisdictions have high proportions of older residents. For example, in 2015, 30.4 percent of all residents of the European principality of Monaco were aged 65 and over, and the share is projected to reach 59 percent by 2050.

[4] See Chapter 3 for more discussion on fertility and population aging.

Figure 2-6.

The World's 25 Oldest Countries and Areas: 2015 and 2050



Note: The list includes countries and areas with a total population of at least 1 million in 2015.
Source: U.S. Census Bureau, 2013; International Data Base.

THE TWO POPULATION BILLIONAIRES, CHINA AND INDIA, ARE ON DRASTICALLY DIFFERENT PATHS OF AGING

In 2015, the total population of China stands at 1.4 billion, with India close behind at 1.3 billion. It is projected that 10 years from now, by 2025, India will surpass China and become the most populous country in the world.

However, these two population giants are on drastically different paths of population aging, thanks largely to different historical fertility trends. Although both China and India introduced family planning programs decades ago (see Box 3-2 for a discussion of the impact of China's program), the fertility level in India has remained well above the level in China since the 1970s. Historic fertility levels have affected the pace of aging in these two countries. In 2015, the older population in China represents 10.1 percent of its total population, while the share is only 6.0 percent in India. By 2030, after India is projected to have overtaken China in terms of total population, 8.8 percent of India's population

will be aged 65 and older, or 128.9 million people. In contrast, in the same year, China will have nearly twice the number and share of older population (238.8 million and 17.2 percent). By 2050, it is projected that China will have 100 million more older people than India, 348.8 million compared with 243.4 million, even though China's projected total population of 1.304 billion will be 352.8 million fewer than India's total population of 1.657 billion.

The sheer size of China's older population can be further illustrated by comparing its 65-and-older population with the population of all ages in some other populous countries. In 2015, the number of older people in China (136.9 million) exceeds Japan's total population (126.9 million). In 2030, the total projected populations of Japan plus Egypt (231.8 million) will be smaller than China's projected 65-and-older population (238.8 million). By 2050, it will take the combined total populations of Japan, Egypt, Germany, and Australia (345.6 million) to match the older population in China (348.8 million).

SOME COUNTRIES WILL EXPERIENCE A QUADRUPLING OF THEIR OLDEST POPULATION FROM 2015 TO 2050

The older population itself has been aging, with the oldest segment growing faster than the younger segment because of increasing life expectancy at older ages. In the United States, for example, life expectancy at age 65 increased from 11.9 years in 1900–1902 to 19.1 years in 2010, and for age 80 from 5.3 to 9.1 years during the same span of time (Arias, 2014). Worldwide, the population aged 80 and over is projected to more than triple between 2015 and 2050, from 126.5 million to 446.6 million (Figure 2-2).

The 80-and-older population in some rapidly aging Asian and Latin American countries will go through remarkable growth; their share of the total population in the next 35 years is projected to quadruple from 2015 to 2050 (Table 2-3). In Asia, 23 countries are projected to experience this quadrupling. In contrast, because the vast majority of European countries started the aging process long ago and now are experiencing a slowdown in the speed of aging, only one European country, Bosnia and Herzegovina, is projected to see a quadrupling of their population aged 80 and over during the 2015 to 2050 period.

Within the oldest populations, those at extremely old ages (90 and older, or 100 and older) are growing faster than their younger counterparts in some countries, even though they are a very small portion of the total population. From 1980 to 2010, U.S. census data showed that the 90 and older population almost tripled over the period, compared to a doubling of the population aged 65 to 89 (He and Muenchrath, 2011). Centenarians, people aged 100 or older, increased by 65.8 percent in the United States during the same period of time (Meyer, 2012). These oldest old people are distinct from the rest of the older population in many sociodemographic characteristics and are more likely to have chronic conditions that require long-term care, thus may consume public resources disproportionately and constitute a heavier burden on informal care often provided by families (National Institute on Aging and U.S. Department of State, 2007; Tsai, 2010).

Table 2-3.
Countries With Percentage of Population Aged 80 and Over Projected to Quadruple: 2010–2050

Africa	Cote d'Ivoire, Egypt, Libya, Mauritius, Tunisia
Asia	Bahrain, Bangladesh, Brunei, Burma, Cambodia, China, India, Indonesia, Kuwait, Malaysia, Mongolia, North Korea, Qatar, Saudi Arabia, Singapore, South Korea, Syria, Thailand, Timor-Leste, Turkey, Turkmenistan, United Arab Emirates, Vietnam
Europe	Bosnia and Herzegovina
Latin America and the Caribbean	Brazil, Colombia, Costa Rica, Cuba, Nicaragua, Trinidad and Tobago
Northern America; Oceania	Papua New Guinea

Note: The list includes countries with a total population of at least 1 million in 2015.
Source: U.S. Census Bureau, 2013; International Data Base.

Box 2-2.

Doubling of the Share of Older Population, or Is it Tripling?

A commonly used indicator for the speed of population aging is the number of years for a country's population aged 65 and over to double from 7 percent of the total population to 14 percent. It is often noted that it took France 115 years for its share of older population to achieve this doubling, and many European and Northern American countries waited more than half a century for this doubling to complete—Sweden, 85 years; Australia, 73 years; and the United States, 69 years (Figure 2-7). Japan is an exception among the more developed countries. It took Japan only 25 years (1970 to 1995) to have its older population double from 7 percent to 14 percent of its total population.

While most of the more developed countries have already completed this doubling, the less developed countries, especially those in Asia and Latin America, started this process in the 21st century and are moving at a much faster speed. That the doubling may take only a couple of decades in China and many other Asian and Latin American countries raises serious concerns in these countries regarding their readiness to deal with a rapidly aging society. As the Director-General of the World Health Organization pointed out at the United Nation's Second World Assembly on Ageing in 2002, "We must be aware that the developed countries became rich before they became old, the developing countries will become old before they become rich" (Butler, 2002).

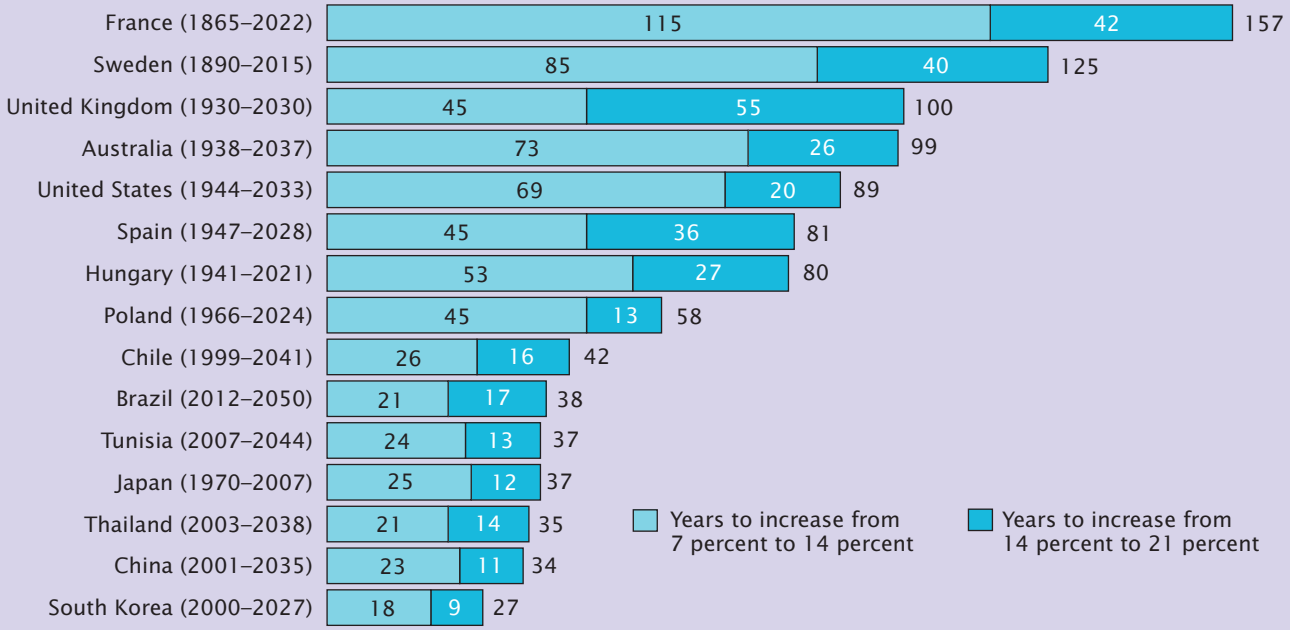
In the near future, countries may face not just doubling but tripling of the share of the older population from 7 percent to 21 percent of the total population. Japan, the oldest country in the world, achieved its tripling in 2007, and today's older Japanese represent about 27 percent of the total population. Projections show that by 2030, a short 15 years from now, the majority of European countries (32 out of 42) will have completed this tripling.

The tripling will take place in some rapidly aging Asian and Latin American countries at an accelerated pace. South Korea, for example, is projected to take just 18 years for its older population to double from 7 percent to 14 percent, and half that time (9 years) to reach 21 percent. Chile's doubling will take 26 years and just another 16 years to complete the tripling.

Figure 2-7.

Number of Years for Percentage Aged 65 and Older in Total Population to Triple: Selected Countries

(Number of years)



Sources: Kinsella and Gist, 1995; U.S. Census Bureau, 2013, 2014a, 2014b; International Data Base, U.S. population estimates, and U.S. population projections.

Chapter 2 References

Arias, Elizabeth. 2014. *United States Life Tables, 2010*. National Vital Statistics Reports 63/7. Hyattsville, MD: National Center for Health Statistics.

Bongaarts, John. 2008. "Fertility Transitions in Developing Countries: Progress or Stagnation?" Population Council Poverty, Gender, and Youth Working Paper 7.

Butler, Robert N. 2002. "Guest Editorial: Report and Commentary From Madrid: The United Nations World Assembly on Ageing." *Journal of Gerontology: Medical Sciences* 57/12: M770-M771.

Canning, David. 2011. "The Causes and Consequences of the Demographic Transition." Harvard University Program on the Global Demography of Aging Working Paper 79.

Cleland, John, James F. Phillips, Sajeda Amin, and G. M. Kamal. 1994. "The Determinants of Reproductive Change in Bangladesh: Success in a Challenging Environment." Washington, DC: The World Bank.

Ezeh, Alex C., Blessing U. Mberu, and Jacques O. Emina. 2009. "Stall in Fertility Decline in Eastern African Countries: Regional analysis of patterns, determinants, and implications." *Philosophical Transactions of the Royal Society B* 364: 2991–3007.

Galor, Oded. 2012. "The Demographic Transition: Causes and Consequences." The Institute for the Study of Labor (IZA) Discussion Paper 6334.

He, Wan and Mark N. Muenchrath. 2011. *90+ in the United States: 2006–2008*. American Community Survey Reports, ACS-17, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

Khuda, Barkat-e- and Mian Bazle Hossain. 1996. "Fertility Decline in Bangladesh: Toward an Understanding of Major Causes." *Health Transition Review, Supplement* 6: 155–167.

Kinsella, Kevin and Wan He. 2009. *An Aging World: 2008*. International Population Reports, P95/09-1, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

Kinsella, Kevin and Yvonne J. Gist. 1995. *Older Workers, Retirement, and Pensions: A Comparative International Chartbook*. IPC/95-2, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

Livingston, Gretchen and D'Vera Cohn. 2012. *U.S. Birth Rate Falls to a Record Low; Decline Is Greatest Among Immigrants*. Pew Research Center, Social & Demographic Trends.

Meyer, Julie. 2012. *Centenarians: 2010*. 2010 Census Special Reports, C2010SR-03, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

National Institute on Aging (NIA) and U.S. Department of State. 2007. *Why Population Aging Matters: A Global Perspective*. National Institute on Aging of National Institutes on Health Publication 07-6134. Washington, DC: National Institute on Aging of National Institutes on Health.

Tsai, Tyjen. 2010. *More Caregivers Needed Worldwide for the "Oldest Old."* Washington, DC: Population Reference Bureau.

United Nations. 2013. *World Population Prospects: The 2012 Revision*. United Nations Population Division of the Department of Economic and Social Affairs.

U.S. Census Bureau. 2013. *International Data Base*. Available at <www.census.gov/population/international/data/idb/informationGateway.php>, accessed between January and November 2014.

_____. 2014a. *Current Estimates Data*. Available at <www.census.gov/population/popest/data/>, accessed on December 11, 2014.

_____. 2014b. *2014 National Projections*. Available at <www.census.gov/population/projections/data/national/2014.html>, accessed on December 11, 2014.

CHAPTER 3.

The Dynamics of Population Aging

Population aging can be measured by various indicators. The primary and most commonly used marker is the proportion of the older population in a society, with population aging defined as an increasing proportion of older people within the age structure as discussed in the previous chapter.

Another indicator of population aging is the median age, the age that divides a population into numerically equal parts of younger and older people. As population aging progresses, the median age rises. Population aging's effect on a country's societal support burden is often measured by the older dependency ratio, the ratio of the older population to the working-age population.

Owing to the longer life expectancy of women compared with men (both at birth and at older ages), the sex ratio (the number of males per 100 females) of the older population is often skewed toward females. This results in a demographic phenomenon referred to as the excess of women, which could have significant implications in providing for old age care.

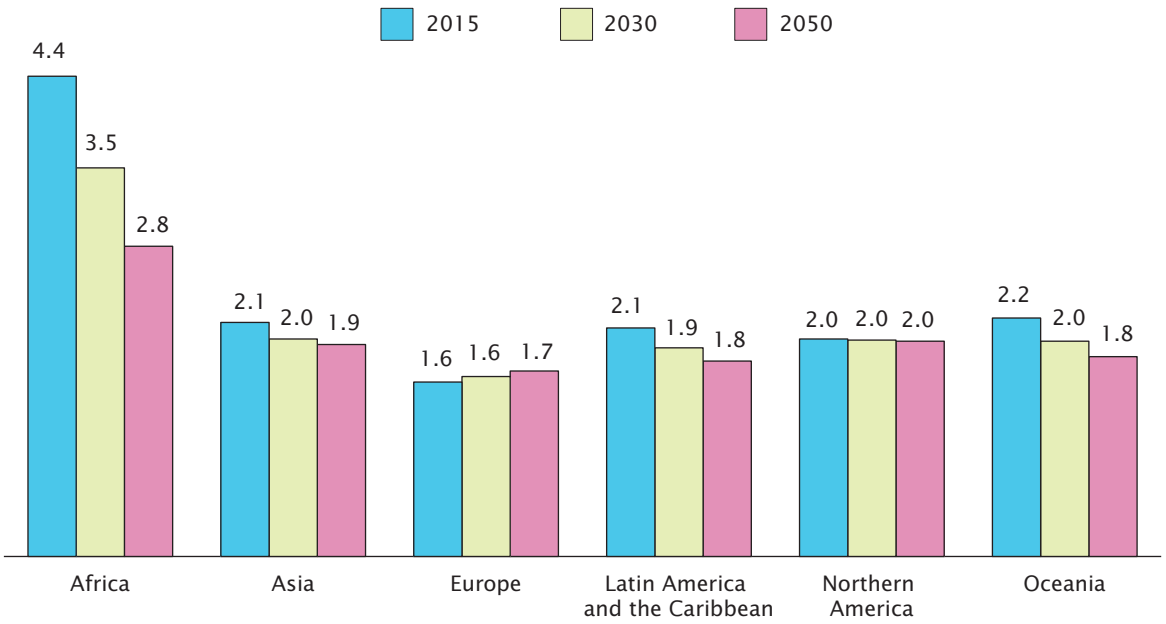
TOTAL FERTILITY RATES HAVE DROPPED TO OR UNDER REPLACEMENT LEVEL IN ALL WORLD REGIONS BUT AFRICA

The main demographic force behind population aging is declining fertility rates. Populations with high fertility tend to have a young age distribution with a high proportion of children and a low proportion of older people, while those with low fertility have the opposite, resulting in an older society.

In many countries today, the total fertility rate (TFR) has fallen below the 2.1 children that a couple needs to replace themselves.[1] In 2015, the TFR is near or below replacement level in all world regions but Africa (Figure 3-1). The more developed countries in Europe, where fertility reduction started more than 100 years ago, have had TFR levels below replacement rate since the 1970s. Currently, the average TFR for Europe is a very low 1.6. Interestingly, the downward trend in the TFR throughout Europe has recently reversed in a number of countries, although the TFR still remains well below replacement.

[1] The total fertility rate (TFR) is defined as the average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given set of age-specific fertility rates.

Figure 3-1.
Total Fertility Rate by Region: 2015, 2030, and 2050



Source: U.S. Census Bureau, 2013; International Data Base.

Box 3-1.

China's One-Child Policy and Population Aging

In the early 1970s, China began to institute fertility restrictions out of concern that rapid population growth would derail its development. A group of policies known as "later-longer-fewer" was designed to encourage delayed childbearing after marriage, longer intervals between births, and fewer births overall. Under these policies, China's fertility fell dramatically from over 5 births per woman in 1972 to under 3 by 1977, the fastest decline ever recorded, although declines varied by province (Tien, 1984).

China introduced an even stricter policy in 1979 requiring most parents to have only one child. In 1984, due to strong son preference, most rural couples with a first-born daughter were permitted to have a second child. In 1991, China's fertility fell below 2 children per woman, and since 2000 it has hovered around 1.5 (U.S. Census Bureau, 2013).

What effect have China's birth planning policies had on population structure and aging? Experts seem unanimous in concluding that the "later-longer-fewer" campaign of the 1970s resulted in faster fertility declines than would have occurred in the absence of these policies. The exact impact depends on counterfactual assumptions of what policies might have otherwise been in place as well as the pattern of fertility decline that might have occurred under them (Goodkind, 1992; Wang, Cai, and Gu, 2012).

Opinions are more divided about the extent to which birth restrictions are responsible for the pace of China's fertility decline from the 1980s forward. Many experts in recent years argue that China's fertility is very low due primarily to improved socioeconomic conditions and that fertility restrictions are increasingly irrelevant for childbearing decisions (e.g., Cai, 2010).

Whatever the exact number of averted births, the impact of low fertility on China's population may be understood by looking at its age-sex pyramids in 2015 and 2050 (Figure 3-2). The size of each birth cohort is determined by two factors—fertility rates at the time of birth and the number of females at childbearing ages. The notable constriction of the 2015 population pyramid for the age groups 30 to 34 and 35 to 39 corresponds to the cohort born during the "later-longer-fewer" era of the 1970s and after the one-child policy was instituted in 1979. The subsequent enlargement of younger cohorts (peaking at ages 25–29) is an "echo" of the large number of females born in the late 1960s, which likely counterbalanced the reduction in fertility caused by the one-child policy.

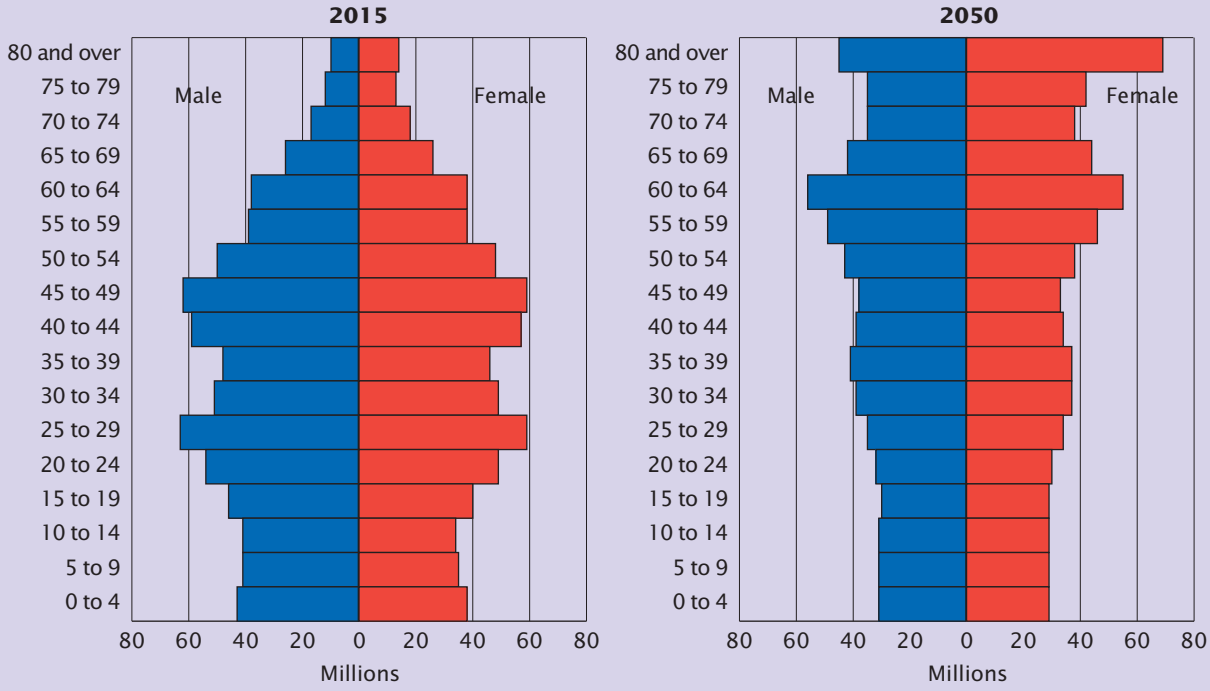
In 2050, the population pyramid reflects the longer term effects of China's declining fertility. The echo generation will be approaching older ages (60 to 64). Age groups older than 60 will likely form a heavy top for China's age distribution. As the smaller birth cohorts of the 1990s and 2000s reach prime working ages, China will experience a shrinking labor force. By 2050, the population in the primary working ages, 20 to 59, is projected to represent only 46.5 percent of the total population, down from the peak of 61.6 percent in 2011.

Note: The primary working ages 20 to 59 are used in this discussion because China's mandatory retirement ages for the majority of salaried workers are 60 for men and 55 for women, except for government officials or workers in heavy or hazardous industries.

Continued on next page.

Figure 3-2.

Population by Age and Sex for China: 2015 and 2050



Source: U.S. Census Bureau, 2013; International Data Base.

Many less developed countries in Asia and Latin America, on the other hand, have experienced more recent and rapid fertility declines than Europe. Overall TFR levels in Asia and Latin America decreased by about 50 percent (from 6 to 3 children per woman) during the period 1965 to 1995 (Kinsella and He, 2009). As of 2015, the average TFR for both regions is at the replacement level of 2.1, and it is projected that the decline will continue over the next 35 years through 2050, albeit at a slower pace.

While the average TFR for Latin America is 2.1, the majority of countries in the region have below replacement fertility rates as of 2015, with Cuba (1.5) and Brazil (1.8) having the lowest fertility levels. By 2050, all Latin American countries are projected to have fertility rates at or below 2.1. This would be a significant achievement in Latin America's fertility transition, regardless of each country's development level today.

Asia's current low regional TFR is particularly impressive, considering that there are still some Asian countries with quite high 2015 fertility levels, such as Afghanistan

(5.3), Yemen (3.9), Iraq (3.3), and the Philippines (3.0). These high fertility rates are offset by exceptionally low fertility in countries such as Taiwan (1.1), Hong Kong (1.2), South Korea (1.3), Japan (1.4), Thailand (1.5), and China (1.6). By 2050, all 52 Asian countries are projected to have below replacement fertility rates except Afghanistan (2.8), Jordan (2.5), Philippines (2.2), and Timor-Leste (2.2).

FERTILITY DECLINES IN AFRICA BUT MAJORITY OF AFRICAN COUNTRIES STILL HAVE ABOVE REPLACEMENT LEVEL FERTILITY IN 2050

Africa's current regional TFR stands at 4.4, more than twice the replacement level. Nevertheless, Africa has experienced fertility decline in the last 15 years. At the turn of the twenty-first century, two-thirds (34) of African countries had a TFR at or above 5, with the TFR exceeding 7 in a few of these countries (Uganda, 7.1; Somalia and Mali, 7.2; Niger, 8.0). In 2015, 15 years later, the fertility decline has reduced the number of countries with above 5 TFR to 13, and 22 other countries have a TFR between 4 and 5. In another 15 years, 2030, it is projected that only Burundi will maintain a fertility level above 5 and the number of countries with a TFR between 4 and 5 will decline to 14.

Africa's fertility decline will continue into the middle of the century. However, it is projected that by 2050, two-thirds of African countries will still have a TFR higher than 2.1. Demographers (Caldwell, Orubuloye, and Caldwell, 1992) point out the different path of fertility transition followed in Africa ("African exceptionalism") compared with the rest of the world. They posit that the slow fertility decline in Africa is the result of the still high ideal family size, stemming from the distinctive pronatalist cultural norms of African societies, the pervasive fertility control regime focused on postponement but not stopping, and unmet need for family planning (Moultrie, Sayi, and Timaeus, 2012; Bongaarts and Casterline, 2013; Casterline and El-Zeini, 2014).

Among African countries that are projected to have the highest TFRs in 2015, 2030, and 2050 (Table 3-1) are some populous African countries. The 11th-ranked TFR in 2015 is Nigeria, Africa's most populous country, which has a total population of 181.6 million in 2015 and a projected 391.3 million in

Table 3-1.
Ten Lowest and Highest Total Fertility Rates for African Countries: 2015, 2030, and 2050

2015		2030		2050	
Mauritius	1.8	Mauritius	1.7	Mauritius	1.7
Tunisia	2.0	Namibia	1.8	Namibia	1.7
Libya	2.1	Tunisia	1.9	Tunisia	1.7
Morocco	2.1	Libya	2.0	Algeria	1.9
Namibia	2.2	Morocco	2.0	Kenya	2.0
South Africa	2.2	South Africa	2.0	Libya	2.0
Cabo Verde	2.3	Botswana	2.1	Morocco	2.0
Botswana	2.3	Kenya	2.1	South Africa	2.0
Lesotho	2.7	Algeria	2.2	Botswana	2.0
Algeria	2.8	Swaziland	2.2	Swaziland	2.0
Mozambique	5.2	Nigeria	4.3	Tanzania	3.1
South Sudan	5.3	Mali	4.3	Nigeria	3.3
Angola	5.4	Mozambique	4.4	Gabon	3.3
Zambia	5.7	Angola	4.5	Angola	3.5
Burkina Faso	5.9	Uganda	4.5	Mozambique	3.5
Uganda	5.9	Somalia	4.5	Rwanda	3.5
Somalia	6.0	Niger	4.7	Burkina Faso	3.5
Mali	6.1	Burkina Faso	4.8	Sierra Leone	3.6
Burundi	6.1	Zambia	5.0	Zambia	3.9
Niger	6.8	Burundi	5.3	Burundi	4.1

Notes: Total fertility rate is the average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given set of age-specific fertility rates.

The list includes countries with a total population of at least 1 million in 2015.

Source: U.S. Census Bureau, 2013; International Data Base.

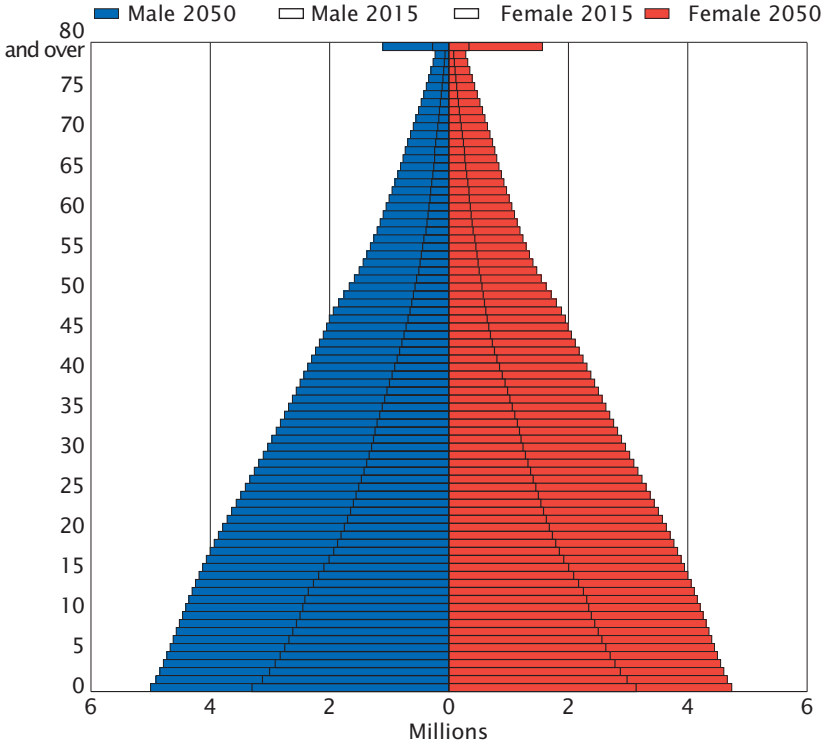
2050. Some other populous African countries with fertility rates projected to continue to be high are Ethiopia, 99.5 million in 2015 and 228.1 million in 2050; Tanzania, 51.0 million in 2015 and 118.6 million in 2050; and Mozambique, 25.3 million in 2015 and 59.0 million in 2050.

Compared with the rest of the world, the slow fertility transition and above-replacement level fertility in Africa will bring about sustained population growth and a corresponding slow pace of population aging in most of the region, especially in Sub-Saharan Africa. The age structure of most Sub-Saharan African countries may continue to be that of the traditional pyramid shape (see Figure 3-3 for the population distribution by age and sex in 2015 and 2050 for Nigeria, an African society with high fertility levels). With the fertility transition only in the early stages in most Sub-Saharan countries, population aging in Africa is only on the far horizon.

It is worth noting that the current relatively high fertility levels in many African countries could also produce a sizable working age population in 2050 (see Figure 3-4 for an example). If the fertility decline accelerated, then the proportion of the population in the working ages could rise relative to 2015 and result in lower dependency ratios (see discussion

Figure 3-3.

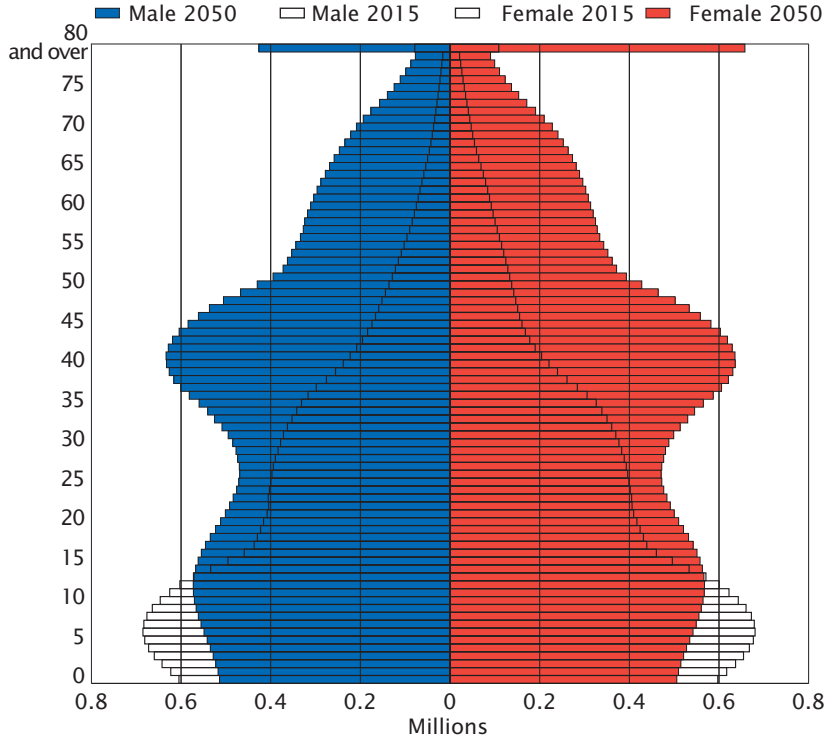
Population by Age and Sex for Nigeria: 2015 and 2050



Source: U.S. Census Bureau, 2013; International Data Base.

Figure 3-4.

Population by Age and Sex for Kenya: 2015 and 2050



Source: U.S. Census Bureau, 2013; International Data Base.

Box 3-2.

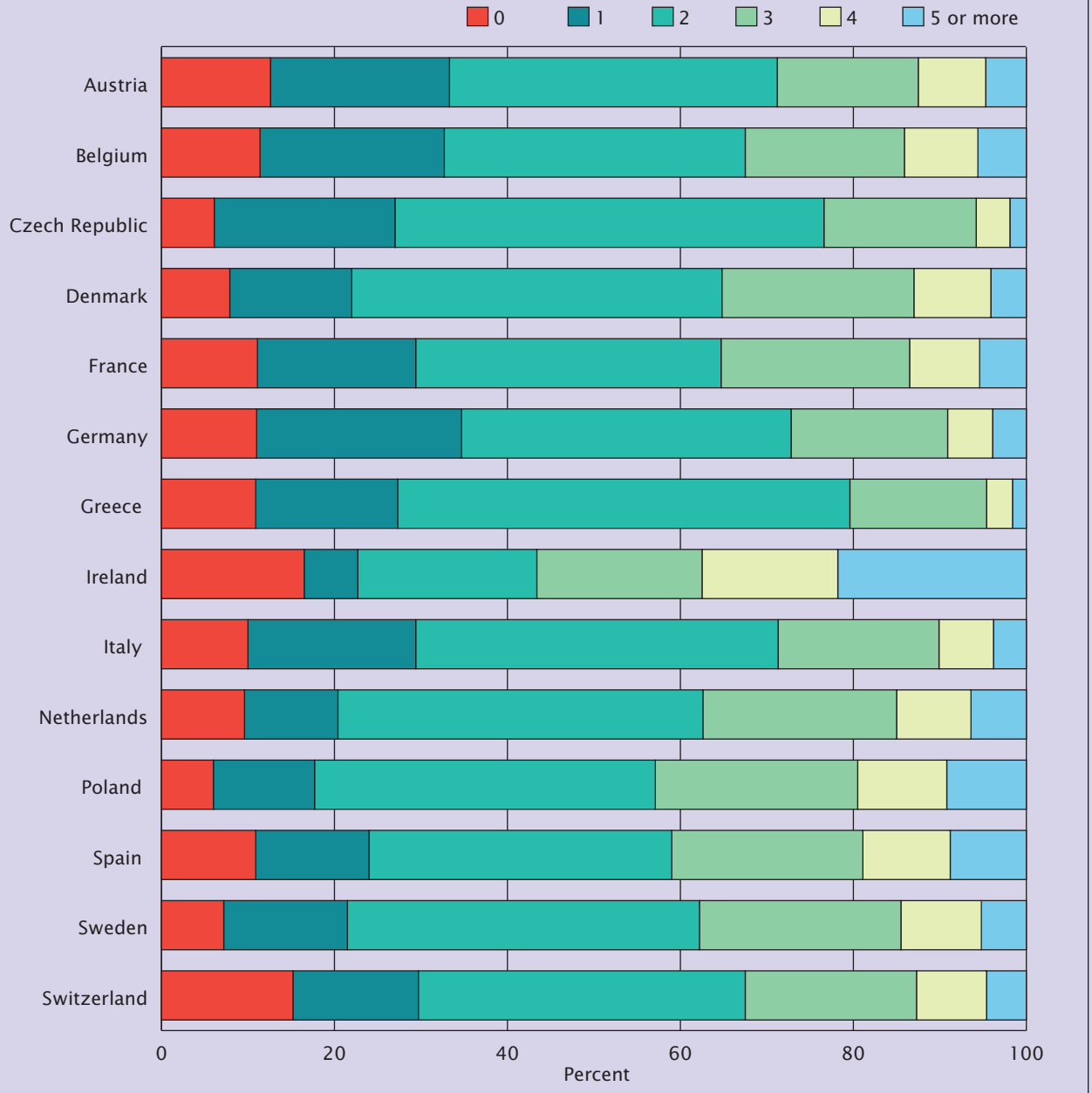
Support of Childless Older People in an Aging Europe

By *Martina Brandt, TU Dortmund University, and Christian Deindl, University of Cologne*

Western societies tend to have the highest proportion of older people (Kinsella and He, 2009) and are facing considerable pressure on pension and health systems, including services and financial resources for old age care (Börsch-Supan and Ludwig, 2010). An important aspect for old age support is who will provide the care, especially

Figure 3-5.

Percentage Distribution of Population Aged 50 and Over by Number of Surviving Children for Selected European Countries: 2006–2007



Note: The population with 0 surviving children includes those who never had any children and those who have outlived their children.
Source: Survey of Health, Ageing, and Retirement in Europe, release 2.5.0, May 2011.

Continued on next page.

for those who are very old and have no partners. Traditionally, children are the mainstay of old age support, especially when only one parent is still living. However, people are not only living longer but also having fewer children, with rising childlessness among the older people (Albertini and Mencarini, 2014; Hayford, 2013; Rowland, 2007).

Thus new challenges arise: Who will provide help and care to the childless older people? On what support networks can they rely? And, what role does the state play in care provision?

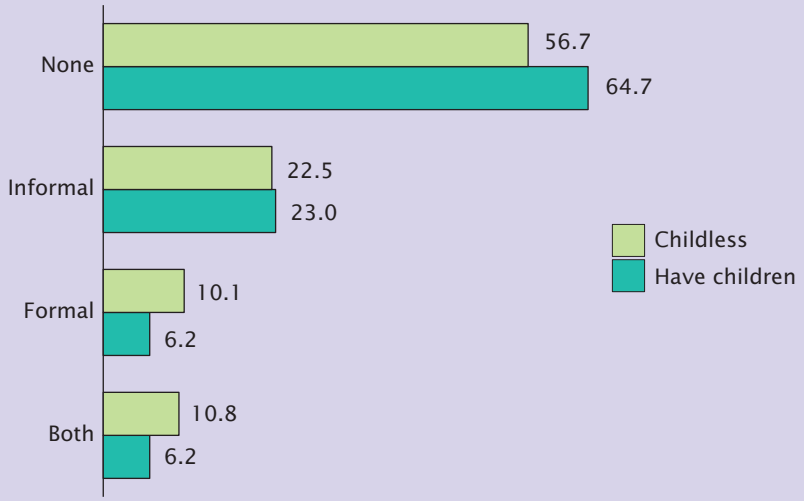
Today about 10 percent of the population aged 50 and over in Europe are childless, according to data from the Survey of Health, Ageing, and Retirement in Europe (see Börsch-Supan et al., 2011 for details), ranging from 5 to 15 percent in individual countries (Figure 3-5; also see Hank and Wagner, 2013). Childless elders in this study are defined as those who never had any children and those who have outlived their children (3 percent of the childless people aged 50 and older).

Family and intergenerational relations play an important role for support in old age. Older parents in need typically receive the most help from their children. In the absence of children, vital support for older persons has been taken over by public providers in many countries in Europe. In countries with low social service provision such as Italy, Spain, and Poland, older people are thus likely to experience a lack of help (Deindl and Brandt, 2011), especially when childless and dependent on care. Childless elders also often receive care by extended family, friends, and neighbors (Deindl and Brandt, 2014).

Compared with those who have children, childless older people in need of care (with at least one limitation in instrumental activities of daily living) are more likely to receive any support (Figure 3-6). With regard to the type of support (formal, informal, or both), childless older people are more likely than their counterparts to receive formal and combined support. Older parents, however, on average receive more help hours from their children and their broader social network such as family, friends, and neighbors (Deindl and Brandt, 2014).

The provision of formal care is of great importance not only for childless older people but also for older parents whose children live far away. It will likely become even more important in the future when the number of available family helpers is expected to further decline, due to fewer siblings and children and greater living distances between family members. In developed welfare states, social networks and services work hand in hand, and likely leading to a higher quantity and better quality of support for older people without children who are especially dependent on formal care arrangements.

Figure 3-6.
Type of Support Received by People Aged 50 and Over in Selected European Countries by Child Status: 2006–2007
(In percent)



Notes: This figure includes only older people with limitations in Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL).
Aggregate data are based on the following countries: Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, and Switzerland.
Source: Survey of Health, Ageing, and Retirement in Europe, release 2.5.0, May 2011.

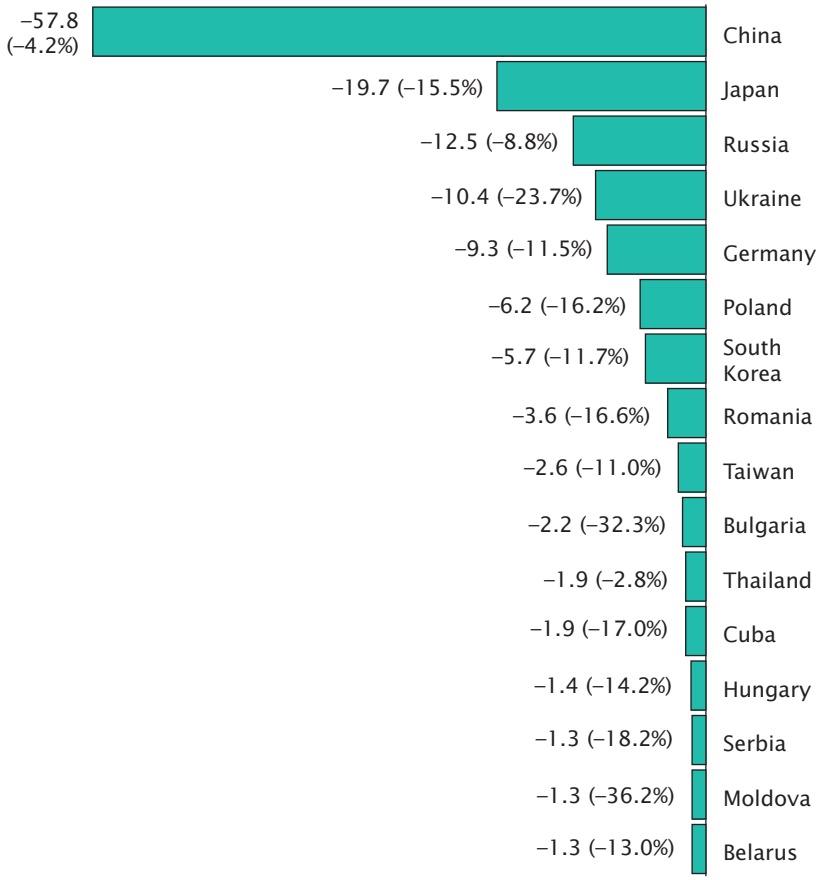
on dependency ratios later in this chapter), potentially enabling demographic dividends in the next few decades for many African countries.[2] However, demographers and economists warn that Sub-Saharan Africa's continued rapid increase of children may translate into a large number of unemployed youth, hindering economic development with an adverse impact on food security and sustainability of natural resources (Sippel et al., 2011; African Development Bank Group, 2012; Drummond, Thakoor, and Yu, 2014).[3]

SOME COUNTRIES TO EXPERIENCE SIMULTANEOUS POPULATION AGING AND POPULATION DECLINE

European demographers have warned for decades about the possibility of declining total population size accompanying population aging in some European countries, due to their persistent "lowest-low fertility" levels (Kohler, Billari, and Ortega, 2002). In some European countries, such as Belarus, Bulgaria, Romania, Serbia, and Ukraine, population decline started 2 decades ago.

Interestingly, a list of countries projected to experience a population decline of at least 1 million compiled by Kinsella and He (2009, Figure 3-3) in 2008 differs somewhat from the same list compiled in 2015 (Figure 3-7). Four countries included in the earlier list are no longer projected to face a substantial population decline—South Africa, Italy, Spain, and the Czech Republic. Decreases in mortality due to HIV/AIDS has changed the prospects for South Africa and removed it from the list. Italy and Spain have dropped off the list primarily due to increases in fertility and major immigration flows. Italy's total population is still projected to decline but only by 0.4 million by 2050.

Figure 3-7.
Countries With Expected Decline of at Least 1 Million in Total Population From 2015 to 2050
(Numbers in millions)



Note: Percentage decline is shown in parentheses.
Source: U.S. Census Bureau, 2013; International Data Base.

[2] Demographic dividend refers to accelerated economic growth as a result of fertility and mortality declines and subsequent lower dependency ratios. For more information on the demographic dividend, see Bloom, Canning, and Sevilla, 2003.

[3] For more discussion on possible overestimates of the pace of Sub-Saharan Africa's future fertility decline, and thus underestimates of the growth of children, see Eastwood and Lipton (2011) and UNICEF (2014).

New countries joining the list include China, South Korea, Thailand, Cuba, Hungary, Serbia, and Moldova. The addition of the three Asian countries is being driven by rapid decreases in their fertility rates. It is important to bear in mind that the projected decline in total population in these Asian countries will be accompanied by the rapid expansion of their older population. The demographic phenomenon of simultaneous population aging and population decline, originally projected to occur only in European countries, is now spreading to Asia.

COMPOSITION OF DEPENDENCY RATIO WILL CONTINUE TO SHIFT TOWARD OLDER DEPENDENCY

The total dependency ratio is the sum of the older dependency ratio and the youth dependency ratio. The older dependency ratio in this report is defined as the number of people aged 65 and over per 100 people of working ages 20 to 64, and the youth dependency ratio is the number of people aged 0 to 19 per 100 people aged 20 to 64. The working ages of 20 to 64 are used here with the acknowledgment that world regions and countries differ vastly in youngest working age and retirement age.

Dependency ratios provide a gross estimate of the pressure on the productive population, and offer an indication of a society's caregiving burden by estimating the potential supply of caregivers and the potential demand for care (number of care recipients). However, not all individuals who fall in a certain age category are actually "dependents" or "providers"—some older (or younger) people work or have the financial resources to be independent and some in the "working ages" do not work.

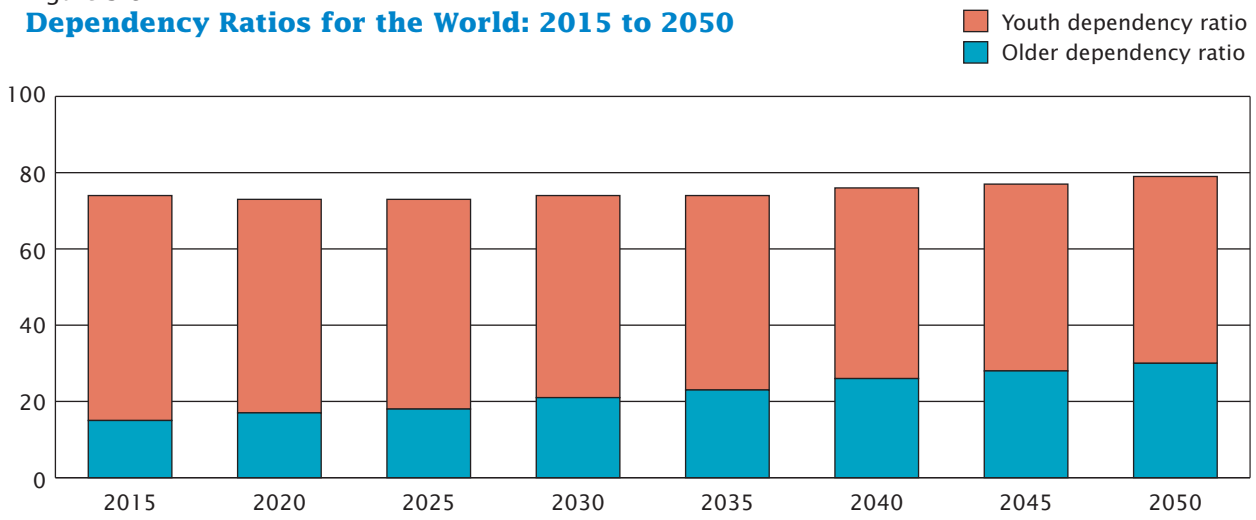
The total dependency ratio for the world in 2015 is 73, indicating that every 100 people aged 20 to 64 are supporting 73 youth and older people combined (Figure 3-8). The world's total dependency ratio is not expected to rise very much in the next few decades, reaching 78 in 2050. However, the composition of the total dependency ratio will change considerably—in 2015, there are 15 older people and 59 youth per 100 working age people, and by 2050 the older dependency ratio is projected to double to 30 and the youth dependency ratio to decline to 48 per 100 working age people. Youth will still account for the majority of all dependents, but the older share is rising.

Countries vary drastically in their total dependency ratio composition, largely due to differences in their stages of fertility and mortality decline. Indonesia, for example (Figure 3-9), experienced a nearly 50 percent reduction in the total dependency ratio from 1980 (121) to 2015 (70), due in large measure to a sharp fertility decline and corresponding decrease in the youth dependency ratio. The youth dependency ratio dropped from 114 in 1980 to 59 in 2015, while the older dependency ratio increased slightly from a mere 7 to 11 over the same period, providing an ideal opportunity to reap the demographic dividend. However, looking forward, while Indonesia's total dependency ratio is projected to increase just slightly to 74 in 2050, the contributing factors will be shifted due to both ongoing fertility decline and increasing life expectancy. By 2050, the youth dependency ratio will decrease further to 41 and the older dependency ratio will rise sharply to 33.

Zambia, on the other hand, presents a sharp contrast in the level and trend of its total dependency ratio. Zambia's total dependency ratio was at a much higher level in 1980 (165) and is projected to decline at a slower rate than the trajectory for Indonesia (Figure 3-9). By 2050, the total dependency ratio in Zambia is projected to remain over 100 (at 116), indicating that the dependent population of youth and older people will continue to exceed the size of the working age population. The composition of the total dependency ratio in Zambia changes very little from 1980 to 2050. Fertility decline lowers the youth dependency ratio from 159 in 1980 to 140 in 2015 and to 109 in 2050, while the older dependency ratio remains almost constant at an extremely low level of about 6 to 7. Even by the middle of the twenty-first century, population aging will not have materialized in Zambia.

Figure 3-8.

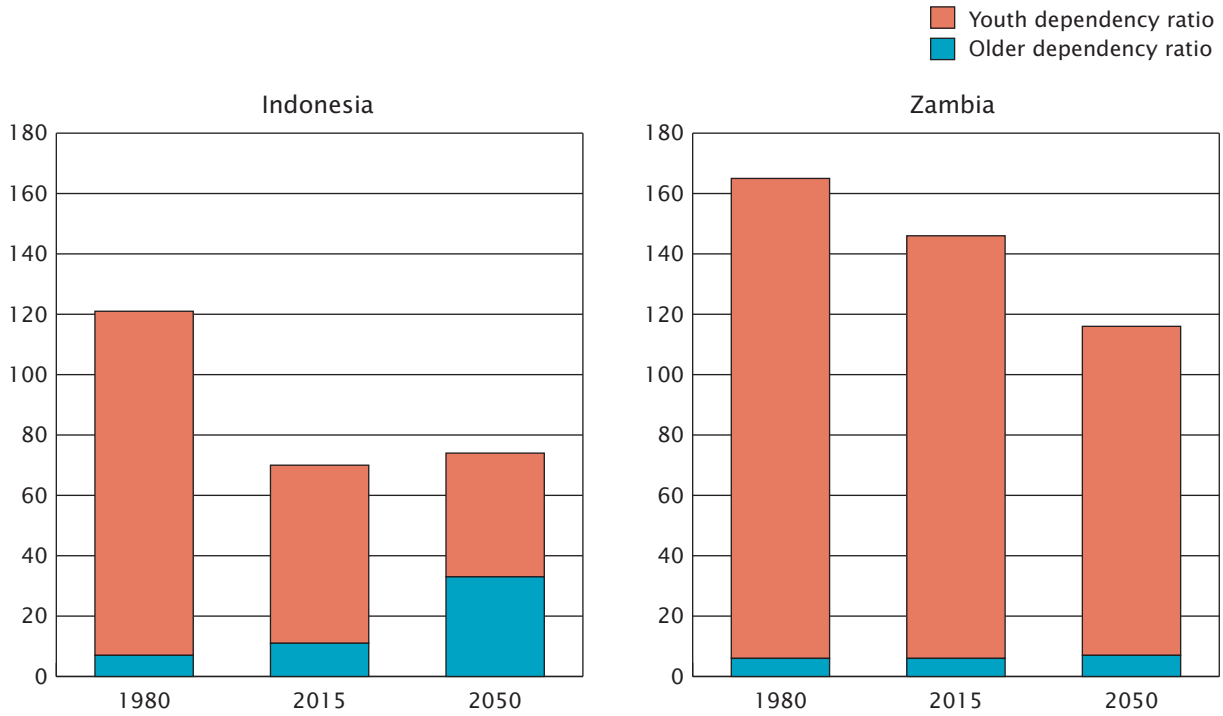
Dependency Ratios for the World: 2015 to 2050



Note: The older dependency ratio is the number of people aged 65 and over per 100 people aged 20 to 64. The youth dependency ratio is the number of people aged 0 to 19 per 100 people aged 20 to 64.
Source: U.S. Census Bureau, 2013; International Data Base.

Figure 3-9.

Dependency Ratios for Indonesia and Zambia: 1980, 2015, and 2050



Note: The older dependency ratio is the number of people aged 65 and over per 100 people aged 20 to 64. The youth dependency ratio is the number of people aged 0 to 19 per 100 people aged 20 to 64.
Source: U.S. Census Bureau, 2013; International Data Base.

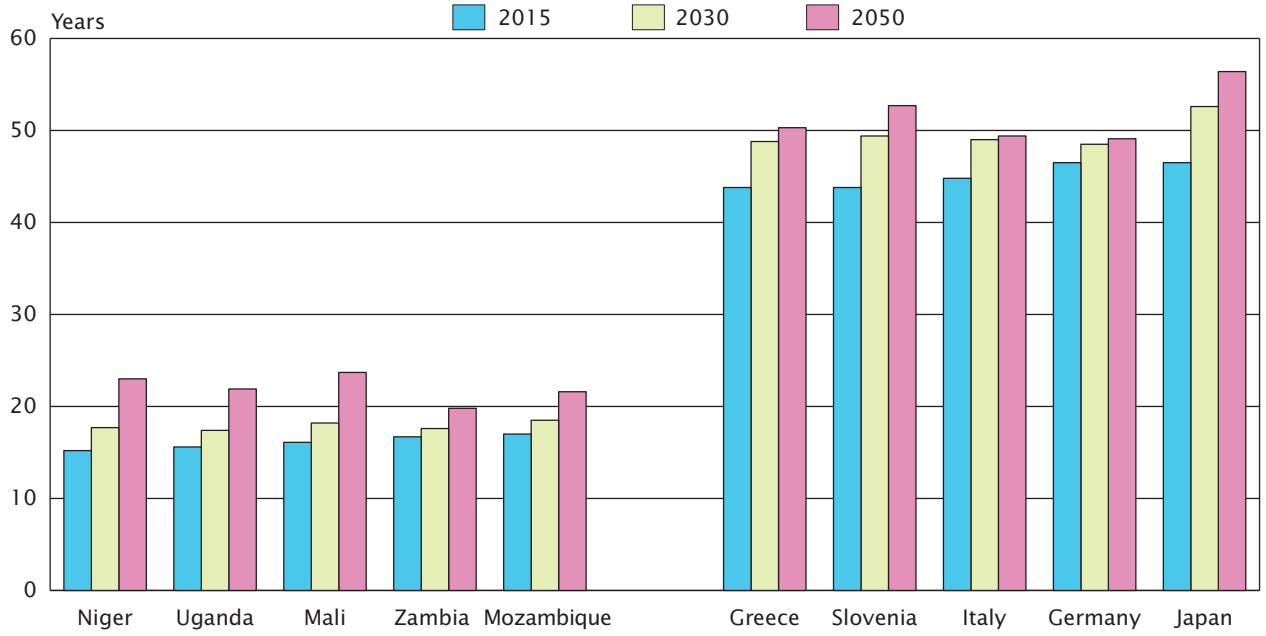
MEDIAN AGES FOR COUNTRIES RANGE FROM 15 TO NEAR 50

Another way to measure population aging is to consider a country's median age, the age that divides a population into numerically equal shares of younger and older people. African countries are among the youngest, with relatively low median ages. For example, Niger, Uganda, and Mali have current median ages of about 15 to 16 (Figure 3-10)—more than half of the population in these countries are children under age 18. Furthermore, African countries with sustained high fertility are expected to have very young median ages even by 2050 (e.g., Zambia, 20).

At the other end of the spectrum are Japan and Germany with a current median age of 47. It is projected that Japan's median age will reach 53 by 2030 and 56 by 2050—half of the population in Japan will be at or near the ages for the older population. Obviously the allocation of resources in countries with drastically different median ages will diverge significantly.

As expected, older regions have a higher median age and vice versa (Table 3-2). However, an interesting observation is the variation in the median age by sex differentials, reflecting the differences in mortality and life expectancy by sex in different regions. While women in

Figure 3-10.
Countries With Lowest or Highest Median Age in 2015: 2015, 2030, and 2050



Note: Median age for the years 2015, 2030, and 2050 is shown for the five countries with the lowest and highest median age as of 2015.
Source: U.S. Census Bureau, 2013; International Data Base.

Table 3-2.
Median Age by Sex and Region: 2015, 2030, and 2050

(In years)

Region	Both sexes			Male			Female		
	2015	2030	2050	2015	2030	2050	2015	2030	2050
Africa	19.7	22.0	26.0	19.4	21.7	25.6	19.9	22.3	26.4
Asia	30.6	35.7	40.5	29.9	34.9	39.6	31.3	36.6	41.5
Europe	41.6	45.3	47.1	39.7	43.4	44.8	43.4	47.2	49.6
Latin America and the Caribbean	29.1	34.4	40.6	28.2	33.3	39.2	30.0	35.5	42.1
Northern America	38.1	40.0	41.1	36.8	38.8	39.8	39.5	41.3	42.4
Oceania	34.0	36.8	40.0	33.5	36.1	39.1	34.6	37.5	41.0

Source: U.S. Census Bureau, 2013; International Data Base.

all regions have older median ages than men, the female-male gap is currently and projected to be largest in the oldest region, Europe (3.7 in 2015 and 4.8 in 2050). The higher proportion of women among the older population combined with a larger number of older people result in a European society with many more older and oldest women than men. In contrast, in the youngest region of Africa, males and females are almost equally young, with a differential of less than 1 year in median age for 2015, 2030, and 2050.

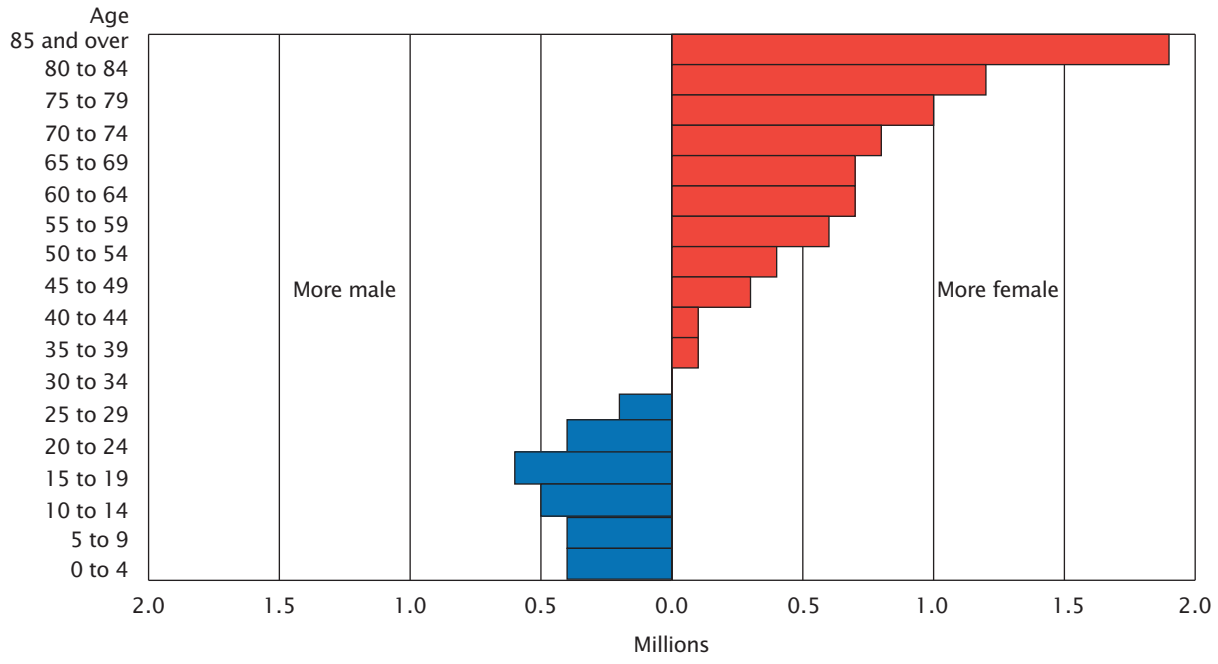
SEX RATIOS AT OLDER AGES RANGE FROM LESS THAN 50 TO OVER 100

Sex ratio is defined as the number of males for every 100 females. It is a common measure of a population's gender composition with implications for social support needs. In general, younger males outnumber younger females, but thanks to the female advantage in life expectancy at birth and at older ages, older women outnumber older men, as illustrated in Figure 3-11 for the United States.[4]

At older ages, the sex ratio decreases with increasing age (Figure 3-12). Globally, the total number of males slightly exceeds

[4] See Chapter 4 for more information on sex differentials in life expectancy.

Figure 3-11.
Difference Between Female and Male Populations by Age in the United States: 2010



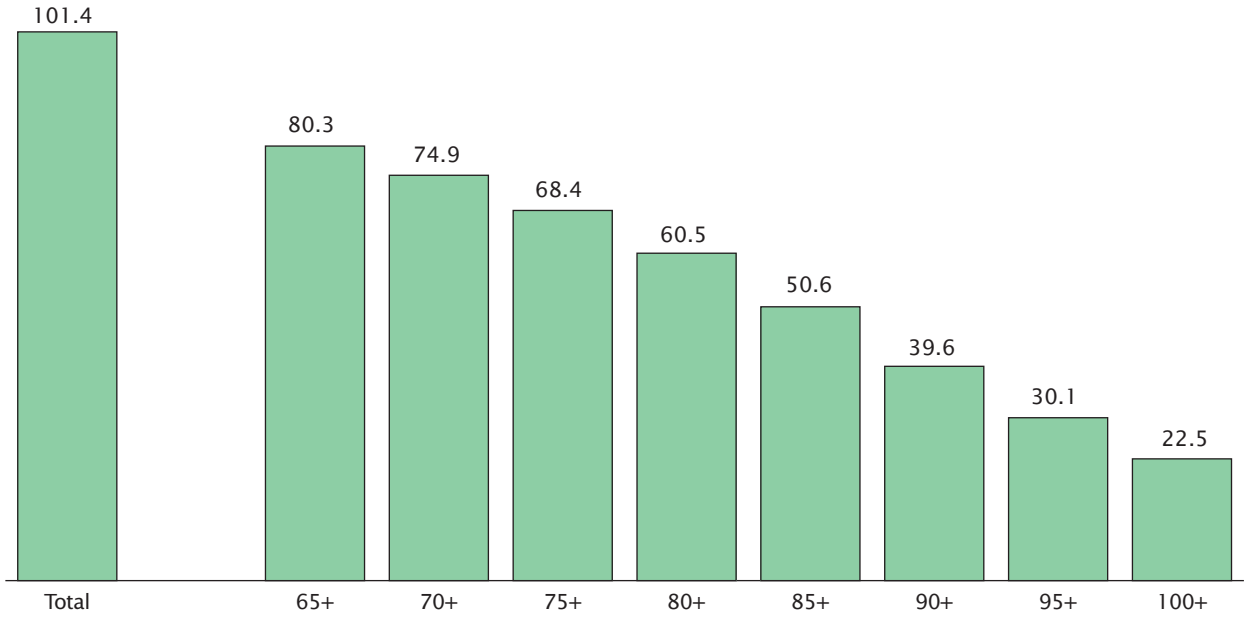
Source: U.S. Census Bureau, 2011; 2010 Census.

the number of females in 2015, with a sex ratio of 101.4. However, by age 65 and older, the sex ratio is only 80.3. The sex ratio continues to decline steadily for older age groups. For example, there are only half as many men as women in the world in the age group 85 and over. The sex ratio drops to a low of 22.5 for people aged 100 and over, indicating that for every male centenarian, there are over 4 female counterparts.

Sex ratios vary greatly by region and country (see Appendix B, Table B-4). While the vast majority of countries have a sex ratio below 100 for their older population, Russia and some other Eastern European countries have unusually low sex ratios (e.g., in 2015, Belarus, 46.4; Latvia, 48.5; Ukraine, 48.9; and Estonia, 49.8). These exceptionally low sex ratios for the older population started in the late 1980s when the World War II combat cohort reached the older age ranks, a reflection of the devastating male casualties in the war for these former Soviet Union countries (Vassin, 1996; Heleniak, 2014).

Russia's sex ratio for the older population in 1990 was a very low 35.8. It climbed up to the 40s by the mid-1990s and remained steady throughout the 2000s and 2010s, and is at 44.6 in 2015. It is projected that Russia's sex ratio will not rise above 50 until the

Figure 3-12.
Sex Ratio for World Total Population and Older Age Groups: 2015



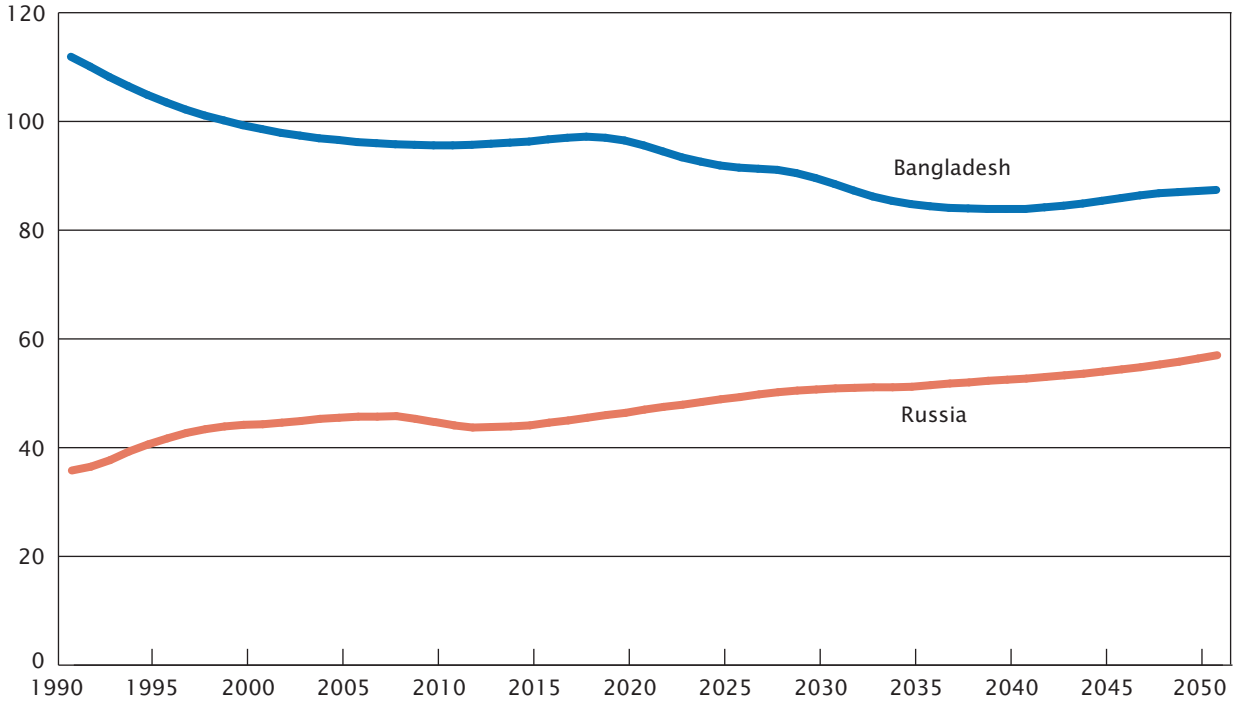
Note: Sex ratio is number of men per 100 women.
Source: U.S. Census Bureau, 2013; International Data Base.

mid-2020s and will remain at that level through 2050 (Figure 3-13). With the passage of the World War II cohort, the main contributors to the low sex ratio in Russia in recent years have been high male midlife mortality from various diseases such as cardiovascular disease as well as violence, accidents, and alcohol-related causes (Oksuzyan et al., 2014).

An opposite and also unusual pattern for sex ratios is found in parts of Asia and Sub-Saharan Africa—the sex ratios for the older population are as high as 90 or even above 100 (e.g., in 2015, India, 90.1; Malaysia, 90.3; China, 91.9; Bangladesh, 96.7; Mali, 100.0; Niger, 103.6; Bhutan, 109.9; and Sudan, 119.4). These remarkably high sex ratios are projected to decline only slightly through 2050. For example, Bangladesh's sex ratio for the population aged 65 and over in 1990 was 111.9. It stayed over 100 until 1999, and is projected to remain over 90 until 2029 (Figure 3-13). By 2050, Bangladesh's sex ratio for the older population likely will be about 87.

The excess male sex imbalance in older ages, found primarily in parts of Asia, is often referred to as "missing women." This phenomenon is believed to be the result of long standing female disadvantage in health and nutrition, leading to higher female infant and child mortality in addition to maternal mortality (Sen, 1990; 2001). Looking forward, the distorted sex ratio at older ages could persist due to the introduction of prenatal diagnosis technology around 1980. The available technology combined with traditional patriarchal cultural norms of son preference led to unusually high sex ratios at birth in several countries, including China, India, and South Korea. While concerns have been raised about "an irreversible demographic masculinization" (Guilmoto, 2012), South Korea may lead a new trend for reversing the distorted sex ratio at birth—the sex ratio at birth in South Korea has been declining from the mid-1990s. Son preference in the country has decreased, impacted by normative changes in desired family size triggered by social and economic development (Chung and Das Gupta, 2007).

Figure 3-13.
Sex Ratios for Population Aged 65 and Over for Bangladesh and Russia: 1990 to 2050



Note: Sex ratio is number of men per 100 women.
Source: U.S. Census Bureau, 2013; International Data Base.

Chapter 3 References

African Development Bank Group. 2012. "Africa's Demographic Trends." Briefing Notes for AfDB's Long-Term Strategy, Briefing Note 4.

Albertini, Marco and Letizia Mencarini. 2014. "Childlessness and Support Networks in Later Life: New Pressures on Familistic Welfare States?" *Journal of Family Issues* 35/3: 331–357.

Bloom, David E., David Canning, and Jaypee Sevilla. 2003. *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*. Santa Monica, CA: RAND.

Bongaarts, John and John Casterline. 2013. "Fertility Transition: Is Sub-Saharan Africa Different?" *Population and Development Review* 38 /Supplement: 153–168.

Börsch-Supan, Axel H. and Alexander Ludwig. 2010. *Old Europe Ages: Reforms and Reform Backlashes*. National Bureau of Economic Research Working Paper 15744.

Börsch-Supan, Axel H., Martina Brandt, Karsten Hank, and Mathis Schroder (eds.). 2011. *The Individual and the Welfare State: Life Histories in Europe*. Heidelberg, Germany: Springer.

Cai, Yong. 2010. "China's Below-Replacement Fertility: Government Policy or Socioeconomic Development?" *Population and Development Review* 36/3: 419–440.

Caldwell, John C., I. Olatunji Orubuloye, and Pat Calwell. 1992. "Fertility Decline in Africa: A New Type of Transition?" *Population and Development Review* 18/2: 211–242.

Casterline, John B. and Laila O. El-Zeini. 2014. "Unmet Need and Fertility Decline: A Comparative Perspective on Prospects in Sub-Saharan Africa." *Studies in Family Planning* 45/2: 227–245.

Chung, Woojin and Monica Das Gupta. 2007. "The Decline of Son Preference in South Korea: The Roles of Development and Public Policy." *Population and Development Review* 33/4: 757–783.

Deindl, Christian and Martina Brandt. 2011. "Financial Support and Practical Help Between Older Parents and Their Middle-Aged Children in Europe." *Ageing & Society* 31/4: 645–662.

_____. 2014. "Support Networks of Childless Elders: Informal and Formal Support in Europe." Mimeo.

Drummond, Paulo, Vimal Thakoor, and Shu Yu. 2014. *Africa Rising: Harnessing the Demographic Dividend*. International Monetary Fund Working Paper WP/14/143.

Eastwood, Robert and Michael Lipton. 2011. "Demographic Transition in Sub-Saharan Africa: How Big Will the Economic Dividend Be?" *Population Studies* 65/1: 9–35.

Goodkind, Daniel. 1992. *Estimates of Averted Chinese Births, 1971-1990: Comparisons of Fertility Decline, Family Planning Policy, and Development in Six Confucian Societies*. Australian National University Working Paper in Demography 38. Canberra: Research School of Social Sciences, Australian National University.

Guilmoto, Christophe Z. 2012. *Sex Imbalances at Birth: Current Trends, Consequences and Policy Implications*. Bangkok, Thailand: UNFPA Asia and the Pacific Regional Office.

Hank, Karsten and Michael Wagner. 2013. "Parenthood, Marital Status, and Well-Being in Later Life: Evidence from SHARE." *Social Indicators Research* 114/2: 639–653.

Hayford, Sarah R. 2013. "Marriage (Still) Matters: The Contribution of Demographic Change to Trends in Childlessness in the United States." *Demography* 50/5: 1641–1661.

Heleniak, Timothy. 2014. *Census Atlas of Russia: Sex Composition, Age Structure,and Marital Status*. Washington, DC: National Council for Eurasian and East European Research.

Kinsella, Kevin and Wan He. 2009. *An Aging World: 2008*. International Population Reports, P95/09-1, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

Kohler, Hans-Peter, Francesco C. Billari, and Jose Antonio Ortega. 2002. "The Emergence of Lowest-Low Fertility in Europe During the 1990s." *Population and Development Review* 28/4: 641–680.

Moultrie, Tom A., Takudzwa S. Sayi, and Ian M. Timaeus. 2012. "Birth Intervals, Postponement, and Fertility Decline in Africa: A New Type of Transition?" *Population Studies* 66/3: 241–258.

Oksuzyan, Anna, Maria Shkolnikova, James W. Vaupel, Kaare Christensen, and Vladimir M. Shkolnikov. 2014. "Sex Differences in Health and Mortality in Moscow and Denmark." *European Journal of Epidemiology* 29/4: 243–252.

Rowland, Donald T. 2007. "Historical Trends in Childlessness." *Journal of Family Issues* 28/10: 1311–1337.

Sen, Amartya. 1990. "More Than 100 Million Women Are Missing." *The New York Review of Books* December 20.

_____. 2001. "Many Faces of Gender Inequality." *Frontline* 18/22.

Sippel, Lilli, Tanja Kiziak, Franziska Woellert, and Reiner Klingholz. 2011. *Africa's Demographic Challenges: How a Young Population Can Make Development Possible*. Berlin: Berlin Institute for Population and Development.

Survey of Health, Ageing, and Retirement in Europe (SHARE). 2011. Available at <www.share-project.org>.

Tien, H. Yuan. 1984. "Induced Fertility Transition: Impact of Population Planning and Socio-Economic Change in the People's Republic of China." *Population Studies* 38/3: 385–400.

United Nations Children's Fund (UNICEF). 2014. *Generation 2030 / AFRICA*. New York, NY: UNICEF Division of Data, Research, and Policy.

U.S. Census Bureau. 2011. *2010 Census Summary File 1 (SF 1)*. Table PCT12. Washington, DC.

_____. 2013. *International Data Base*. Available at <www.census.gov/population/international/data/idb/informationGateway.php>, accessed between January and November 2014.

Vassin, Sergei A. 1996. "The Determinants and Implications of an Aging Population in Russia." In Julie DaVanzo (ed.), *Russia's Demographic "Crisis:"* 175–201. Santa Monica, CA: RAND Center for Russian and Eurasian Studies.

Wang, Feng, Yong Cai, and Baochang Gu. 2012. "Population, Policy, and Politics: How Will History Judge China's One-Child Policy?" *Population and Development Review* 38/Supplement: 115–129.

CHAPTER 4.

Life Expectancy, Health, and Mortality

There is little doubt that population aging will accelerate over the coming decades, as outlined in Chapter 2. The changed age structures in most parts of the world have contributed to a growing number of older people who may have various health conditions or concerns about functioning in older age. Understanding the differences in health status and well-being of older populations is essential not only to those who comprise this age group, but also for the social and economic systems. Variations within regions or between countries help to identify the impact of different policies and to plan for future health care services and social support systems.

Current questions about whether or not limits to human life span exist and whether healthy life expectancy will keep pace with increasing average life expectancy are just two of the scientific issues being robustly debated about our aging world (Oeppen and Vaupel, 2002; Olshansky et al., 2007, Sanderson and Scherbov, 2010; Lee, 2011). A number of other related topics, including frailty, mild cognitive impairment, predisease thresholds, and premature death, are also generating considerable discussion. The scientific outcomes of these debates have practical implications: the health levels among the growing number of older adults have real and potentially significant cost considerations for health and pension systems.

Despite considerable interest in the negative impact of aging on population health and public coffers, the contributions to society would likely outweigh burdens if adults reach older age healthier. However, the current evidence about whether older adult cohorts are physically and cognitively healthier than preceding generations is mixed (Langa et al., 2008; Crimmins and Beltran-Sanchez, 2011; Lin et al., 2012; Matthews et al., 2013; Lowsky et al., 2014). Better health for those reaching older age could be realized through addressing the social determinants of health, minimizing health risks, and reconfiguring health and social support systems to maximize well-being in an aging population; and these efforts could simultaneously sustain the growth in life expectancy seen since the mid-1800s and lead to more rational use of resources (Brandt, Deindl, and Hank, 2012; Rizzuto et al., 2012; Bloom et al., 2015; Kruk, Nigenda, and Knaul, 2015).

DEATHS FROM NONCOMMUNICABLE DISEASES RISING

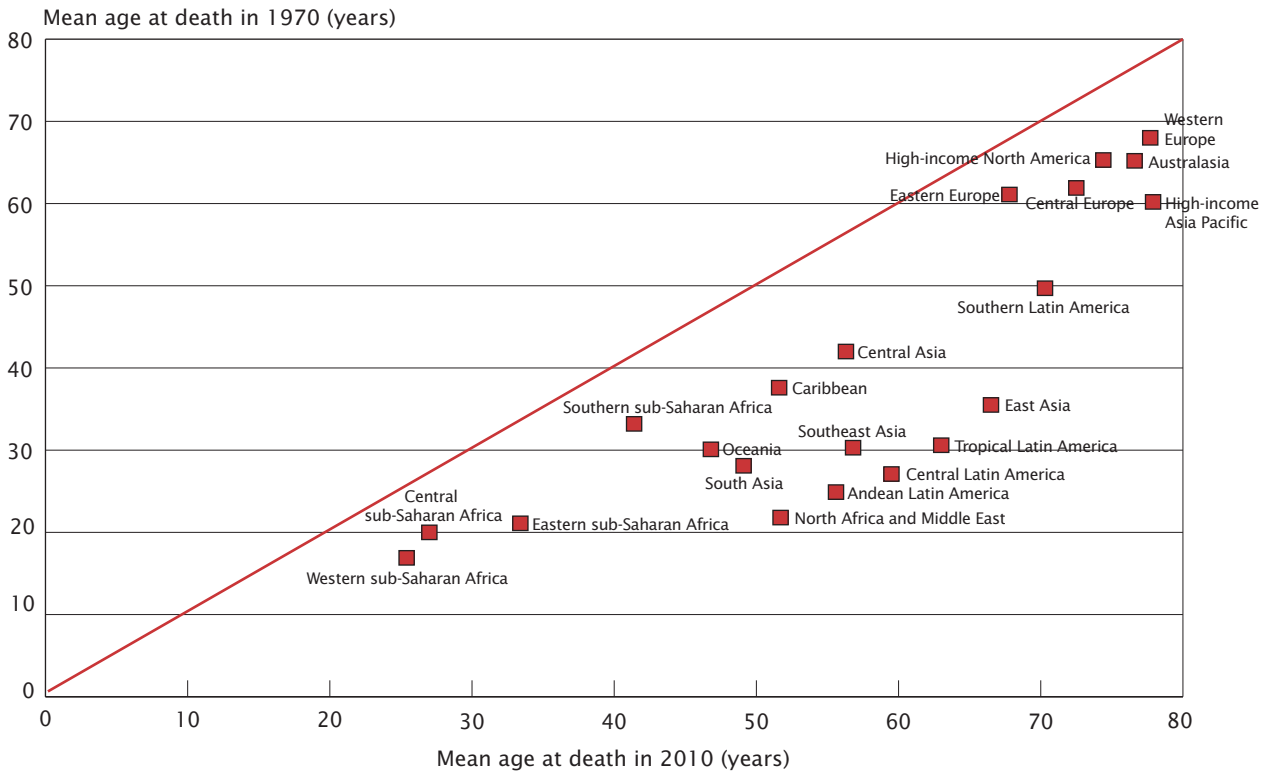
The world average age of death has increased by 35 years since 1970, with declines in death rates in all age groups, including those aged 60 and older (Institute for Health Metrics and Evaluation, 2013; Mathers et al., 2015). From 1970 to 2010, the average age of death increased by 30 years in East Asia and 32 years in tropical Latin America, and in contrast, by less than 10 years in western, southern, and central Sub-Saharan Africa (Institute for Health Metrics and Evaluation, 2013; Figure 4-1).[1]

The leading causes of death are shifting, in part because of increasing longevity. Between 1990 and 2013, the number of deaths from noncommunicable diseases (NCDs) has increased by 42 percent; and the largest increases in the proportion of global deaths took place among the population aged 80 and over (Lozano et al., 2012; GBD 2013 Mortality and Causes of Death Collaborators, 2015). An estimated 42.8 percent of deaths worldwide occur in the population aged 70 and over, with 22.9 percent in the population aged 80 and over (Wang et al., 2012).

Cardiovascular disease, lung disease, cancer, and stroke are the leading killers for the population aged 60 and over; however, with a few notable exceptions such as diabetes and chronic kidney disease, age-standardized rates for many of the leading NCDs have generally declined. The drivers of mortality also vary considerably by region and level of economic development. The communicable disease burden is highest in the World Health Organization's (WHO) Africa region, but also more broadly in low and lower-middle income countries (Table 4-1). These same regions are also facing a significant burden from NCDs and injuries. Deaths and disability from NCDs are rapidly rising in less developed countries and yielding worse outcomes than in more developed countries; some diseases that are preventable or treatable in more developed countries are leading to deaths in less developed countries (Daniels, Donilon, and Bollyky, 2014). Age-standardized mortality rates due to communicable diseases in 2012 show a clear gradient by country income grouping. While these differences

[1] These geographic areas are defined by the World Health Organization.

Figure 4-1.
Mean Age of Death in Global Burden of Disease Regions: 1970 and 2010



Source: Wang et al., 2012. Adapted from Figure 8.

Table 4-1.
Age-Standardized Mortality Rates by Cause of Death, WHO Region, and Income Group: 2012

(Per 100,000 population)

Characteristic	Communicable diseases	Non-communicable diseases	Injuries
Global	178	539	73
WHO Region			
Africa	683	652	116
Americas	63	437	62
South-East Asia	232	656	99
Europe	45	496	49
Eastern Mediterranean	214	654	91
Western Pacific	56	499	50
Income Group			
Low income	502	625	104
Lower-middle income	272	673	99
Upper-middle income	75	558	59
High income	34	397	44

Note: Region refers to World Health Organization regional grouping. Income groupings refer to World Bank analytical income of economies for fiscal year 2014.
Source: World Health Organization, 2014.

contribute to considerable changes in the mean age at death between 1970 and 2010 across different WHO regions, all regions have had increases in mean age at death, particularly East Asia and tropical Latin America (Figure 4-1).

LIFE EXPECTANCY AT BIRTH EXCEEDS 80 YEARS IN 24 COUNTRIES WHILE IT IS LESS THAN 60 YEARS IN 28 COUNTRIES

In July 2015, a woman in the United States celebrated her 116th birthday, becoming the world's oldest person according to the *Guinness World Records*, following the death of a 117-year-old woman from Japan earlier in the year (Associated

Press, 2015). Increasing longevity around the globe is indeed remarkable, but looking across countries reveals uneven progress in population health as demonstrated by the cross-country differences in average life expectancy. Life expectancy at different ages for men and women points to considerable heterogeneity and plasticity of aging processes, but also extreme variation and persistent inequality. The very same factors correlated with the dramatic drops in mortality in Western Europe and North America at the beginning of the 1900s, namely water, sanitation, and diet still contribute to mortality rates across many other regions—although with considerable and ongoing progress.

Global life expectancy at birth reached 68.6 years in 2015 (Table 4-2). A female born today is expected to live 70.7 years on average and a male 66.6 years. The global life expectancy at birth is projected to increase almost 8 years, reaching 76.2 years in 2050. Northern America currently has the highest life expectancy at 79.9 years and is projected to continue to lead the world with an average regional life expectancy of 84.1 years in 2050. The current life expectancy for Africa is only 59.2 years. However, Africa is expected to undergo major improvements in health and AIDS-related mortality in the next few decades and its life expectancy in 2050 is projected to be 71.0 years, narrowing the gap between Northern America and Africa.

As of 2015, 24 countries have a life expectancy at birth of 80 years or longer. Japan, Singapore, and Macau lead this group with life expectancy at birth exceeding 84 years (Table 4-3). Women born in these countries today are expected on average to live to about age 88, compared with about age 82 for men. In the next 35 years, most of these 24 countries will see an extension of 2 to 3 years in their life expectancy at birth, with the top two countries, Japan and Singapore, projected to have life expectancy exceeding 90 years (both sexes).

At the other end of the spectrum, 28 countries have a life expectancy at birth below 60 years in 2015. Among the 28 countries, 27 are in Africa and one is in Asia (Afghanistan). By 2050, all 28 countries, except Botswana and Namibia, are projected to have their life expectancy at birth increase by more than 10 years, with Lesotho (an impressive increase of 19.4 years) and Mozambique (17.9 years increase) leading the way.

Women currently live longer than men on average, except in four countries: Botswana, Lesotho, Mali, and Swaziland. However, the female advantage generally is narrower (about 2 to 3 years currently) among countries with the lowest life expectancies at birth as compared to countries with the highest life expectancies at birth (gaps of about 5 to 6 years). Global mortality rates show a uniformly smaller percentage decline for men than women at all age groups, with the possible exception of men in the 80 years and older age group (Wang et al., 2012; GBD 2013 Mortality and Causes of Death Collaborators, 2015). This means that the female mortality advantage persists and is generally expanding at the global level. Over time, the gender gap is expected to increase in countries with the lowest life expectancies at birth (Table 4-3).

Table 4-2.
Life Expectancy at Birth by Sex for World Regions: 2015 and 2050

Region	Both sexes		Male		Female	
	2015	2050	2015	2050	2015	2050
World	68.6	76.2	66.6	73.7	70.7	78.8
Africa	59.2	71.0	57.6	68.7	60.7	73.4
Asia	71.0	78.5	69.1	76.0	73.0	81.1
Europe	77.3	82.1	73.7	78.8	81.1	85.5
Latin America and the Caribbean	74.5	80.3	71.6	77.3	77.6	83.5
Northern America	79.9	84.1	77.4	81.9	82.2	86.2
Oceania	76.7	80.7	74.4	78.2	79.2	83.4

Source: U.S. Census Bureau, 2013; International Data Base.

Table 4-3.

Countries With Highest and Lowest Life Expectancy at Birth by Sex in 2015 and Projected for 2050

(In percent)

Country	Life expectancy at birth					
	2015			2050		
	Both sexes	Male	Female	Both sexes	Male	Female
Japan	84.7	81.4	88.3	91.6	88.4	95.0
Singapore	84.7	82.1	87.5	91.6	88.7	94.6
Macau	84.5	81.6	87.6	85.1	82.2	88.1
Hong Kong	82.9	80.2	85.8	84.4	81.6	87.4
Switzerland	82.5	80.2	84.9	84.2	81.6	87.0
Australia	82.2	79.7	84.7	84.1	81.4	86.9
Italy	82.1	79.5	84.9	84.1	81.3	87.0
Sweden	82.0	80.1	84.0	84.0	81.5	86.6
Canada	81.8	79.2	84.5	83.9	81.1	86.8
France	81.8	78.7	85.0	83.9	80.9	87.0
Norway	81.7	79.7	83.8	83.9	81.4	86.5
Spain	81.6	78.6	84.8	83.8	80.9	86.9
Israel	81.4	79.1	83.7	83.8	81.1	86.5
Netherlands	81.2	79.1	83.5	83.7	81.1	86.4
New Zealand	81.1	79.0	83.2	83.6	81.1	86.3
Ireland	80.7	78.4	83.1	83.4	80.8	86.2
Germany	80.6	78.3	83.0	83.4	80.7	86.2
Jordan	80.5	79.1	82.1	83.4	81.1	85.8
United Kingdom	80.5	78.4	82.8	83.4	80.8	86.1
Greece	80.4	77.8	83.2	83.3	80.6	86.3
Austria	80.3	77.4	83.4	83.3	80.3	86.4
Belgium	80.1	76.9	83.4	83.2	80.1	86.3
South Korea	80.0	77.0	83.3	84.2	81.5	87.1
Taiwan	80.0	76.9	83.3	83.1	80.1	86.3
Rwanda	59.7	58.1	61.3	72.0	69.6	74.4
Congo (Brazzaville)	58.8	57.6	60.0	71.1	69.0	73.2
Liberia	58.6	56.9	60.3	70.7	68.3	73.2
Cote d'Ivoire	58.3	57.2	59.5	69.7	68.0	71.4
Cameroon	57.9	56.6	59.3	72.0	69.7	74.4
Sierra Leone	57.8	55.2	60.4	70.2	67.1	73.3
Zimbabwe	57.1	56.5	57.6	67.2	66.9	67.5
Congo (Kinshasa)	56.9	55.4	58.5	70.2	67.8	72.7
Angola	55.6	54.5	56.8	69.2	67.1	71.5
Mali	55.3	53.5	57.3	68.4	65.7	71.1
Burkina Faso	55.1	53.1	57.2	67.8	65.1	70.5
Niger	55.1	53.9	56.4	68.2	66.1	70.5
Uganda	54.9	53.5	56.4	67.8	65.6	70.0
Botswana	54.2	56.0	52.3	61.6	64.8	58.4
Malawi	53.5	52.7	54.4	65.3	64.0	66.5
Nigeria	53.0	52.0	54.1	68.1	66.0	70.3
Lesotho	52.9	52.8	53.0	72.3	71.5	73.2
Mozambique	52.9	52.2	53.7	70.8	69.0	72.7
Zambia	52.2	50.5	53.8	64.5	62.5	66.7
Gabon	52.0	51.6	52.5	62.1	61.6	62.6
Somalia	52.0	49.9	54.1	65.5	62.6	68.5
Central African Republic	51.8	50.5	53.2	65.5	63.5	67.7
Namibia	51.6	52.1	51.2	57.8	60.1	55.5
Swaziland	51.1	51.6	50.5	61.4	63.0	59.8
Afghanistan	50.9	49.5	52.3	64.5	62.2	66.9
Guinea-Bissau	50.2	48.2	52.3	63.5	61.0	66.2
Chad	49.8	48.6	51.0	63.4	61.7	65.1
South Africa	49.7	50.7	48.7	63.2	64.1	62.3

Note: Life expectancy at birth for 2015 and 2050 is shown for countries with the highest and lowest life expectancy at birth as of 2015.
Source: U.S. Census Bureau, 2013; International Data Base.

LIVING LONGER FROM AGE 65 AND AGE 80

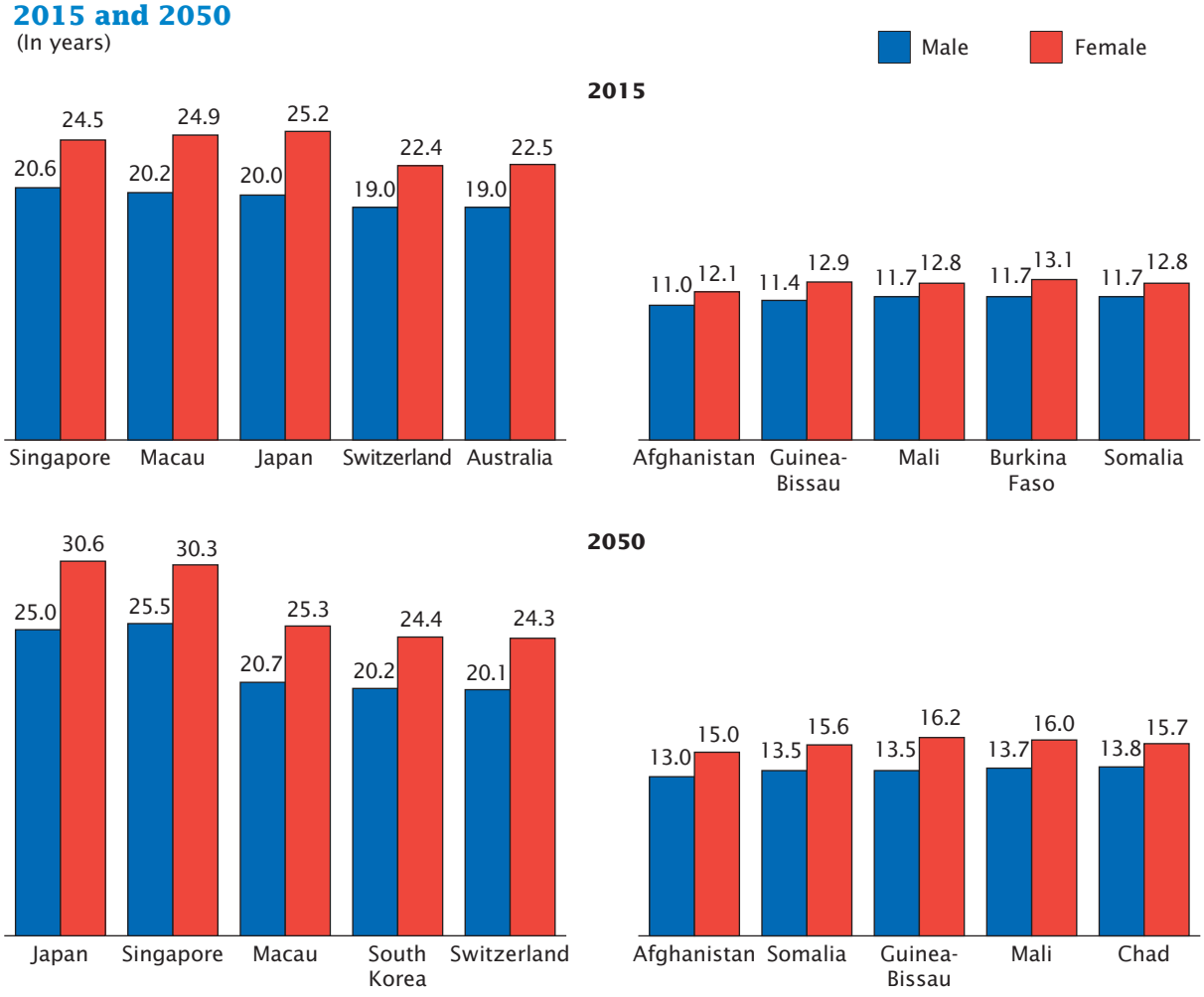
Extension of life expectancy has also occurred at older ages. In the United States, for example, life expectancy at age 65 has increased from 11.9 years in 1900–1902 to 19.1 years in 2009. Life expectancy at age 80 over the same time period also almost doubled from 5.3 years to 9.1 years (Arias, 2014).

The female advantage in life expectancy is also demonstrated at older ages. In 2015, older men at age 65 in Singapore, Macau, and Japan would live on average for about another 20 years, but older women in these countries live on average about another 25 years (Figure 4-2). By 2050, the life expectancy for Japanese and Singaporean older men is projected to be about 25 years and for older women about 30 years.

Countries with the lowest life expectancy at older ages are also projected to see improvement. Afghanistan, for example, has the lowest current life expectancy for age 65, 11.0 years for men and 12.1 for women. By 2050, these rates are projected to improve to 13.0 years and 15.0 years for men and women, respectively.

The largest gains in life expectancy at age 60 have come from the reduction in cardiovascular disease and diabetes mortality (Figure 4-3). In high-income countries, reduction in cardiovascular disease and diabetes mortality contributed a gain of 3.0 years in life expectancy for men and 4.3 years for women, and for men reductions in tobacco-caused mortality contributed to another 2.0 years of gain in life expectancy. On the other hand, an

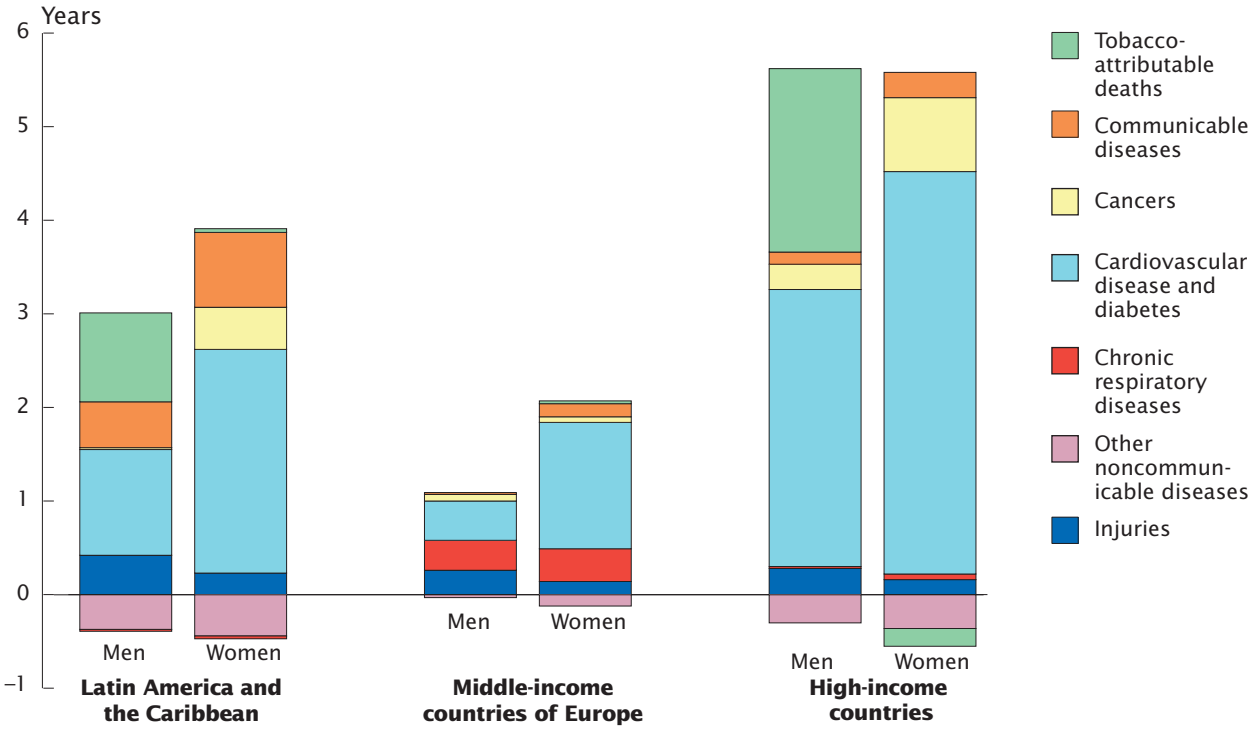
Figure 4-2.
Countries With Highest and Lowest Life Expectancy at Age 65 by Sex: 2015 and 2050
(In years)



Note: Life expectancy estimates are derived from population estimates and projections produced for over 220 countries by the U.S. Census Bureau. For methodology, see <www.census.gov/population/international/data/idb/estandproj.pdf>.
Source: U.S. Census Bureau, 2013; unpublished lifetables.

Figure 4-3.

Drivers of Increase or Decrease in Life Expectancy at Age 60 by Sex, Region, and Income: 1980 to 2011



Note: Tobacco-attributable deaths for specific disease causes are subtracted from the disease cause categories and shown as a single cause group. Thus, for example, the category labeled "Cancers" excludes tobacco-caused cancers.

Source: Mathers et al., 2015. Adapted from Figure 2.

increase in tobacco-related deaths among women has limited their gains in life expectancy at age 60 in high-income countries. Similar patterns in cause-specific mortality reductions were found in the middle-income countries in Latin America and the Caribbean.

The burden of simultaneous communicable and noncommunicable diseases, higher tobacco use, and lower effective health care coverage has contributed to slower improvements in older age mortality in middle-income countries than in high-income countries (Mathers et al., 2015). However, aging populations and shifting infectious disease epidemiology mean that older adults are likely to account for a larger share of communicable disease morbidity and mortality in low- and middle-income countries (Salomon et al., 2012). Meanwhile, dementia and obesity are underlying factors for the small losses in life expectancy and may limit progress in older age mortality in the coming decades.

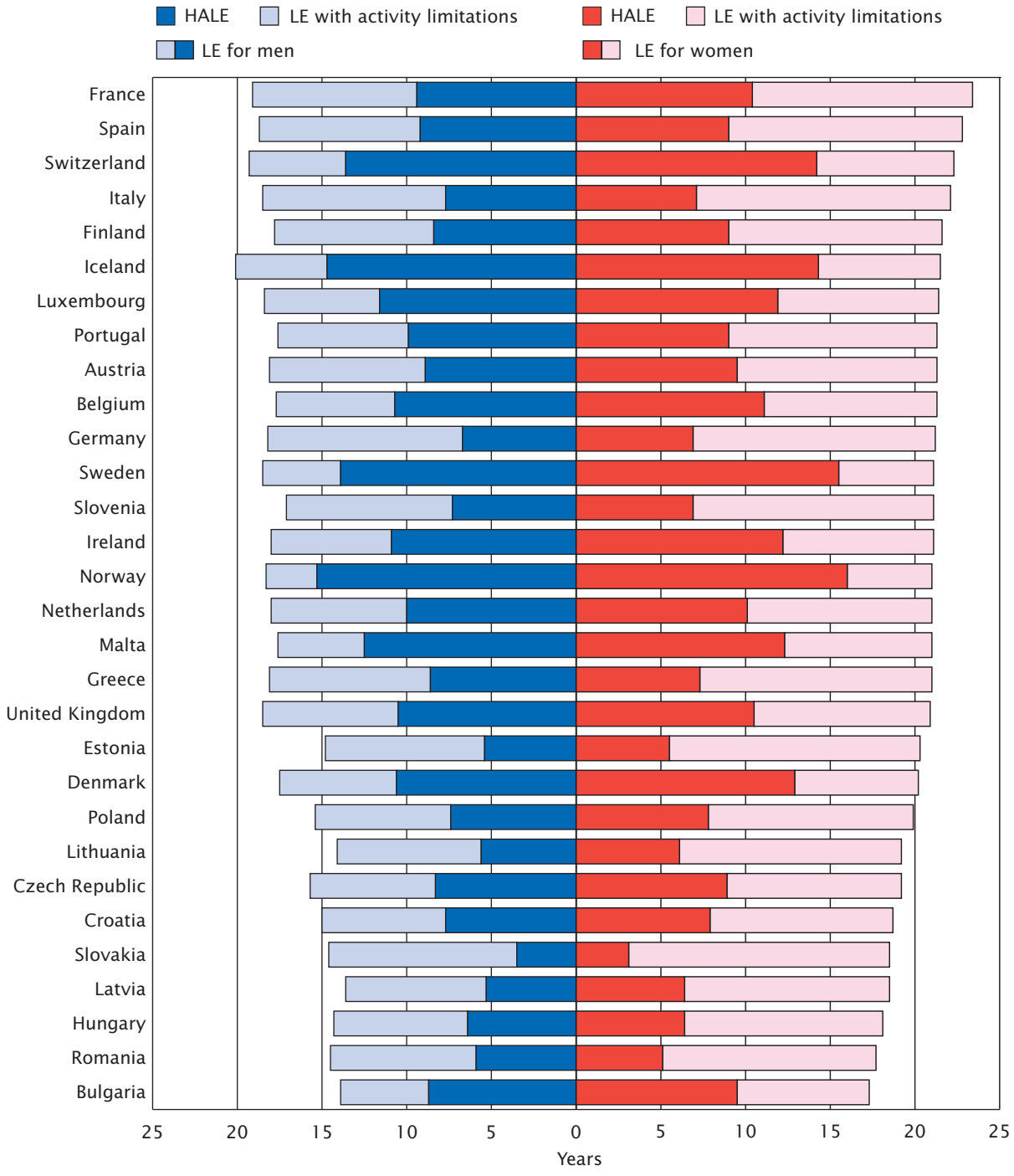
YES, PEOPLE ARE LIVING LONGER, BUT HOW MANY YEARS WILL BE LIVED IN GOOD HEALTH?

Life expectancy is a good summary measure of population mortality levels. Increasing life expectancy at birth and at older ages suggests healthier populations overall in most countries. However, because of population aging and the accompanying morbidity, a summary measure that also incorporates functioning, disease, and ill health may better describe population health across the life span. Healthy life expectancy (HALE) is one such measure.

HALE takes into account both mortality and morbidity and is described by the WHO as "the average number of years that a person can expect to live in "full health" by taking into account "years lived in less than full health due to disease and/or injury" (World Health Organization, 2012). Among European countries in 2012, French women had the longest life expectancy at age 65, 23.4 years (European Commission, 2014; Figure 4-4). French men were also among the highest in life

Figure 4-4.

Life Expectancy (LE) and Healthy Life Years (HALE) at Age 65 by Sex for Selected European Countries: 2012



Note: HALE is the average number of years that a person can expect to live in full health by taking into account years lived in less than full health due to disease and/or injury.
Source: European Commission, 2014; Eurostat.

expectancy at age 65, 19.1 years. However, Norway was at the top in 2012 for both men and women for healthy life expectancy. Norwegian women at age 65 were expected to live another 16 years without activity limitations, and their male counterparts 15.3 years. At the other end of the spectrum, some Eastern European countries had a very short HALE. In Slovakia, for example, women aged 65 were expected to live just 3.1 years without activity limitations and men 3.5 years.

Healthy life expectancy can also help to assess the extent to which prevailing health conditions diverge or converge with mortality patterns. The proportion of life lived in good health, the ratio of HALE to life expectancy, is a measure of the compression or expansion of morbidity, or the extent to which the extra years of life lived are in a state of good or poor health and well-being. For example, among European countries, Slovakia had the lowest proportion of remaining years of life expectancy at age 65 in good health—16 percent for women and 23 percent for men. Sweden, on the other hand, had the highest proportion at age 65 of remaining years with no activity limitation—73 percent for women and 77 percent for men.

BIG IMPACTS, OPPOSITE DIRECTIONS? SMOKING AND OBESITY

Risk factors, such as tobacco use, physical inactivity, obesity, midlife hypertension, and household air pollution from solid fuels are directly or indirectly responsible for a large share of the global burden of disease (Lim et al., 2012). A leading contributor to mortality and morbidity, tobacco use has dropped dramatically in countries like the United States over the past 3 decades. Yet an estimated 18 percent of the general U.S. adult population still smoke (Colditz, 2015) and the long latency of health consequences from smoking means that it is still playing out in current mortality rates in the United States and worldwide (Crimmins, Preston, and Cohen, 2011; Preston et al., 2014; Ng et al., 2014; Carter et al., 2015). Therefore, while smoking-related mortality is declining for American men and women, the history of heavy smoking in the United States is still contributing to current and future life expectancy estimates and projections and to the poor international ranking of U.S. life expectancy at age 50 (Preston, Glei, and Wilmoth, 2011). Meanwhile, the time lapse for smoking decline in other high-income countries (for example in Western Europe) means that the mortality impact will continue to play out for many years with uncertainty about the exact trajectory; more fine-grained data about smoking intensity and duration are required for more precise projections (Michaud et al., 2011; Ng et al., 2014; Bilano et al., 2015). The majority of smokers worldwide live in low- and middle-income countries (Ezzati and Riboli, 2013), where, for example, smokers exceed 70 percent of men aged 60 and over in Laos and 20 percent of women aged 60 and over in the Philippines (Byles et al., 2014).

Both a history of obesity and current obesity are important risk factors in mortality (Abdullah et al., 2011; Flegal et al., 2013; Kramer, Zinman, and Retnakaran, 2013). In older ages, being underweight is also associated with increased mortality (Population Reference Bureau, 2007). The prevalence of obesity has increased in the United States since the 1970s and accounts for as much as 30 percent of the lower U.S. life expectancy compared to other high-income countries (Alley, Lloyd, and Shardell, 2011; Crimmins, Preston, and Cohen, 2011). While weight increase in the United States has been larger and at earlier ages than other high-income countries, the obesity epidemic is neither restricted to the United States nor to younger people (Ng et al., 2014). The prevalence of adult obesity ranges from over 60 percent in some Pacific Island nations to less than 2 percent in Bangladesh (Stevens et al., 2012; Ezzati and Riboli, 2013; Ng et al., 2015). At ages 50 and older, the United States has the highest level of obesity when compared to other high-income countries. Only older English men and Spanish women approach the levels of obesity found among older U.S. men and women (Crimmins, Garcia, and Kim, 2011).

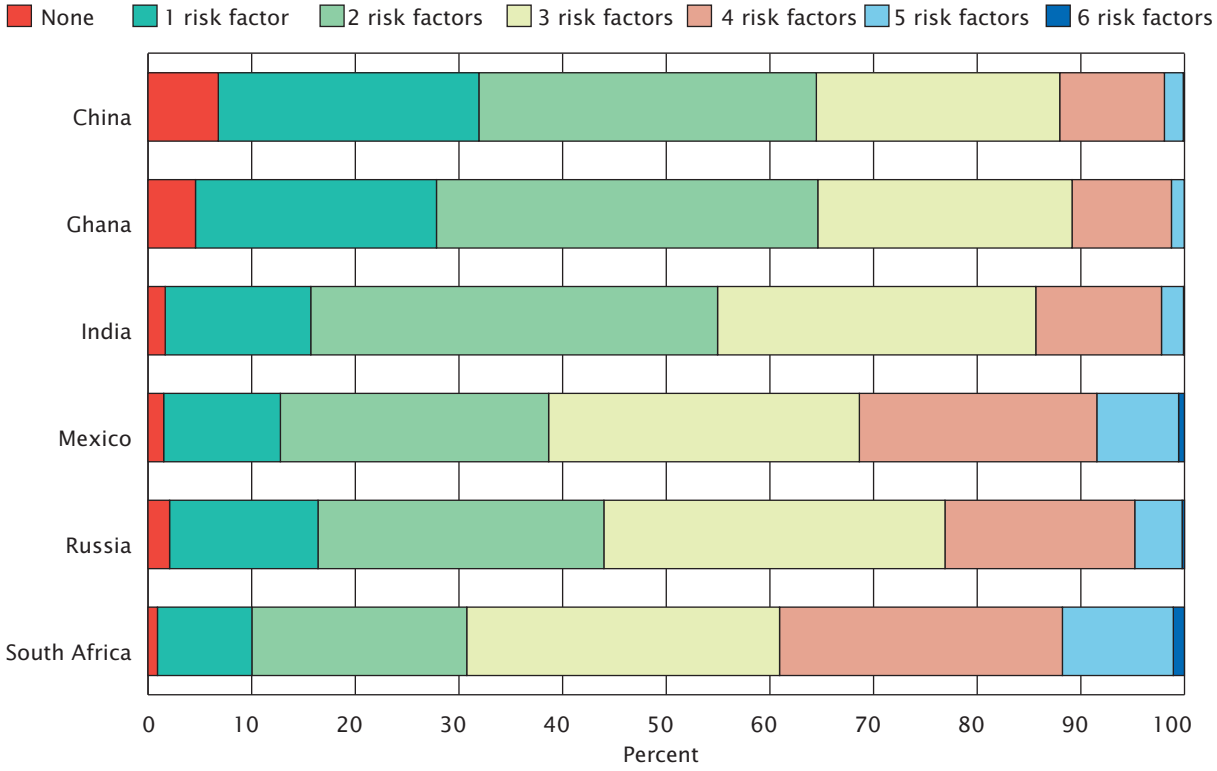
Clustering of risk factors increases as age advances and increases the risk of disease and poor health (Negin et al., 2011a; Teo et al.,

2013). For example, the combination of dietary risk factors and physical inactivity was responsible for 10 percent of global disability-adjusted life years (DALYs) in 2010 (Lim et al., 2012).[2] A multicountry study of NCD risk factors that included over 38,000 respondents aged 50 and older found a high proportion of individuals with multiple risk factors (Wu et al., 2015). China, Ghana, and India had comparatively lower rates of multiple risk factors than Mexico, Russia, and South Africa (Figure 4-5). Another cross-Asian study found that over 70 percent of adults aged 25 to 64 had three or more risk factors for chronic NCDs (Ahmed et al., 2009). The nature and patterns of individual risk factors and risk factor clusters are rapidly changing by age, sex, education, and wealth at the individual level, as well as within and between high-, middle-, and low-income countries (Dans et al., 2011; Hosseinpoor et al., 2012; Lim et al., 2012). Ongoing surveillance and interventions will be required to prevent NCDs and to model the current and future impacts of risk factors on health (Ng et al., 2006; Bonita, 2009).

[2] One DALY can be thought of as 1 lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

Figure 4-5.

Percentage Distribution of Cumulative Risk Factors Among People Aged 50 and Over for Six Countries: 2007–2010



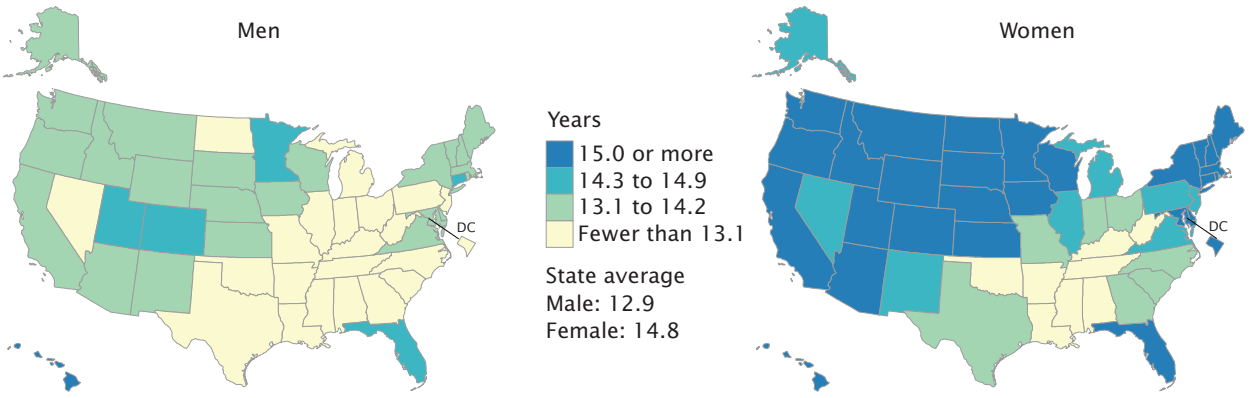
Note: Risk factors include current daily tobacco use, frequent heavy drinking, hypertension, insufficient vegetable and fruit intake, low level of physical activity, and obesity.
Source: Wu et al., 2015. Adapted from Figure 2.

With U.S. life expectancy at birth and at age 65 falling behind many other high- and middle-income countries, the American wealth-health paradox (wealthiest larger country, but not the healthiest in the world) and increasing regional variability in the United States confounds current understanding about population health and well-being (Murray et al., 2006; Woolf and Aron, 2013). Smoking, obesity, and high blood pressure contributed to the relative increase in female mortality as compared to male mortality from the 1980s to 2000s (Ezzati et al., 2008; Danaei et al., 2010). Generally, men and women living in the (poorer) southern states of the United States had lower healthy life expectancy than elsewhere in the country (Figure 4-6), and regional inequalities in mortality appear to be growing (Wilmoth, Boe, and Barbieri, 2011; Olshansky et al., 2012). Yet, the results are not all in a negative direction for the United States: it has higher survival after age 75 than many high-income countries, lower current smoking rates, and better management of hypertension. In fact, a measure that captures functioning and presence of health conditions together resulted in no differences in health when comparing the United States and England (Banks et al., 2006; Cieza et al., 2015). A better understanding of the key dynamics contributing to the U.S. health disadvantage relative to other high-income countries, and a standardized metric for measurement, may well inform trajectories of aging and health in many other contexts.

Figure 4-6.

United States Healthy Life Expectancy at Age 65 by Sex and State: 2007–2009

(In years)



Source: Centers for Disease Control and Prevention, 2013. Adapted from Figure 1.

Box 4-1.

Early Life Conditions and Older Adult Health

By *Mary C. McEniry, University of Wisconsin-Madison*

Adult health, disease, and mortality in later life are influenced by early life factors (Barker, 1998; Crimmins and Finch, 2006; Smith et al., 1998). Research also supports the influence of the social determinants of health and socioeconomic conditions on health outcomes later in life (Marmot and Wilkinson, 2005; Almond and Currie, 2010). These findings demonstrate the importance of a life-course approach to understanding older adult health. This life-course approach has expanded our understanding of modern shifts in life expectancy in diverse settings.

The intriguing links between early life adversities and later life health can be examined through the rapid mortality declines during the 1930s to the 1960s in less developed countries (Palloni, Pinto-Aguirre, and Pelaez, 2002). During this period, less developed countries experienced significant reductions in infant and child mortality triggered by the medical and public health revolution (Preston, 1976). However, adults born during these 4 decades were still exposed to poor socioeconomic conditions, poor nutrition, and infectious diseases as infants and children. Exposure to these conditions in early life can increase the risk of poor health at older ages and, in particular, increase the risk of adult diabetes, obesity, and heart disease (Barker, 1998; Elo and Preston, 1992; Lillycrop et al., 2014; Tarry-Adkins and Ozanne, 2014).

Cohorts increasingly characterized by their exposure to and survivorship of poor early life conditions may be at higher risk of poor health at older ages, especially for diseases known to originate in early life. The projected large increases in adult health conditions, such as diabetes, obesity, and heart disease, may well have their origins in the past (Murray and López, 1996; Hossain, Kawar, and El Nahas, 2007). These circumstances may also have important implications for older adult health for at least the next 20 to 30 years (Palloni, Pinto-Aguirre, and Pelaez, 2002).

The timing of rapid mortality decline was different across countries for the birth cohorts of the 1930s to 1960s. The present-day middle-income countries, such as Costa Rica, experienced rapid mortality reductions in the 1930s and 1940s, whereas several of today's low-income countries did not experience significant mortality changes until the 1950s and 1960s. If early life events indeed have large impacts on adult health, and if differences in timing and pace of mortality decline created cohorts with markedly different health patterns in later life, then differences in health patterns for adults aged 60 and over should appear.

A newly compiled data set contains harmonized cross-sectional and longitudinal data from major surveys of older adults or households in 20 countries and areas in Asia, Africa, and Latin America, as well as England, the Netherlands, and the United States (McEniry, 2013). The countries contributing data are diverse in their patterns of mortality decline and early life nutrition and infectious disease environments during the 1930s to the 1960s. The data set includes both very poor and wealthier countries and areas in the 1930s, including those that saw their economic status rise over time (e.g., Barbados, Puerto Rico, and Taiwan) and their average caloric intake increase (China, Costa Rica, Mexico, and others) (Table 4-4).

These data reveal health patterns in older adults born during periods of rapid demographic changes, particularly for adult diabetes in the cohort born in the 1930s and 1940s. Figure 4-7 compares country-specific prevalence of self-reported diabetes for these older adults surveyed in the 2000s with country-level per-capita daily caloric intake in the 1930s and 1940s during their childhood. A high prevalence of adult diabetes is found for those born in very poor caloric intake countries that experienced significant and rapid mortality decline in the 1940s (countries labeled C and D in Figure 4-7). The prevalence is higher than for those born in

Continued on next page.

countries that experienced a more gradual mortality decline (countries labeled A and B), or countries that did not experience significant mortality decline (countries labeled E). Being born into a country that experienced rapidly increasing life expectancy during the 1940s (labeled C and D) increased the odds of adult diabetes by 61 percent to 72 percent and of adult obesity by 46 percent to 53 percent (McEniry, 2014). Even though the numbers in the graph for diabetes are self-reported and are probably underestimated, especially for low- and middle-income countries, the prevalence of diabetes in C and D countries is higher now than what appeared historically in more developed countries (labeled A) (Wilkerson and Krall, 1947; Gordon, 1964; García-Palmieri et al., 1970; Hadden and Harris, 1987; Harris et al., 1998). With more accurate information about the prevalence of diabetes, the steepness of the line would most likely increase, suggesting a larger contrast between middle- and high-income countries. The rapid demographic changes between the 1930s and the 1960s may help explain these health patterns and predict what is to come for adults in low-income countries born in the 1950s and 1960s.

Two avenues of research hold promise in further examining early life conditions and older adult health. The epigenetic basis for disease may lead to developing future therapeutic approaches to prevent or address disease. Epigenetic patterns may also provide clearer evidence about lifetime health risks resulting from exposures that occur *in utero* and in childhood (Horvath, 2013; Lillycrop et al., 2014). On the other hand, emerging interest in using genomic data with social science survey data may provide a better understanding of how genes and early life environment combine to influence adult health. Recent evidence shows that poor early life conditions can impact gene expression at older ages (Levine et al., 2015). Both research avenues have the potential to lead to informed health policy that benefits those exposed to poor early life conditions.

Table 4-4.
GDP per Capita and Caloric Intake in Selected Countries and Areas: 1930s and 2000s

Country	GDP per capita 1930s	Income group 2000s	Caloric intake	
			1930s	2000s
Barbados	1,815	High	N	3,025
England	5,441	High	3,005	3,370
Netherlands	5,603	High	2,958	3,215
Puerto Rico	815	High	2,219	N
Taiwan	1,150	High	2,153	N
United States	6,231	High	3,249	3,732
Argentina	4,080	Upper middle	3,275	3,272
Brazil	1,048	Upper middle	2,552	2,885
Chile	2,859	Upper middle	2,481	2,806
Costa Rica	1,626	Upper middle	2,014	2,804
Cuba	1,505	Upper middle	2,918	3,051
Mexico	1,618	Upper middle	1,909	3,172
South Africa	2,247	Upper middle	2,300	2,886
Uruguay	4,301	Upper middle	2,902	2,831
Bangladesh	659	Low	2,021	2,125
China	568	Lower middle	2,201	2,908
Ghana	878	Low	2,311	2,596
India	726	Lower middle	2,021	2,314
Indonesia	1,141	Lower middle	2,040	2,498

N Not available.

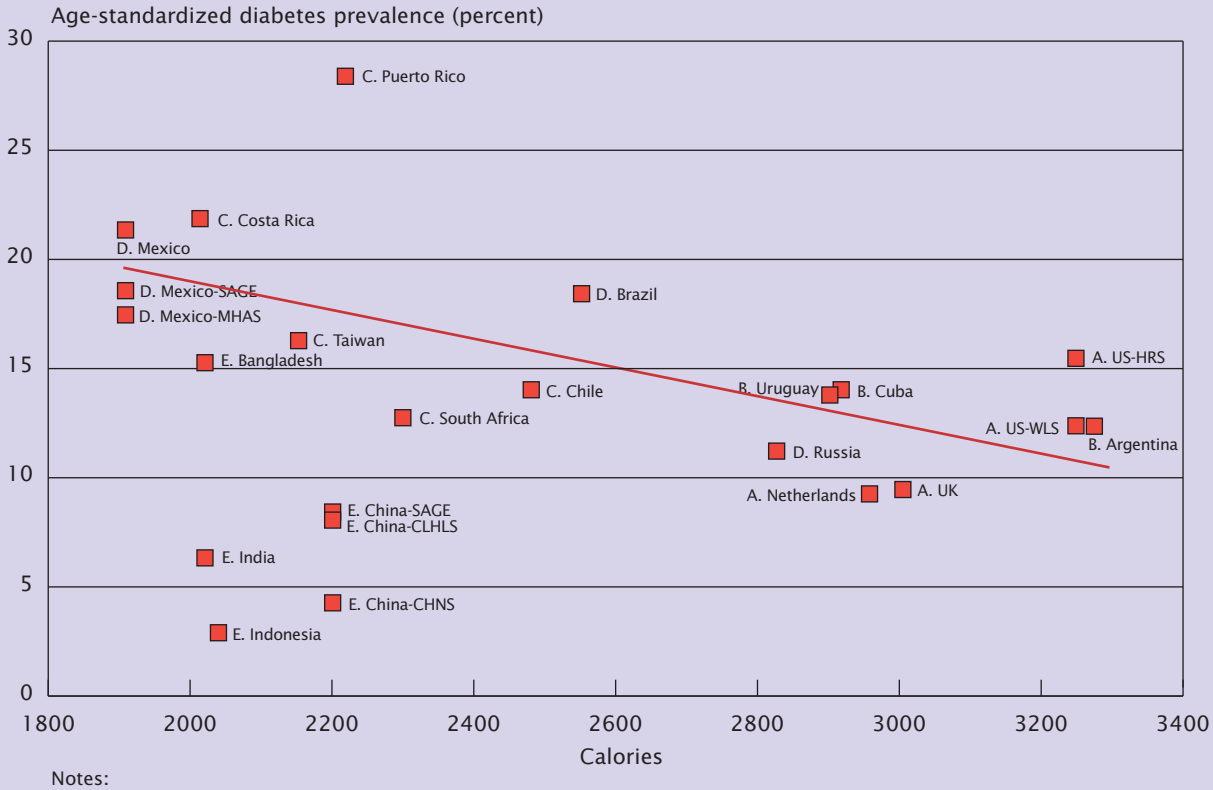
Note: GDP per capita is expressed in 1990 international dollars. Income group reflects World Bank categories. Puerto Rico was classified as high income due to its relationship with the United States. Caloric intake is daily caloric intake per capita.

Source: McEniry, 2014. Adapted from Table 1.1 and Table 2.1.

Continued on next page.

Figure 4-7.

Caloric Intake in Early Life and Diabetes in Later LIfe



Notes:
A = more developed countries, experiencing earlier and gradual mortality decline (beginning or prior to mid 20th century)
B = less developed countries, experiencing earlier and more gradual mortality decline (early to mid 20th century)
C = less developed countries, experiencing later and more rapid mortality decline (around 1930s)
D = less developed countries, experiencing later and more rapid mortality decline (around 1940s)
E = less developed countries, experiencing very late rapid mortality decline (after 1950s)

CLHLS = Chinese Longitudinal Healthy Longevity Survey
CHNS = China Health and Nutrition Study
HRS = Health and Retirement Study
MHAS = Mexican Health and Aging Study
SAGE = Study on Global Ageing and Adult Health
WLS = Wisconsin Longitudinal Study
For a complete listing of surveys used in the figure, see McEniry, 2014.

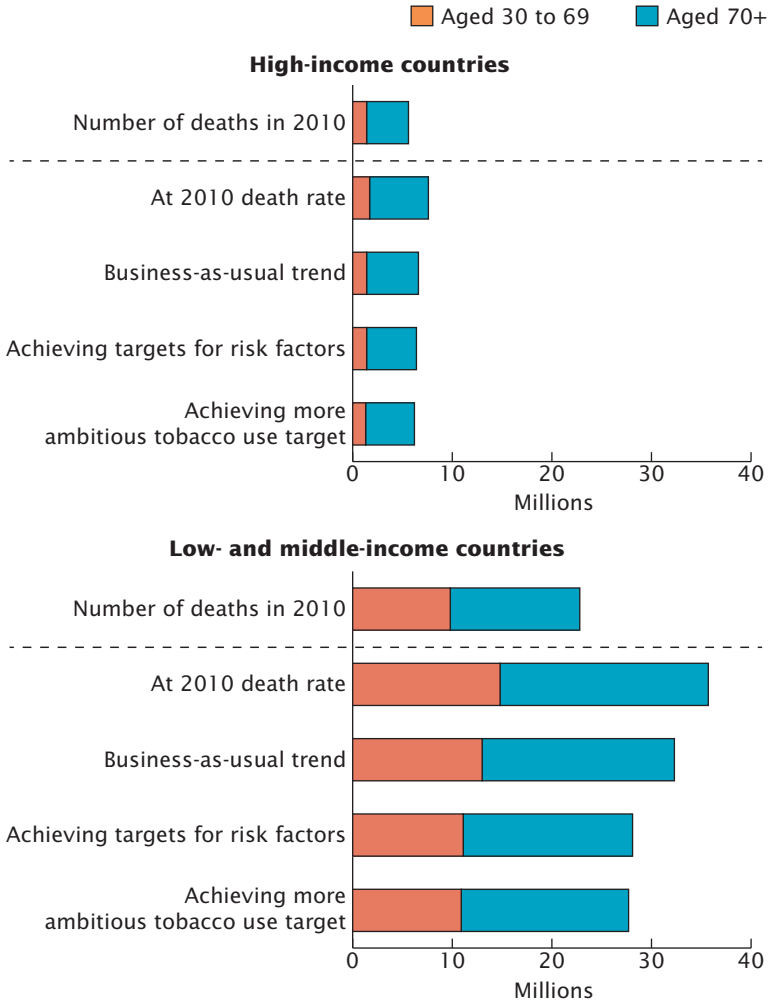
Source: McEniry, 2014. Adapted from Figure 4.2.

CHANGE IS POSSIBLE!

The good news is that large-scale chronic disease prevention is possible, resulting in gains in both population health and wealth (Bloom et al., 2011; Capewell and O'Flaherty, 2011; Ezzati and Riboli, 2012; Franco et al., 2013). Modification or elimination of health risk factors, even for men and women aged 75 and older, can add years to life (Rizzuto et al., 2012). The benefits of risk factor modification are most clear for control of hypertension and high cholesterol in older adults (Prince et al., 2014). High-income countries are doing better at treatment for these chronic diseases than middle-income countries (Crimmins, Garcia, and Kim, 2011; Lloyd-Sherlock et al., 2014).

While significant health gains can be realized from changes in risks at older ages, changes earlier in life will compound the benefits (Sabia et al., 2012; Danaei et al., 2013; Wong et al., 2015). Current projections for reduction of the major risk factors, including smoking and obesity, show the potential benefit of the resulting decrease in deaths (see Figure 4-8) from four main NCDs (cardiovascular diseases, chronic respiratory diseases, cancers, and diabetes) and is likely an underestimate of the full impact (Kontis et al., 2014; Carter et al., 2015).

Figure 4-8.
Projected 2025 Deaths by Age, Income Level, and Projection Assumptions



Note: Number of deaths due to cardiovascular diseases, chronic diseases, cancers, and diabetes.
Source: Kontis et al., 2014. Adapted from Figure 4B.

WHAT DOESN'T KILL YOU, MAKES YOU . . . POSSIBLY UNWELL

For most countries, age- and sex-specific mortality is decreasing, with a progressive shift towards a larger share of deaths caused by NCDs and injury (GBD 2013 Mortality and Causes of Death Collaborators, 2015). This means that more people are living longer with these chronic conditions and the resulting decrements in health. The loss of health, not including death, is more difficult to quantify. Does the presence of chronic disease in one of two otherwise identical populations make the population without the disease healthier (Banks et al., 2006; Martinson, Teitler, and Reichman, 2011)? Other researchers (Fries, 1980; Gruenberg, 1977; Manton, 1982) recommend using a metric of decrements in functioning to define population health and aging. Still other researchers recommend that a combination of both number of chronic diseases and decrements in functioning be used (Cieza et al., 2015; Beltrán-Sánchez, Razak, and Subramanian, 2014).

The global burden of NCDs, such as heart and lung diseases, diabetes, depression, and dementia, in people aged 60 and older grew by 33 percent between 1990 and 2010 (Prince et al., 2014). People in this broad older age group account for 23.1 percent of the total disease burden (World Health Organization, 2008). The per-capita disease burden, DALYs/1000 population, for older adults is higher in low- and middle-income countries than in high-income countries (Prince et al., 2014).

The largest increases from 1990 to 2010 are seen in the burdens from dementia (113 percent) and diabetes (79 percent; Table 4-5). The five most burdensome conditions for adults aged 60 years and older in 2010 are ischaemic heart disease (77.7 million DALYs), stroke (66.4 million DALYs), chronic obstructive pulmonary disease (43.3 million DALYs), and diabetes (22.6 million DALYs; Table 4-5).

Table 4-5.
Disability-Adjusted Life Years (DALYs) Attributable to Chronic Noncommunicable Diseases for World Population Aged 60 and Over: 1990 and 2010

(Nmbers in millions)

Chronic noncommunicable disease	1990		2010		Change 1990–2010 Percent
	Number	Percent of total	Number	Percent of total	
Cerebrovascular disease	54.5	12.5	66.4	11.6	21.8
Chronic obstructive pulmonary disease	44.7	10.3	43.3	7.5	–3.1
Dementia	4.7	1.1	10.0	1.7	112.8
Diabetes mellitus	12.6	2.9	22.6	3.9	79.4
Hearing impairment	5.3	1.2	7.5	1.3	41.5
Ischaemic heart disease	60.7	14.0	77.7	13.5	28.0
Vision impairment	7.0	1.6	10.4	1.8	48.6

Note: One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

Source: Prince et al., 2014. Adapted from Table 1.

Box 4-2.

The Rising Tide of Aging With HIV

By *Joel Negin and Robert Cumming, University of Sydney*

The HIV pandemic has had a profound impact across the world. In 2013, an estimated 35 million people were living with HIV and the global response to the epidemic has been unprecedented in terms of funding, attention, and action (Joint United Nations Programme on HIV/AIDS, 2014). Despite considerable progress, important gaps remain in the global HIV response. Older adults have long been neglected despite important evidence of the growing impact among those aged 50 and older in both developing and developed countries (Mills, Barnighausen, and Negin, 2012).

As of 2013, more than one-third of those living with HIV in North America and Western Europe were aged 50 and older (Mahy et al., 2014; Joint United Nations Programme on HIV/AIDS, 2014). In Latin America, 15.4 percent of those living with HIV were in this age group and in Sub-Saharan Africa—the region most affected by HIV—almost 12 percent were aged 50 and over (Joint United Nations Programme on HIV/AIDS, 2014). The numbers are increasing, with a dramatic rise in those aged 50 and older living with HIV in all regions of the world (Figure 4-9). In Sub-Saharan Africa, there are already more than 2.5 million adults aged 50 and over living with HIV.

This rapid increase in the HIV burden among older adults can be attributed to a number of factors. Principally, the 13 million people accessing anti-retroviral treatment are living longer with life expectancies returning to near normal in most countries (Joint United Nations Programme on HIV/AIDS, 2014; Mills et al., 2011). Therefore, many individuals are now aging with HIV into their 50s and beyond. In addition, older adults remain sexually active and condom use among those aged 50 and over remains low, thus putting these individuals at risk of HIV transmission (Drew and Sherrard, 2008; Freeman and Anglewicz, 2012). In general, older adults have lower levels of HIV-related knowledge than younger adults (Figure 4-10). Lack of knowledge works to impede preventative actions and, as a result, contributes to emerging evidence of new HIV infection among older adults (Wallrauch, Barnighausen, and Newell, 2010).

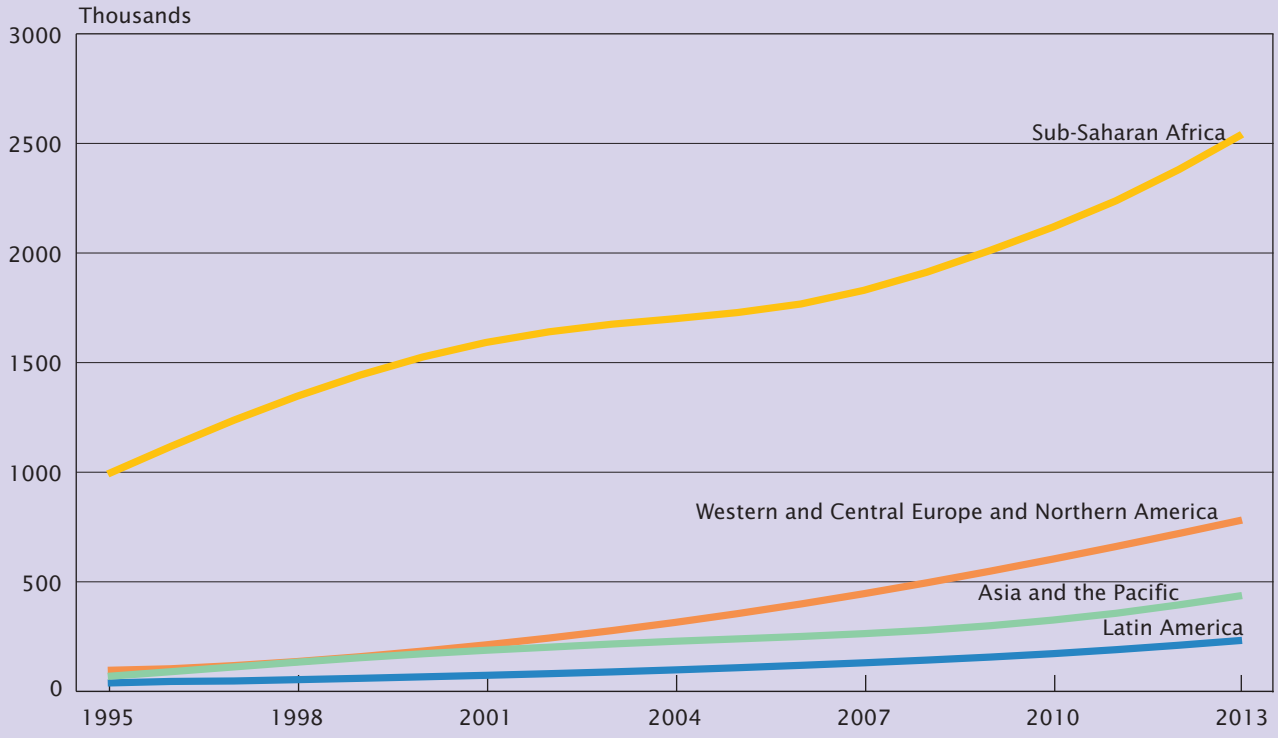
Lower levels of HIV-related knowledge and HIV testing among older adults not only have implications for HIV transmission, but for HIV treatment as well. Those aged 50 and older have smaller CD4+ T-cell gains while on treatment (Vinikoor et al., 2014). They also have poorer therapy outcomes than younger adults (Bakanda et al., 2011; Negin et al., 2011b).

The emergence of multimorbidity is a further challenge for HIV care as a result of living longer with HIV. Aging with HIV means older individuals often have the additional burden of multiple chronic health conditions. Older people living with HIV have high rates of kidney disease, cognitive impairment, and metabolic abnormalities (Calvo and Martinez, 2014; Cysique and Brew, 2014; Nadkarni, Konstantinidis, and Wyatt, 2014). There is ongoing debate whether claims of accelerated aging as a result of HIV and its treatment have been overstated (Justice and Falutz, 2014). However, there is evidence from South Africa that those living with HIV have markers of accelerated aging—reduced telomere length and CD2NKA expression—when compared to HIV-negative individuals (Pathai et al., 2013). Prevention, testing, and treatment services targeted at older adults and designed appropriately will help ensure an inclusive response to the continuing HIV epidemic.

Continued on next page.

Figure 4-9.

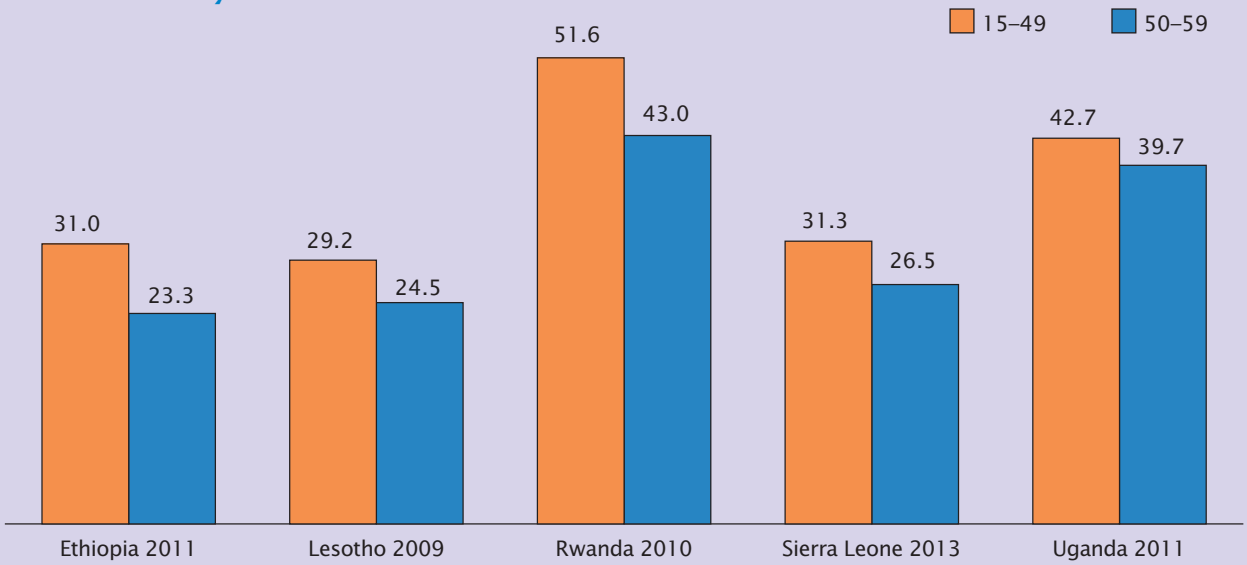
Number of People Aged 50 and Over Living With HIV for Selected Regions: 1995 to 2013



Note: Regional grouping per UNAIDS, 2014.
Source: Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014.

Figure 4-10.

Percentage With Comprehensive Knowledge About HIV and AIDS by Age and Country: Selected Years



Sources: ICF International, 2014; Demographic and Health Surveys, various countries and years.

PRESENCE OF MULTIPLE CONCURRENT CONDITIONS INCREASES WITH AGE

NCDs often occur together and when two or more such chronic health conditions occur, it is termed "multimorbidity" (Boyd et al., 2008; Fortin et al., 2010; Diederichs, Berger, and Bartels, 2011). The complex care required to manage multimorbidity often adversely impacts health and quality of life and increases health service use (Schoenberg et al., 2007; Lehnert et al., 2011; Barnett et al., 2012). Evidence from both high- and low-income countries indicates that older age is a risk for multimorbidity, from over 30 percent in India and 58 percent in Bangladesh, to 60 percent in Spain and Germany, and 76 percent among Scottish adults aged 75 and older (Khanam et al., 2011; Kirchberger et al., 2012; Pati et al., 2014; McLean et al., 2014; Garin et al., 2014).

A review of 26 studies from WHO's Eastern-Mediterranean countries reported that a higher prevalence of multimorbidity is associated with low income, low level of education, and unemployment (Boutayeb, Boutayeb, and Boutayeb, 2013). One study of 28 countries (Afshar et al., 2015), using highest level of education as a proxy for socioeconomic status, reveals a positive association between age and multimorbidity and a negative association between education and multimorbidity across different regions (Table 4-6). Compared with the reference group (odds ratio of 1.00), an odds ratio greater than "1" indicates that the comparison group was more likely to have multimorbidity; and an odds ratio smaller than "1" indicates the opposite. The results here point to a higher multimorbidity burden in those who are older or the least educated in both higher- and lower-income countries. In a study of six countries, multimorbidity showed clear age, sex, and wealth patterns, with resulting higher levels of disability, depression, and poor quality of life (Arokiasamy et al., 2015).

For the growing population of older adults with HIV (Negin and Cumming, 2010), now considered a chronic condition given the success of antiretroviral therapy (Negin et al., 2012; Deeks, Lewin, and Havlir, 2013), multimorbidity is an even bigger problem. In one study, 91 percent of older adults with HIV had one comorbidity condition and 77 percent had multiple comorbidity conditions (Karpiak, Shippy, and Cantor, 2006). The most common comorbidities in that study were depression (52 percent), arthritis (31 percent), hepatitis (31 percent), neuropathy (30 percent), and hypertension (27 percent). A challenge for aging with HIV is the additional layer of treatment-related complexity and associated adverse effects (High et al., 2012).

TREND OF AGE-RELATED DISABILITY VARIES BY COUNTRY

Whether the additional years of life lived will be in good or poor health remains contested, but research suggests that the aging process is modifiable (Christensen et al., 2009). Data show that disability rates rise with age (He and Larsen, 2014; Table 4-7). An examination of limitation in activities of

Table 4-6.
Odds Ratios for Effect of Age, Sex, and Educational Attainment on Multimorbidity for World Regions: 2002–2004

Region	Age		Sex		Educational attainment			
	Under 55	55 and over	Male	Female	Less than primary	Primary	Secondary	Higher
All regions	1.00	***4.10	***0.59	1.00	***1.33	1.00	0.97	0.97
Africa	1.00	***3.13	***0.56	1.00	***1.64	1.00	0.99	0.90
Central and South America	1.00	***2.99	***0.43	1.00	***1.31	1.00	0.91	0.81
Eastern Europe and Central Asia	1.00	***6.02	***0.59	1.00	1.17	1.00	***0.60	***0.49
South Asia	1.00	***4.08	***0.68	1.00	***1.36	1.00	***0.53	***0.46
South East Asia	1.00	***3.09	***0.80	1.00	***1.81	1.00	**0.82	0.90
Western Europe	1.00	***5.95	***0.53	1.00	***1.61	1.00	***0.40	***0.18

Notes: * p-value<0.05; ** <0.01; *** <0.001. Regional grouping per Afshar et al., 2015.
Source: Afshar et al., 2015. Adapted from Table 4.

Table 4-7.
Disability Prevalence Rate by Age Group for Malawi: 2008

(In percent)

Age group	Total	Male	Female
5 and over	4.3	4.3	4.4
5 to 14	2.8	2.9	2.6
15 to 64	4.2	4.2	4.2
65 and over	17.6	17.1	18.0

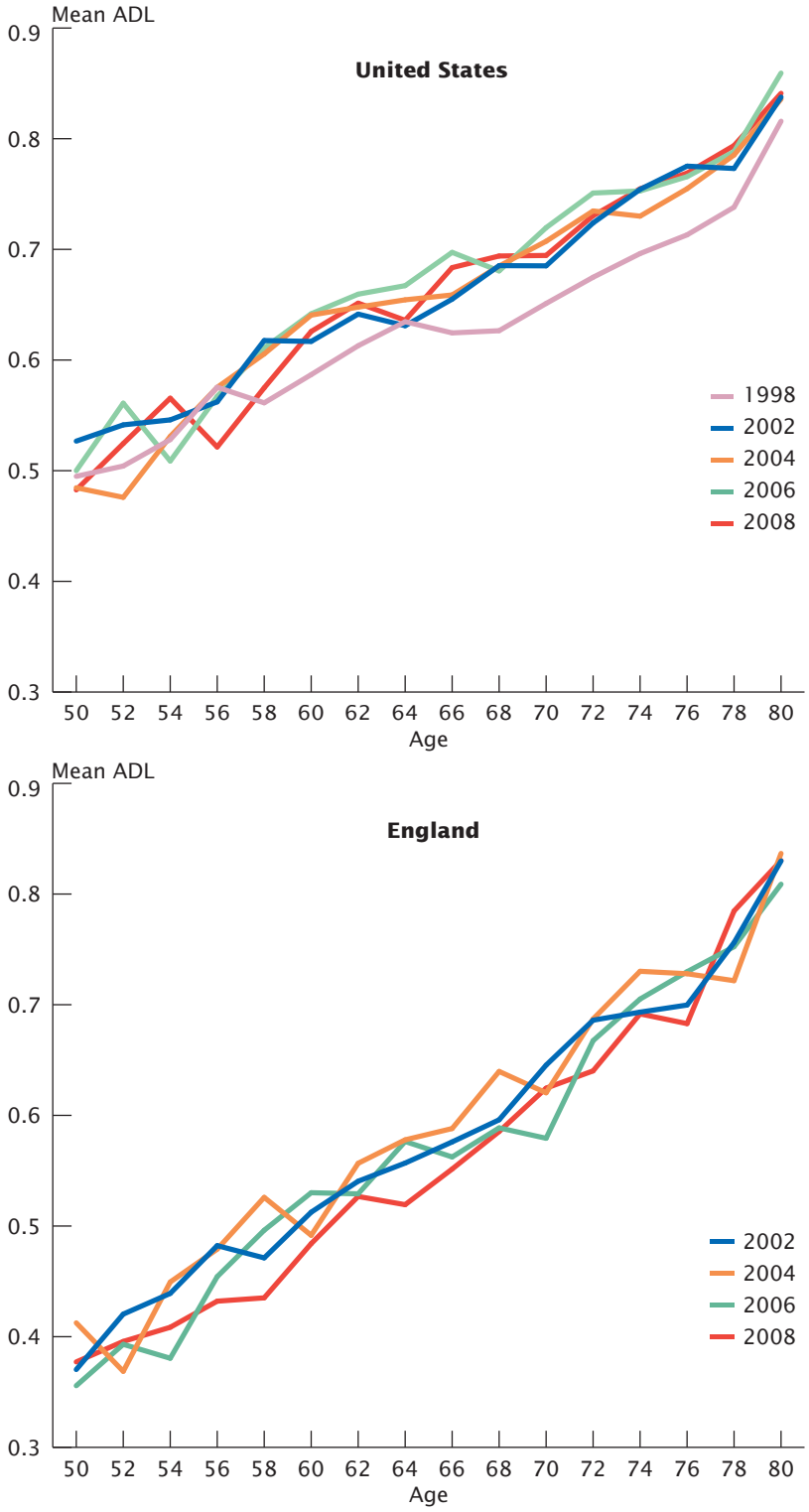
Source: Malawi National Statistical Office, 2010.

daily living (ADLs) in 12 European countries, Israel, and the United States shows a steady rise with age in all countries. The increase is considerable between the ages of 50 and 70 in Greece, Italy, and Spain, whereas increases are more evident in adults aged 70 and older in the Netherlands, Sweden, and Switzerland (Chatterji et al., 2015). Levels of ADL limitations have been falling steadily across consecutive study cohorts in England compared to the United States (Figure 4-11). In the United States, the mean proportions of ADL have steadily increased across all ages older than 50, while in England, the proportions decreased except for those at the oldest ages (Figure 4-11).

FRAILTY IS A PREDISABLED STATE

Frailty and disability are interrelated yet have distinct conditions. The classifications and definitions of frailty are numerous, with no consensus at this point (Abellan van Kan et al., 2008). However, two definitions are often operationalized as a physical phenotype (Fried et al., 2001) and a multidomain phenotype (Rockwood, 2005). One description of frailty is a multidimensional syndrome of loss of reserves (energy, physical ability, cognition, or health) that gives rise to vulnerability (Rockwood et al., 2005). In this case, frailty could be a predisabled state. An individual could be frail but without any disabilities; or frail people could have comorbidity and disability. A study comparing community-dwelling adults aged 50 and older found clear socioeconomic gradients in higher- and lower-income countries—individuals with lower education and wealth levels were more likely to be frail. The study also reported higher levels of frailty in older age and higher rates in women than men (Harttgen et al., 2013).

Figure 4-11.
Activity of Daily Living Limitations by Age for the United States and England: 1998 to 2008



Note: U.S. data are from the Health and Retirement Study; English data are from the English Longitudinal Study of Ageing.
Source: Chatterji et al., 2015. Adapted from Figure 1.

THE U-SHAPE OF SUBJECTIVE WELL-BEING BY AGE IS NOT OBSERVED EVERYWHERE

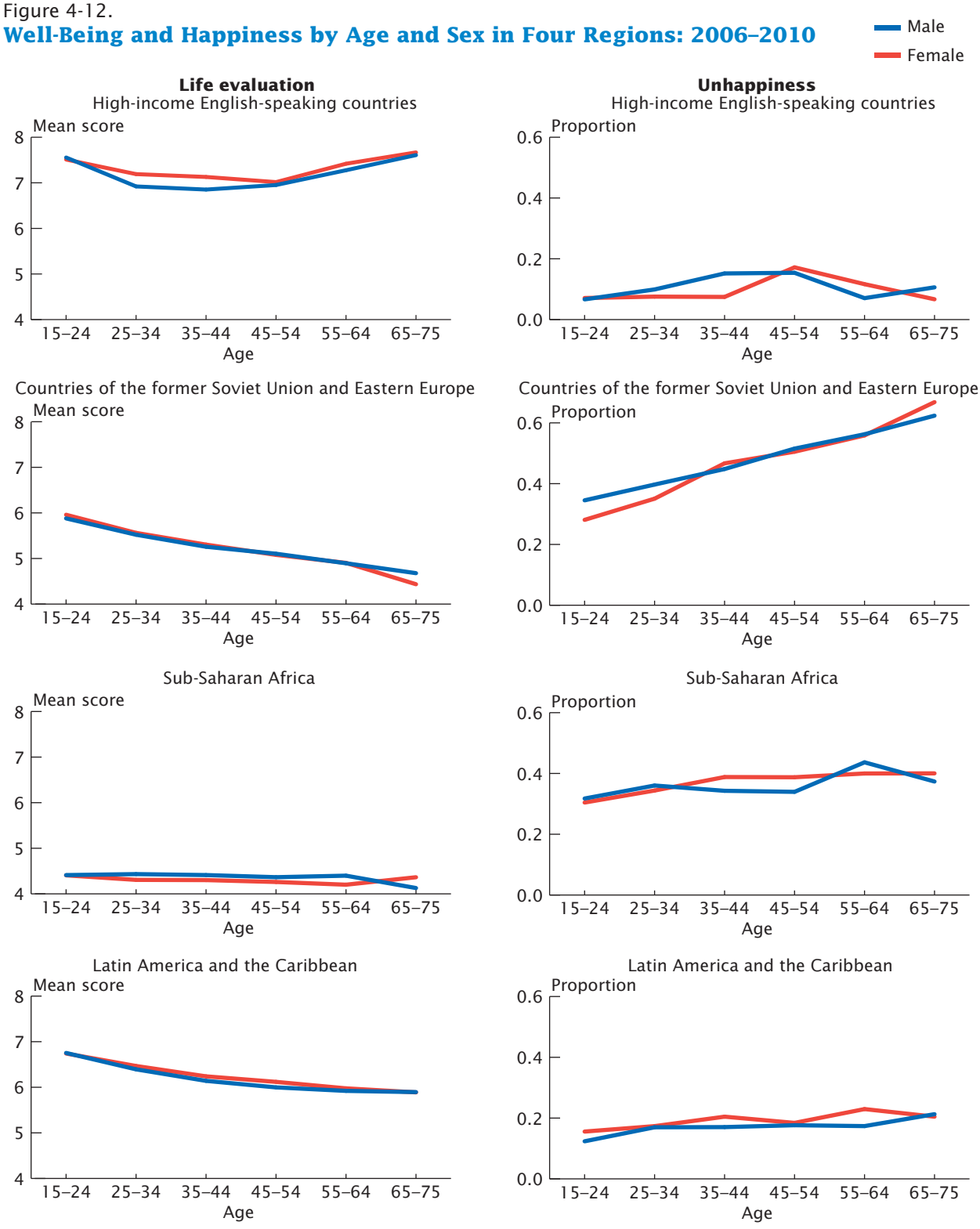
Quality of life is important at all ages, but in later life it becomes of paramount importance for the remaining years to be lived. As life expectancy increases and treatments for life-threatening disease become more effective, the issue of maintaining well-being at advanced ages is growing in importance (National Research Council, 2013). Yet research into subjective well-being and health at older ages is at an early stage (Steptoe, Deaton, and Stone, 2014). Within subjective well-being, at least three different approaches have been used to capture different aspects of well-being. One approach is life evaluation that generally refers to one's overall life satisfaction or general happiness with one's life. Eudemonic well-being, a second approach, focuses on judgments about the meaning and purpose of one's life. Finally, hedonic well-being refers to everyday feelings or moods, such as experienced happiness, sadness, anger, and stress.

Looking at aspects of life evaluation and hedonic well-being, a U-shaped pattern is more evident in high-income, English-speaking countries (Figure 4-12), compared to other regions where life satisfaction either declines at older ages, or remains rather stable across the lifespan (Sub-Saharan Africa). Lack of happiness (as an experienced moment-to-moment emotion) is rather uncommon in high-income English-speaking and Latin America and Caribbean countries, but quite common in transition countries (countries of the former Soviet Union and Eastern Europe), including nearly 70 percent of those aged 65 and older who were not happy on the previous day (Steptoe, Deaton, and Stone, 2014).

Although in high-income countries subjective well-being has a typical U-shaped pattern with age, it progressively decreases in older adults in the former Soviet Union, Eastern Europe, and Latin America. This pattern is corroborated by evidence from Finland, Poland, and Spain, where poor health status is significantly associated with negative emotional status and reduced life satisfaction (Miret et al., 2014). The dynamics between good health and subjective well-being are associated with longer survival, which increases support for these to be goals of economic and social policies (Stiglitz, Sen, and Fitoussi, 2010). To achieve the proposed post-2015 development agenda goal of promoting well-being at all ages will require a focus on the health of the older population (Suzman et al., 2014).

Figure 4-12.

Well-Being and Happiness by Age and Sex in Four Regions: 2006–2010



Note: Cantril ladder ranges from 0 (worst possible life) to 10 (best possible life).
Source: Steptoe, Deaton, and Stone, 2014. Adapted from Figure 1 and Figure 5.

Box 4-3.

Epigenetics of Aging

By *Kirstin N. Sterner, University of Oregon*

Most health outcomes associated with aging result from a complex interplay of an individual's genome and life experiences. Life experiences and environmental factors influence the expression of complex genetic traits, making it difficult to identify specific genetic markers that can be used to slow aging or unambiguously diagnose, treat, or prevent aging-related diseases. The epigenome helps mediate these gene-environment interactions and, therefore, has the potential to provide insights into aging and disease processes.

Life experiences, such as stress, nutrition, and environmental exposure, can affect the genome through "epigenetic modifications," which are biochemical alterations of the genome and chromatin that make specific regions of the genome more or less accessible to the cell's transcriptional machinery without changing the underlying DNA sequence itself. The results of these biochemical modifications are changes in gene expression (when genes are turned on/off and the quantity of gene product made). Unlike the genome, the epigenome can be dynamic and flexible, and varies across tissue/cell types and the lifespan.

One of the most commonly studied forms of epigenetic modification is DNA methylation. In DNA methylation, a methyl group is added to a cytosine in the genome sequence by DNA methyltransferases. A modified cytosine is typically followed by a guanine, forming a "CpG" site. DNA methylation typically reduces gene expression. During the normal aging process, there is an overall reduction in DNA methylation across the genome, although increases have been observed in more localized regions (D'Aquila et al., 2013). This raises the question of whether DNA methylation status can be used as a biomarker of aging and aging-related diseases.

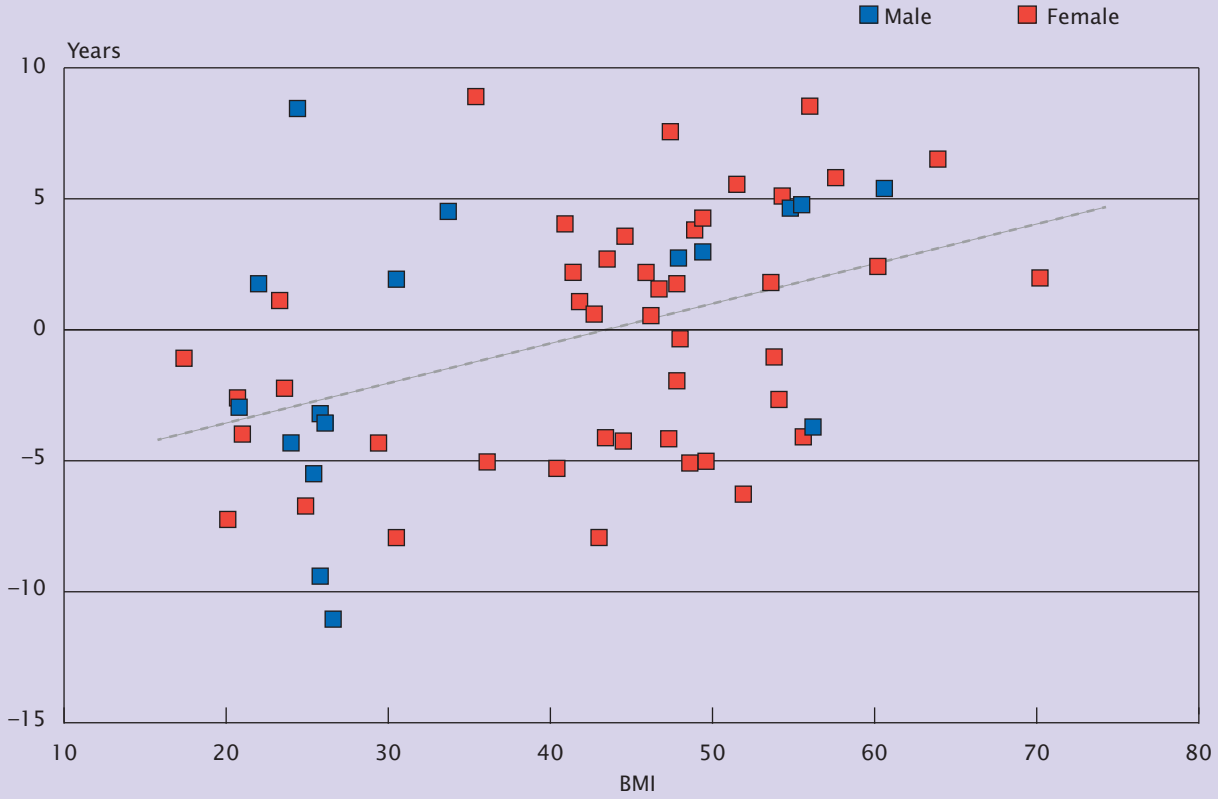
A number of recent studies have identified epigenetic markers associated with common aging-related diseases, including Alzheimer's, cardiovascular disease, and cancers, although the significance of these findings is unclear (Kanherkar, Bhatiq-Dey, and Csoka, 2014; Jung and Pfeifer, 2015). In addition, some epigenetically modified CpG sites predict age in specific tissues and across tissue and cell types (Hannum et al., 2013; Horvath, 2013). These sites behave in a clocklike manner, with a higher rate of methylation early in life that slows after adulthood and can be used to estimate an individual's methylation age (Horvath et al., 2014). In most cases, methylation age and true chronological age are highly correlated. When methylation age and chronological age differ, it may suggest acceleration or deceleration of aging (see note).

There is a growing interest in identifying lifestyle, environmental, and genetic factors that are associated with age acceleration to better understand aging-related diseases. While use of epigenetic data and the epigenetic clock is relatively new to aging-research, a number of recent studies hint at its potential. For instance, methylation age acceleration is associated with decreased lung function, grip strength, and cognition and increased all-cause mortality (Marioni et al., 2015a; Marioni et al., 2015b). Horvath (2013) used the epigenetic clock to identify evidence of age acceleration in liver tissue, adipose tissue, muscle, and blood. A study of German patients found a strong correlation between body mass index (BMI) and liver disease, and between BMI and age acceleration (Horvath et al., 2014; Figure 4-13). Age acceleration was defined as the residual resulting from the regression of methylation age on chronological age. Further research is needed to determine: 1) the molecular mechanisms that underlie age acceleration; 2) how divergent patterns of methylation influence health outcomes associated with aging; and, 3) how the epigenome changes throughout an individual's lifetime.

Continued on next page.

Figure 4-13.

Age Acceleration in Liver Tissue and BMI



Note: Age acceleration is when someone's epigenetic age, as measured overall or in particular body parts like the liver, is deemed to be older than chronological age. BMI is body mass index. The dashed line indicates the regression line and data point corresponds to a human subject. Age acceleration in liver tissue is significantly correlated with BMI (r=0.42, P=6.8X10-4).

Source: Horvath et al., 2014. Adapted from Figure 1E.

Chapter 4 References

Abdullah, Asnawi, Rory Wolfe, Johannes U. Stoelwinder, Maximilian de Courten, Christopher Stevenson, Helen L. Walls, and Anna Peeters. 2011. "The Number of Years Lived With Obesity and the Risk of All-Cause and Cause-Specific Mortality." *International Journal of Epidemiology* 40/4: 985–996.

Abellan van Kan, Gabor, Yves Rolland, Howard Bergman, John E. Morley, Stephen B. Kritchevsky, and Bruno Vellas. 2008. "The I.A.N.A. Task Force on Frailty Assessment of Older People in Clinical Practice." *Journal of Nutrition, Health and Aging* 12/1: 29–37.

Afshar, Sara, Paul J. Roderick, Allan G. Hill, Borislav D. Dimitrov, and Paul Kowal. 2015. "Multimorbidity and the Inequalities of Global Ageing: A Cross-Sectional Study of 28 Countries Using the World Health Surveys." Presented in Session 87. Chronic Diseases in Developing Countries at annual meeting of the Population Association of America, San Diego, CA, April 30–May 2.

Ahmed, Syed Masud, Abdullahel Hadi, Abdur Razzaque, Ali Ashraf, Sanjay Juvekar, Nawi Ng, Uraiwan Kanungsukkasem, Kusol Soonthornthada, Hoang Van Minh, and Tran Huu Bich. 2009. "Clustering of Chronic Non-Communicable Disease Risk Factors Among Selected Asian Populations: Levels and Determinants." *Global Health Action 2*/Supplement 1: 68–75.

Alley, Dawn E., Jennifer Lloyd, and Michelle Shardell. 2011. "Chapter 6. Can Obesity Account for Cross-National Differences in Life-Expectancy Trends?" In Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen (eds.), *International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: The National Academies Press.

Almond, Douglas and Janet Currie. 2010. "Human Capital Development Before Age Five." National Bureau of Economic Research Working Paper 15827. Cambridge, MA: National Bureau of Economic Research.

Arias, Elizabeth. 2014. *United States Life Tables, 2009*. National Vital Statistics Reports 62/7. Hyattsville, MD: National Center for Health Statistics.

Arokiasamy, Perianayagam, Uttamacharya, Kshipra Jain, Richard Berko Biritwum, Alfred Edwin Yawson, Fan Wu, Yanfei Guo, Tamara Maximova, Betty Manrique Espinoza, Aarón Salinas Rodríguez, Sara Afshar, Sanghamitra Pati, Gillian Ice, Sube Banerjee, Melissa A. Liebert, James Josh Snodgrass, Nirmala Naidoo, Somnath Chatterji, and Paul Kowal. 2015. "The Impact of Multimorbidity on Adult Physical and Mental Health in Low- and Middle-Income Countries: What Does the Study on global AGEing and adult health (SAGE) Reveal?" *BMC Medicine* 13:178.

Associated Press. 2015. "Jeralean Talley, World's Oldest Person, Dies At 116 in Michigan." In *Huffington Post*, June 18, 2015.

Bakanda, Celestin, Josephine Birungi, Robert Mwesigwa, Nathan Ford, Curtis L. Cooper, Christopher Au-Yeung, Keith Chan, Jean B. Nachega, Evan Wood, Robert S. Hogg, Mark Dybul, and Edward J. Mills. 2011. "Association of Aging and Survival in a Large HIV-Infected Cohort on Antiretroviral Therapy." *AIDS* 25/5: 701–705.

Banks, James, Michael Marmot, Zoe Oldfield, and James P. Smith. 2006. "Disease and Disadvantage in the United States and in England." *Journal of the American Medical Association* 295/17: 2037–2045.

Barker, David James Purslove. 1998. *Mothers, Babies, and Health in Later Life*. 2nd ed. Edinburgh: Churchill Livingstone.

Barnett, Karen, Stewart W. Mercer, Micheal Norbury, Graham Watt, Sally Wyke, and Bruce Guthrie. 2012. "Epidemiology of Multimorbidity and Implications for Health Care, Research, and Medical Education: A Cross-Sectional Study." *The Lancet* 380/9836: 37–43.

Beltrán-Sánchez, Hiram, Fahad Razak, and S. V. Subramanian. 2014. "Going Beyond the Disability-Based Morbidity Definition in the Compression of Morbidity Framework." *Global Health Action* 7/24766.

Bilano, Ver, Stuart Gilmour, Trevor Moffiet, Edouard Tursan d'Espaignet, Gretchen A Stevens, Alison Commar, Frank Tuyl, Irene Hudson, and Kenji Shibuya. 2015. "Global Trends and Projections for Tobacco Use, 1990–2025: An Analysis of Smoking Indicators From the WHO Comprehensive Information Systems for Tobacco Control." *The Lancet* 385/9972: 966–976.

Bloom, David E., Elizabeth T. Cafiero, Eva Jané-Llopis, Shafika Abrahams-Gessel, Lakshmi Reddy Bloom, Sana Fathima, Andrea B. Feigl, Tom Gaziano, Ali Hamandi, Mona Mowafi, Danny O'Farrell, Emre Ozaltin, Ankur Pandya, Klaus Prettner, Larry Rosenberg, Benjamin Seligman, Adam Z. Stein, Cara Weinstein, and Jonathan Weiss. 2011. *The Global Economic Burden of Noncommunicable Diseases*. Geneva: World Economic Forum.

Bloom, David E., Somnath Chatterji, Paul Kowal, Peter Lloyd-Sherlock, Martin McKee, Bernd Rechel, Larry Rosenberg, and James P. Smith. 2015. "Macroeconomic Implications of Population Ageing and Selected Policy Responses." *The Lancet* 385/9968: 649–657.

Bonita, Ruth. 2009. "Strengthening NCD Prevention Through Risk Factor Surveillance." *Global Health Action 2*/Supplement 1: 4–6.

Boutayeb, Abdessiam, Saber Boutayeb, and Wiam Boutayeb. 2013. "Multi-Morbidity of Non- Communicable Diseases and Equity in WHO Eastern Mediterranean Countries." *International Journal for Equity in Health* 12/60.

Boyd, Cynthia M., Christine S. Ritchie, Edmond F. Tipton, Stephanie A. Studenski, and Darryl Wieland. 2008. "From Bedside to Bench: Summary From the American Geriatrics Society/National Institute on Aging Research Conference on Comorbidity and Multiple Morbidity in Older Adults." *Aging Clinical and Experimental Research* 20/3: 181–188.

Brandt, Martina, Christian Deindl, and Karsten Hank. 2012. "Tracing the Origins of Successful Aging: The Role of Childhood Conditions and Social Inequality in Explaining Later Life Health." *Social Science & Medicine* 74/9: 1418–1425.

Byles, Julie E., Cassie Curryer, Natalie Edwards, Natasha Weaver, Cate D'Este, John Hall, and Paul Kowal. 2014. *The Health of Older People in Selected Countries of the Western Pacific Region*. Manila: World Health Organization.

Calvo, Marta and Esteban Martinez. 2014. "Update on Metabolic Issues in HIV Patients." *Current Opinion in HIV and AIDS* 9/4: 332–339.

Capewell, Simon and Martin O'Flaherty. 2011. "Rapid Mortality Falls After Risk-Factor Changes in Populations." *The Lancet* 378/9793: 752–753.

Carter, Brian D., Christian C. Abnet, Diane Feskanich, Neal D. Freedman, Patricia Hartge, Cora E. Lewis, Judith K. Ockene, Ross L. Prentice, Frank E. Speizer, Michael J. Thun, and Eric J. Jacobs. 2015. "Smoking and Mortality—Beyond Established Causes." *New England Journal of Medicine* 372/7: 631–640.

Centers for Disease Control and Prevention. 2013. "State-Specific Health Life Expectancy at Age 65 Years—United States, 2007–2009." *Morbidity and Mortality Weekly Report* 62/28: 561–566.

Chatterji, Somnath, Julie Byles, David Cutler, Teresa Seeman, and Emese Verdes. 2015. "Health, Functioning, and Disability in Older Adults—Present Status and Future Implications." *The Lancet* 385/9967: 563–575.

Christensen, Kaare, Gabriele Doblhammer, Roland Rau, and James W. Vaupel. 2009. "Ageing Populations: The Challenges Ahead." *The Lancet* 374/9696: 1196–1208.

Cieza, Alarcos, Cornelia Oberhauser, Jerome Bickenbach, Richard N. Jones, Tevfik Bedirhan Ustun, Nenad Kostanjsek, John N. Morris, and Somnath Chatterji. 2015. "The English are Healthier Than the Americans: Really?" *International Journal of Epidemiology* 44/1: 229–238.

Colditz, Graham A. 2015. "Smoke Alarm—Tobacco Control Remains Paramount." *New England Journal of Medicine* 372/7: 665–666.

Crimmins, Eileen M. and Caleb E. Finch. 2006. "Infection, Inflammation, Height, and Longevity." *Proceedings of the National Academy of Sciences of the United States of America* 103/2: 498–503.

Crimmins, Eileen M. and Hiram Beltran-Sanchez. 2011. "Mortality and Morbidity Trends: Is There Compression of Morbidity?" *Journals of Gerontology Series B-Psychological Sciences and Social Sciences* 66B/1: 75–86.

Crimmins, Eileen M., Krista Garcia, and Jung Ki Kim. 2011. "Chapter 3. Are International Differences in Health Similar to International Differences in Life Expectancy?" In Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen (eds.), *International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: The National Academies Press.

Crimmins, Eileen M., Samuel H. Preston, and Barney Cohen (eds.). 2011. *Explaining Divergent Levels of Longevity in High-Income Countries*. National Research Council Panel on Understanding Divergent Trends in Longevity in High-Income Countries. Committee on Population, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Cysique, Lucette A. and Bruce J. Brew. 2014. "The Effects of HIV and Aging on Brain Functions: Proposing a Research Framework and Update on Last 3 Years' Findings." *Current Opinion in HIV and AIDS* 9/4: 355–364.

Danaei, Goodarz, Eric B. Rimm, Shefali Oza, Sandeep C. Kulkarni, Christopher J. L. Murray, and Majid Ezzati. 2010. "The Promise of Prevention: The Effects of Four Preventable Risk Factors on National Life Expectancy and Life Expectancy Disparities by Race and County in the United States." *PLoS Medicine* 7/3: e1000248.

Danaei, Goodarz, An Pan, Frank B. Hu, and Miguel A. Hernan. 2013. "Hypothetical Midlife Interventions in Women and Risk of Type 2 Diabetes." *Epidemiology* 24/1: 122–128.

Daniels, Jr., Mitchell E., Thomas E. Donilon, and Thomas J. Bollyky. 2014. *The Emerging Global Health Crisis, Noncommunicable Diseases in Low- and Middle-Income Countries*. Independent Task Force Report No. 72. New York: Council on Foreign Relations.

Dans, Antonio, Nawi Ng, Cherian Varghese, E. Shyong Tai, Rebecca Firestone, and Ruth Bonita. 2011. "The Rise of Chronic Non-Communicable Diseases in Southeast Asia: Time for Action." *The Lancet* 377/9766: 680–689.

D'Aquila, Patrizia, Rose Giuseppina, Dina Bellizzi, and Giuseppe Passarino. 2013. "Epigenetics and Aging." *Maturitas* 74/2: 130–136.

Deeks, Steven G., Sharon R. Lewin, and Diane V. Havlir. 2013. "The End of AIDS: HIV Infection as a Chronic Disease." *The Lancet* 382/9903: 1525–1533.

Diederichs, Claudia, Klaus Berger, and Dorothee B. Bartels. 2011. "The Measurement of Multiple Chronic Diseases—A Systematic Review on Existing Multimorbidity Indices." *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 66A/3: 301–311.

Drew, Olivia and Jackie Sherrard. 2008. "Sexually Transmitted Infections in the Older Woman." *Menopause International* 14/3: 134–135.

Elo, Irma T. and Samuel H. Preston. 1992. "Effects of Early-Life Conditions on Adult Mortality: a Review." *Population Index* 58/2: 186–212.

European Commission (EC). 2014. Eurostat, <http://ec.europa.eu/eurostat/data/database>, accessed on October 10, 2014.

Ezzati, Majid, Ari B. Friedman, Sandeep C. Kulkarni, and Christopher J. L. Murray. 2008. "The Reversal of Fortunes: Trends in County Mortality and Cross-County Mortality Disparities in the United States." *PLoS Medicine* 5/4: e66.

Ezzati, Majid and Elio Riboli. 2012. "Can Noncommunicable Diseases Be Prevented? Lessons From Studies of Populations and Individuals." *Science* 337/6101: 1482–1487.

_____. 2013. "Behavioral and Dietary Risk Factors for Noncommunicable Diseases." *New England Journal of Medicine* 369/10: 954–964.

Flegal, Katherine M., Brian K. Kit, Heather Orpana, and Barry I. Graubard. 2013. "Association of All-Cause Mortality With Overweight and Obesity Using Standard Body Mass Index Categories, A Systematic Review and Meta-Analysis." *Journal of the American Medical Association* 309/1: 71–82.

Fortin, Martin, Catherine Hudon, Jeannie Haggerty, Marjan van den Akker, and Jose Almirall. 2010. "Prevalence Estimates of Multimorbidity: A Comparative Study of Two Sources." *BioMedCentral Health Services Research* 10: 111.

Franco, Manuel, Usama Bilal, Pedro Orduñez, Mikhail Benet, Alain Morejón, Benjamin Caballero, Joan F. Kennelly, and Richard S. Cooper. 2013. "Population-Wide Weight Loss and Regain in Relation to Diabetes Burden and Cardiovascular Mortality in Cuba 1980–2010: Repeated Cross Sectional Surveys and Ecological Comparison of Secular Trends." *British Medical Journal* 346/f1515.

Freeman, Emily and Phillip Anglewicz. 2012. "HIV Prevalence and Sexual Behaviour at Older Ages in Rural Malawi." *International Journal of STD & AIDS* 23/7: 490–496.

Fried, Linda P., Catherine M. Tangen, Jeremy Walston, Anne B. Newman, Calvin Hirsch, John Gottdiener, Teresa Seeman, Russell Tracy, Willem J. Kop, Gregory Burke, and Mary Ann McBurnie. 2001. "Frailty in Older Adults: Evidence for a Phenotype." *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 56/3: M146–M157.

Fries, James F. 1980. "Aging, Natural Death, and the Compression of Morbidity." *New England Journal of Medicine* 303/3: 130–135.

García-Palmieri, Mario R., Raul Costas, Jr., Mercedes Cruz-Vidal, Marcelino Cortes-Alicea, Angel A. Colon, Manuel Feliberti, Angel M. Ayala, Dolores Patterne, Rafael Sobrino, Raquel Torres, and Emilio Nazario. 1970. "Risk Factors and Coronary Heart Disease in Puerto Rico." *Circulation* 42: 541–549.

Garin, Noe, Beatriz Olaya, Jaime Perales, Maria Victoria Moneta, Marta Miret, Jose Luis Ayuso-Mateos, and Josep Maria Haro. 2014. "Multimorbidity Patterns in a National Representative Sample of the Spanish Adult Population." *PLoS ONE* 9/1: e84794.

GBD 2013 Mortality and Causes of Death Collaborators. 2015. "Global, Regional, and National Age-Sex Specific All-Cause and Cause-Specific Mortality for 240 Causes of Death, 1990–2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *The Lancet* 385/9963: 117–171.

Gordon, Tavia. 1964. "Glucose Tolerance of Adults: United States—1960–1962." Public Health Service Publication No. 1000—Series 11, No. 2. Washington, DC: U.S. Government Printing Office.

Gruenberg, Ernest M. 1977. "The Failures of Success." *Milbank Memorial Fund Quarterly* 55/1: 3–24.

Hadden, Wilbur C. and Maureen I. Harris. 1987. "Prevalence of Diagnosed Diabetes, Undiagnosed Diabetes, and Impaired Glucose Tolerance in Adults 20–74 Years of Age." Data from the National Health Survey Series 11, No. 237. Hyattsville, MD: US Department of Health and Human Services.

Hannum, Gregory, Justin Guinney, Ling Zhao, Li Zhang, Guy Hughes, SriniVas Sadda, Brandy Klotzle, Marina Bibikova, Jian-Bing Fan, Yuan Gao, Rob Deconde, Menzies Chen, Indika Rajapakse, Stephen Friend, Trey Ideker, and Kang Zhang. 2013. "Genome-Wide Methylation Profiles Reveal Quantitative Views of Human Aging Rates." *Molecular Cell* 49/2: 359–367.

Harris, Maureen I., David E. Goldstein, Katherine M. Flegal, Randie R. Little, Catherine C. Cowie, Hsiao-Mei Wiedmeyer, Mark S. Eberhardt, and Danita D. Byrd-Holt. 1998. "Prevalence of Diabetes, Impaired Fasting Glucose, and Impaired Glucose Tolerance in U.S. Adults." *Diabetes Care* 21/4: 518–524.

Harttgen, Kenneth, Paul Kowal, Holger Strulik, Somnath Chatterji, and Sebastian Vollmer. 2013. "Patterns of Frailty in Older Adults: Comparing Results From Higher and Lower Income Countries Using the Survey of Health, Ageing, and Retirement in Europe (SHARE) and the Study on Global AGEing and Adult Health (SAGE)." *PLoS ONE* 8/10: e75847.

He, Wan and Luke J. Larsen. 2014. *Older Americans With a Disability: 2008–2012*. American Community Survey Reports, ACS-29, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

High, Kevin P., Mark Brennan-Ing, David B. Clifford, Mardge H. Cohen, Judith Currier, Steven G. Deeks, Sherry Deren, Rita B. Effros, Kelly Gebo, Jorg J. Goronzy, Amy C. Justice, Alan Landay, Jules Levin, Paolo G. Miotti, Robert J. Munk, Heidi Nass, Charles R. Rinaldo Jr, Michael G. Shlipak, Russell Tracy, Victor Valcour, David E. Vance, Jeremy D. Walston, and Paul Volberding. 2012. "HIV and Aging: State of Knowledge and Areas of Critical Need for Research. A Report to the NIH Office of AIDS Research by the HIV and Aging Working Group." *Journal of Acquired Immune Deficiency Syndromes 60/ Supplement* 1: S1–18.

Horvath, Steve. 2013. "DNA Methylation Age of Human Tissues and Cell Types." *Genome Biology* 14/R115:1–19.

Horvath, Steve, Wiebke Erhart, Mario Brosch, Ole Ammerpohl, Witigo von Schönfels , Markus Ahrens, Nils Heits, Jordana T. Bell, Pei-Chien Tsai, Tim D. Spector, Panos Deloukas, Reiner Siebert, Bence Sipos, Thomas Becker, Christoph Röcken, Clemens Schafmayer, and Jochen Hampe. 2014. "Obesity Accelerates Epigenetic Aging of Human Liver." *Proceedings of the National Academy of Science, USA* 111/43: 15538–15543.

Hossain, Parvez, Bisher Kawar, and Meguid El Nahas. 2007. "Obesity and Diabetes in the Developing World—A Growing Challenge." *The New England Journal of Medicine* 356/3: 213–215.

Hosseinpoor, Ahmad Reza, Nicole Bergen, Anton Kunst, Sam Harper, Regina Guthold, Dag Rekve, Edouard Tursan d'Espaignet, Nirmala Naidoo, and Somnath Chatterji. 2012. "Socioeconomic Inequalities in Risk Factors for Non Communicable Diseases in Low-Income and Middle-Income Countries: Results From the World Health Survey." *BioMedCentral Public Health*. 12/912.

ICF International. 2014. *Demographic and Health Survey* (various countries and years). Rockville, MD: ICF International.

Institute for Health Metrics and Evaluation (IHME). 2013. *The Global Burden of Disease: Generating Evidence, Guiding Policy*. Seattle, WA: IHME.

Joint United Nations Programme on HIV/AIDS (UNAIDS). 2014. *The Gap Report*. Geneva, Switzerland: UNAIDS.

Jung, Marc and Gerd P. Pfeifer. 2015. "Aging and DNA Methylation." *BioMedCentral Biology* 13:7.

Justice, Amy C. and Julian Falutz. 2014. "Aging and HIV: An Evolving Understanding." *Current Opinion in HIV and AIDS* 9/4: 291–293.

Kanherkar, Riya R., Naina Bhatia-Dey, and Antonei B. Csoka. 2014. "Epigenetics Across the Human Lifespan." *Frontiers in Cell and Developmental Biology* 2/Article 49: 1–19.

Karpiak, Stephen E., R. Andrew Shippy, and Marjorie Cantor. 2006. *Research on Older Adults With HIV*. New York: AIDS Community Research Initiative of America.

Khanam, Masuma Akter, Peter Kim Streatfield, Zarina Nahar Kabir, Chengxuan Qiu, Christel Cornelius, and Åke Wahlin. 2011. "Prevalence and Patterns of Multimorbidity Among Elderly People in Rural Bangladesh: A Cross-Sectional Study." *Journal of Health Population and Nutrition* 29/4: 406–414.

Kirchberger, Inge, Christa Meisinger, Margit Heier, Anja-Kerstin Zimmermann, Barbara Thorand, Christine S. Autenrieth, Annette Peters, Karl-Heinz Ladwig, and Angela Doring. 2012. "Patterns of Multimorbidity in the Aged Population. Results from the KORA-Age Study." *PLoS ONE* 7/1: e30556.

Kontis, Vasilis, Colin D. Mathers, Jürgen Rehm, Gretchen A. Stevens, Kevin D. Shield, Ruth Bonita, Leanne M. Riley, Vladimir Poznyak, Robert Beaglehole, and Majid Ezzati. 2014. "Contribution of Six Risk Factors to Achieving the 25×25 Non-Communicable Disease Mortality Reduction Target: a Modelling Study." *The Lancet* 384/9941: 427–437.

Kramer, Caroline K., Bernard Zinman, and Ravi Retnakaran. 2013. "Are Metabolically Healthy Overweight and Obesity Benign Conditions?: A Systematic Review and Meta-Analysis." *Annals of Internal Medicine* 159/11: 758–769.

Kruk, Margaret E., Gustavo Nigenda, and Felicia M. Knaul. 2015. "Redesigning Primary Care to Tackle the Global Epidemic of Noncommunicable Disease." *American Journal of Public Health* 105/3: 431–437.

Langa, Kenneth M., Eric B. Larson, Jason H. Karlawish, David M. Cutler, Mohammed U. Kabeto, Scott Y. Kim, and Allison B. Rosen. 2008. "Trends in the Prevalence and Mortality of Cognitive Impairment in the United States: Is there Evidence of a Compression of Cognitive Morbidity?" *Alzheimer's & Dementia* 4/2: 134–144.

Lee, Ronald. 2011. "The Outlook for Population Growth." *Science* 333/6042: 569–573.

Lehnert, Thomas, Dirk Heider, Hanna Leicht, Sven Heinrich, Sandro Corrieri, Melanie Luppa, Steffi Riedel-Heller, and Hans-Helmut Konig. 2011. "Review: Health Care Utilization and Costs of Elderly Persons With Multiple Chronic Conditions." *Medical Care Research and Review* 68/4: 387–420.

Levine, Morgan E., Steve W. Cole, David R. Weir, and Eileen M. Crimmins. 2015. "Childhood and Later Stressors and Increased Inflammatory Gene Expression at Older Ages." *Social Science and Medicine* 130: 16–22

Lillycrop, Karen A., Samuel P. Hoile, Leonie Grenfell, and Graham C. Burdge. 2014. "DNA Methylation, Ageing, and the Influence of Early Life Nutrition." *Proceedings of the Nutrition Society* 73/3: 413–21.

Lim, Stephen S. et al. 2012. "A Comparative Risk Assessment of Burden of Disease and Injury Attributable to 67 Risk Factors and Risk Factor Clusters in 21 Regions, 1990–2010: A Systematic Analysis for the Global Burden of Disease Study 2010." *The Lancet* 380/9859: 2224–2260.

Lin, Shih-Fan, Audrey N. Beck, Brian K. Finch, Robert A. Hummer, and Ryan K. Master. 2012. "Trends in U.S. Older Adult Disability: Exploring Age, Period, and Cohort Effects." *American Journal of Public Health* 12/11: 2157–2163.

Lloyd-Sherlock, Peter, John Beard, Nadia Minicuci, Shah Ebrahim, and Somnath Chatterji. 2014. "Hypertension Among Older Adults in Low- and Middle-Income Countries: Prevalence, Awareness and Control." *International Journal of Epidemiology* 43/1: 116–128.

Lowsky, David J., S. Jay Olshansky, Jay Bhattacharya, and Dana P. Goldman. 2014. "Heterogeneity in Healthy Aging." *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 69A/6: 640–649.

Lozano, Rafael et al. 2012. "Global and Regional Mortality From 235 Causes of Death for 20 Age Groups in 1990 and 2010: A Systematic Analysis for the Global Burden of Disease Study 2010." *The Lancet* 380/9859: 2095–2128.

Mahy, Mary, Christine S. Autenrieth, Karen Stanecki, and Shona Wynd. 2014. "Increasing Trends in HIV Prevalence Among People Aged 50 Years and Older: Evidence From Estimates and Survey Data." *AIDS* Suppl 4: S453–S459.

Malawi National Statistical Office. 2010. *Population and Housing Census 2008 Analytical Report: Volume 11 Disability and the Elderly*.

Manton, Kenneth G. 1982. "Changing Concepts of Morbidity and Mortality in the Elderly Population." *Milbank Fund Quarterly* 60/2: 183–244.

Marioni, Riccardo E., Sonia Shah, Allan F. McRae, Brian H. Chen, Elena Colicino, Sarah E. Harris, Jude Gibson, Anjali K. Henders, Paul Redmond, Simon R. Cox, Alison Pattie, Janie Corley, Lee Murphy, Nicholas G. Martin, Grant W. Montgomery, Andrew P. Feinberg, M. Daniele Fallin, Michael L. Multhaup, Andrew E. Jaffe, Roby Joehanes, Joel Schwartz, Allan C. Just, Kathryn L. Lunetta, Joanne M. Murabito, John M. Starr, Steve Horvath, Andrea A. Baccarelli, Daniel Levy, Peter M. Visscher, Naomi R. Wray, and Ian J. Deary. 2015a. "DNA Methylation Age of Blood Predicts All-Cause Mortality in Later Life." *Genome Biology* 16:25.

Marioni, Riccardo E., Sonia Shah, Allan F. McRae, Stuart J. Ritchie, Graciela Muniz-Terrera, Sarah E. Harris, Jude Gibson, Paul Redmond, Simon R. Cox, Alison Pattie, Janie Corley, Adele Taylor, Lee Murphy, John M. Starr, Steve Horvath, Peter M. Visscher, Naomi R. Wray, and Ian J. Deary. 2015b. "The Epigenetic Clock Is Correlated With Physical and Cognitive Fitness in the Lothian Birth Cohort 1936." *International Journal of Epidemiology*. doi: 10.1093/ije/dyu277.

Marmot, Michael and Richard Wilkinson (eds.). 2005. *Social Determinants of Health*. 2nd edition. Geneva: World Health Organization.

Martinson, Melissa L., Julien O. Teitler, and Nancy E. Reichman. 2011. "Health Across the Life Span in the United States and England." *American Journal of Epidemiology* 173/8: 858–865.

Mathers, Colin D., Gretchen A. Stevens, Ties Boerma, Richard A. White, and Martin I. Tobias. 2015. "Causes of International Increases in Older Age Life Expectancy." *The Lancet* 385/9967: 540–548.

Matthews, Fiona E., Antony Arthur, Linda E. Barnes, John Bond, Carol Jagger, Louise Robinson, and Carol Brayne. 2013. "A Two-Decade Comparison of Prevalence of Dementia in Individuals Aged 65 Years and Older From Three Geographical Areas of England: Results of the Cognitive Function and Ageing Study I and II." *The Lancet* 382/9902: 1405–1412.

McEniry, Mary. 2013. Research on Early Life and Aging: Trends and Effects (RELATE): A Cross-National Study. ICPSR 34241-v1. Ann Arbor, MI: Inter-university of Consortium for Political and Social Research (ICPSR).

_____. 2014. *Early Life Conditions and Rapid Demographic Changes in the Developing World: Consequences for Older Adult Health*. Springer Science and Business Media.

McLean, Gary, Jane Gunn, Sally Wyke, Bruce Guthrie, Graham C. M. Watt, David N. Blane, and Stewart W. Mercer. 2014. "The Influence of Socioeconomic Deprivation on Multimorbidity at Different Ages: A Cross-Sectional Study." *British Journal of General Practice* 64/624: e440–e447.

Michaud, Pierre-Carl, Dana Goldman, Darius Lakdawalla, Adam Gailey, and Yuhui Zheng. 2011. "Differences in Health Between Americans and Western Europeans: Effects on Longevity and Public Finance." *Social Science and Medicine* 73(2): 254–263.

Mills, Edward J., Celestin Bakanda, Josephine Birungi, Keith Chan, Nathan Ford, Curtis L. Cooper, Jean B. Nachega, Mark Dybul, and Robert S. Hogg. 2011. "Life Expectancy of Persons Receiving Combination Antiretroviral Therapy in Low-Income Countries: A Cohort Analysis From Uganda." *Annals of Internal Medicine* 155/4: 209–216.

Mills, Edward J., Till Bärnighausen, and Joel Negin. 2012. "HIV and Aging—Preparing for the Challenges Ahead." *New England Journal of Medicine* 366/14: 1270–1273.

Miret, Marta, Francisco Felix Caballero, Somnath Chatterji, Beatriz Olaya, Beata Tobiasz-Adamczyk, Seppo Koskinen, Matilde Leonardi, Josep Maria Haro, and Jose Luis Ayuso-Mateos. 2014. "Health and Happiness: Cross-Sectional Household Surveys in Finland, Poland, and Spain." *Bulletin of the World Health Organization* 92/10: 716–725.

Murray, Christopher J. L. and Alan D. López. 1996. *Global Health Statistics: A Compendium of Incidence, Prevalence, and Mortality Estimates for Over 200 Conditions*. The Global Burden of Disease and Injury 2. Boston, MA: Harvard University Press.

Murray, Christopher J. L., Sandeep C. Kulkarni, Catherine Michaud, Neils Tomijima, Maria T. Bulzacchelli, Terrell J. Iandiorio, and Majid Ezzati. 2006. "Eight Americas: Investigating Mortality Disparities Across Races, Counties, and Race-Counties in the United States." *PLoS Medicine* 3/9: e260.

Ng, Marie et al. 2014. "Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults During 1980–2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *The Lancet* 384/9945: 776–781.

Nadkarni, Girish N., Ioannis Konstantinidis, and Christina M. Wyatt. 2014. "HIV and the Aging Kidney." *Current Opinion in HIV and AIDS* 9/4: 340–345.

National Public Radio (NPR). 2015. "Born In 1898: World's Oldest Living Person Celebrates Birthday."

National Research Council (NRC). 2013. *Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience*. Washington, DC: The National Academies Press.

Negin, Joel and Robert G. Cumming. 2010. "HIV Infection in Older Adults in Sub-Saharan Africa: Extrapolating Prevalence From Existing Data." *Bulletin of the World Health Organization* 88/11: 847–853.

Negin, Joel, Robert Cumming, Sarah Stewart de Ramirez, Seye Abimbola, and Sonia Ehrlich Sachs. 2011a. "Risk Factors for Non-Communicable Diseases Among Older Adults in Rural Africa." *Tropical Medicine and International Health* 16/5: 640–646.

Negin, Joel, Monique van Lettow, Medson Semba, Alexandra Martiniuk, Adrienne Chan, and Robert G. Cumming. 2011b. "Anti-Retroviral Treatment Outcomes Among Older Adults in Zomba District, Malawi." *PLoS ONE* 6/10: e26546.

Negin, Joel, Bennett Nemser, Robert Cumming, Eliud Lelerai, Yanis Ben Amor, and Paul Pronyk. 2012. "HIV Attitudes, Awareness, and Testing Among Older Adults in Africa." *AIDS and Behavior* 16/1: 63–68.

Ng, Marie, Tom Fleming, Margaret Robinson, Blake Thomson, Nicholas Graetz, Christopher Margono, Erin C Mullany, and Stan Biryukov. 2015. "Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults During 1980–2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *The Lancet* 384: 766–81.

Ng, Marie, Michael K. Freeman, Thomas D. Fleming, Margaret Robinson, Laura Dwyer-Lindgren, Blake Thomson, Alexandra Wollum, Ella Sanman, Sarah Wulf, Allan D.Lopez, Christopher J. L. Murray, and Emmanuela Gakidou. 2014. "Smoking Prevalence and Cigarette Consumption in 187 Countries, 1980–2012." *Journal of the American Medical Association* 311/2: 183–192.

Ng, Nawi, Hoang Van Minh, Fikru Tesfaye, Ruth Bonita, Peter Byass, Hans Stenlund, Lars Weinehall, and Stig Wall. 2006. "Combining Risk Factors and Demographic Surveillance: Potentials of WHO STEPS and INDEPTH Methodologies for Assessing Epidemiological Transition." *Scandinavian Journal of Public Health* 34/2: 199–208.

Oeppen, Jim and James W. Vaupel. 2002. "Broken Limits to Life Expectancy." *Science* 296/5570: 1029–1031.

Olshansky, S. Jay, Daniel Perry, Richard A. Miller, and Robert N. Butler. 2007. "Pursuing the Longevity Dividend, Scientific Goals for an Ageing World." *Annals of New York Academy of Science* 1114: 11–13.

Olshansky, S. Jay, Toni Antonucci, Lisa Berkman, Robert H. Binstock, Axel Boersch-Supan, John T. Cacioppo, Bruce A. Carnes, Laura L. Carstensen, Linda P. Fried, Dana P. Goldman, James Jackson, Martin Kohli, John Rother, Yuhui Zheng, and John Rowe. 2012. "Differences in Life Expectancy Due to Race and Educational Differences Are Widening and Many May Not Catch Up." *Health Affairs* 31/8: 1803–1813.

Palloni, Alberto, Guido Pinto-Aguirre, and Martha Pelaez. 2002. "Demographic and Health Conditions of Ageing in Latin America and the Caribbean." *International Journal of Epidemiology* 31/4: 762–771.

Pathai, Sophia, Stephen D. Lawn, Clare E. Gilbert, Dagmara McGuinness, Liane McGlynn, Helen A. Weiss, Jennifer Port, Theresa Christ, Karen Barclay, Robin Wood, Linda-Gail Bekker, and Paul G. Shiels. 2013. "Accelerated Biological Ageing in HIV-Infected Individuals in South Africa: A Case-Control Study." *AIDS* 27/15: 2375–2384.

Pati, Sanghamitra, Sutapa Agrawal, Subhashisa Swain, John Tayu Lee, Sukumar Vellakkal, Mohammad Akhtar Hussain, and Christopher Millett. 2014. "Non Communicable Disease Multimorbidity and Associated Health Care Utilization and Expenditures in India: Cross-Sectional Study." *BioMedCentral Health Services Research* 14: 451.

Population Reference Bureau (PRB). 2007. "Underweight, Undernutrition, and the Aging." *Today's Research on Aging* 8: 1–5.

Preston, Samuel. 1976. *Mortality Patterns in National Populations With Special Reference to Recorded Causes of Death*. New York, NY: Academic Press.

Preston, Samuel H., Dana A. Glei, and John R. Wilmoth. 2011. "Chapter 4. Contribution of Smoking to International Differences in Life Expectancy." In Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen (eds.), *International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: The National Academies Press.

Preston, Samuel H., Andrew Stokes, Neil K. Mehta, and Bochen Cao. 2014. "Projecting the Effect of Changes in Smoking and Obesity on Future Life Expectancy in the United States." *Demography* 51/1: 27–49.

Prince, Martin J., Fan Wu, Yanfei Guo, Luis M. Gutierrez Robledo, Martin O'Donnell, Richard Sullivan, and Salim Yusuf. 2014. "The Burden of Disease in Older People and Implications for Health Policy and Practice." *The Lancet* 385/9967: 549–562.

Rizzuto, Debora, Nicola Orsini, Chengxuan Qiu, Hui-Xin Wang, and Laura Fratiglioni. 2012. "Lifestyle, Social Factors, and Survival After Age 75: Population Based Study." *British Medical Journal* 345: e5568.

Rockwood, Kenneth. 2005. "Frailty and Its Definition: A Worthy Challenge." *Journal of the American Geriatrics Society* 53/6: 1069–1070.

Rockwood, Kenneth, Xiaowei Song, Chris MacKnight, Howard Bergman, David B. Hogan, Ian McDowell, and Arnold Mitnitski. 2005. "A Global Clinical Measure of Fitness and Frailty in Elderly People." *Canadian Medical Association Journal* 173/5: 489–495.

Sabia, Severine, Alexis Elbaz, Aline Dugravot, Jenny Head, Martin Shipley, Gareth Hagger-Johnson, Mika Kivimaki, and Archana Singh-Manoux. 2012. "Impact of Smoking on Cognitive Decline in Early Old Age: The Whitehall II Cohort Study." *Archives of General Psychiatry* 69/6: 627–635.

Salomon, Joshua A., Haidong Wang, Michael K. Freeman, Theo Vos, Abraham D. Flaxman, Alan D. Lopez, and Christopher J. L. Murray. 2012. "Healthy Life Expectancy for 187 Countries, 1990–2010: A Systematic Analysis for the Global Burden Disease Study 2010." *The Lancet* 380/9859: 2144–2162.

Sanderson, Warren C. and Sergei Scherbov. 2010. "Remeasuring Aging." *Science* 329/5997: 1287–1288.

Schoenberg, Nancy E., Hyungsoo Kim, William Edwards, and Steven T. Fleming. 2007. "Burden of Common Multiple-Morbidity Constellations on Out-of-Pocket Medical Expenditures Among Older Adults." *The Gerontologist* 47/4: 423–437.

Smith, George Davey, Carole Hart, David Blane, and David Hole. 1998. "Adverse Socioeconomic Conditions in Childhood and Cause Specific Adult Mortality: Prospective Observational Study." *British Medical Journal* 316/7145: 1631–1635.

Steptoe, Andrew, Angus Deaton, and Arthur A. Stone. 2014. "Subjective Well-being, Health, and Ageing." *The Lancet* 385 (9968): 640–648.

Stevens, Gretchen A., Gitanjali M. Singh, Yuan Lu, Goodarz Danaei, John K. Lin, Mariel M. Finucane, Adil N. Bahalim, Russell K. McIntire, Hialy R. Gutierrez, Melanie Cowan, Christopher J. Paciorek, Farshad Farzadfar, Leanne Riley, Majid Ezzati, and the Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group (Body Mass Index). 2012. "National, Regional, and Global Trends in Adult Overweight and Obesity Prevalences." *Population Health Metrics* 10/22.

Stiglitz, Joseph E., Amartya Sen, and Jean-Paul Fitoussi. 2010. "Report by the Commission on the Measurement of Economic Performance and Social Progress."

Suzman, Richard, John R. Beard, Ties Boerma, and Somnath Chatterji. 2014. "Health in an Ageing World—What Do We Know?" *The Lancet* 385/9967: 484–486.

Tarry-Adkins, Jane L. and Susan E. Ozanne. 2014. "The Impact of Early Nutrition on the Ageing Trajectory." *Proceedings of the Nutrition Society* 73/2: 289–301.

Teo, Koon, Scott Lear, Shofiqul Islam, Prem Mony, Mahshid Dehghan, Wei Li, Annika Rosengren, Patricio Lopez-Jaramillo, Rafael Diaz, Gustavo Oliveira, Maizatullifah Miskan, Sumathy Rangarajan, Romaina Iqbal, Rafal Ilow, Thandi Puone, Ahmad Bahonar, Sadi Gulec, Ebtihal A. Darwish, Fernando Lanas, Krishnapillai Vijaykumar, Omar Rahman, Jephat Chifamba, Yan Hou, Ning Li, and Salim Yusuf. 2013. "Prevalence of a Healthy Lifestyle Among Individuals With Cardiovascular Disease in High-, Middle-, and Low-Income Countries: The Prospective Urban Rural Epidemiology (PURE) Study." *Journal of the American Medical Association* 309/15: 1613–1621.

U.S. Census Bureau. 2013. *International Data Base*. Available at <www.census.gov/population/international/data/idb/informationGateway.php>, accessed between January and November 2014.

Vinikoor, Michael J., Jessica Joseph, Jonas Mwale, Melissa A. Marx, Fastone M. Goma, Lloyd B. Mulenga, Jeffrey S.A. Stringer, Joseph J. Eron, and Benjamin H. Chi. 2014. "Age at Antiretroviral Therapy Initiation Predicts Immune Recovery, Death, and Loss to Follow-Up Among HIV-Infected Adults in Urban Zambia." *AIDS Research and Human Retroviruses* 30/10: 949–955.

Wallrauch, Claudia, Til Barnighausen, and Marie-Louise Newell. 2010. "HIV Prevalence and Incidence in People 50 Years and Older in Rural South Africa." *South African Medical Journal* 100/12: 812–814.

Wang, Haidong, Laura Dwyer-Lindgren, Katherine T. Lofgren, Julie Knoll Rajaratnam, Jacob R. Marcus, Alison Levin-Rector, Carly E. Levitz, Alan D. Lopez, and Christopher J. L. Murray. 2012. "Age-Specific and Sex-Specific Mortality in 187 Countries, 1970–2010: A Systematic Analysis for the Global Burden of Disease Study 2010." *The Lancet* 380/9859: 2071–2094.

Wilkerson, Hugh L.C. and Leo P. Krall. 1947. "Diabetes in a New England Town; Study of 3,516 Persons in Oxford, Mass." *Journal of the American Medical Association* 135/4: 209–216.

Wilmoth, John R., Carl Boe, and Magali Barbieri. 2011. "Chapter 12. Geographic Differences in Life Expectancy at Age 50 in the United States Compared With Other High-Income Countries." In Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen (eds.), *International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: The National Academies Press.

Wong, Evelyn, Christopher Stevenson, Kathryn Backholer, Mark Woodward, Jonathan E. Shaw, and Anna Peeters. 2015. "Predicting the Risk of Physical Disability in Old Age Using Modifiable Mid-Life Risk Factors." *Journal of Epidemiology and Community Health* 69/1:70–76

Woolf, Steven H. and Laudan Aron (eds). 2013. *U.S. Health in International Perspective, Shorter Lives, Poorer Health*. Washington, DC: The National Academies Press.

World Health Organization (WHO). 2008. T*he Global Burden of Disease: 2004 Update*. Geneva.

_____. 2012. *Global Health Observatory*. Available at <www.who.int/gho/en/>, accessed on October 10, 2014.

Wu, Fan, Yanfei Guo, Somnath Chatterji, Yang Zheng, Nirmala Naidoo , Yong Jiang, Richard Biritwum, Alfred Yawson, Nadia Minicuci, Aaron Salinas-Rodriguez, Betty Manrique-Espinoza, Tamara Maximova, Karl Peltzer, Nancy Phaswanamafuya, James J. Snodgrass, Elizabeth Thiele, Nawi Ng, and Paul Kowal. 2015. "Common Risk Factors for Chronic Non-Communicable Diseases Among Older Adults in China, Ghana, Mexico, India, Russia, and South Africa: The Study on Global AGEing and Adult Health (SAGE) Wave 1." *BioMedCentral Public Health* 15/88.

CHAPTER 5.

Health Care Systems and Population Aging

Increasing longevity will force adjustments to health care systems and finance, retirement policies and pensions, and likely labor and capital markets (Lutz, Sanderson, and Scherbov, 2008; Bloom, Canning, and Fink, 2010; Lee and Mason, 2011; National Research Council, 2012). Population aging is frequently placed in the framework of whether health services, welfare provision, and economic growth are sustainable, dismissing the substantial social, economic, and cultural contributions from older adults (Lloyd-Sherlock et al., 2012).

Aging is a concern for costs to health care systems, as much as health care costs are a concern for older people, especially in settings where there is limited institutional, human, and financial resource capacity to meet the basic needs of older people and where social safety nets do not exist. High-income countries may differ from low- and middle-income countries in readiness or resources available to provide health care for an aging population.

The growing number and share of older people in all societies are also posing an increasing burden to old age care. Institutional long-term care and informal care combined are some of the options to meet this challenge.

INCREASING FOCUS ON UNIVERSAL HEALTH CARE AND AGING

As part of the post-Millennium Development Goals set by the United Nations (UN), universal health coverage has become a focus for the post-2015 Sustainable Development Goals (United Nations, 2012). Multiple international organizations and many governments argue that health and other systems should be reformulated to eliminate or minimize inequalities and maximize healthy life expectancy, capabilities, and well-being in older ages (Sen, 1999; Krueger et al., 2009; Stiglitz, Sen, and Fitoussi, 2009; Marmot, 2013; Chatterji et al., 2015). The goal is for people at all ages to receive the health services they need without undue financial hardship.

The World Health Organization (WHO) defines the goal for universal health coverage (UHC) as ensuring that all people obtain the health services they need without risk of financial ruin or impoverishment, and presents the concept of UHC in three dimensions: (1) the health services that are needed, (2) the number of people that need them, and (3) the costs to whoever must pay (WHO, 2010; 2013). UHC is understood and implemented in many ways, with differences largely based on potential recipients, range and quality of services to be provided, and financing of those services (Stuckler et al., 2010; Global Health Workforce Alliance and World Health Organization, 2013; Global Health Watch, 2014). In some countries, UHC is viewed as a health insurance model that would provide a means-tested, basic package of limited services with a multitude of service buyers and providers, while in other countries it is a single provider, public tax-financed system based on the principles of equality of access for all who need care.

Today close to half of the countries worldwide are engaged in health reforms as a result of the resurgence in interest in UHC, and a little more than a half of the world population is covered for about half of the possible services they need (Boerma et al., 2014; Marzouk, 2014). Two years after the UN General Assembly Resolution on global health and foreign policy calling for UHC among all of its Member States (United Nations, 2012), a coalition of more than 500 organizations from more than 100 countries marked December 12, 2014, as the first-ever Universal Health Coverage Day (Universalhealthcoverageday.org, 2014; WHO and World Bank, 2015).

However, significant differences remain between more developed countries and less developed countries in coverage level (Table 5-1), and the urban/rural divide in health coverage and access is consistent across the world (Scheil-Adlung, 2015). Furthermore, challenges common to all health care systems extend beyond coverage and include financing and quality (Massoud, 2014; USAID Health Finance and Governance Project, 2015).

There is considerable evidence that population aging does not contribute substantially to growing health care costs (Geue et al., 2014; Bloom et al., 2015; Yu, Wang, and Wu, 2015). Public health and health care systems that successfully reorient toward the health and long-term care needs of the older population may help produce a "triple dividend—thriving lives, costing less, contributing more" (Early Action Task Force, 2014). Given this, the implications of population aging on systems are far from bleak if governments make the necessary and targeted changes in the face of population aging (Economist Intelligence Unit, 2009; Bloom et al., 2015). Nevertheless, aging will demand action on health care for the older population (Boerma et al., 2014).

HEALTH SYSTEMS IN RESPONSE TO AGING

The contribution of health care systems to population health has long been contested, and while some believe that health care does not contribute significantly to health, evidence is now emerging that systems which promote the adoption of healthy lifestyles are improving or maintaining the health of older people (Cutler, Landrum, and Stewart, 2006; McKee et al., 2009).

In both more developed and less developed countries, chronic noncommunicable diseases are the main causes of mortality, morbidity, and disability in old age. Yet, throughout the world, health systems are mainly designed to provide episodic acute care. In particular, health services geared to the needs of older people would need to be strengthened and better integrated with other levels of care to provide the continuum of chronic care required (Tinetti, Fried, and Boyd, 2012). The primary health care system is also the best channel to provide support to the informal caregiver who provides long-term, home-based care to a dependent older person.

Table 5-1.
Country Distribution of Share of Population Without Legal Health Coverage by Region

Region	Total number of countries studied	0% without coverage		1–49% without coverage		50–74% without coverage		75–100% without coverage	
		Number of countries	Percent of region	Number of countries	Percent of region	Number of countries	Percent of region	Number of countries	Percent of region
Africa	47	4	8.5	8	17.0	6	12.8	29	61.7
Asia	43	14	32.6	16	37.2	6	14.0	7	16.3
Europe	40	19	47.5	20	50.0	0	0.0	1	2.5
Latin America and the Caribbean	31	6	19.4	9	29.0	5	16.1	11	35.5
Northern America	2	1	50.0	1	50.0	0	0.0	0	0.0
Oceania	4	4	100.0	0	0.0	0	0.0	0	0.0

Notes: Legal health coverage is defined as percentage of population affiliated to or registered in a public or private health system or scheme.
Number of countries includes only countries with available data for legal health coverage; data as of latest available year.
Source: Scheil-Adlung, 2015. (Percentage distribution calculated based on the Statistical Annex.)

The demographic transition is shifting population epidemiology from primarily acute infectious disease to primarily chronic infectious and noninfectious disease. This alone would suggest a need to reorient health systems to ensure services meet population needs, where health and social services are integrated, with continuity of care across different services. Aging populations will have different health care needs, with more people affected by dementia, stroke, cancer, fractured hips, osteoporosis, Parkinson's disease, lower back pain, sleep problems, and urinary incontinence, for example. As mentioned in Chapter 4, it is also likely that the complexity of health problems will increase as populations age, with more multimorbidity and risk factor clustering, resulting in a plethora of treatments that potentially interact with each other (Dubois, McKee, and Nolte, 2006; Boyd and Fortin, 2010). This complexity makes coordination of care across health and social services and integration across different levels of care particularly important. Some of this care might be provided at home, rather than in a facility—regardless, primary care providers with geriatric training or a comprehensive geriatric assessment in all settings provide better outcomes (Ellis et al., 2011; O'Neill, 2011). Health system reforms that incorporate people-centered health services that are sensitive to the health needs at all ages over the life course, including geriatric assessments in older age, would be an effective approach to integration of care services (WHO, 2015).

Even before needing formal or informal care, increased primary or secondary prevention efforts could have significant impacts on health in older age, such as tobacco cessation, cognitive training, and immunization programs for vaccine-preventable diseases stemming from human papillomavirus, influenza- and pneumococcal-related infections (Esposito et al., 2014).

Additionally, greater attention to the unique needs of aging minority populations by the health and social systems may improve their healthy life expectancy. All older adults would benefit from appropriate and well-coordinated health and social policies, thereby slowing the rate of age-related health decline and the subsequent amount of services required (Goldman et al., 2013).

Previous research on utilization of health services at old age in individual countries has found that use peaks at about 80 years of age, falling in those who are older (McGrail et al., 2000; Kardamanidis et al., 2007). These findings were confirmed in the Survey of Health, Ageing, and Retirement in Europe (SHARE) which surveyed 20,000 Europeans over age 50 across 11 countries. The survey found that the use of health services peaks at ages 75 to 79, levels off at age 80, and falls among those older than 85 years (Chawla, Betcherman, and Banerji, 2007). The Study on global AGEing and adult health (SAGE) surveyed 35,000 people aged 50 and older across six middle- and lower-income countries and found that the 70–79 age group had the highest likelihood of using both outpatient and inpatient services (Peltzer et al., 2014).

Box 5-1.

Global Aging and Minority Populations: Healthcare Access, Quality of Care, and Use of Services

By *Karen I. Fredriksen-Goldsen, University of Washington*

In addition to the common concerns about aging, older adults from minority and migrant groups face additional worries about support and access to services as they age. Barriers and discrimination at many levels may impact access to needed services for themselves or loved ones, formal financial arrangements and security, and physical accommodation in older age. The impact of discrimination and ongoing disadvantage over a lifetime are borne out by recent numbers: lower life expectancies and higher disease burdens.

Despite recent attention, the gaps in life expectancy and other indicators are not closing, for instance, in indigenous populations in Australia, Canada, and New Zealand, and for those with lower levels of education (Olshansky et al., 2012; Mitrou et al., 2014). The variations in health often reflect differences by group status such as race, ethnicity, immigration, socioeconomic status, sexual and gender identities, and physical and mental abilities (National Institutes of Health, 2013). This is likely compounded by additional language, linguistic, and cultural barriers (Warnes et al, 2004; Bramley et al., 2005; Sayegh and Knight, 2013). Among lesbian, gay, bisexual, and transgender (LGBT) older adults, experiences of discrimination and victimization are linked to poor health outcomes, yet they often experience barriers to accessing care and remain largely invisible in services given their stigmatized identities (Fredriksen-Goldsen et al., 2011; Fredriksen-Goldsen et al., 2013). Among those with intellectual, emotional, and physical disabilities, adjustments in healthcare information are often needed to better match capacity (Emerson et al., 2011).

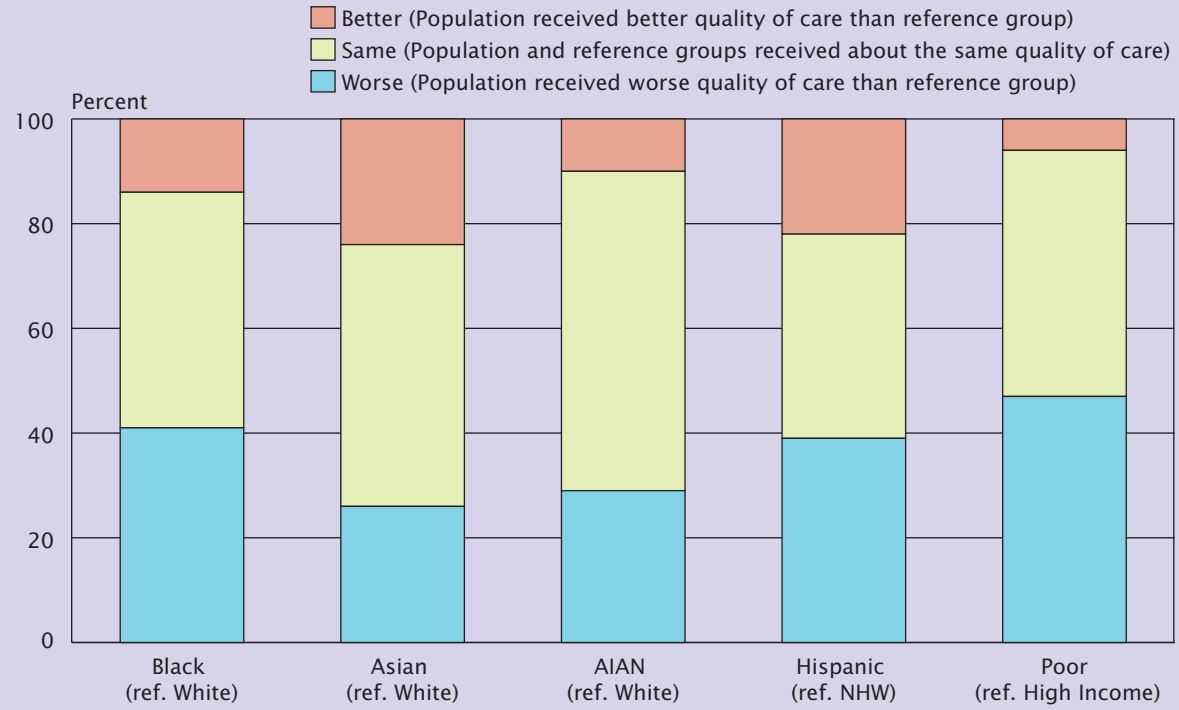
Health inequities, resulting from economic, environmental, and social disadvantage, are costly. In the United States, where the 65-and-older population has nearly complete health care coverage by Medicare, it is estimated that among Blacks, Hispanics, and Asian Americans, nearly one-third of direct healthcare expenditures are excess costs as a result of health inequities (LaVeist, Gaskin, and Richard, 2009). Furthermore, when examining differences in health care quality in the United States, those living in poverty, compared to those with high incomes, received worse care for 47 percent of the quality measures; people aged 65 and older received worse care for 39 percent of the quality measures compared to adults aged 18 to 44 (Figure 5-1; Agency for Healthcare Research and Quality, 2012). There were also significant differences by race and ethnicity. Ensuring appropriate access to and use of care and quality care are critical factors in the promotion of health, especially for racial and ethnic minorities, indigenous and aboriginal people, immigrants, LGBT people, as well as those with intellectual, emotional, and physical disabilities.

Across population groups, several factors have been linked to inequities in health, including the heightened risk of exposure to social determinants of poor health (such as poverty, unemployment, isolation, and discrimination) and other structural and organizational barriers, including lack of available services and institutional and societal biases in services as well as policies (Braveman, Egerter, and Williams, 2011). In addition, older adults from these population groups may be at elevated risk of adverse health behaviors as well as at risk of reduced health literacy. They may also be reluctant to utilize healthcare services, preventative screenings, and other health promotion activities. Promoting health equity, embedded within a life course perspective, is critical for older adults across diverse population groups to have the capacity to reach their full health potential (Fredriksen-Goldsen et al., 2014).

Continued on next page.

Figure 5-1.

Proportion of Quality Measures for Which Members of Selected Groups Experienced Better, Same, or Worse Quality of Care Compared With Reference Group in the United States: 2011



AIAN American Indian or Alaska Native. NHW Non-Hispanic White.
Note: "ref." is reference groups.
Source: Agency for Healthcare Research and Quality, 2012.

HEALTH SYSTEM'S RESPONSE TO AGING IN HIGH-INCOME COUNTRIES

Older population in higher-income countries are typically further along the epidemiologic transition; however, many of the existing health care systems were created at the early stages of the antibiotic era and still need to evolve to provide well-coordinated and integrated care for chronic diseases. Health systems in high-income countries are at different stages of this evolution, but most have cost and continuity of care issues related to long-term treatment of chronic conditions. In some cases, the systems themselves, to some extent, shape population preferences (Mair, Quinones, and Pasha, 2015). Regardless of preferences though, removal of financial and other barriers to access, through universal coverage efforts, would benefit all people including vulnerable populations in wealthier countries (Nolte and McKee, 2012).

Just as national health and social systems are at different stages in their service capacity, some countries have older adult populations with declining disability, while other countries have increasing

disability (Wahrendorf, Reinhardt, and Siegrist, 2013). These systems will need to invest in patient-centered prevention, treatment, and palliation in correct proportions and across an integrated continuum, incorporate cutting-edge knowledge of what improves health as a population ages—not necessarily expensive new technology—and offer health prevention opportunities across the life course so that individuals arrive at older age in a healthier state (Fried and Paccaud, 2012). Such health care models would need a multidisciplinary team to deal with diverse health needs, including increasing illness complexity, disability, and frailty.

HEALTH SYSTEM'S RESPONSE TO AGING IN LOW- AND MIDDLE-INCOME COUNTRIES

The competition for resources is strong in all countries—albeit, at different starting points in terms of level of existing infrastructure, human resources, and available finances and mechanisms for cost-sharing (Ali et al., 2013). The rate of aging in lower-income countries today means that governments will have less time to prepare than higher-income countries have had in the past. Fortunately, international attention to achieving universal health care has the potential to stimulate national political will, as well as financial and technical assistance.

Regarding infrastructure, few low- and middle-income countries have vital registration systems with high coverage of deaths, a cornerstone of well-functioning health systems; whereas high-income countries are more likely to have accurate and complete vital registration systems (United Nations Statistics Division, 2014). Another important difference is in the quality of care, often quite low in many low-income countries, with few professionals trained to provide multidisciplinary geriatric care. Further complicating matters is the loss of professionals trained in lower-income countries to positions in higher-income countries (Aluttis, Bishaw, and Frank, 2014).

Increasingly though, populations are demanding that better health services be provided without causing financial hardship: the top priority of African and Asian respondents to a recent UN survey (Kruk, 2013). Beyond provision of a public good, governments may gain public trust as a result of improving health system access and performance (Rockers, Kruk, and Laugesen, 2012).

HEALTHCARE COST FOR AGING POPULATIONS

A debate as robust as the ones about lifespan limits and the compression of morbidity (see Chapter 4) is raging about the role of aging populations on increasing health care costs (Peterson, 1999; Wallace, 1999; Heller, 2006; McKee et al., 2009; The Economist, 2009; Bloom et al., 2015). Despite the fact that increased longevity underscores one of the most remarkable human success stories of any era, there are serious concerns about the potential economic consequences of this global trend for rich and poor countries alike. Yet, evidence about the contribution of late life costs to lifetime health care costs is somewhat mixed (Alemayehu and Warner, 2004; Martini et al., 2007; Suhrcke et al., 2008; Ogawa et al., 2009; Payne et al., 2009; Center for Studies on Aging—Lebanon, 2010; Tchoe and Nam, 2010; Medici, 2011; World Bank, 2011).

While health care costs at the individual level are largely driven by ill health, hosts of demographic and nondemographic factors are driving costs for the entire health system. Aging is just one of the demographic contributors; others include urbanization, migration, and family/household structures. Numerous nondemographic factors contribute to health care costs, including technological advances in health care, increasing use of technology, and higher female employment levels—resulting in less informal (unpaid) caregiving (Rechel et al., 2009). While somewhat limited data are available, the current evidence suggests that health costs are highest around the beginning and end of life in many countries, and that the final 2 years before death consume around one-quarter of one's lifetime health cost, regardless if one is young or old (Economist Intelligence Unit, 2009; Ji-yoon, 2010). Nonetheless, and noting the limitations of available research, at the population level and removing proximity to death, longer life does not necessarily correlate with higher health expenditure, (Felder, Zweifel, and Werblow, 2006; Seshamani and Gray, 2004; Felder, Werblow, and Zweifel, 2010).

Chronic conditions are, on average, typically more costly to treat than acute, time-limited infectious diseases. While older adults are more likely to have chronic diseases, population aging alone has been found to contribute only a small amount to health spending growth (White, 2007; Martin, Gonzalez, and Garcia, 2011; Xu, Saksena, and Holly, 2011; de Meijer et al., 2013). Current evidence suggests that the promotion of "healthy" or "active" aging may reduce lifetime health care expenditure (Dormont et al., 2008; Suhrcke et al., 2008; Fried, 2011).

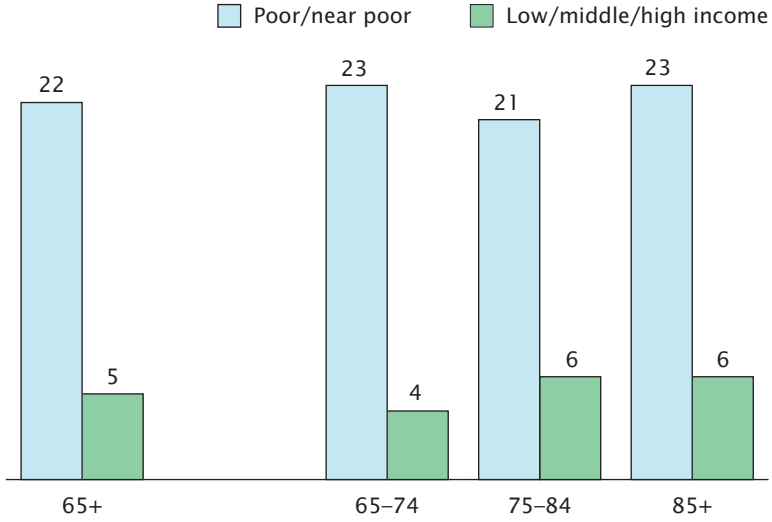
The contribution from population aging on overall health spending remains difficult to clearly delineate. We do know that older adults are typically high users of care, this population group is growing in number, and per capita health costs continue to grow in many countries (de la Maisonneuve and Martins, 2013). A challenge for governments will be to slow or stop ever-growing health spending as a proportion of gross domestic product (GDP) where population aging is likely acting as a modest cost driver (Appleby, 2013; OECD 2015). Encouragingly, the proportion of public-sector health spending on older adults (as a percentage of GDP) did not change significantly in Canada between 2002 (44.6 percent) and 2012 (45.2 percent), although there was considerable variability across different regions in the country (Canadian Institute for Health Information, 2014). Furthermore, total aging costs as a percentage of GDP in the European Union have been revised downwards in recent forward projection analyses from 3.5 percent to 1.5 percent (European Commission, 2015).

COST IS ONE THING . . .

It is essential to reform the health care financing system when dealing with an aging population (Economist Intelligence Unit, 2009). It may well be that aging contributes only a small amount to overall health care spending growth in high-income countries. Given the clear positive relationship between wealth and health spending at the country and individual levels, the association between aging and health expenditures may differ by level of country development or by the wealth of individuals within countries. Even in high-income countries like the United States, the burden of out-of-pocket expenditures was considerably higher for poorer than wealthier older adults (Figure 5-2). Poor or near poor U.S. households with older adults had 3 to 5 times higher out-of-pocket health care costs as a percentage of household income than wealthier households.[1] Overall though, out-of-pocket expenditures as a percentage of household income in the United States was below the 2009 average for Organisation for Economic Co-operation and Development (OECD) countries, suggesting a considerable impact in many high-income countries (Organisation for Economic Co-operation and Development, 2011).

[1] Out-of-pocket expenses for U.S. older adults depend on health status.

Figure 5-2.
Out-of-Pocket Health Care Expenditures as a Percentage of Household Income by Age Group and Income Category in the United States: 2009



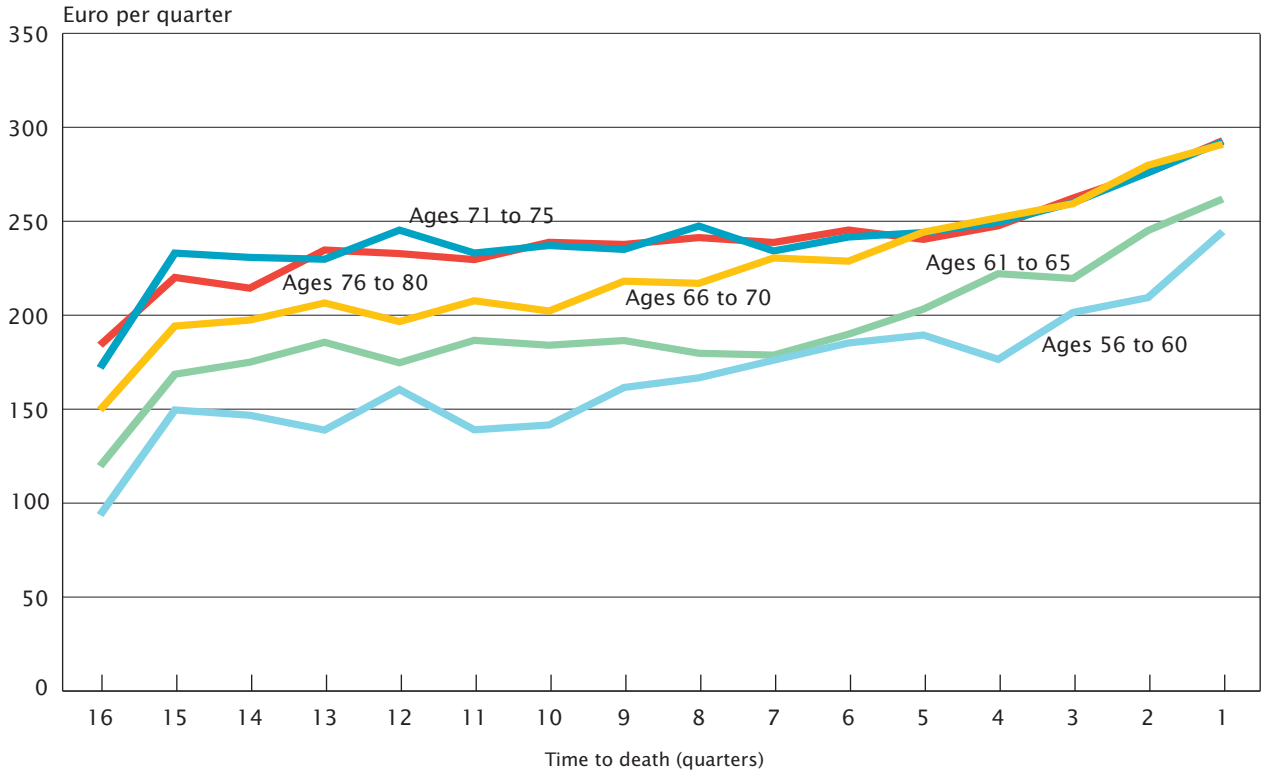
Source: Federal Interagency Forum on Aging-Related Statistics, 2012.

In high-income countries, costs may also differ by type of care. An example from Italy shows generally higher costs for primary care in older adults than younger adults, somewhat attenuated with proximity to death (Figure 5-3), but also notes higher inpatient costs for younger adults than older adults (Atella and Conti, 2014). A study in New Zealand with more comprehensive health system spending data also found wide variation in costs by age (with costs per person-year highest at age 0 and ages 80 and over), but the variation was substantially less among people within 6 months of death (Blakely et al., 2014). With rising life expectancy, projections of health spending should separate end-of-life expenditures and expenditures for those not about to die, otherwise future health costs will be overestimated (ibid.).

Meanwhile, in middle- and low-income countries, demographic and epidemiological shifts are creating higher costs for care and financing systems not yet adapted to providing the type of chronic care required at a reasonable cost. At the individual level, the burden of noncommunicable diseases is already large for the adult population overall and may start at earlier ages in many lower-income countries, providing additional rationale to start reconfiguring health systems sooner rather than later (Engelgau et al., 2011; Robinson and Hort, 2012). Costs from ongoing chronic care can be especially debilitating for households in low- and middle-income countries where a much higher percentage of health costs are out-of-pocket, compared to high-income countries; however, considerable challenges remain for the uptake of health insurance in these settings (Schieber et al., 2006; Acharya et al., 2012; Kruk, 2013).

In a number of middle- and low-income countries, a long lag exists in increasing per capita health expenditure in line with growth in national income. Even so, a system overall that views chronic disease management as serial acute episodes necessitating more interaction with care providers is not a sustainable arrangement (Allotey

Figure 5-3.
Predicted Quarterly Primary Care Costs by Time to Death and Age in Italy: 2006–2009



Source: Atella and Conti, 2014. Adapted from Figure 1.

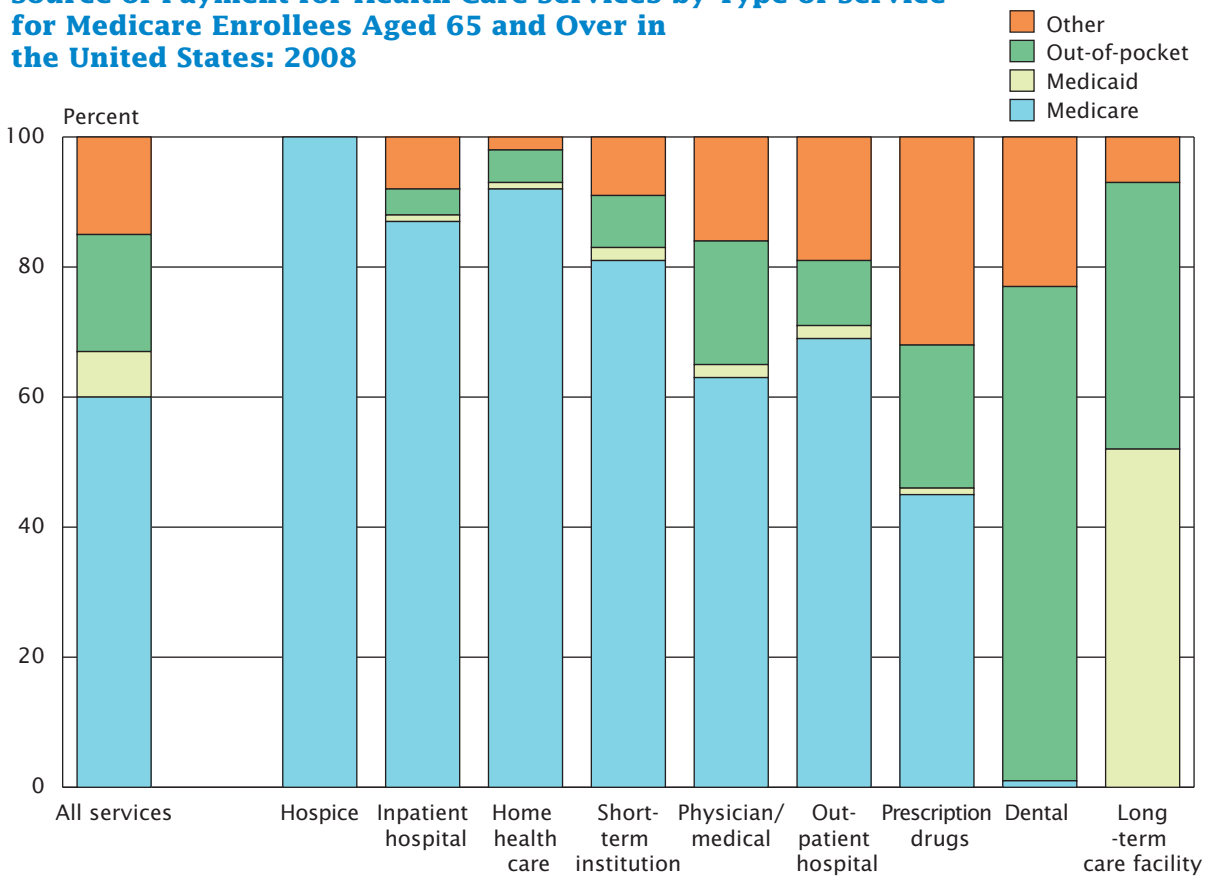
et al., 2011; McKee, Basu, and Stuckler, 2012). From a systems perspective, inequalities in health worker distribution within countries are often significant. Without incentives, health professionals will remain concentrated in urban centers, while many older people will continue to live in rural settings even with current urbanization trends. Financing of health systems is an increasing concern for economies as a whole when considering the growth in overall population sizes, the benefits of universal coverage, and the need to provide social protection in older age. The costs and financing of care should be examined in light of all drivers of health spending, not just aging.

. . . ABILITY TO PAY IS ANOTHER

When faced with health care costs, a large portion of the global population do not benefit from cost sharing schemes, such as health insurance, that would defray potentially impoverishing health expenses (Saksena, Hsu, and Evans, 2014). These individuals and households may delay or forgo needed health care. This happens more often in lower-income countries where formal health insurance is rare, but cost and access are also a concern for poorer and vulnerable populations in high-income countries. A high percentage of costs for drug, dental, and long-term care facility services are out-of-pocket for U.S. older adults covered by Medicare insurance (Figure 5-4).

While not guaranteed, provisions for health care in older age are more often available for those living in countries with social protection systems, or with universal care schemes. Those without insurance coverage or not living in countries with social protection schemes are forced to rely on alternative financing mechanisms. These coping mechanisms provide important information about how households deal with payments and also income loss from inability to work (Leive and Xu, 2008). For example, almost 26 percent of households

Figure 5-4.
Source of Payment for Health Care Services by Type of Service for Medicare Enrollees Aged 65 and Over in the United States: 2008



Note: "Other" refers to private insurance, Department of Veteran's Affairs, and other public programs.
Source: Federal Interagency Forum on Aging-Related Statistics, 2012.

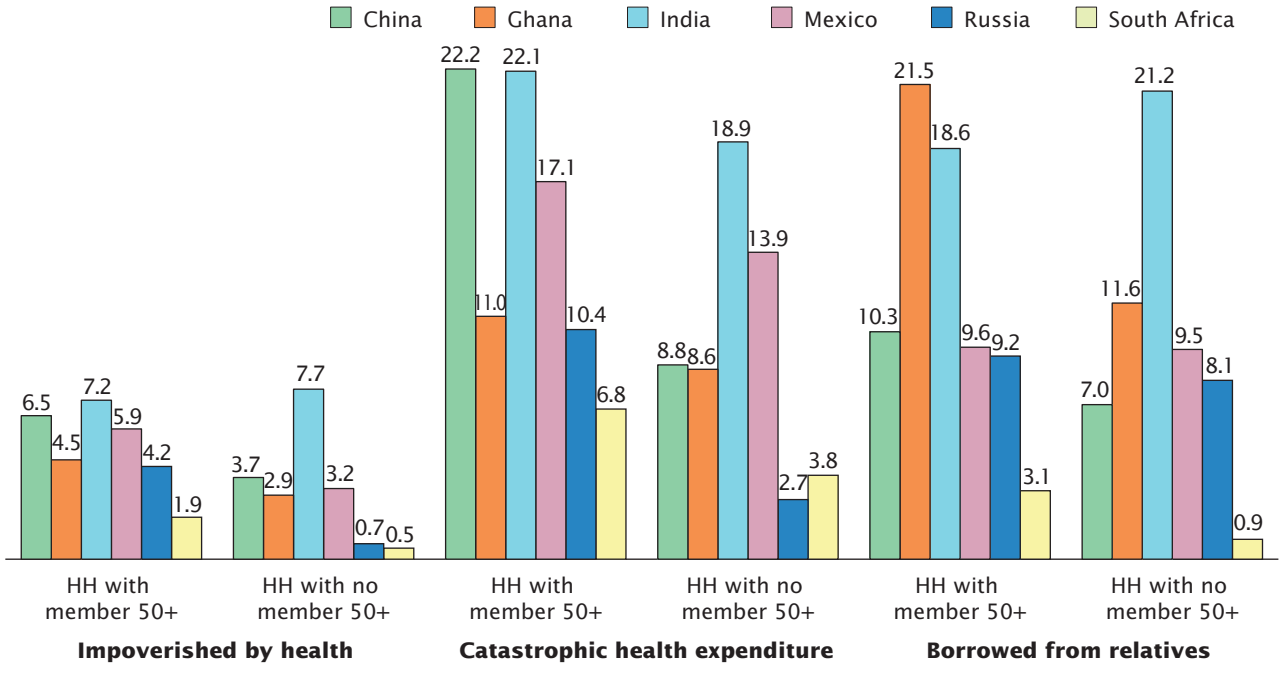
from 40 low- and middle-income countries borrowed money or sold items to pay for health care (Kruk, Goldmann, and Galea, 2009).

WHO's SAGE also provides a recent look at the microeconomic impact of aging on both households and individuals (He, Muenchrath, and Kowal, 2012). A larger financial burden was seen in households with members aged 50 and older in all six countries. Households with older adult members tended to have higher rates of impoverishment and face higher rates of catastrophic payment experience (Figure 5-5). These increased demands on personal financial resources resulted in increased borrowing from relatives and, consequently, amplified the burden on the broader family and the household unit. Increased borrowing from family members and relatives suggests a need for financial support or improved access to risk pooling for health care costs. Formalized solutions which address this need, such as publicly funded health care that is free or (highly) subsidized at the point of use, can alleviate the burden not only on the individual but also on the extended household.

LONG-TERM CARE NEEDS AND COSTS WILL INCREASE

Long-term care use consists of a broad continuum of care, use of which will undoubtedly increase with population aging (Rechel et al., 2009). Unlike health care costs, a strong positive correlation is seen with long-term care costs and increasing size of the older adult population. Long-term care refers to services for persons who have chronic, ongoing health and functional dependency. Age and disability are two main predictors of long-term care need and expenditures (Giovannetti and Wolff, 2010; Olivares-Tirado et al., 2011; de Meijer et al., 2013). While we know populations are aging, the evidence about levels of current and projected disability remains unclear (Chapter 4). The percentage of those aged 65 and older receiving long-term care exceeded 15 percent in seven OECD countries in 2011 (Figure 5-6).

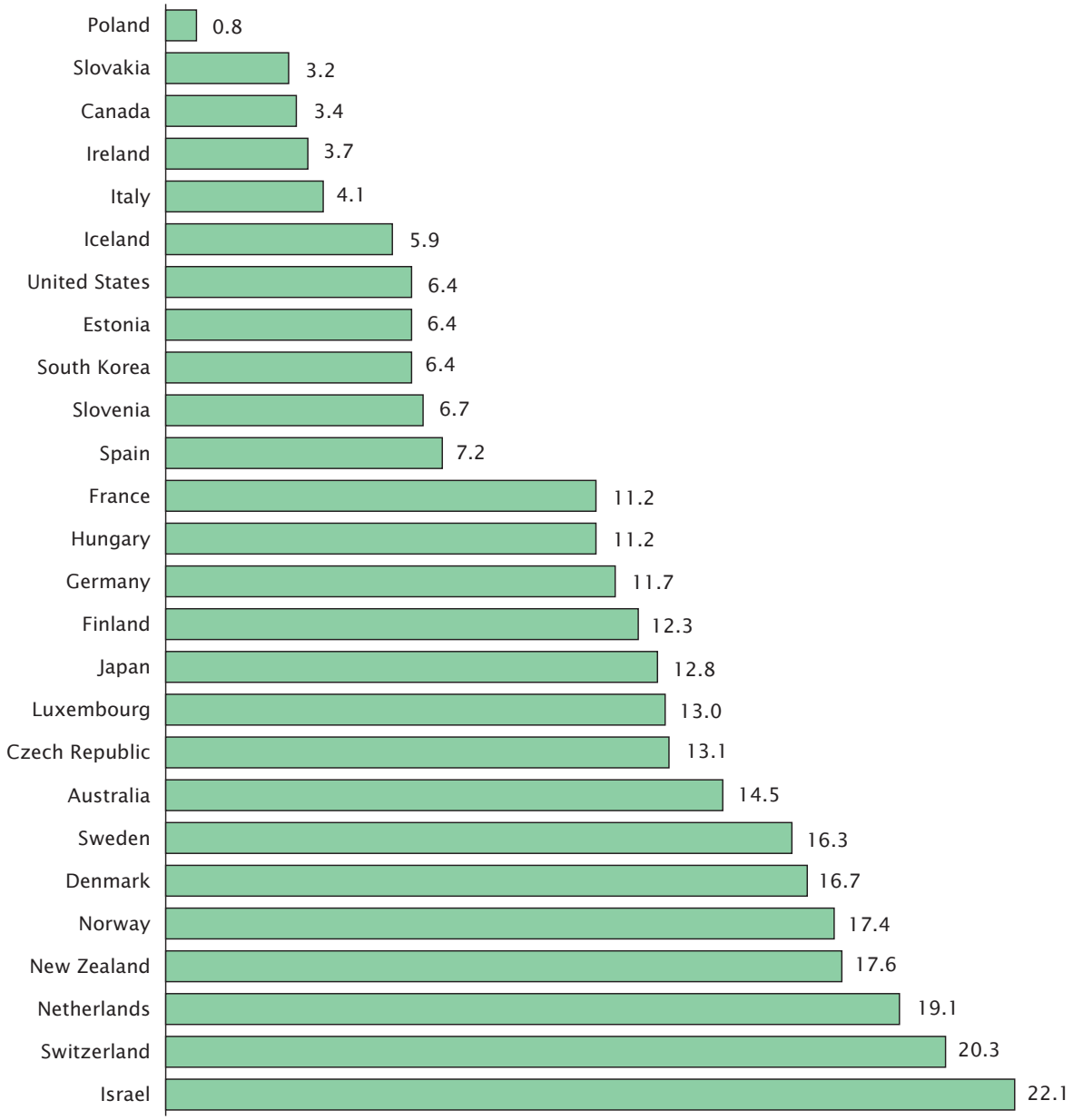
Figure 5-5.
Financial Impacts of Having a Household Member Aged 50 and Over in Six Middle-Income Countries: 2007–2010



HH Household.
Notes: A nonpoor household is considered to be impoverished by health payments when it becomes poor after paying for health care. Catastrophic expenditures are out-of-pocket payments of at least 40 percent of a household's capacity to pay nonsubsistence spending. For more information, see Xu et al., 2003.
Source: Bloom et al., 2015. Adapted from Figure 5.

Figure 5-6.

Percentage Receiving Long-Term Care Among Population Aged 65 and Over in Selected Countries: Circa 2011



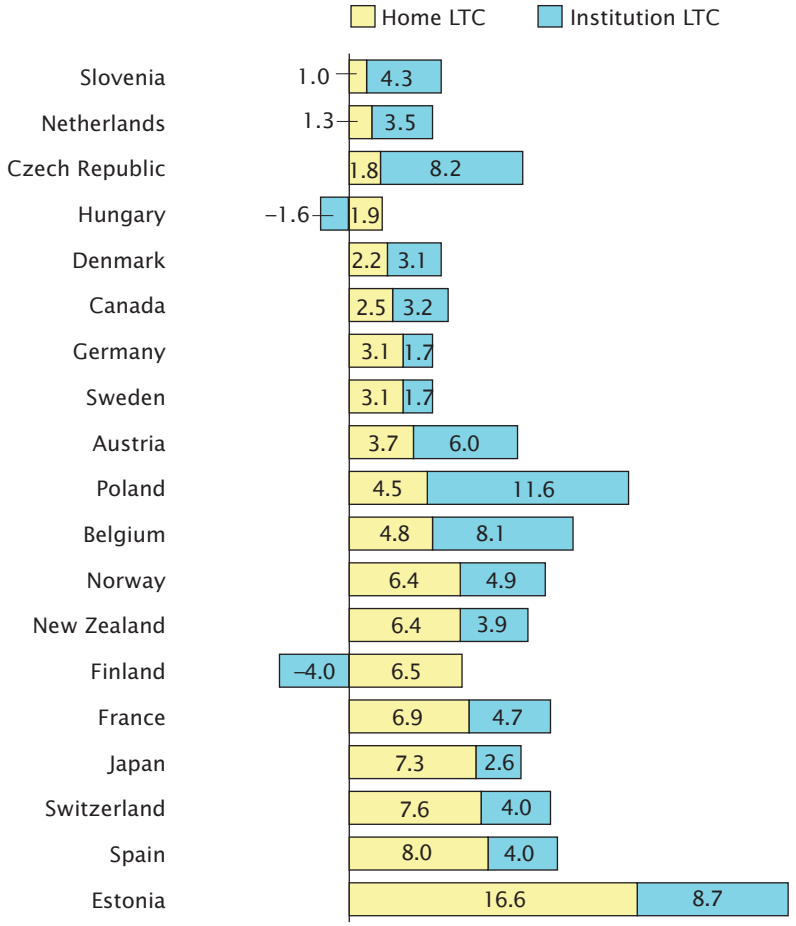
Note: Long-term care includes services provided at home or in institutions (nursing and residential care facilities which provide accommodation and long-term care as a package).
Source: Organisation for Economic Co-operation and Development, 2013.

A wide range of funding sources are used for long-term care, with four common models: (1) a special long-term care insurance scheme, as in Germany, Japan, and South Korea; (2) general taxation, as in Austria; (3) a combination of insurance, general taxation, and private contributions, as in Greece; and (4) special programs, as in the Netherlands (Chawla, Betcherman, and Banerji, 2007). Private cofunding also plays a role in almost all European countries. However, the annual growth in public long-term care spending increased in most OECD countries between 2005 and 2011 (Figure 5-7); over the same period, the growth in spending on institutional long-term care decreased in Finland and Hungary.

Long-term care programs also differ in terms of whether they cover people needing such care at all ages or are limited to older people, whether there is means testing, the degree of cost-sharing, the scope and depth of coverage, and whether they support care by family members or by trained and supervised staff (Tamiya et al., 2011). Regardless, there is substantial scope for better organization and coordination of services (Kendrick and Conway, 2006).

Outside of wealthy countries, long-term care remains a neglected policy issue. The common view in lower-income countries relates to the primacy of family provision

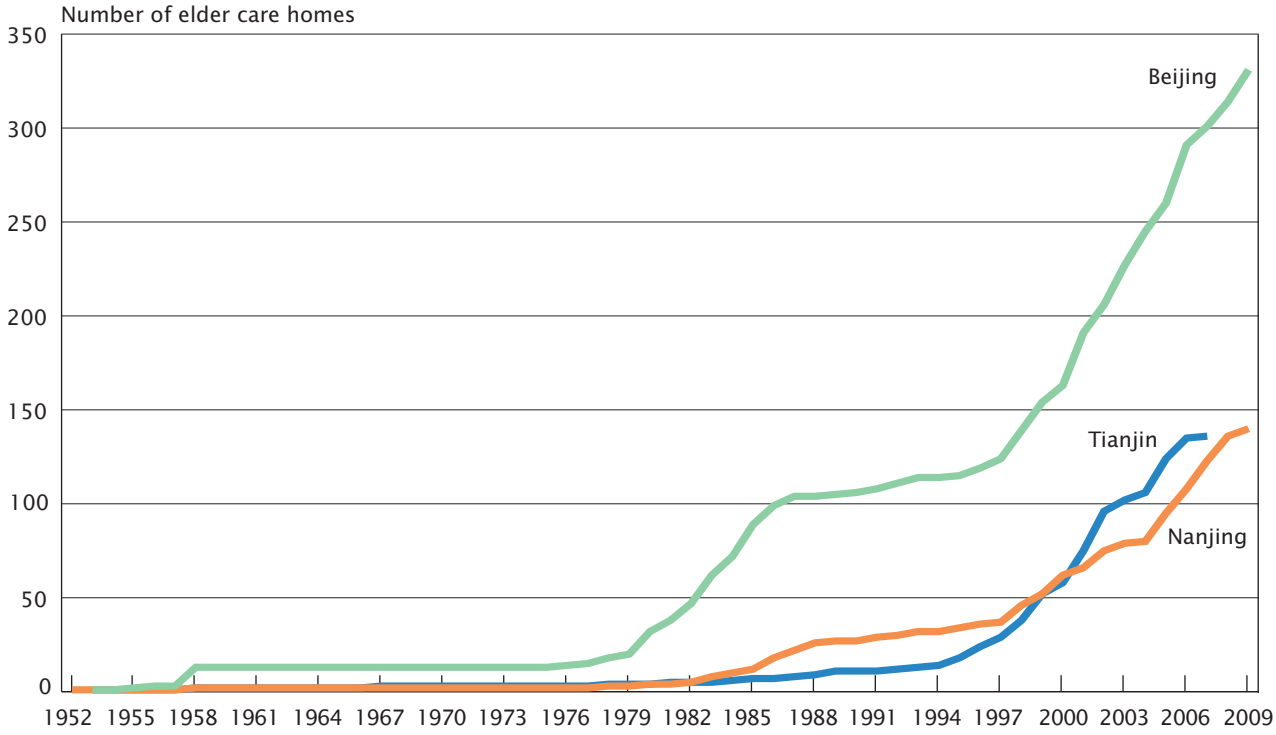
Figure 5-7.
Annual Growth Rate in Public Expenditure on Long-Term Care (LTC) in Institutions and at Home in Selected Countries: 2005–2011



Source: Organisation for Economic Co-operation and Development, 2013.

of long-term care. This assumes continued material and nonmaterial family support in the face of widely documented demographic and economic shifts. In many lower-income countries, although also in high-income countries, longstanding assumptions about families taking care of older people, including health care expenses, are breaking down—as young people move to cities, more women enter the labor force, couples have fewer children, and intergenerational spacing becomes greater. As a result of these realities, social attitudes towards formal care in these settings may already be shifting. In China, for example, where the Constitution stipulates that "children who have come of age have the duty to support and assist their parents," institutional elder care was virtually unknown until recent years (Feng et al., 2011). However, some major cities have seen dramatic growth in elder care homes operated by the city government (Figure 5-8).

Figure 5-8.
Cumulative Growth in Elder Care Homes in Selected Chinese Cities: 1952 to 2009



Note: Elder care home is defined as a provider of institutional long-term care services licenced by the city government.
Source: Feng et al., 2011. Adapted from Figure 2.

Box 5-2.

Social Networks and Health Care Utilization

In recent years, a wide range of technological innovations, such as robot nurses and telemedicine, has been developed in the United States, Europe, and Asia, to help care for older people (Economist Intelligence Unit, 2009). While technology will undoubtedly play an increasing role in future health care systems, social interactions and relationships remain one of the drivers of health, behaviours, and health care utilization worldwide.

Social interactions and networks influence a wide range of behaviours and decisions in life, including some impacting health that are quite remarkable—from recovery after a heart attack and susceptibility to the common cold, to the dynamic spread of negative (smoking and obesity) and positive (happiness) factors for health (Berkman, Leo-Summer, and Horwitz, 1992; Cohen et al., 1997; Christakis and Fowler, 2007; Christakis and Fowler, 2008; Fowler and Christakis, 2008). Social integration also plays a considerable role in preserving memory as we age (Ertel, Glymour, and Berkman, 2008; Wang, He, and Dong, 2015).

Equally astonishing are recent findings about the role of social connectedness in disease pathways: experimentally induced inflammation in otherwise healthy women and men contributed to greater increases in depressed mood and feelings of social disconnection among women—suggesting a better understanding of sex differences in depression prevalence and a possible avenue for interventions (Moieni et al., 2015). One such health promoting intervention had a positive impact on social support and healthy lifestyle in a small sample of adults aged 60 to 73 in Tehran (Foroushani et al., 2014), and multiple interventions to reduce loneliness in older adults show promise (Cohen-Mansfield and Perach, 2015).

Social isolation, on the other hand, has been shown to be detrimental to health in older adults, including higher all-cause mortality risk (Holt-Lunstad, Smith, and Layton, 2010; Shankar et al., 2011; Steptoe et al., 2013). In another cohort of older community-dwelling adults, lack of social activity was associated with disability (James et al., 2011). Similarly, some social relationships have the potential for a health damaging effect in older adults (Seeman, 2000).

Social relationships are critical for well-being in older adults and are also central to health maintenance over the life course. Reaching older age in better health, partly as a result of strong positive social relationships, would decrease health service needs and demands, yet the direct evidence behind the peer effect of social networks on health care utilization in older age is sparse (Wang, He, and Dong, 2015). Researchers in the United States showed how social relationships influenced the prevalence of having visited a dentist (Watt et al., 2014) and a significant association with health service demand (Wang, He, and Dong, 2015). A study in Canada found that social networks influence health care utilization through two main channels—sharing of information and social norms (Deri, 2005). How this extends to older people in lower income countries and the impact of social media remains to be determined.

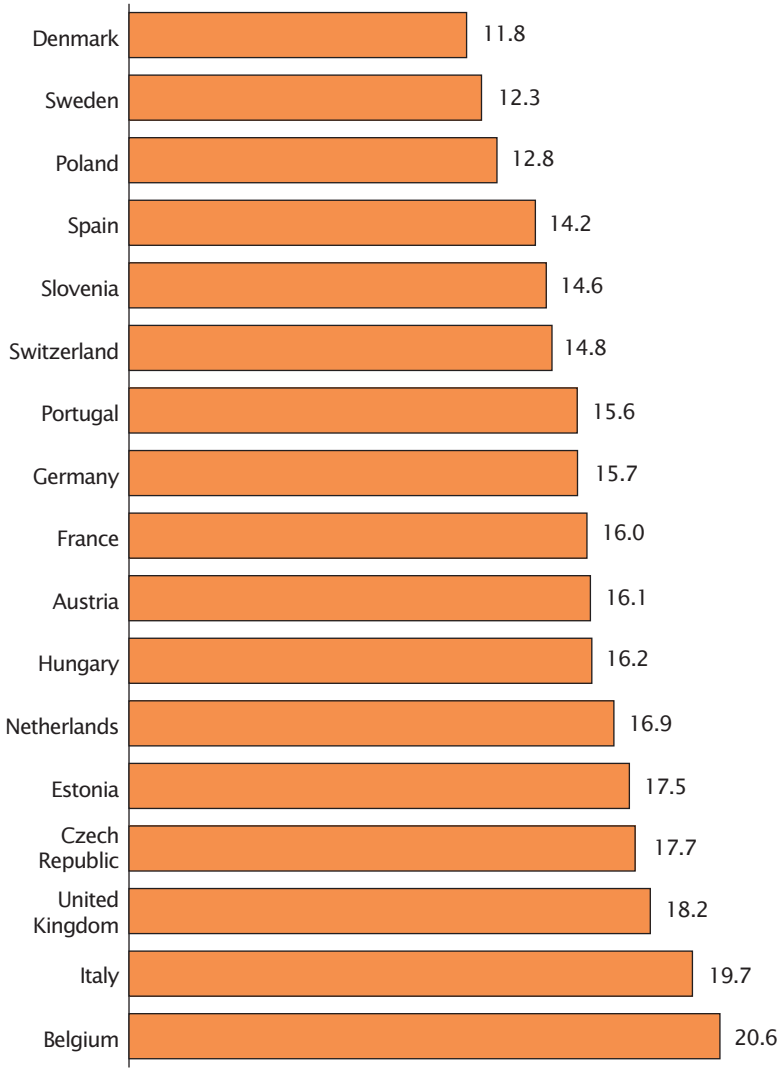
One challenge for all countries will be to identify an etiologic period clearly enough to know when to intervene. The follow-on challenge is how to construct an intervention in something as inherently complicated as social networks over a lifetime.

However, a number of factors hamper the development of long-term care programs including it being a low policy priority, a lack of disability data, and poor understanding of the extent and changes in informal support systems. The extent of neglect on this topic was clearly illustrated in a recent study about the heavily skewed balance of published research on the topic favoring high-income countries (Lloyd-Sherlock, 2014).

QUANTIFYING INFORMAL CARE AND CARE AT HOME

Unpaid caregiving by family members and friends remains the main source of long-term care for older people worldwide (Fernández et al., 2009). Yet it has a cost. At the individual level, caregiving exacts a considerable toll on the caregiver. For example, in rural India, older caregivers spent an average of 39 hours per week providing informal care with consequences for their own health and well-being (Brinda et al., 2014). In 11 European countries, over 15 percent of the populations aged 50 and over reported being informal caregivers in 2010 (Figure 5-9).

Figure 5-9.
Percentage of Population Aged 50 and Over Who Report Being Informal Caregivers in Selected European Countries: 2010



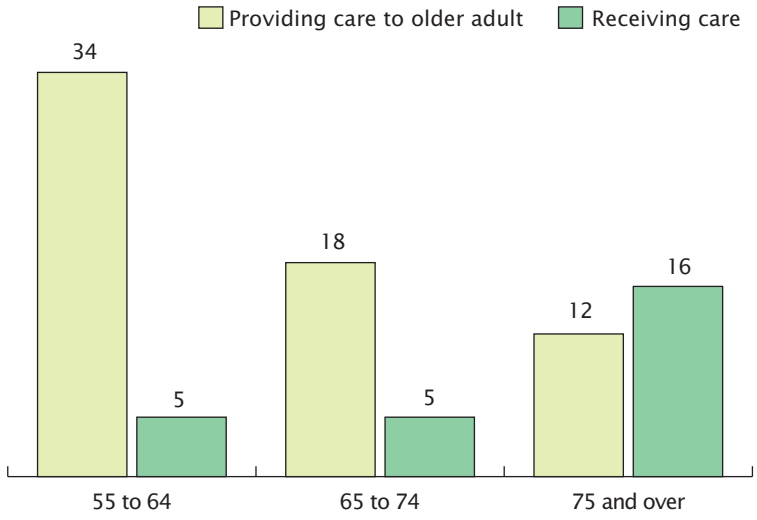
Source: Organisation for Economic Co-operation and Development, 2013.

At the population level, efforts to quantify the costs have helped to increase recognition of the importance of informal unpaid care. In some cases, this has translated into payment schemes for informal care, but more often has provided insights into the types of support that can be given to informal caregivers to keep older people at home. The value of informal care to the economy has been increasing, reaching $522 billion annually in a recent estimate from the United States (Chari et al., 2014). One particular condition, dementia, has received attention because of its increasing prevalence and the high cost of care provision; and was estimated to be around $200 billion in 2010 in the United States alone, with much of this cost borne by informal caregivers (Schwarzkopf et al., 2012; Hurd et al., 2013).

A number of high-income countries have moved to reduce expensive, formal institutional care while increasing support for self-care and other services that enable older people to remain in their own homes or a home-like environment (Coyte, Goodwin, and Laporte, 2008; Häkkinen et al., 2008). Informal care may substitute for formal long-term care in some circumstances in Europe, particularly when low levels of unskilled care are needed (Bonsang, 2009).

Older adults are not solely recipients of pensions or health and long-term care. This population also provides a large proportion of care for other people, including older adults and spouses. In Canada, for instance, 34 percent of those aged 55 to 64 were care providers and 5 percent were care recipients (Figure 5-10). This shifted to 12 percent care providers and 16 percent care recipients in the group aged 75 and older, but nonetheless demonstrates giving and receiving even into older age. Informal care is more often provided by older women, many of whom have higher levels of disability and chronic conditions than men. Up to 71 percent of informal caregivers in Hungary are women, while this drops closer to parity

Figure 5-10.
Percentage of Canadians Providing Care to Older Population or Receiving Care by Age Group: 2014



Source: Canadian Medical Association, 2014.

in Denmark, where 54 percent of informal caregivers are women (Figure 5-11).

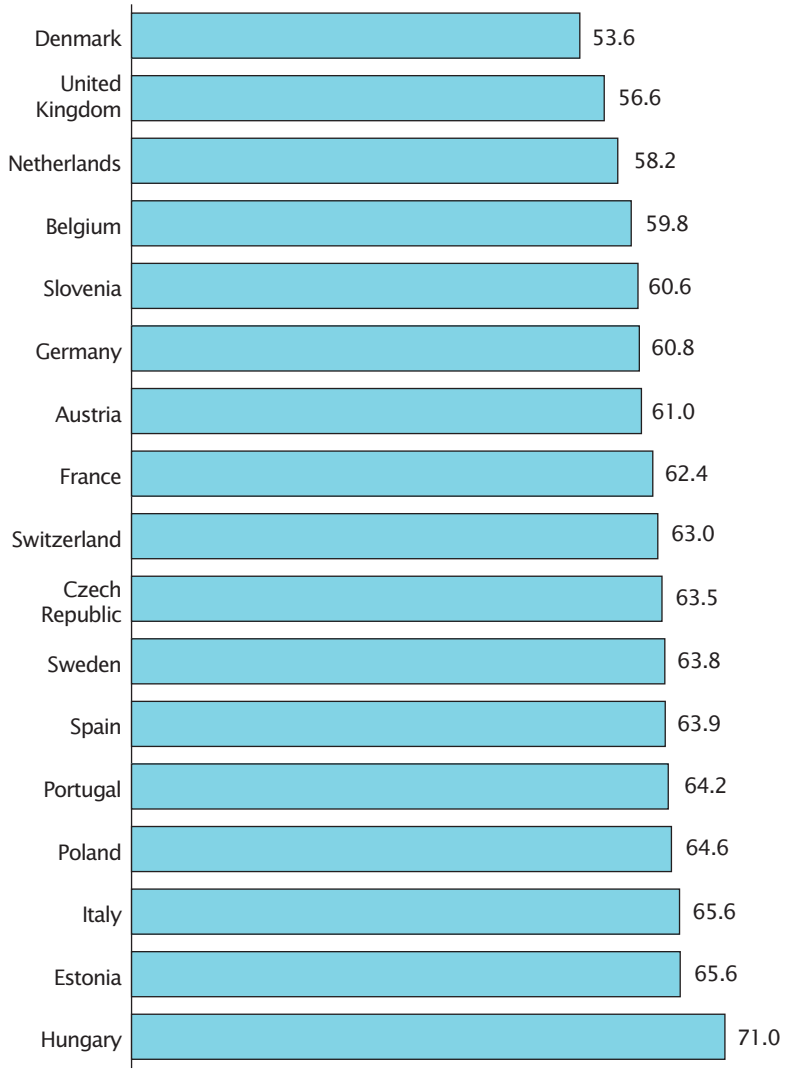
Improvements in the caregivers' health status may mean that more older adults are able to provide such care to a spouse or parent, effectively enlarging the pool of potential caregivers. Additionally, a significant number of older people in many countries engage in volunteer work or help to look after their grandchildren, providing an important input into society that would otherwise have to be purchased in the marketplace (Chari et al., 2014).

OTHER CARE OPTIONS: RESPITE, REHABILITATIVE, PALLIATIVE, AND END-OF-LIFE CARE

A proportion of the older adult population is faced with heavier burdens from poor health and illness in older age that overwhelms informal care or does not fit easily within the bulk of formal care structures. Additionally, otherwise healthy older adults who need rehabilitative care after a health shock may face a trajectory of declining functioning and dependence if they fail to receive the care. These individuals, and often their families, need viable alternate types of care such as rehabilitative, palliative, respite, or end-of-life care options.

Further yet, a secular trend in higher-income countries has seen a steady increase in the proportion of deaths at home (Gomes, Calanzani, and Higginson, 2012). In these cases in particular, health promotion and universal care systems require enough breadth to incorporate the idea of a good death (Kelly et al., 2009; Rumbold, 2011; Prince, Prina, and Guerchet, 2013; Davies et al., 2014).

Figure 5-11.
Percentage of Women Among Informal Caregivers Aged 50 and Over in Selected European Countries: 2010



Source: Organisation for Economic Co-operation and Development, 2013.

Chapter 5 References

Acharya, Arnab, Sukumar Vellakkal, Fiona Taylor, Edoardo Masset, Ambika Satija, Margaret Burke, and Shah Ebrahim. 2012. *Impact of National Health Insurance for the Poor and the Informal Sector in Low- and Middle-Income Countries: A Systematic Review*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

Agency for Healthcare Research and Quality (AHRQ). 2012. *National Healthcare Disparities Report 2011*. AHRQ Publication 12-006, March. Washington, DC: U.S. Department of Health and Human Services.

Alemayehu, Berhanu and Kenneth E. Warner. 2004. "The Lifetime Distribution of Health Care Costs." *Health Services Research* 39/3: 627–642.

Ali, Mohammed K., Cristina Rabadán-Diehl, John Flanigan, Claire Blanchard, K. M.Venkat Narayan, and Michael Engelgau. 2013. "Systems and Capacity to Address Noncommunicable Diseases in Low- and Middle-Income Countries." *Science Transational Medicine* 5/181: 181cm4.

Allotey, Pascale, Daniel D. Reidpath, Sara Yasan, Carina K. Chan, and Ama De-Graft Aikins. 2011. "Rethinking Health-Care Systems: A Focus on Chronicity." *The Lancet* 377/9764: 450–451.

Aluttis, Christoph, Tewabech Bishaw, and Martina W. Frank. 2014. "The Workforce for Health in a Globalized Context — Global Shortages and International Migration." *Global Health Action* 7: 23611.

Appleby, John. 2013. *Spending on Health and Social Care Over the Next 50 Years. Why Think Long Term?* London: The King's Fund.

Atella, Vincenzo and Valentina Conti. 2014. "The Effect of Age and Time to Death on Primary Care Costs: The Italian Experience." *Social Science & Medicine* 114/C: 0–17.

Berkman, Lisa F., Linda Leo-Summer, and Ralph I. Horwitz. 1992. "Emotional Support and Survival after Myocardial Infarction: A Prospective, Population-Based Study of the Elderly." *Annals of Internal Medicine* 117/12:1003–1009.

Blakely, Tony, June Atkinson, Giorgi Kvizhinadze, Nhung Nghiem, Health McLeod, and Nick Wilson. 2014. "Health System Costs by Sex, Age and Proximity to Death, and Implications for Estimation of Future Expenditure." *New Zealand Medical Journal* 127/1393: 12–25.

Bloom, David E., David Canning, and Gunther Fink. 2010. "Implications of Population Ageing for Economic Growth." *Oxford Review of Economic Policy* 26/4: 583–612.

Bloom, David E., Somnath Chatterji, Paul Kowal, Peter Lloyd-Sherlock, Martin McKee, Bernd Rechel, Larry Rosenberg, and James P. Smith. 2015. "Macroeconomic Implications of Population Ageing and Selected Policy Responses." *The Lancet* 385/9968: 649–657.

Boerma, Ties, Patrick Eozenou, David Evans, Tim Evans, Marie-Paule Kieny, and Adam Wagstaff. 2014. "Monitoring Progress towards Universal Health Coverage at Country and Global Levels." *PLoS Medicine* 11/9: e1001731.

Bonsang, Eric. 2009. "Does Informal Care From Children to Their Elderly Parents Substitute for Formal Care in Europe?" *Journal of Health Economics* 28: 143–154.

Boyd, Cynthia M. and Martin Fortin. 2010. "Future of Multimorbidity Research: How Should Understanding of Multimorbidity Inform Health System Design?" *Public Health Reviews* 32/2: 451–472.

Bramley, Dale, Paul Hebert, Leah Tuzzio, and Mark Chassin. 2005. "Disparities in Indigenous Health: A Cross-Country Comparison Between New Zealand and the United States." *American Journal of Public Health* 95/5: 844–850.

Braveman, Paula, Susan Egerter, and David R. Williams. 2011. "The Social Determinants of Health: Coming of Age." *Annual Review of Public Health* 32: 381–398.

Brinda, Ethel M., Anto P. Rajkumar, Ulrika Enemark, Jorn Attermann, and K. S. Jacob. 2014. "Cost and Burden of Informal Caregiving of Dependent Older People in a Rural Indian Community." *BioMedCentral Health Services Research* 14: 207.

Canadian Institute for Health Information (CIHI). 2014. *National Health Expenditure Trends, 1975 to 2014*. Ottawa: CIHI.

Canadian Medical Association. 2014. *National Report on Health Care: Seniors Health Issues and the Impact of an Ageing Population*.

Center for Studies on Aging, Lebanon. 2010. *Chronic Disease and Ageing in the Eastern Mediterranean Region: From Research to Policy and Practice*. Policy Brief Issue 3, September.

Chari, Amalavoyal V., John Engberg, Kristin N. Ray, and Ateev Mehrotra. 2014. "The Opportunity Costs of Informal Elder-Care in the United States: New Estimates from the American Time Use Survey." *Health Services Research*, doi: 10.1111/1475–6773.12238.

Chatterji, Somnath, Julie Byles, David Cutler, Teresa Seeman, and Emese Verdes. 2015. "Health, Functioning, and Disability in Older Adults—Present Status and Future Implications." *The Lance*t 385/9967: 563–575.

Chawla, Mukesh, Gordon Betcherman, and Arup Banerji. 2007. *From Red to Gray: The 'Third Transition' of Aging Populations in Eastern Europe and the Former Soviet Union*. Washington, DC: The World Bank.

Christakis, Nicholas A. and James H. Fowler. 2007. "The Spread of Obesity in a Large Social Network over 32 Years." *The New England Journal of Medicine* 357/4: 370–379.

_____. 2008. "The Collective Dynamics of Smoking in a Large Social Network." *The New England Journal of Medicine* 358/21: 2249–2258.

Cohen, Sheldon, William J. Doyle, David P. Skoner, Bruce S. Rabin, and Jack M. Gwaltney Jr. 1997. "Social Ties and Susceptibility to the Common Cold." *The Journal of the American Medical Association* 277/24: 1940–1944.

Cohen-Mansfield, Jiska and Rotem Perach. 2015. "Interventions for Alleviation Loneliness Among Older Persons: A Critical Review." *American Journal of Health Promotion* 29/3: e109–e125.

Coyte, Peter C., Nick Goodwin, and Audrey Laporte. 2008. *How Can the Settings Used to Provide Care to Older People be Balanced?* Joint Observatory/HEN series on Health Systems and Policy Analysis, Policy Brief. Copenhagen: World Health Organization, on behalf of the European Observatory on Health Systems and Policies.

Cutler, David M., Mary Beth Landrum, and Kate A. Stewart. 2006. *Intensive Medical Care and Cardiovascular Disease Disability Reductions*. National Bureau of Economic Research Working Paper 12184.

Davies, Nathan, Laura Maio, Jasper van Riet Paap, Elena Mariani, Birgit Jaspers, Ragni Sommerbakk, Daniela Grammatico, Jill Manthorpe, Sam Ahmedzai, Myrra Vernooij-Dassen, and Steve Iliffe. 2014. "Quality Palliative Care for Cancer and Dementia in Five European Countries: Some Common Challenges." *Aging & Mental Health* 18/4: 400–410.

de La Maisonneuve, Christine and Joaquim Oliveira Martins. 2013. "Public Spending on Health and Long-Term Care: A New Set of Projections." *OECD Economics Department Working Papers* No. 1048. Paris: OECD.

de Meijer, Claudine, Bram Wouterse, Johan Polder, and Marc Koopmanschap. 2013. "The Effect of Population Aging on Health Expenditure Growth: A Critical Review." *European Journal on Ageing* 10/4: 353–361.

Deri, Catherine. 2005. "Social Networks and Health Service Utilization." *Journal of Health Economics* 24/6: 1076–1107.

Dormont, Brigitte, Joaquim Oliveira Martins, Florian Pelgrin, and Marc Suhrcke. 2008. "Health Expenditures, Longevity and Growth." Paper presented at IX Annual Conference of the Fonazione Rodolfo de Benedetti on Health, Longevity and Productivity, held at Limone sul Garda May 2007.

Dubois, Carl-Ardy, Martin McKee, and Ellen Nolte. 2006. "Analysing Trends, Opportunities and Challenges." In Carl-Ardy Dubois, Martin McKee, Ellen Nolte (eds.), *Human Resources for Health in Europe*. European Observatory on Health Systems and Policies Series. Maidenhead: Open University Press.

Early Action Task Force (EATF). 2014. *Looking Forward to Later Life: Taking an Early Action Approach to our Ageing Society*. London: Community Links.

The Economist. 2009. *A Slow Burning Fuse: A Special Report on Ageing Populations*. London: *The Economist*, 27 June.

Economist Intelligence Unit (EIU). 2009. *Healthcare Strategies for an Ageing Society*. London: *The Economist*.

Ellis, Graham, Martin A. Whitehead, David Robinson, Desmond O'Neill, and Peter Langhorne. 2011. "Comprehensive Geriatric Assessment for Older Adults Admitted to Hospital: Meta-Analysis of Randomised Controlled Trials." *British Medical Journal* 343: d6553.

Emerson, Eric, Susannah Baines, Lindsay Allerton, and Vicki Welch. 2011. *Health Inequalities & People with Learning Disabilities in the UK: 2011*. United Kingdom: Department of Health.

Engelgau, Michael Maurice, Sameh El-Saharty, Preeti Kudesia, Vikram Rajan, Sandra Rosenhouse, and Kyoko Okamoto. 2011. "Chapter 3. Rationale for Action." In *Capitalizing on Demographic Transition:Tackling Noncommunicable Diseases in South Asia*. Washington, DC: World Bank.

Ertel, Karen A., M. Maria Glymour, and Lisa F. Berkman. 2008. "Effects of Social Integration on Preserving Memory Function in a Nationally Representative US Elderly Population." *American Journal of Public Health* 98/7:1215–1220.

Esposito, Susanna, Paolo Durando, Samantha Bosis, Filippo Ansaldi, Claudia Tagliabue, and Giancarlo Icardi. 2014. "Vaccine-Preventable Diseases: From Paediatric to Adult Targets." *European Journal of Internal Medicine* 25/3: 203–212.

European Commission. 2015. *The 2015 Ageing Report. Economic and budgetary projections for the 28 EU Member States (2013–2060)*. Luxembourg: Publications Office of the European Union.

Federal Interagency Forum on Aging-Related Statistics. 2012. *Older Americans 2012: Key Indicators of Well-Being*. Washington, DC: U.S. Government Printing Office.

Felder, Stefan, Peter Zweifel, and Andreas Werblow. 2006. "Population Ageing and Health Care Expenditure: Is Long-Term Care Different?" *Swiss Journal of Economics and Statistics* 7: 43–48.

Felder, Stefan, Andreas Werblow, and Peter Zweifel. 2010. "Do Red Herrings Swim in Circles? Controlling for the Endogeneity of Time to Death." *Journal of Health Economics* 29/2: 205–212.

Feng, Zhanlian, Heying Jenny Zhan, Xiaotian Feng, Chang Liu, Mingyue Sun, and Vincent Mor. 2011. "An Industry in the Making: The Emergence of Institutional Elder Care in Urban China." *Journal of the American Geriatric Society* 59/4: 738–744.

Fernández, Jose-Luis, Julien Forder, Birgit Trukeschitz, Martina Rokosová, and David McDaid. 2009. *How Can European States Design Efficient, Equitable and Sustainable Funding Systems for Long-Term Care for Older People?* Joint Observatory/HEN series on Health Systems and Policy Analysis, Policy Brief 11. Copenhagen: World Health Organization, on behalf of the European Observatory on Health Systems and Policies.

Foroushani, Abbas Rahimi, Fatemeh Estebsari, Davoud Mostafaei, Hasan Eftekhar Ardebili, Dvoud Shojaeizadeh, Maryam Dastoorpour, Ensiyeh Jamshidi, and Mohammad Hossein Taghdisi. 2014. "The Effect of Health Promoting Intervention on Healthy Lifestyle and Social Support in Elders: A Clinical Trial Study." *Iran Red Crescent Medical Journal* 16/8: e18399.

Fowler, James H. and Nicholas A. Christakis. 2008. "Dynamic Spread of Happiness in a Large Social Network: Longitudinal Analysis over 20 Years in the Framingham Heart Study." *The BMJ* 337: a2338. dx.doi.org/10.1136/bmj.a2338.

Fredriksen-Goldsen, Karen I., Hyun-Jun Kim, Charles A. Emlet, Anna Muraco, Elena A. Erosheva, Charles P. Hoy-Ellis, Jayn Goldsen, and Heidi Petry. 2011. *The Aging and Health Report: Disparities and Resilience Among Lesbian, Gay, Bisexual, and Ttransgender Older Adults*. Seattle: Institute for Multigenerational Health.

Fredriksen-Goldsen, Karen I., Hyun-Jun Kim, Susan E. Barkan, Anna Muraco, and Charles P. Hoy-Ellis. 2013. "Health Disparities Among Lesbian, Gay, and Bisexual Older Adults: Results from a Population-Based Study." *Amercian Journal of Public Health* 103/10: 1802–1809.

Fredriksen-Goldsen, Karen I., Jane M. Simoni, Hyun-Jun Kim, Keren Lehavot, Karina L. Walters, Joyce Yang, Charles P. Hoy-Ellis, and Anna Muraco. 2014. "The Health Equity Promotion Model: Reconceptualization of Lesbian, Gay, Bisexual, and Transgender (LGBT) Health Disparities." *American Journal of Orthopsychiatry* 84/6: 653–663.

Fried, Linda P. 2011. "Longevity and Aging: The Success of Global Public Health." In Richard Parker and Marni Sommer (eds.), *Routledge Handbook on Global Public Health*. London: Routledge.

Fried, Linda P. and Fred Paccaud. 2012. "Editorial: The Public Health Needs for an Ageing Society." *Public Health Reviews* 32/2: 351–355.

Geue, Claudia, Andrew Briggs, James Lewsey, and Paula Lorgelly. 2014. "Population Ageing and Healthcare Expenditure Projections: New Evidence From a Time to Death Approach." *The European Journal of Health Economics* 15/8: 885–896.

Giovannetti, Erin R. and Jennifer L. Wolff. 2010. "Cross-Survey Differences in National Estimates of Numbers of Caregivers of Disabled Older Adults." *Milbank Quarterly* 88/3: 310–349.

Global Health Watch (GHW). 2014. "The Current Discourse on Universal Health Coverage (B1)." In *Global Health Watch 4: An Alternative World Health Report*. London: Zed Books.

Global Health Workforce Alliance and World Health Organization. 2013. *A Universal Truth: No Health Without a Workforce: Third Global Forum on Human Resources for Health Report*. Geneva: World Health Organization.

Goldman, Dana P., David Cutler, John W. Rowe, Pierre-Carl Michaud, Jeffrey Sullivan, Desi Peneva, and S. Jay Olshansky. 2013. "Substantial Health and Economic Returns From Delayed Aging May Warrant a New Focus for Medical Research." *Health Affairs* 32/10: 1698–1705.

Gomes, Barbara, Natalia Calanzani, and Irene J. Higginson. 2012. "Reversal of the British Trends in Place of Death: Time Series Analysis 2004-2010." *Palliative Medicine* 26/2: 102–107.

Häkkinen, Unto, Pekka Martikainen, Anja Noro, Elina Nihtilä, and Mikko Peltola. 2008. "Aging, Health Expenditure, Proximity of Death and Income in Finland." *Health Economics, Policy and Law* 3/2: 165–195.

He, Wan, Mark N. Muenchrath, and Paul Kowal. 2012. *Shades of Gray: A Cross-Country Study of Health and Well-Being of the Older Populations in SAGE Countries, 2007–2010*. Washington, DC: U.S. Government Printing Office.

Heller, Peter S. 2006. "Asia: Ready or Not." *Finance and Development* 43/3: 18–22.

Holt-Lunstad, Julianne, Timothy B. Smith, and J. Bradley Layton. 2010. "Social Relationships and Mortality Risk: A Meta-Analytic Review." *PLoS Medicine* 7/7: e1000316.

Hurd, Micheal D., Paco Martorelli, Adeline Delavande, Kathleen J. Mullen, and Kenneth M. Langa. 2013. "Monetary Costs of Dementia in the United States." *New England Journal of Medicine* 368/14: 1326–1334.

James, Bryan D., Patricia A. Boyle, Aron S. Buchman, and David A. Bennett. 2011. "Relation of Late-Life Social Activity With Incident Disability Among Community-Dwelling Older Adults." *Journal of Gerontology: Biological Sciences* 66A/4: 467–473.

Ji-yoon, Lee. 2010. "Spectre of Ageing Population Worries Economists." *Bulletin of the World Health Organization* 88/3:169–170.

Kardamanidis, Katina, Kim Lim, Cristalyn Da Cunha, Lee K. Taylor, and Louis R. Jorm. 2007. "Hospital Costs of Older People in New South Wales in the Last Year of Life." *Medical Journal of Australia* 187/7: 383–386.

Kelly, Len, Barb Linkewich, Helen Cromarty, Natalie St. Pierre-Hansen, Irwin Antone, and Chris Gilles. 2009. "Palliative Care of First Nations People." *Canada Family Physician* 55/4: 394–395.e7.

Kendrick, Steve and Margaret Conway. 2006. "Demographic and Social Change: Implications for Use of Acute Care Services in Scotland." *European Journal of Population* 22/3: 81–307.

Krueger, Alan B., Daniel Kahneman, David Schkade, Norbert Schwarz, and Arthur A. Stone. 2009. "National Time Accounting: The Currency of Life." In Alan B. Krueger (ed.), *Measuring the Subjective Well-Being of Nations: National Accounts of Time Use and Well-Being*. Chicago: University of Chicago Press.

Kruk, Margaret E., Emily Goldmann, and Sandro Galea. 2009. "Borrowing And Selling To Pay for Health Care in Low- and Middle-Income Countries." *Health Affairs* 28/4: 1056–1066.

Kruk, Margaret E. 2013. "Universal Health Coverage: A Policy Whose Time Has Come." *The BMJ* 347/7930: f6360.

LaVeist, Thomas A., Darrell J. Gaskin, and Patrick Richard. 2009. *The Economic Burden of Health Inequalities in the United States*. Washington, DC: Joint Center for Political and Economic Studies.

Lee, Ronald and Andrew Mason. 2011. "The Price of Maturity." *Finance and Development* 48/2: 7–11.

Leive, Adam and Ke Xu. 2008. "Coping With Out-of-Pocket Health Payments: Empirical Evidence From 15 African Countries." *Bulletin of the World Health Organization* 86/11: 817–908.

Lloyd-Sherlock, Peter, Martin McKee, Shah Ebrahim, Mark Gorman, Sally Greengross, Martin Prince, Rachel Pruchno, Gloria Gutman, Tom Kirkwood, Desmond O'Neill, Luigi Ferrucci, Stephen B. Kritchevsky, and Bruno Vellas. 2012. "Population Ageing and Health." *The Lancet* 379/9823: 1295–1296.

Lloyd-Sherlock, Peter. 2014. "Beyond Neglect: Long-Term Care Research in Low and Middle Income Countries." *International Journal of Gerontology* 8: 66–69.

Lutz, Wolfgang, Warren Sanderson, and Sergei Scherbov. 2008. "The Coming Acceleration of Global Population Ageing." *Nature* 451/7179: 716–719.

Mair, Christine A., Ana R. Quiñones, and Maha A. Pasha. 2015. "Care Preferences Among Middle-Aged and Older Adults with Chronic Disease in Europe: Individual Health Care Needs and National Health Care Infrastructure." *The Gerontologist* doi:10.1093/geront/gnu119.

Marmot, Michael. 2013. "Fair Society Healthy Lives." In Nir Eyal, Samia A. Hurst, Ole F. Norheim, and Dan Wikler (eds.), *Inequalities in Health: Concepts, Measures and Ethics*. New York: Oxford University Press.

Martin, Jose J. Martin, M. Puerto Lopez del Amo Gonzalez, and M. Dolores Cano Garcia. 2011. "Review of the Literature on the Determinants of Healthcare Expenditure." *Applied Economics* 43/1: 19–46.

Martini, E. Mary, Nancy Garrett, Tammie Lindquist, and George J. Isham. 2007. "The Boomers Are Coming: A Total Cost of Care Model of the Impact of Population Aging on Health Care Costs in the United States by Major Practice Category." *Health Services Research* 42/1p1): 201–218.

Marzouk, Sarah. 2014. "World Health Day 2014: Campaign for Universal Health Coverage." HelpAge International.

Massoud, M. Rashad. 2014. *Why Quality Matters for Universal Health Coverage*. USAID Assist Project, <www.usaidassist.org/blog/why-quality-matters-universal-heath-coverage>, accessed on April 28, 2015.

McGrail, Kimberlyn, Bo Green, Morris L. Barer, Robert G. Evans, and Clyde Hertzman. 2000. "Age, Costs of Acute and Long-Term Care and Proximity to Death: Evidence for 1987-88 and 1994-95 in British Columbia." *Age and Ageing* 29/3: 249–253.

McKee, Martin, Marc Suhrcke, Ellen Nolte, Suszy Lessof, Josep Figueras, Antonio Duran, and Nata Menabde. 2009. "Health Systems, Health, and Wealth: A European Perspective." *The Lancet* 373/9660: 349–351.

McKee, Martin, Sanjay Basu, and David Stuckler. 2012. "Health Systems, Health and Wealth: The Argument for Investment Applies Now More Than Ever." *Social Science & Medicine* 74/5: 684–687.

Medici, Andre C. 2011. "Chapter 4. How Age Influences the Demand for Health Care in Latin America." In Daniel Cotlear (ed.), *Population Aging: Is Latin America Ready?* Washington, DC: World Bank.

Mitrou, Francis, Martin Cooke, David Lawrence, David Povah, Elena Mobilia, Eric Guimond, and Stephen R. Zubrick. 2014. "Gaps in Indigenous Disadvantage not Closing: A Census Cohort Study of Social Determinants of Health in Australia, Canada, and New Zealand from 1981-2006." *BioMedCentral Public Health* 14: 201.

Moieni, Mona, Michael R. Irwin, Ivana Jevtic, Richard Olmstead, Elizabeth C. Breen, and Naomi I. Eisenberger. 2015. "Sex Differences in Depressive and Socioemotional Responses to an Inflammatory Challenge: Implications for Sex Differences in Depression." *Neuropsychopharmacology* January 19. dx.doi.org/10.1038/npp.2015.17

National Institutes of Health (NIH), National Institute of Allergy and Infectious Diseases (NIAID). 2013. *Health & Research Topics: Minority Health*. Washington, DC: NIH/NIAID.

National Research Council (NRC). 2012. *Aging and the Macroeconomy: Long-Term Implications of an Older Population*. Washington, DC: National Academies Press.

Nolte, Ellen and C. Martin McKee. 2012. "In Amenable Mortality—Deaths Avoidable Through Health Care—Progress in The US Lags That Of Three European Countries." *Health Affairs* 31/9: 2114–2122.

Ogawa, Naohiro, Amonthep Chawla, Rikiya Matsukura, and An-Chi Tung. 2009. "Health Expenditures and Ageing in Selected Asian Countries." Paper presented at the Expert Group Meeting on Population Ageing, Intergenerational Transfers and Social Protection, held from October 20–21, in Santiago, Chile.

Olivares-Tirado, Pedro, Nanako Tamiya, Masayo Kashiwagi, and Kimikazu Kashiwagi. 2011. "Predictors of the Highest Long-Term Care Expenditures in Japan." *BioMedCentral Health Services Research* 11:103.

Olshansky, S. Jay, Toni Antonucci, Lisa Berkman, Robert H. Binstock, Axel Boersch-Supan, John T. Cacioppo, Bruce A. Carnes, Laura L. Carsensen, Linda P. Fried, Dana P. Goldman, James Jackson, Martin Kohli, John Rother, Yuhui Zheng, and John Rowe. 2012. "Differences in Life Expectancy Due To Race and Educational Differences Are Widening, and Many May Not Catch Up." *Health Affairs* 31/8: 1803–1813.

O'Neill, Desmond. 2011. "Respect and Care for the Older Person." *The Lancet* 377/9766: 640.

Organisation for Economic Co-operation and Development (OECD). 2011. "Burden of Out-of-Pocket Health Expenditure." In *Health at a Glance 2011: OECD Indicators*. Paris: OECD Publishing.

_____. 2013. *Health at a Glance 2013: OECD Indicators*. Paris: OECD Publishing.

_____.2015. *Focus on Health Spending. Health Statistics 2015*. Paris: OECD Publishing.

Payne, Greg, Audrey Laporte, David Foot, and Peter C. Coyte. 2009. "Temporal Trends in the Relative Cost of Dying: Evidence from Canada." *Health Policy* 90/2-3: 270–276.

Peltzer, Karl, Jennifer Stewart Williams, Paul Kowal, Joel Negin, James Josh Snodgrass, Alfred Yawson, Nadia Minicuci, Liz Thiele, Nancy Phaswana-Mafuya, Richard Berko Biritwum, Nirmala Naidoo, and Somnath Chatterji. 2014. "Universal Health Coverage in Emerging Economies: Findings on Health Care Utilization by Older Adults in China, Ghana, India, Mexico, the Russian Federation, and South Africa." *Global Health Action* 7: 25314.

Peterson, Peter G. 1999. *Gray Dawn: How the Coming Age Wave Will Transform America—and the World*. New York: Times Books.

Prince, Martin, Matthew Prina, and Maelenn Guerchet. 2013. *World Alzheimer Report 2013: Journey of Caring: An Analysis of Long-Term Care for Dementia*. London: Alzheimer's Disease International.

Rechel, Bernd, Yvonne Doyle, Emily Grundy, and Martin McKee. 2009. *How Can Health Systems Respond to Population Ageing?* Joint Observatory/HEN series on Health Systems and Policy Analysis, Policy Brief 10. Copenhagen: World Health Organization, on behalf of the European Observatory on Health Systems and Policies.

Robinson, Helen and Krishna Hort. 2012. "Non-Communicable Diseases and Health Systems Reform in Low-and-Middle-Income Countries." *Pacific Health Dialog* 18/1: 179–190.

Rockers, Peter C., Margaret E. Kruk, and Miriam J. Laugesen. 2012. "Perceptions of the Health System and Public Trust in Government in Low- and Middle-Income Countries: Evidence from the World Health Surveys." *Journal of Health Politics, Policy, and Law* 37/3: 405–437.

Rumbold, Bruce. 2011. "Health Promoting Palliative Care and Dying in Old Age." In Merryn Gott and Christine Ingleton (eds.), *Living with Ageing and Dying: Palliative and End of Life Care for Older People*. New York: Oxford University Press.

Saksena, Priyanka, Justine Hsu, and David B. Evans. 2014. "Financial Risk Protection and Universal Health Coverage: Evidence and Measurement Challenges." *PLoS Medicine* 11/9: e1001701.

Sayegh, Philip and Bob G. Knight. 2013. "Cross-Cultural Differences in Dementia: The Sociocultural Health Belief Model." *International Psychogeriatrics* 25/4: 517–530.

Scheil-Adlung, Xenia, ed. 2015. *Global Evidence on Inequities in Rural Health Protection: New Data on Rural Deficits in Health Coverage for 174 Countries*. International Labour Office Extension of Social Security (ESS) Document 47. Geneva: International Labour Organization.

Schieber, George, Cristian Baeza, Daniel Kress, and Margaret Maier. 2006. "Chapter 12. Financing Health Systems in the 21st Century." In Dean T. Jamison, Joel G. Breman, Anthony R. Measham. George Alleyne, Mariam Claeson, David B. Evans, Prabhat Jha, Anne Mills, and Philip Musgrove (eds), *Disease Control Priorities in Developing Countries, Second Edition*. Washington, DC: World Bank.

Schwarzkopf, Larissa, Petra Menn, Reiner Leidl, Sonja Wunder, Hilmar Mehlig, Peter Marx, Elmar Graessel, and Rolf Holle. 2012. "Excess Costs of Dementia Disorders and the Role of Age and Gender – An Analysis of German Health and Long-Term Care Insurance Claims Data." *BioMedCentral Health Services Research* 12:165.

Seeman, Teresa E. 2000. "Health Promoting Effects of Friends and Family on Health Outcomes in Older Adults." *American Journal of Health Promotion* 14/6: 362–370.

Sen, Amartya. 1999. *Development as Freedom*. New York: Knopf.

Seshamani, Meena and Alastair Gray. 2004. "A Longitudinal Study of the Effects of Age and Time to Death on Hospital Costs." *Journal of Health Economics* 23/2: 217–235.

Shankar, Aparna, Anne McMunn, James Banks, and Andrew Steptoe. 2011. "Loneliness, Social Isolation, and Behavioral and Biological Health Indicators in Older Adults." *Health Psychology* 30/4: 377–385.

Steptoe, Andrew, Aparna Shankar, Panayotes Demakakos, and Jane Wardle. 2013. "Social Isolation, Loneliness, and All-Cause Mortality in Older Men and Women." *Proceedings of the National Academy of Sciences* 110/15: 5797–5801.

Stiglitz, Joseph E., Amartya Sen, and Jean-Paul Fitoussi. 2009. *Report by the Commission on the Measurement of Economic Performance and Social Progress*.

Stuckler, David, Andrea B. Feigl, Sanjay Basu, and Martin McKee. 2010. *The Political Economy of Universal Health Coverage*. Background paper for the First Global Symposium on Health Systems Research, 16–19 November, Montreux, Switzerland. Geneva: Alliance for Health Systems Research.

Suhrcke, Marc, Regina Sauto Arce, Martin McKee, and Lorenzo Rocco. 2008. *The Economic Costs of Ill Health in the European Region*. Background document for the WHO European Ministerial Conference on Health Systems: "Health Systems, Health and Wealth." Copenhagen: WHO Regional Office for Europe.

Tamiya, Nanako, Haruko Noguchi, Akihiro Nishi, Michael R. Reich, Naoki Ikegami, Hideki Hashimoto, Kenji Shibuya, Ichiro Kawachi, and John Creighton Campbell. 2011. "Population Ageing and Wellbeing: Lessons from Japan's Long-Term Care Insurance Policy." *The Lancet* 378/9797: 1183–1192.

Tchoe, Byongho and Sang-Ho Nam. 2010. "Aging Risk and Health Care Expenditure in Korea." *International Journal of Environmental Research and Public Health* 7: 3235–3254.

Tinetti, Mary E., Terri R. Fried, and Cynthia M. Boyd. 2012. "Designing Health Care for the Most Common Chronic Condition: Multimorbidity." *Journal of the American Medical Association* 307/23: 2493–2494.

United Nations (UN). 2012. *Global Health and Foreign Policy*. United Nations General Assembly Resolution 67/123. New York: United Nations.

United Nations Statistics Division (UNSD). 2014. *Coverage of Birth and Death Registration*, <http://unstats.un.org/unsd/demographic/CRVS/CR_coverage.htm>, accessed on February 22, 2015. New York: United Nations.

Universalhealthcoverageday. 2014. *Global Coalition*. <http://universalhealthcoverageday.org/coalition/>, accessed on April 29, 2015.

USAID Health Finance and Governance Project. 2015. *Health Finance: Strengthening Financing for Health*. <www.hfgproject.org/what-we-do/health-financing/>, accessed on April 16, 2015.

Wahrendorf, Morten, Jan D. Reinhardt, and Johannes Siegrist. 2013. "Relationships of Disability With Age Among Adults Aged 50 to 85: Evidence from the United States, England and Continental Europe." *PLoS ONE* 8/8: e71893.

Wallace, Paul. 1999. *Agequake: Riding the Demographic Rollercoaster Shaking Business, Finance and Our World*. London: Nicholas Brealey.

Wang, Binyou, Ping He, and Birong Dong. 2015. "Associations Between Social Networks, Social Contacts, and Cognitive Function Among Chinese Nonagenarians/Centenarians." *Archives of Gerontology and Geriatrics* 60/3: 522–527.

Warnes, Anthony M., Klaus Friedrich, Leonie Kellaher, and Sandra Torres. 2004. "The Diversity and Welfare of Older Migrants in Europe." *Ageing & Society* 24/3: 07–326.

Watt, Richard G., Anja Heilman, Wael Sabbah, Tim Newton, Tarani Chandola, Jun Aida, Aubrey Sheiham, Michael Marmot, Ichiro Kawachi, and Georgios Tsakos. 2014. "Social Relationships and Health Related Behaviors Among Older US Adults." *BioMedCentral Public Health* 14: 533.

White, Chapin. 2007. "Health Care Spending Growth: How Different is the United States From the Rest of the OECD?" *Health Affairs* 26/1: 154–161.

World Bank (WB). 2011. "How will Ageing Affect East Asia's Growth?" In *Securing the Present, Shaping the Future. East Asia and Pacific Economic Update, Volume 1*. Washington, DC: World Bank.

World Health Organization (WHO). 2010. *The World Health Report: Health Systems Financing: The Path to Universal Coverage*. Geneva: World Health Organization.

_____. 2013. *The World Health Report 2013: Research for Universal Health Coverage*. Geneva: World Health Organization.

_____. 2015. "WHO Global Strategy on People-Centred and Integrated Health Services. Interim Report." Geneva: World Health Organization.

World Health Organization and World Bank. 2015. "Tracking Universal Health Coverage. First Global Monitoring Report." Geneva: World Health Organization.

Xu, Ke, Priyanka Saksena, and Alberto Holly. 2011. *The Determinants of Health Expenditure: A Country-Level Panel Data Analysis*. Geneva: World Health Organization.

Yu, Tiffany Hui-Kuang, David Han-Min Wang, and Kuo-Lun Wu. 2015. "Reexamining the Red Herring Effect on Healthcare Expenditures." *Journal of Business Research* 68/4: 783–787.

CHAPTER 6.

Work and Retirement

For many individuals, the transition from work to retirement marks one of the most significant changes that they will experience in their lifetime. Increasingly, this transition occurs in stages and may involve multiple entries into and out of the labor force. While labor force participation declines as people age, rates vary by sex and by level of economic development. Evidence suggests that the gap is narrowing between men and women and across countries.

Workers formulate expectations about their lives after retirement but may find that circumstances beyond their control, such as official retirement ages and economic cycles, affect their retirement decisions. The recent Great Recession of 2007–2009 led some workers to delay retirement or to come out of retirement and rejoin the labor force while others retired earlier than planned (Burtless and Bosworth, 2013). In addition to the economic, psychological, and physical implications for individuals transitioning from work to retirement, there may be aggregate effects on the overall economy and society. As traditional family support erodes, new institutions emerge to address the needs of the older population. In addition, how workers prepare for a longer retirement period due to increased life expectancy has implications for economic growth.

LABOR FORCE PARTICIPATION RATES VARY SHARPLY BY AGE AND SEX

The labor force is commonly defined to include those who are either employed or seeking employment. Typically, those who perform unpaid work within a household are not considered to be part of the labor force, even though such work clearly has value and would be expensive to replace (Schultz, 1990). Those who want to work but have given up searching for a job ("discouraged workers") are also considered to be out of the labor force.

The size of the labor force reflects not only economic conditions but also demographic factors, such as the total population size and the age distribution of the population. For cross-country and cross-group comparisons, a more useful indicator is the labor force participation rate, which is the proportion of any particular population that is in the labor force.

For the countries shown in Table 6-1, labor force participation rates in 2012 for men aged 45 to 49 were quite high—exceeding 90 percent in most countries. In general, the rates decline slightly for the next older group aged 50 to 54. Rates continue to decline for each successively older age group. By ages 60 to 64, labor force participation rates were less than half the level for those aged 45 to 49 in countries such as South Africa, Tunisia, Italy, Russia, and Ukraine. For men aged 65 and older, only two countries had participation rates exceeding 50 percent—Zambia and Guatemala. In Germany and Italy, rates were less than 10 percent for older males.

For all countries in Table 6-1 labor force participation rates for women aged 45 to 49 were lower than those of their male counterparts, although the gap was quite small in Russia and Ukraine. Less than one third of women aged 45 to 49 in Morocco and Tunisia were in the labor force. Similar to the trend for men, labor force participation rates for women decline at older age groups. For women aged 65 and older, participation rates were below 20 percent in all countries except Zambia (52.2 percent) and South Korea (23.0 percent).

Table 6-1.
Labor Force Participation Rates by Age and Sex in Selected Countries: 2012

(In percent)

Country	Men					Women				
	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
Africa										
Morocco	95.3	89.1	79.8	51.1	28.7	31.6	31.2	27.9	19.2	8.5
South Africa	82.6	75.6	66.1	31.8	N	62.1	54.3	42.9	18.7	N
Tunisia	94.1	88.2	70.1	34.4	15.4	23.5	16.6	11.5	4.8	1.9
Zambia	96.9	96.8	88.9	89.6	71.2	84.1	84.3	77.8	74.3	52.2
Asia										
Japan	96.1	95.0	92.2	75.4	28.7	75.7	73.4	64.6	45.8	13.4
Malaysia	96.9	92.5	76.8	57.4	N	55.3	48.3	34.6	21.2	N
Singapore	95.6	93.8	88.5	74.6	32.4	73.4	65.6	56.2	41.7	13.7
South Korea	93.0	91.4	84.7	72.3	41.6	67.7	62.5	54.8	43.9	23.0
Europe										
Germany	93.9	91.6	85.7	58.9	7.1	85.3	81.9	73.3	41.1	3.3
Italy	91.6	89.5	74.1	32.7	6.2	66.7	61.3	48.4	15.9	1.4
Russia	92.6	88.7	77.8	38.5	14.1	90.6	84.3	52.9	24.9	8.9
Ukraine	85.2	78.2	66.7	32.2	20.5	83.2	73.5	34.7	25.9	16.7
Latin America/Caribbean										
Argentina	94.6	91.4	86.8	75.7	22.2	67.7	63.4	53.8	33.7	7.5
Brazil	91.6	86.1	78.2	62.0	30.0	67.4	58.8	45.5	30.0	11.7
Costa Rica	94.0	92.0	85.8	67.5	26.5	55.0	50.3	39.8	27.3	6.8
Guatemala	96.2	96.5	92.9	90.0	66.4	56.0	51.8	44.7	36.3	15.0
Mexico	94.9	91.8	85.4	71.5	42.8	55.4	50.2	41.5	32.8	15.5
Northern America										
Canada	89.9	87.8	78.9	58.0	17.1	84.4	80.9	69.4	45.7	8.8
United States	88.1	84.1	78.0	60.5	23.6	75.6	73.7	67.3	50.4	14.4
Oceania										
Australia	89.2	86.7	80.0	62.6	16.8	78.5	76.3	65.7	44.5	7.8
New Zealand	91.5	90.9	88.2	77.6	25.5	82.3	82.8	77.4	64.1	15.0

N Not available.
Note: For historical time series of labor force participation in these and other countries, see Appendix Table B-8.
Source: International Labour Organization, 2014; ILOSTAT Database.

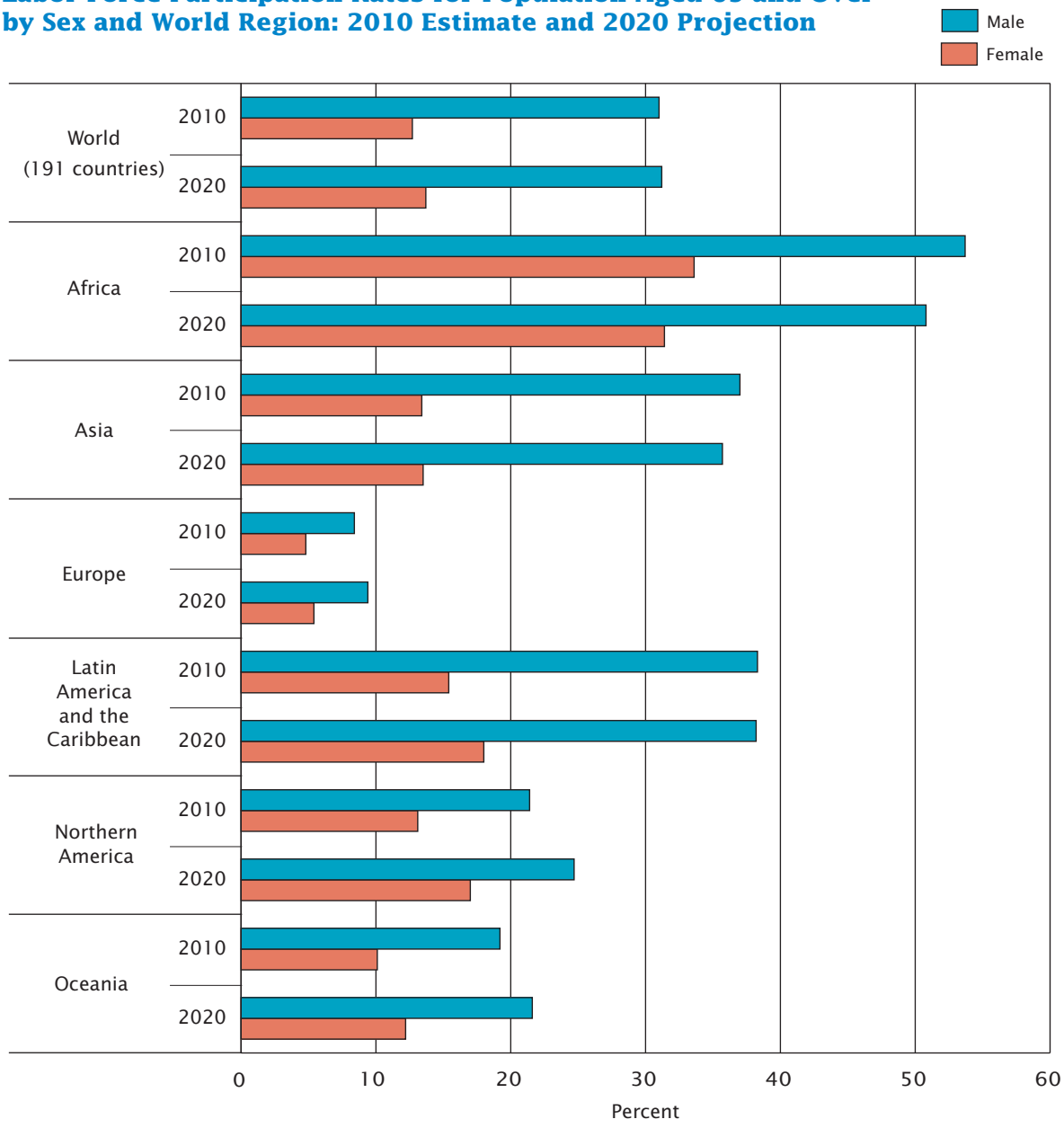
OLDER POPULATION IN HIGHER INCOME COUNTRIES LESS LIKELY TO BE IN LABOR FORCE

Sharp differences in labor force participation at ages 65 and above exist among regions of the world (Figure 6-1). In 2010, older African men and women both had the highest rates of labor force participation—more than 50 percent for men and over 30 percent for women. At the other end of the scale, in Europe, less than 10 percent of older men and less than 5 percent of older women were in the labor force. Clearly, the vast majority of the older population in Europe spends their time on pursuits other than work. Europe's relatively low labor force participation rates are likely due to its substantial economic resources, policies that encourage early retirement, and patterns of public spending that provide security for the older population (World Bank Group, 2014).

In addition to substantial variation in labor force participation across world regions, there are sometimes large differences among countries within the same region. In Africa, for instance, labor force participation of the older population in 2011 was below 15 percent in Algeria, South Africa, Egypt, and

Figure 6-1.

Labor Force Participation Rates for Population Aged 65 and Over by Sex and World Region: 2010 Estimate and 2020 Projection



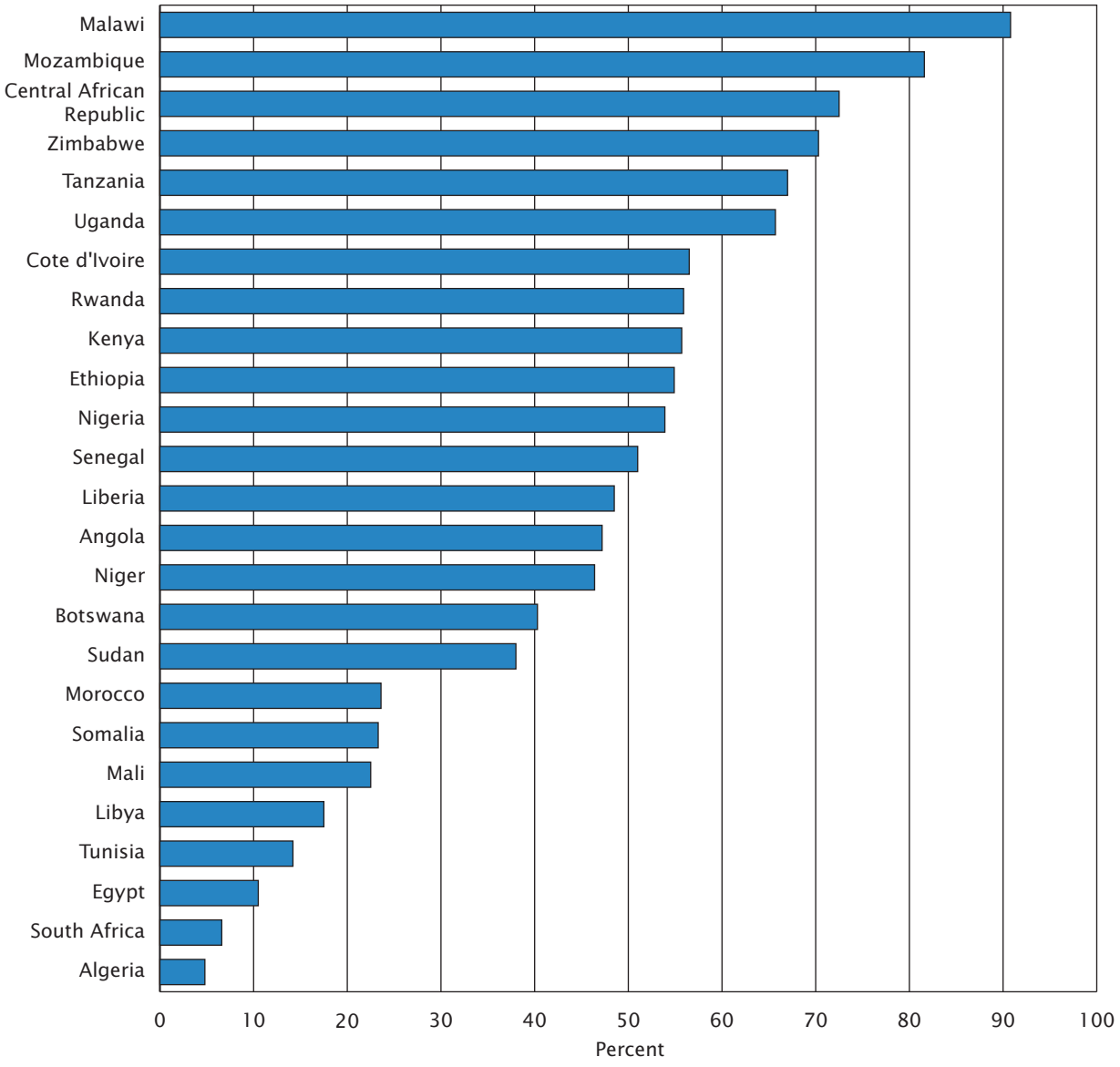
Source: International Labour Organization, 2011; LABORSTA.

Tunisia, and more than 70 percent in Malawi, Mozambique, the Central African Republic, and Zimbabwe (Figure 6-2).

In general, countries with higher incomes per capita and more developed social security systems tend to have lower labor force participation among the older population. In contrast, in lower income countries, the notion of retirement may not make sense—the older population may need to continue to work, perhaps at a reduced level, until physically or mentally unable to do so.

The causal relationships between labor force participation and economic development are often complex. While developmental factors may lead to rises in female labor force participation, those employment patterns in turn contribute to economic development. As noted earlier, a key reason for the

Figure 6-2.
Labor Force Participation Rates for Population Aged 65 and Over for Selected African Countries: 2011



Source: The World Bank, 2013; World DataBank.

difference by sex concerns traditional norms about the division of labor between males and females.

GENDER GAP IN LABOR FORCE PARTICIPATION RATE IS NARROWING

Globally, the gender gap in labor force participation narrowed in the 1990s (decreasing by 1.8 percentage points) and then held constant in the 2000s (International Labour Organization, 2012). Female labor force participation tends to be greater in more developed societies, among women less accepting of traditional norms regarding the division of labor between males and females, and among those with certain demographic characteristics, such as fewer children (Contreras and Plaza, 2010). Female labor force participation at older ages may also reflect a gradual change in the perceived value of wage earnings as subsequent cohorts realize the benefits of working longer (Fernandez, 2013).

Table 6-2 shows the difference in labor force participation rates between men and women aged 65 and over for 34 countries in the 1990s and in 2012. West European countries had some of the smallest gaps between men and women (less than 5 percentage points) in the 1990s, while Guatemala and Pakistan had the largest gaps at 42.6 percentage points and 45.3 percentage points, respectively. By 2012, the gender gap had increased for 18 of the countries and decreased for 16 countries compared to an earlier year in the 1990s. The gap widened in Guatemala, rising to 51.4 percentage points, and narrowed in Pakistan, dropping to 31.0 percentage points.

Table 6-2.
Gender Gap in Labor Force Participation Rates for Population Aged 65 and Over by Country: 1990s and 2012

(Percentage point difference)

Country	1990s	2012
France	0.3	1.5
Belgium	1.2	2.9
Austria	2.4	3.8
Germany	2.8	3.8
Russia	3.9	5.2
United Kingdom	3.9	5.8
Italy	4.2	4.7
Mozambique	4.2	6.4
Czech Republic	4.5	3.5
Australia	6.5	9.0
New Zealand	6.5	10.5
Denmark	6.7	6.1
Poland	6.8	4.7
Sweden	7.0	7.8
United States	7.2	9.2
Greece	7.3	3.0
Canada	8.8	8.3
Israel	11.8	14.4
Uruguay	12.7	14.0
Zimbabwe	13.4	9.6
Singapore	14.4	18.7
Argentina	18.7	14.7
South Korea	18.8	18.6
Turkey	20.3	13.7
Japan	20.6	15.3
Chile	20.9	22.9
Peru	21.9	20.8
Philippines	24.7	21.8
Jamaica	28.0	38.2
Egypt	29.8	19.1
Tunisia	30.5	13.5
Mexico	37.9	27.3
Guatemala	42.6	51.4
Pakistan	45.3	31.0

Note: Gender gap is male labor force participation rate minus female labor force participation rate.
Sources: International Labour Office, 2007, 2014; LABORSTA, ILOSTAT Database.

LABOR FORCE PARTICIPATION AMONG THE OLDER POPULATION CONTINUES TO RISE IN MANY DEVELOPED COUNTRIES

The size of the workforce relative to the number of pensioners can have major implications for economic growth and the sustainability of old age security programs. From the 1950s to the mid-1980s, an increasing share of older men exited the labor force in most developed countries. Beginning in the 1990s, this trend reversed (Kinsella and He, 2009). Labor force participation rates for older men have continued to increase through the 2000s in many developed countries. Older women in these countries also experienced a rise in economic activity over the past 2 decades.

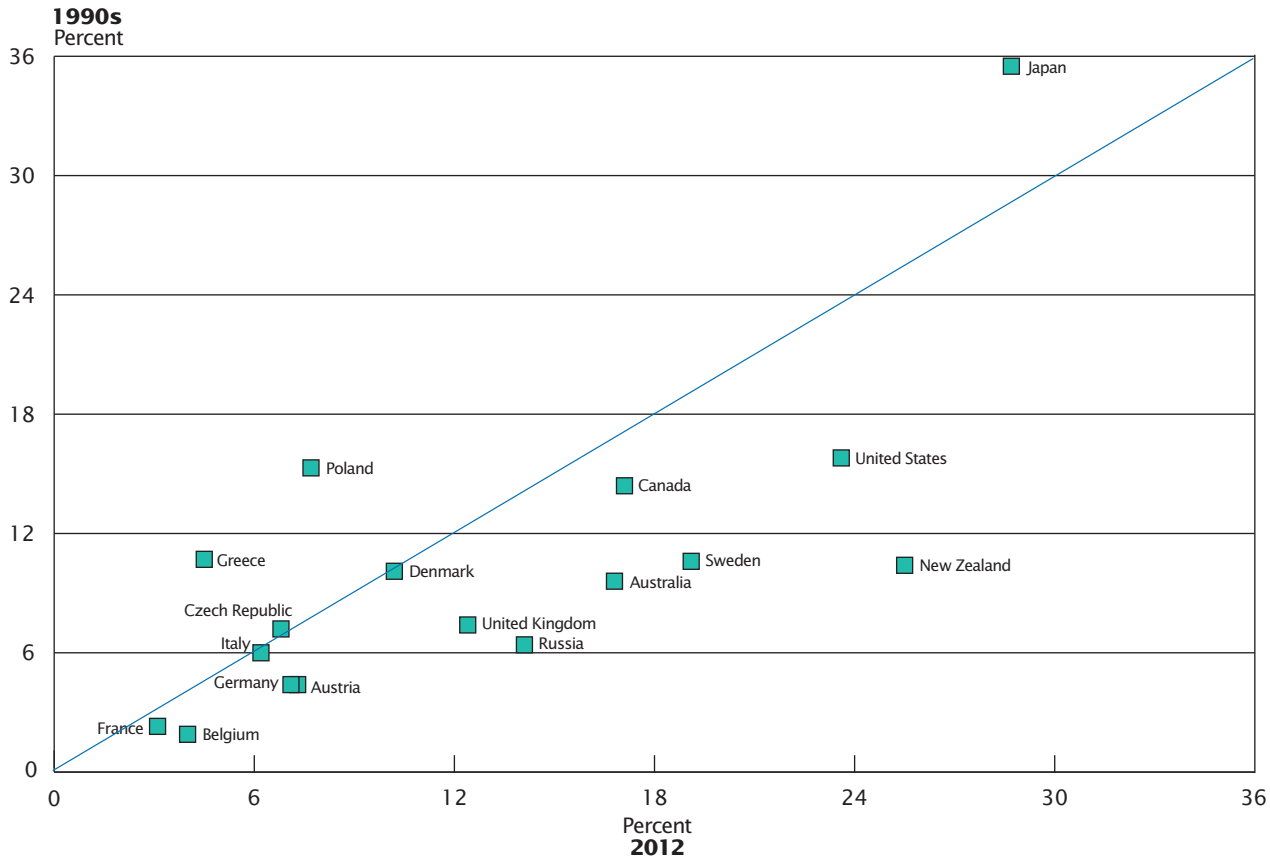
A variety of factors have contributed to this increase, including uncertainty about the sufficiency and viability of public pension systems, increased reliance on defined contribution pension schemes, higher eligibility ages for retirement benefits, and changing social norms favoring a later exit from the labor force (Friedberg and Webb, 2005; van Dalen et al., 2010; Hurd and Rohwedder, 2011; Skugor, Muffels, and Wilthagen, 2012; Hasselhorn and Apt, 2015). All of these changes are driven to some extent by the fact that people

are living longer. For example, unless retirement ages rise along with increased life expectancy, societies will bear the extra cost of a longer period of retirement (The Economist, 2011). This is especially the case in countries where old age security systems are based on pay-as-you-go (PAYGO) financing, which requires payroll deductions from current workers to provide benefits to current retirees.

Although the factors mentioned above tend to encourage later retirement ages, there are also countervailing factors contributing to an individual's retirement decision, which can be complex and hard to predict. Employment participation is affected by individual level factors (such as personal and family health and personal financial resources), work place factors (such as physical demands of job and changing required skill set), and macro level factors (such as the economic growth rate, retirement and pension policy, and changes in information and communication technologies).

The change in labor force participation rates at ages 65 and above between the 1990s and 2012 is illustrated on Figure 6-3 (males) and Figure 6-4 (females) for selected more developed countries. Countries that fall on the diagonal experienced no change in labor force participation rates. For both men and women, most countries are below the diagonal, reflecting an increase in labor force participation. Among countries experiencing a decline in participation rates for older men were Greece, Japan, and Poland. Countries with the largest increases in participation rates for both older men and older women included Australia, New Zealand, Sweden, and the United States.

Figure 6-3.
Labor Force Participation Rates for Men Aged 65 and Over in More Developed Countries: 1990s and 2012



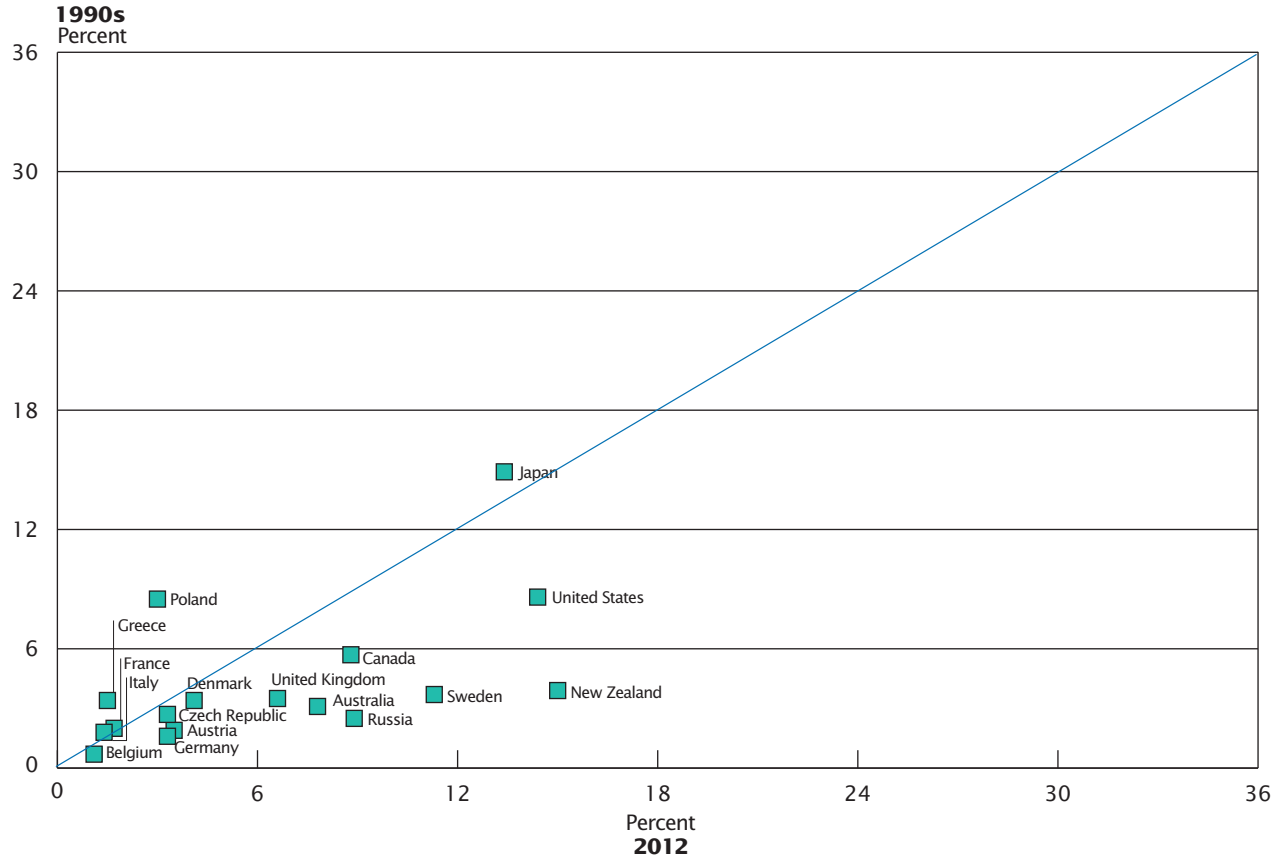
Sources: International Labour Office, 2007, 2014; LABORSTA, ILOSTAT Database.

In countries with high employment in the primary sector (agriculture and mining), participation rates often remain high at older ages. When the scale of agriculture is small with a large share engaged in subsistence farming, family members often continue to work into their 60s and beyond out of economic necessity. As economies develop and the service and industry sectors expand and pension eligibility increases, the labor force participation rate of the older population typically declines from previous levels (Reddy, 2014; Samorodov, 1999).

Among less developed countries shown in Figures 6-5 and 6-6, more experienced declines in labor force participation rates than experienced increases from the 1990s to 2012. Substantial differences exist in participation rates between more developed countries and less developed countries. For example, older males had labor force participation rates that exceeded 50 percent in 2012 in six less developed countries (Guatemala, Jamaica, Mozambique, Peru, Philippines, and Zimbabwe) displayed in Figure 6-5 but did not reach this rate in any more developed countries shown in Figure 6-3. Labor force participation rates for older women exceeded 50 percent in two less developed countries (Mozambique and Zimbabwe) shown in Figure 6-6 but did not come close to this rate in any of the more developed countries included in Figure 6-4.

Demographic forecasts of labor force participation rates among older adults are typically based upon recent trends, such as those implied by Figures 6-3 to 6-6. Forecasts by the International Labour Organization (2011) imply an increase in labor force participation for the older population

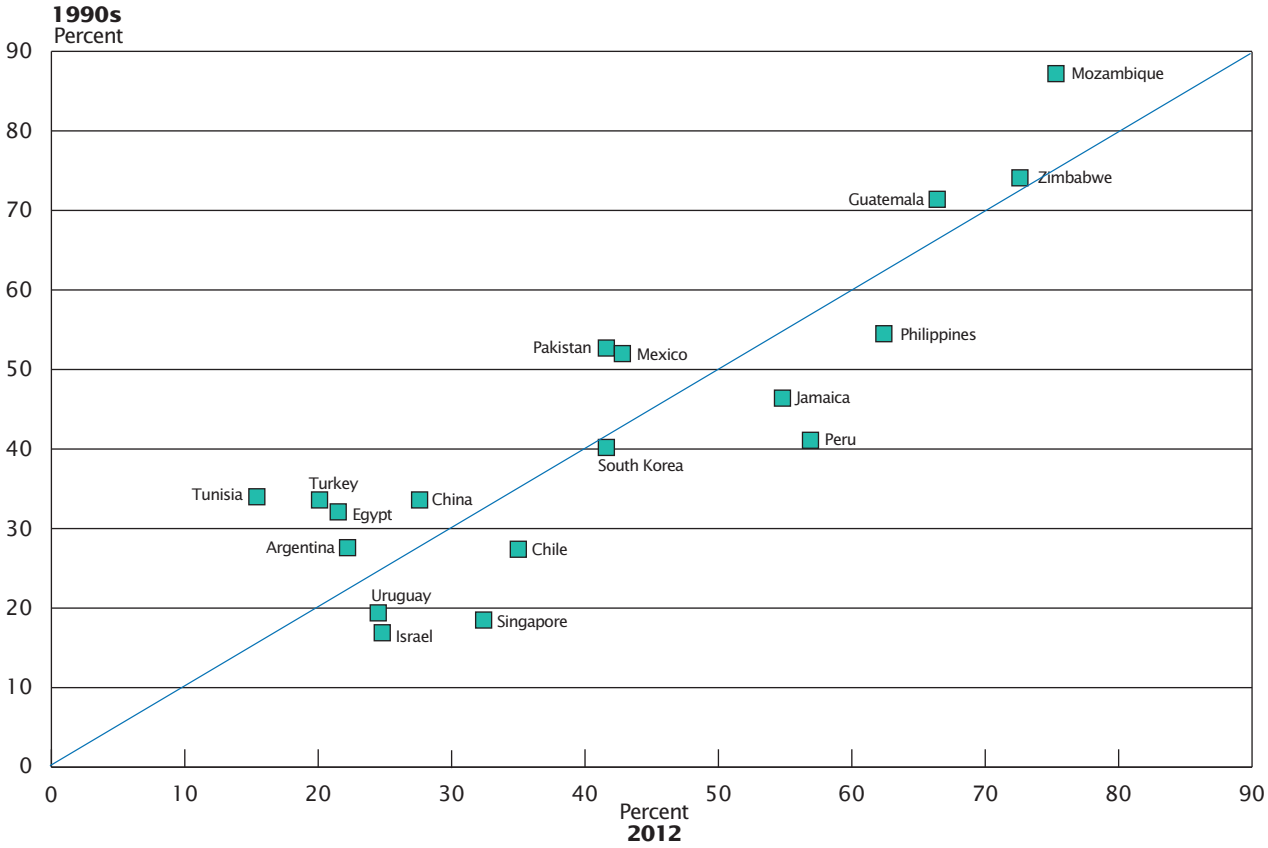
Figure 6-4.
Labor Force Participation Rates for Women Aged 65 and Over in More Developed Countries: 1990s and 2012



Sources: International Labour Office, 2007, 2014; LABORSTA, ILOSTAT Database.

Figure 6-5.

Labor Force Participation Rates for Men Aged 65 and Over in Less Developed Countries: 1990s and 2012



Notes: The earlier year for Singapore is 2000. The later year for Pakistan and Zimbabwe is 2011 and for China, Jamaica, and the Philippines is 2010.
Sources: International Labour Office, 2007, 2014; LABORSTA, ILOSTAT Database.

(both men and women) between 2010 and 2020 in more developed regions such as Oceania, Northern America, and Europe (see Figure 6-1).[1] In contrast, labor force participation rates in Africa, which are currently the world's highest, are expected to continue a gradual decline through 2020 for both men and women. In Asia and Latin America and the Caribbean, the direction of projections is mixed. In Asia, rates for older men are projected to decline while rates for older women are expected to hold steady. In Latin America and the Caribbean, older men are projected to see a slight decline while older women will see an increase.

Increases in labor force participation rates in more developed countries are not confined to the older population. Among 12 European countries and the United States, participation rates increased for those aged 55 to 64 from 2001 to 2011 for all countries except Portugal (Table 6-3). For the group aged 65 to 69, rates increased over the same period in all countries except Greece, Poland, and Portugal. Increasing labor force participation rates among the group aged 55 to 64 may suggest future increases in participation rates for the older population.

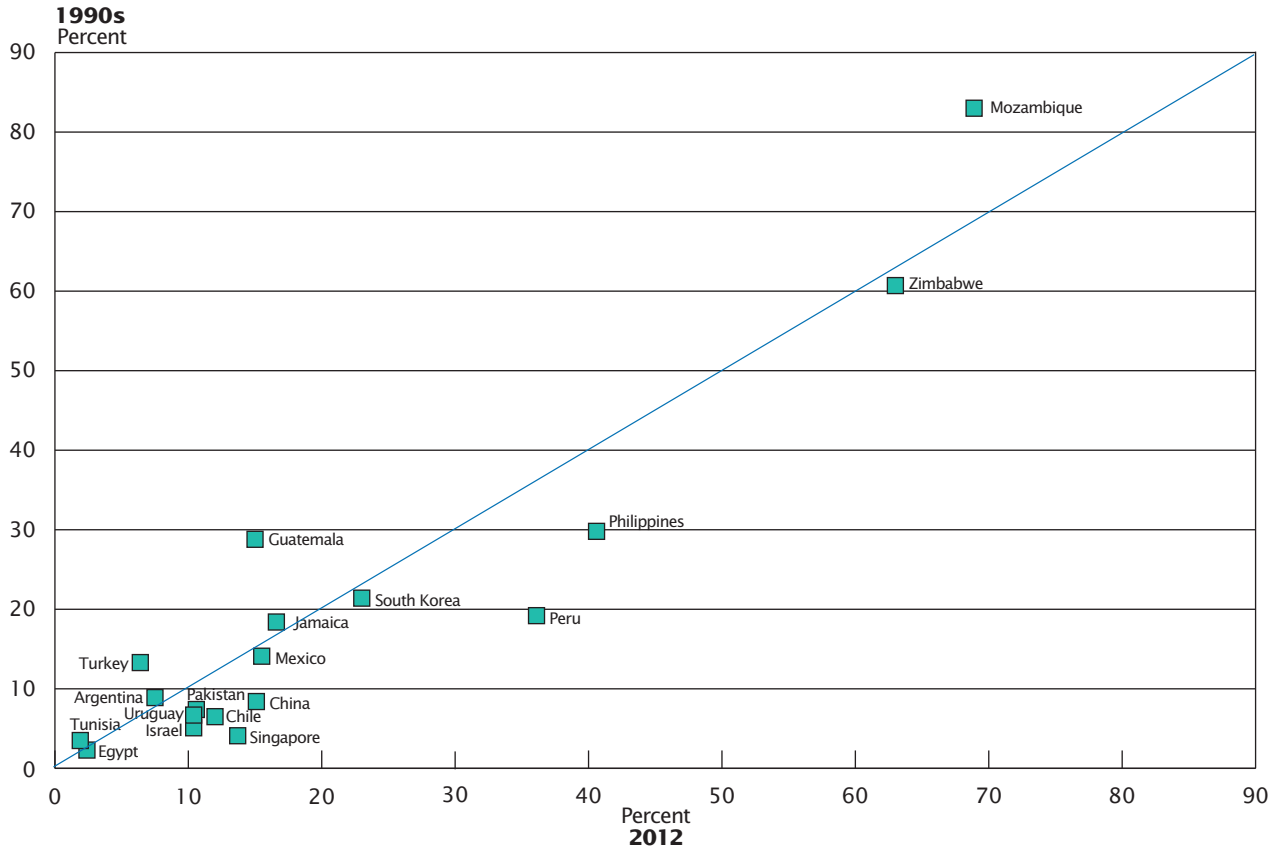
SHARE OF THE OLDER, EMPLOYED POPULATION WORKING PART-TIME VARIES ACROSS COUNTRIES

The labor force includes those who are working (or seeking to work) full-time or part-time. Among older

[1] The International Labour Organization (2011) generates projections of the economically active population using a three-step procedure, including application of extrapolation methods, changes in the business cycle, and judgement adjustments to achieve consistency across gender and age groups. The adjustments are based on the share of the population aged 0–14 and aged 55 and over, the share of the female population in total population, share of immigrant workers in the country, forthcoming changes in retirement and preretirement schemes, other relevant policy or legal changes, and HIV prevalence.

Figure 6-6.

Labor Force Participation Rates for Women Aged 65 and Over in Less Developed Countries: 1990s and 2012



Notes: The earlier year for Singapore is 2000. The later year for Pakistan and Zimbabwe is 2011 and for China, Jamaica, and the Philippines is 2010.
Sources: International Labour Office, 2007, 2014; LABORSTA, ILOSTAT Database.

workers, part-time work may be attractive for a variety of reasons. Part-time work can provide older workers a stream of income and allow them to maintain social connections with colleagues without the daily demands of full-time work. Part-time arrangements may be especially attractive for older workers who are already receiving a pension or have other financial resources, which allow them to sequentially step away from the workforce (Hannon, 2014). In general, part-time work is more common among older women than older men.

Table 6-3.

Labor Force Participation Rates for Older Workers in Selected Countries: 2001 and 2011

(In percent)

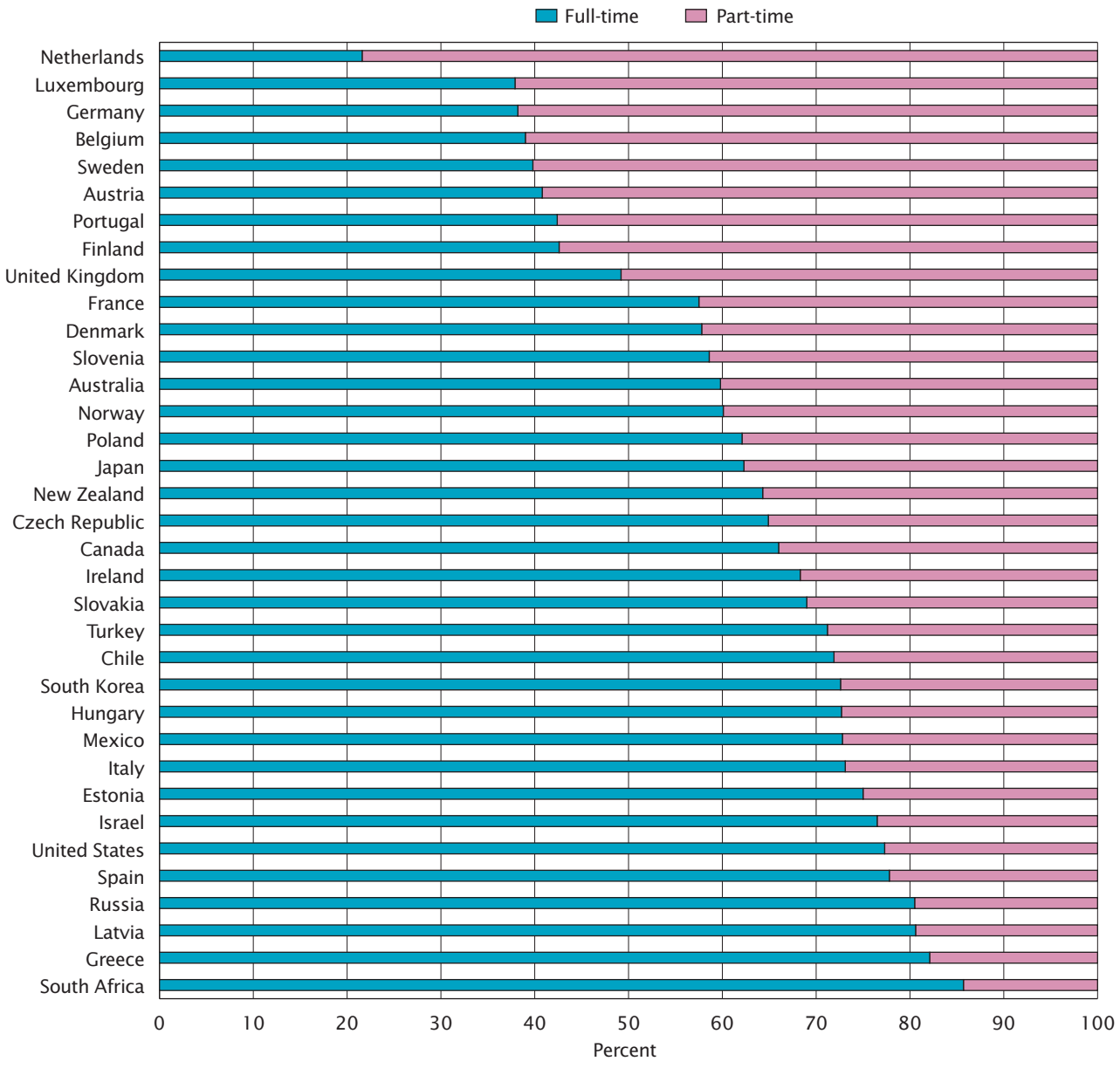
Country	Aged 55 to 64		Aged 65 to 69	
	2001	2011	2001	2011
Belgium	25.2	38.7	2.4	3.5
Czech Republic	37.1	47.6	7.6	9.3
Denmark	56.5	59.5	12.2	13.5
Finland	45.9	57.0	5.3	11.8
France	30.7	41.4	2.1	5.3
Germany	37.9	59.9	5.4	10.1
Greece	38.0	39.4	10.3	8.6
Ireland	46.9	50.8	14.8	16.8
Netherlands	37.3	56.1	5.6	11.4
Poland	29.0	36.9	10.8	9.4
Portugal	50.2	47.9	27.8	21.9
Spain	39.2	44.5	3.9	4.5
United States[1]	61.9	64.3	26.1	32.1

[1] Data for the United States is for 2002 and not 2001.
Sources: Kritzer, 2013; Bureau of Labor Statistics, 2013.

Figures 6-7 and 6-8 show the employment status of older, employed men and women, respectively, in a selection of 35 countries. Across these countries, women account for 33 percent of older workers employed full-time and 49 percent of older workers employed part-time in 2013 (Organisation for Economic Co-operation and Development, 2014). Among the older, employed population of men, the proportion engaged in part-time work as of 2013 ranged from under 20 percent in Greece, Latvia, Russia, and South Africa to over 60 percent in Belgium, Germany, Luxembourg, the Netherlands, and Sweden (Figure 6-7). Overall, employed women aged 65 and over showed higher proportions engaged in part-time work than older, employed men (Figure 6-8). Among the same set of countries, the proportion of older female workers employed part-time was less than 20 percent in Greece only and exceeded 60 percent in 11 countries.

The frequency of part-time employment among the older population

Figure 6-7.
Employment Status of Employed Men Aged 65 and Over by Country: 2013

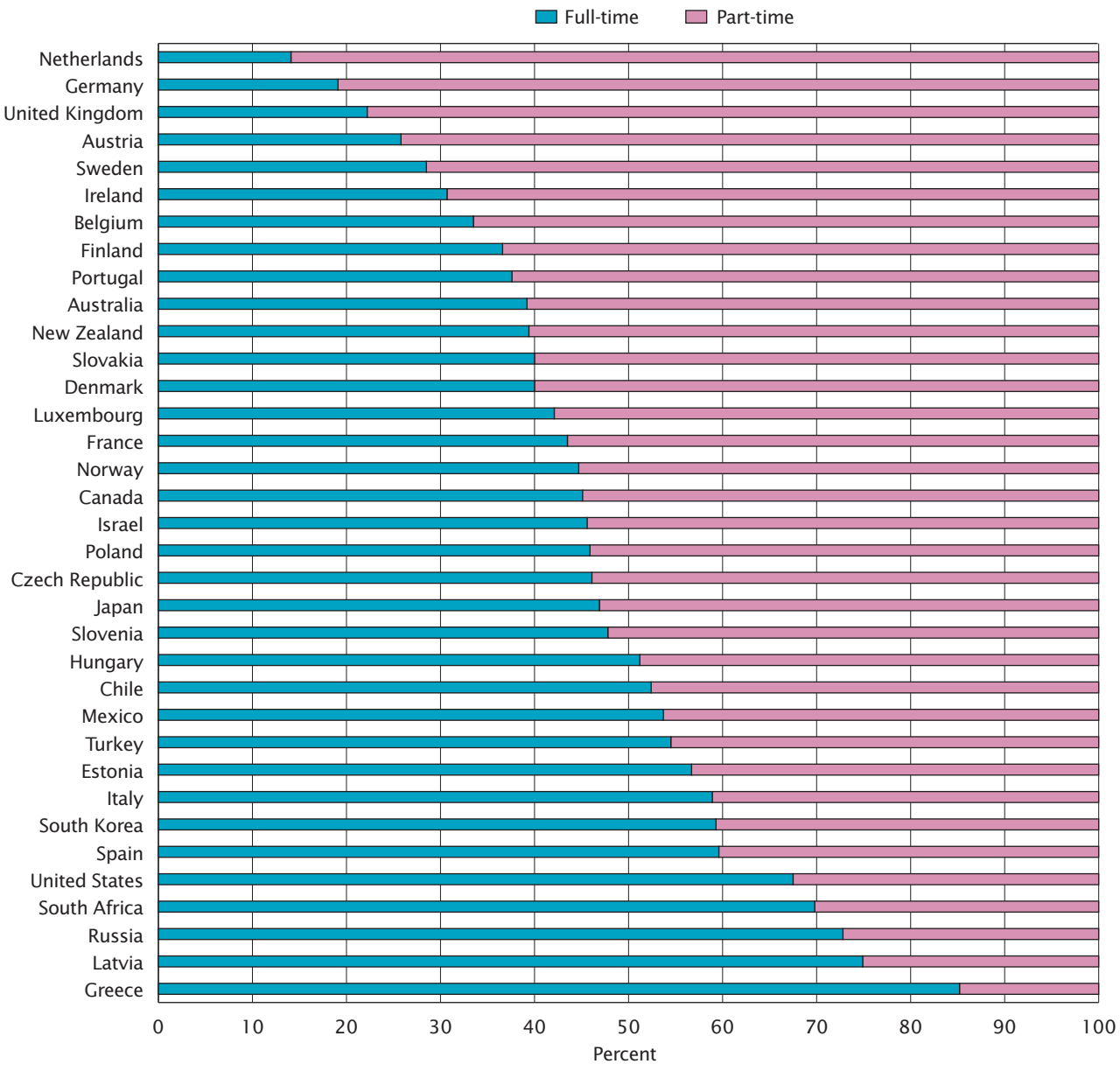


Note: Part-time employment is less than 30 usual hours for main job.
Source: Organisation for Economic Co-operation and Development, 2014; OECD Stat.

is also related to the willingness of employers to allow part-time work. In a survey of 16 countries, the proportion of employees saying that their employer provided the option of part-time work to phase into retirement ranged from a high of 30 to 31 percent in Germany, India, and Sweden to a low of 16 to 17 percent in Japan and Spain (Aegon, 2014). On the other hand, some older workers may prefer to work full-time but can only find part-time employment.

While Greece showed very low reliance on part-time work among the older employed population, the labor force participation rate of older Greeks is among the lowest in the world. The large proportion of older employees working full-time may indicate that when Greek retirees exit the labor force they do so without any sequential step-down to part-time work. Access to generous pensions at retirement may allow more Greek workers to enter total retirement once reaching age 55 for public sector workers and age 60 for private sector workers (Mylonas and de la Maisonneuve, 1999; Organisation for Economic

Figure 6-8.
Employment Status of Employed Women Aged 65 and Over by Country: 2013



Note: Part-time employment is less than 30 usual hours for main job.
Source: Organisation for Economic Co-operation and Development, 2014; OECD Stat.

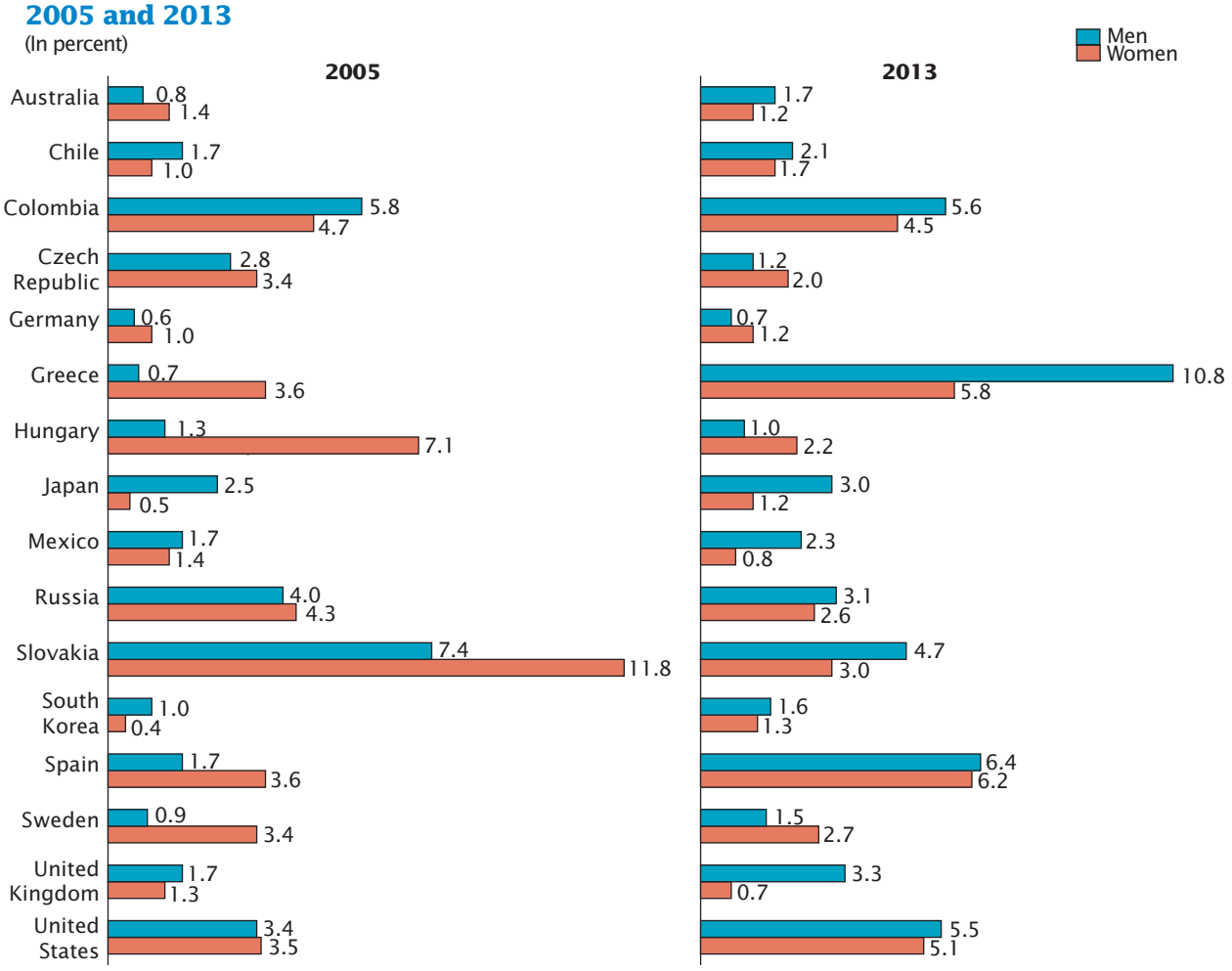
Co-operation and Development, 2007). The reluctance of Greek employers to offer part-time work could also be a partial explanation for the rarity of part-time employment (van Dalen et al., 2010).

UNEMPLOYMENT PATTERNS VARY ACROSS SEXES AND OVER TIME

Assessing levels and trends in unemployment rates of older people is challenging for multiple reasons, including lack of data availability, the nature of the business cycle, and definition differences across countries. Economic upheavals may sometimes affect unemployment patterns across countries. A case study of the recent Global Recession of 2007–2009 and its impact on unemployment patterns and retirement patterns appears in Box 6-1. During economic downturns, older workers may choose to retire rather than remain unemployed for an extended period even though their preference is to remain in the labor force. At the same time, some older workers may delay their retirement to recover financially from the recession.

One comparison of 16 countries shows that unemployment levels and patterns vary by country and timing relative to the Great Recession of 2007–2009 (Figure 6-9). For instance, the

Figure 6-9.
Unemployment Rate for Men and Women Aged 65 and Over by Country: 2005 and 2013
(In percent)



Source: Organisation for Economic Co-operation and Development, 2014; OECD Stat.

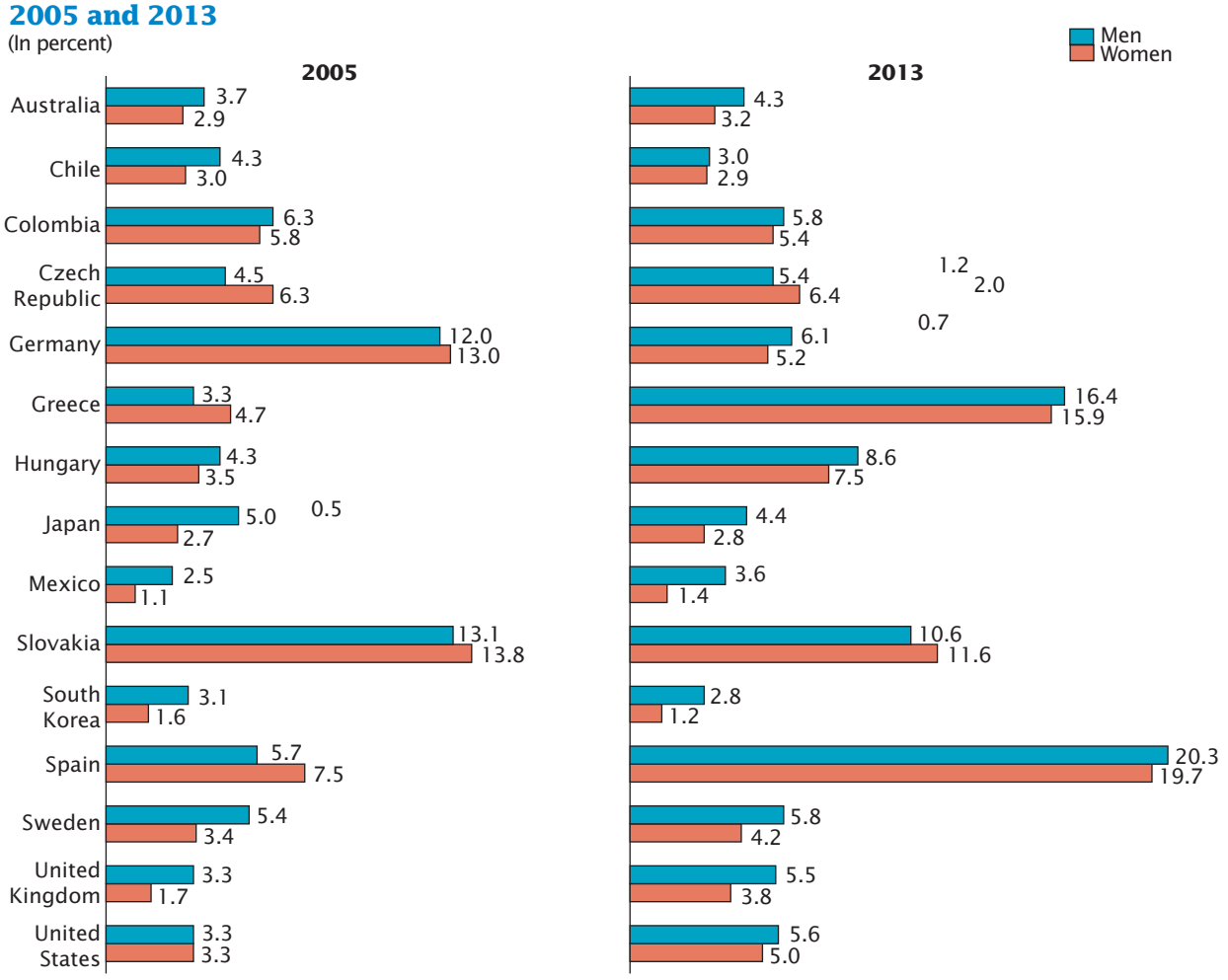
unemployment rate for older men was higher than for older women in both 2005 and 2013 in Chile, Colombia, Japan, Mexico, South Korea, and the United Kingdom, but the opposite was the case for Czech Republic, Germany, Hungary, and Sweden. Older men were more likely to face an increase in the unemployment rate from 2005 to 2013 than older women (unemployment rates rose in 11 of the 16 countries for men but declined for women in 9 of the 16 countries).

The labor force aged 55 to 64 is approaching retirement and their unemployment status can affect the financial security of future retirees; therefore, it is worthwhile to examine this cohort as well. Estimates of the unemployment rate also are likely to be more robust for this age group. Among the same 16 countries, men aged 55 to 64 tended to have higher unemployment rates than women aged 55 to 64 (Figure 6-10). Unemployment rates were substantially higher for both men and women aged 55 to 64 in 2013 compared to 2005 for Greece and Spain. On the other hand, unemployment rates dropped notably in 2013 compared to 2005 for both men and women in this same cohort in Germany.

Figure 6-10.

Unemployment Rate for Men and Women Aged 55 to 64 and Over by Country: 2005 and 2013

(In percent)



Source: Organisation for Economic Co-operation and Development, 2014; OECD Stat.

Box 6-1.

Impact of the Great Recession on the Older Population

World markets experienced a general economic decline during the 2007 to 2009 period. While only a portion of the world's countries saw negative growth rates for gross domestic product (GDP) during this time, many other countries faced slowdowns in their economic growth. In the United States, for example, a recession officially began in December 2007 and ended in June 2009. Nearly all member countries of the European Union also went into recession around the same time. China and India, on the other hand, did not enter recession but did experience slowing economic growth (Bernanke, 2009). In addition, countries whose economies were less integrated with the world economy through trade or financial markets, such as many countries in Africa, were less directly affected. The International Monetary Fund estimated that real world GDP per capita (in purchasing power parity terms) declined in 2009 and stated that the world economy was experiencing a "Great Recession" more severe than at any time since the end of World War II (International Monetary Fund, 2009).

The recession originated in the United States after a sharp decline in housing prices triggered defaults on subprime mortgages, the financial fallout from which spread to other parts of the world (International Monetary Fund, 2009). The recession was characterized by rising unemployment as well as falling prices of housing, commodities, and other investments. To what extent did the recession affect the older population and have any effects lingered?

The unemployment rates over the 2000 to 2013 period for four countries—Portugal, South Korea, United Kingdom, and United States—help illustrate the diverse impact of the Great Recession (Figure 6-11). Unemployment in the United States at ages 65 and over more than doubled between 2006 and 2010—from 2.9 to 6.7 percent, an increase of nearly 4 percentage points—before starting a slow decline and reaching 5.3 percent in 2013. The older labor force in South Korea and Portugal also saw a rise in unemployment levels following 2006 but at levels below those of the United States. However, while the unemployment rate peaked in 2010 for South Korea, the peak did not occur until 2012 in Portugal. In the United Kingdom, unemployment rates fluctuated around 2 percent over the entire 2000 to 2013 period for the older population. While unemployment rose for the older population, they were lower than the rates of younger adults (aged 25 to 54) in each of the four countries. South Korea did not experience sharp fluctuations in unemployment for the population aged 25 to 54 throughout the period. Unemployment rates among younger adults largely flattened in the United Kingdom after 2009 and continued to rise in Portugal after 2008, reaching 15.5 percent in 2013. The lack of notable improvement in unemployment rates in Portugal and the United Kingdom likely reflect the subsequent public debt crisis and implementation of austerity measures in Europe, in contrast to a decline in U.S. unemployment after 2010.

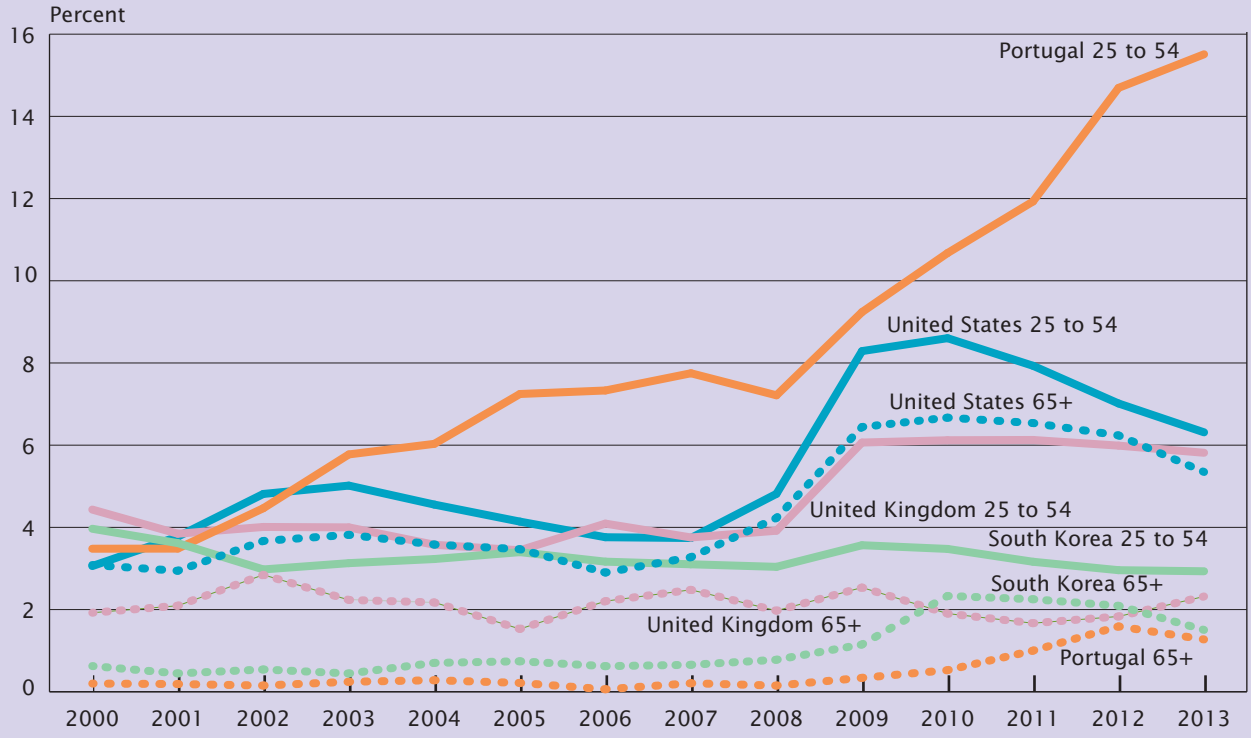
The retirement plans and wealth of the older population in the countries most impacted by the Great Recession were also affected by the declines in asset prices—in particular housing and financial investments. In Denmark, Ireland, the Netherlands, and Spain, for example, real housing prices declined by 25 percent or more (International Monetary Fund, 2015). In the United States, housing prices also declined although older Americans tended to have greater equity accumulated prior to the housing collapse than did younger home owners (West et al., 2014). One study focused on American preretirees aged 53 to 58 in 2006 found that their net housing wealth declined by 23 percent in real terms between 2006 and 2010, although their total wealth declined only 2.8 percent from 2006 to 2010 (Gustman, Steinmeier, and Tabatabai, 2012).

While the Great Recession had a major impact on unemployment rates even among the older population, the trend of rising labor force participation rates among people aged 60 and older in more developed countries was not halted. A study of 20 Organisation for Economic Co-operation and Development (OECD) member countries found that the average rate of increase in labor force participation for those in the groups aged 60 to 64, 65 to

Continued on next page.

Figure 6-11.

Unemployment Rates for Population Aged 25 to 54 and Aged 65 and Over for Portugal, South Korea, United Kingdom, and United States: 2000 to 2013



Source: Organisation for Economic Co-operation and Development, 2014; OECD Stat.

69, and 70 to 74 accelerated in more than half of the 20 countries since the onset of the Great Recession (Burtless and Bosworth, 2013). The trend of a labor force participation rate increase for workers aged 60 and over slowed significantly in only three of the 20 countries—Greece, Portugal, and Ireland—countries that experienced particularly severe recessions (ibid). Overall, the Great Recession motivated some older workers to postpone retirement and drew others back into the labor force.

Lastly, given the many modifications to world social security systems observed between 2008 and 2013 (Organisation for Economic Co-operation and Development, 2013), one may ask whether the Great Recession provided a catalyst for such changes. The answer is not entirely straightforward. Many social security systems were quite generous and financially unsustainable before the Great Recession and likely in need of reform even if the recession had not occurred (Capretta, 2007). However, the Great Recession may have contributed to the substantial reform packages introduced in OECD countries and helped to revise thinking about who should be covered and what is affordable (Organisation for Economic Co-operation and Development, 2013).

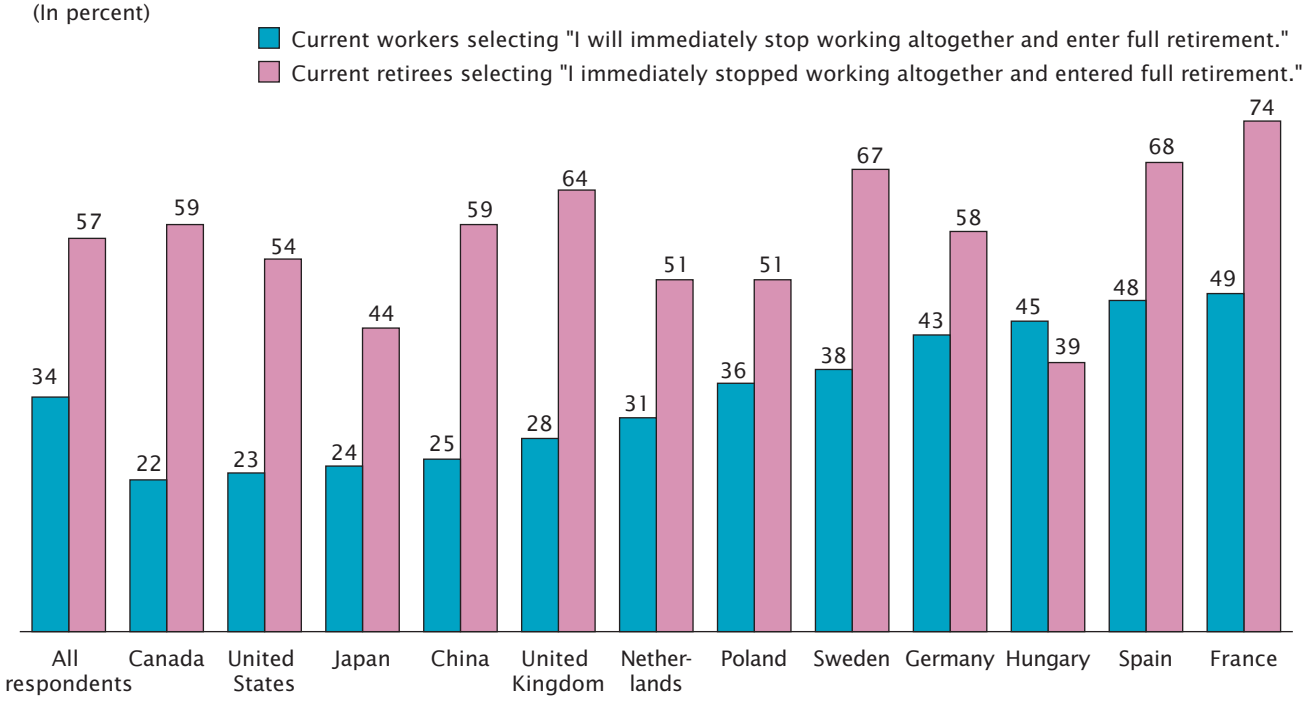
Note: For example, the labor force participation rate of 65- to 69-year-olds increased at an average rate of 0.1 percentage point per year between 1989 and 2007 but at an average rate of 0.8 percentage point a year between 2007 and 2012 for the 20 sample countries.

EXPECTATIONS AND REALITIES—MANY WORKERS UNCERTAIN ABOUT THEIR LIFESTYLE AFTER RETIREMENT AND MANY RETIRE EARLIER THAN EXPECTED

In the transition from work to retirement, some workers prefer a gradual "step down" to retirement, while others wish to move from full-time employment immediately into full-time retirement. Increasingly, the gradual transition model is being preferred by workers in developed countries (Hasselhorn and Apt, 2015). One survey of 12 countries found potential differences between expectations of workers and realities experienced by retirees in 2013 (Figure 6-12). A minority of workers (34 percent) in these 12 countries said they planned to stop working altogether and enter full retirement. Such expectations contrast with the realities of current retirees, among whom 57 percent stopped working entirely after retirement.

These discordant findings likely reflect unforeseen circumstances that individual retirees often encounter, such as health problems that preclude further work even on a part time basis or favorable financial circumstances that allow them to avoid it (Aegon, 2013). The discordancy may also reflect the cohort difference between current workers and current retirees. Thus, if current workers expect an increasingly tenuous future for public social security systems or simply want to continue working to later ages, their plans to continue working part-time may differ from that of current retirees (Organisation for Economic Co-operation and Development, 2013).

Figure 6-12.
Work Plans After Retirement by Workers and Retirees for Selected Countries: 2013
(In percent)

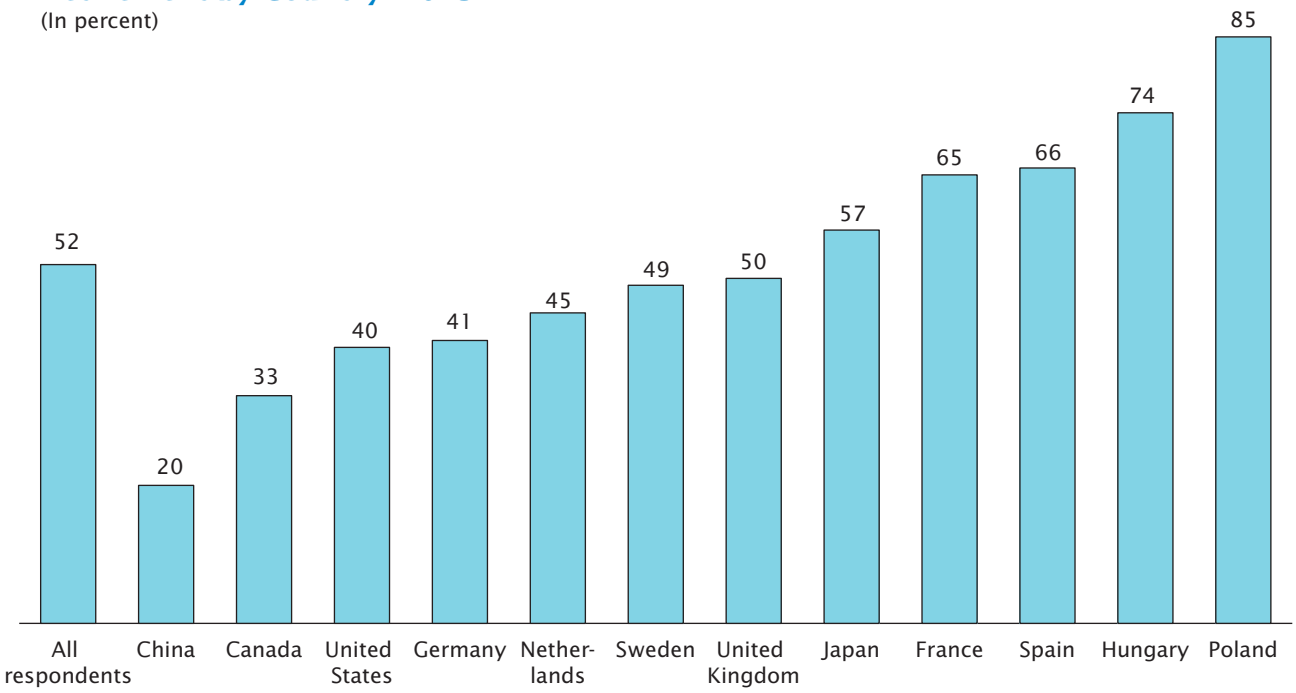


Notes: The question for workers was "Looking ahead, how do you envision your transition to retirement?" The question for retirees was "Looking back, how did your transition to retirement take place?"
Source: Aegon, 2013.

Workers' preferences for when to retire and which transition model to follow are influenced by their expected financial security in retirement. Workers around the world express varying opinions about how comfortable they expect their lifestyle will be upon retirement. Among the 12 countries included in the Aegon (2013) survey, workers in Canada and China seemed to be more optimistic (low proportions who lack confidence about having a comfortable lifestyle in retirement), whereas about two-thirds or more in France, Hungary, Poland, and Spain were not confident about achieving a comfortable lifestyle in retirement (Figure 6-13).

Such differing opinions likely reflect circumstances specific to each country as well as subjective interpretations about what exactly would constitute a comfortable lifestyle in retirement. Confidence about a comfortable retirement may also be related to the generation that each cohort was born into, including the circumstances

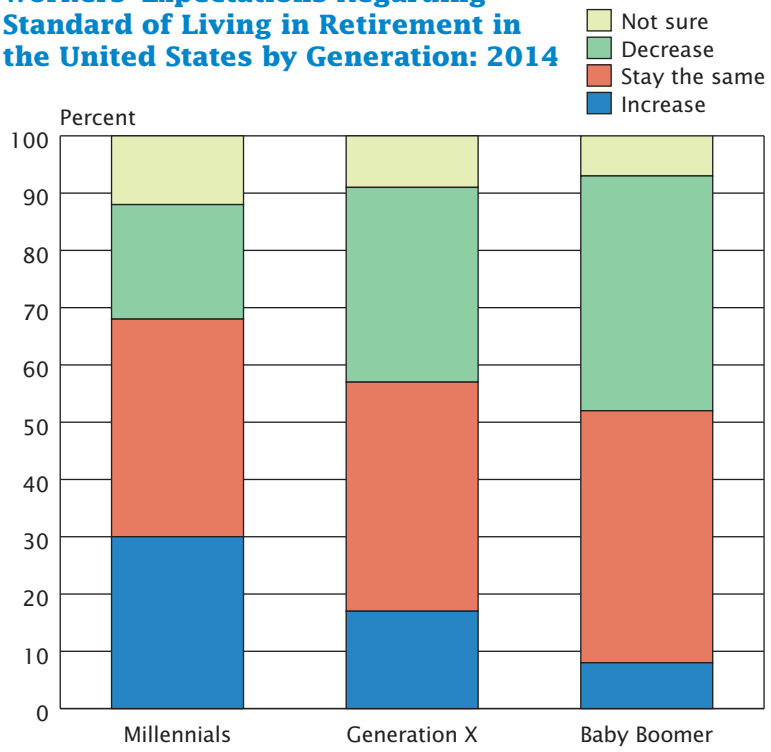
Figure 6-13.
Workers Who Are Not Confident About Having A Comfortable Lifestyle in Retirement by Country: 2013
(In percent)



Notes: The question was "Overall, how confident are you that you will be able to fully retire with a lifestyle you consider comfortable?" Not confident includes those responding "not at all confident" or "not very confident."
Source: Aegon, 2013.

encountered at primary working ages as well as those encountered (or envisioned) at retirement. In the United States, the Baby Boom generation (born between mid-1946 to 1964), which is already in retirement or closest to it, seemed more pessimistic about their standard of living after retirement, while the younger generation of Millennials seemed more optimistic (Figure 6-14). Such differences might simply reflect intergenerational differences of hope and experience—the challenges foreseen during retirement may seem easiest to resolve by those furthest from it.

Figure 6-14.
Workers' Expectations Regarding Standard of Living in Retirement in the United States by Generation: 2014



Notes: The question was "Do you expect your standard of living to increase, decrease, or stay the same when you retire?"
Millennials—born 1979–1996, Generation X—born 1965–1978, and Baby Boomer—born 1946–1964.
Source: Transamerica Center for Retirement Studies, 2014.

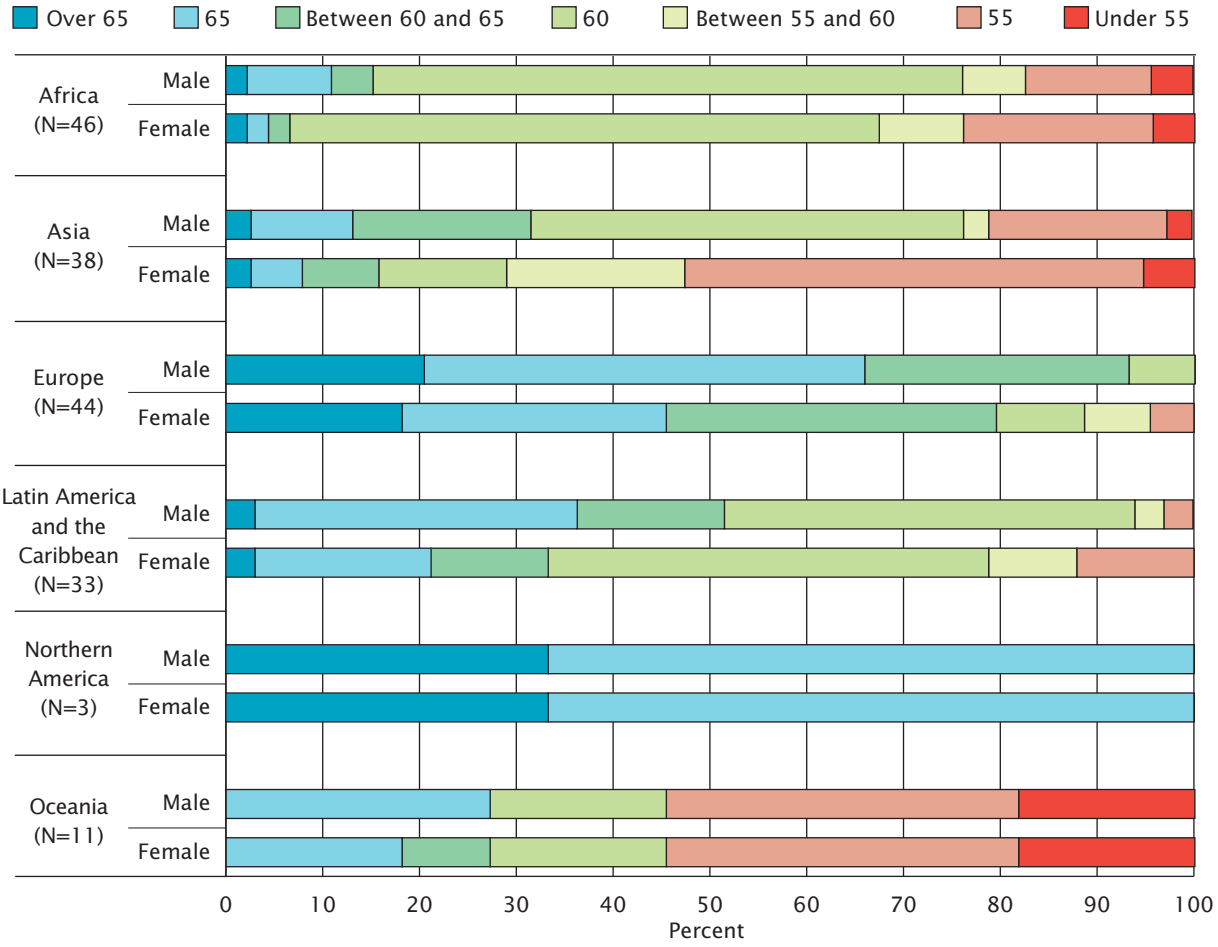
STATUTORY RETIREMENT AGES VARY WIDELY ACROSS WORLD REGIONS, YET TEND TO LUMP AT CERTAIN AGES

When workers are asked to evaluate their prospects upon retirement, one of the first concerns an individual may have is the age at which s/he will qualify for a public pension. The statutory retirement age for social security programs varies widely across the world (Figure 6-15), reflecting any number of local factors, such as life expectancy and available budgets. Among many other considerations, it is often claimed that increases in the official retirement age will result in more youth unemployment, although empirical studies in OECD countries have questioned whether such a connection truly exists (Böheim, 2014).

The youngest statutory retirement ages (ages at which retirees are eligible to receive a social pension) are in Africa, where less than 20 percent of countries specify an eligibility age exceeding 60. In contrast, the share of European countries with pensionable ages above 60 exceeds 90 percent for males and 75 percent for females. Despite such variation, Figure 6-14 illustrates that statutory pensionable ages around the world tend to continue to concentrate on the exact ages 55, 60, and 65.

Figure 6-15.

Percentage Distribution of Statutory Pensionable Age by Region and Sex: 2012/2014



N=Number of countries in each region.
Sources: Social Security Administration, 2013a, 2013b, 2014a, 2014b; Social Security Programs Throughout the World.

Of course, the statutory pensionable age is subject to change. As noted earlier, official retirement ages have tended to rise in many parts of the world (World Bank Group, 2014).

Upward pressure on statutory retirement ages often occurs under PAYGO systems, which rely on payroll deductions from current workers to fund pensions of current retirees. Such systems are readily sustainable when a smaller proportion of the population is at older ages, but as the population ages and the older dependency ratio (retirees per worker) rises (Chapter 2), changes are needed. To remain financially sustainable, such systems require one or more of the following: increases in the payroll tax for workers, cuts to pensioner benefits, or a rise in the official retirement age. For many governments experiencing such challenges, the latter option has often been preferred (Organisation for Economic Co-operation and Development, 2013). A number of European countries and the United States are gradually increasing their statutory pensionable age to 67. For France, Germany, Spain, the United Kingdom, and the United States, pension eligibility will reach age 67 by 2022, 2029, 2027, 2028, and 2027, respectively (Social Security Administration, 2014a; 2014b).

Box 6-2.

A Second Demographic Dividend?—Age Structure, Savings, and Economic Growth

As fertility falls, a "demographic dividend" of more rapid economic growth might be achieved due to a higher proportion of the population at working ages (Chapter 3) and increased labor force participation of women. Conversely, the proportions of children and older adults—who tend to consume economic resources rather than produce them—will be lower. Yet the window of opportunity for reaping this potential benefit from changing age structure is temporary, and there is no guarantee that it will be reaped. Moreover, as fertility remains low for a long time, this initial dividend will dissipate as the large cohort of workers reaches older ages (Chapters 2 and 3).

However, a second demographic dividend might also occur as a population ages and the age structure once again changes. Given longer expected lives and diminished traditional family support due to fewer children, workers may attempt to save more and accumulate additional assets in preparation for their retirement (Bloom, Canning, and Graham, 2003; Bloom et al., 2007). That extra savings and an increase in capital per worker due to a shrinking labor force may lead to rapid economic growth in contrast to the pessimistic view of the labor force shrinking, per capita income declining, and consumption and welfare falling (Mason and Lee, 2006; Bloom and Canning, 2008).

The opportunity to achieve the second demographic dividend will exist for many countries, but the realization of that dividend will depend on how consumption of the older population is supported—through savings or borrowing, governmental transfers, or family transfers (Bloom and Canning, 2008). Economic policies that encourage workers to save and accumulate assets such as housing, businesses, and funded pensions will be important. A developed financial system and access to global markets are key to providing opportunities for workers to achieve financial independence in old age and reduce reliance on families and the government. If governments choose to increase PAYGO public pensions in response to population aging, then this will counter saving incentives and substantially increase the burden on younger generations (ibid.).

Japan, one of the most rapidly aging countries in the world due to a dramatic decline in fertility in the 1950s and mortality improvements that have placed Japan ahead of nearly all other countries in terms of life expectancy, is the first Asian country to begin reaping the second demographic dividend. The second dividend contributions to growth in Japan were high in the 1980s (adding nearly 1.5 percentage points to economic growth), while in more recent years the benefits are more modest—adding about 0.5 percentage point to growth (Ogawa et al., 2010). The traditional family support system is disappearing due to fewer children and increased public pension benefits. One statistic illustrates the change—in 1950 nearly two-thirds of Japanese married women said they intended to rely on their children for old age support but in 2000 only 11 percent expected to depend on their children (Ogawa, Kondo, and Matsukura, 2005). While Japan has increased spending in support of the aging population, the government has set a ceiling of 45 percent of national income for the tax burden for financial social security programs (ibid). The government hopes that increasing financial literacy rates among adults in Japan will further increase life cycle saving among workers and continue the second demographic dividend (Ogawa et al., 2010).

Chapter 6 References

Aegon. 2013. *The Changing Face of Retirement: The Aegon Retirement Readiness Survey 2013*. Aegon and the Transamerica Center for Retirement Studies.

_____. 2014. *The Changing Face of Retirement: The Aegon Retirement Readiness Survey 2014*. Aegon and the Transamerica Center for Retirement Studies.

Bernanke, Ben S. 2009. "Welcome Address Asia and the Global Financial Crisis." In Reuven Glick and Mark M. Spiegel (eds.), *Asia and the Global Financial Crisis*. Proceedings of Asia Economic Policy Conference held October 19–20, 2009 Santa Barbara, California.

Bloom, David E. and David Canning. 2008. "Global Demographic Change: Dimensions and Economic Significance." *Population and Development Review* 34: 17–51.

Bloom, David E., David Canning, and Bryan Graham. 2003. "Longevity and Life-cycle Savings." *Scandinavian Journal of Economics* 105: 319–338.

Bloom, David E., David Canning, Richard K. Mansfield, and Michael Moore. 2007. "Demographic Change, Social Security Systems, and Savings." *Journal of Monetary Economics* 54: 92–114.

Böheim, René. 2014. "The Effect of Early Retirement Schemes on Youth Employment." *IZA World of Labor* 70/June.

Bureau of Labor Statistics. 2013. Labor Force Statistics from the Current Population Survey.

Burtless, Gary and Barry P. Bosworth. 2013. "Impact of the Great Recession on Retirement Trends in Industrialized Countries." Center for Retirement Research at Boston College.

Capretta, James C. 2007. "Global Aging and the Sustainability of Public Pension Systems: An assessment of reform efforts in twelve developed countries." Center for Strategic & International Studies, a report of the Aging Vulnerability Index project.

Contreras, Dante and Gonzalo Plaza. 2010. "Cultural Factors in Women's Labor Force Participation in Chile." *Feminist Economics* 16/2: 27–46.

The Economist. 2011. *70 or Bust! Why the Retirement Age Must Go Up*. A Special Report on Pensions.

Fernández, Raquel. 2013. "Cultural Change as Learning: The Evolution of Female Labor Force Participation Over a Century." *American Economic Review* 103/1: 472–500.

Friedberg, Leora and Anthony Webb. 2005. "Retirement and the Evolution of Pension Structure." *The Journal of Human Resources* 40/2: 281–308.

Gustman, Alan L., Thomas L. Steinmeier, and Nahid Tabatabai. 2012. "How Did the Recession of 2007-2009 Affect the Wealth and Retirement of the Near Retirement Population in the Health and Retirement Survey?" *Social Security Bulletin* 72/4: 47–66.

Hannon, Kerry. 2014. "5 Part-Time Jobs for Retirees." American Association of Retired Persons. April.

Hasselhorn, Hans Martin and Wenke Apt (eds.). 2015. *Understanding Employment Participation of Older Workers: Creating a Knowledge Base for Future Labour Market Challenges*. Research Report. Federal Ministry of Labour and Social Affairs and Federal Institute for Occupational Safety and Health. Berlin.

Hurd, Michael and Susann Rohwedder. 2011. "Trends in Labor Force Participation: How Much is Due to Changes in Pensions?" *Journal of Population Ageing* 4/1-2: 81–96.

International Labour Organization. 2007. LABORSTA Internet. Available at <https://laborsta.ilo.org>, accessed on October 20, 2007.

_____. 2011. Economically Active Population, Estimates and Projections (6th edition, October 2011). LABORSTA Internet. Available at <http://laborsta.ilo.org/applv8/data/EAPEP/eapep_E.html>, accessed on January 7, 2015.

_____. 2012. *Global Employment Trends for Women*. Geneva: International Labour Organization.

_____. 2014. ILOSTAT Database. Available at <www.ilo.org/ilostat>, accessed on September 16, 2014.

International Monetary Fund (IMF). 2009. *World Economic Outlook (WEO). Crisis and Recovery*. Washington, DC: IMF.

_____. 2015. "Housing Recoveries: Cluster Report on Denmark, Ireland, Kingdom of the Netherlands — The Netherlands, and Spain." *IMF Country Report* 15/1.

Kinsella, Kevin and Wan He. 2009. *An Aging World: 2008*. International Population Reports, P95/09-1, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

Kritzer, Barbara E. (ed.). 2013. "International Update: Recent Developments in Foreign Public and Private Pensions." Washington, DC: Social Security Administration.

Larsen, Mona and Peder J. Pedersen. 2012. "Paid Work After Retirement: Recent Trends in Denmark." IZA Discussion Paper Series 6537, May.

Mason, Andrew and Ronald Lee. 2006. "Reform and Support Systems for the Elderly in Developing Countries: Capturing the Second Demographic Dividend." *Genus* 62/2: 11–35.

Mylonas, Paul and Christine de la Maisonneuve. 1999. "The Problems and Prospects Faced by Pay-As-You-Go Pension Systems: A case study of Greece." *OECD Economics Department Working Papers*, No. 215, Paris: OECD Publishing.

Ogawa, Naohiro, Andrew Mason, Amonthep Chawla, and Rikiya Matsukura. 2010. "Japan's Unprecedented Aging and Changing Intergenerational Transfers." In Takatoshi Ito and Andrew K. Rose (eds.), *The Economic Consequences of Demographic Change in East Asia*. Chicago: University of Chicago Press.

Ogawa, Naohiro, Makoto Kondo, and Rikiya Matsukura. 2005. "Japan's Transition From the Demographic Bonus to the Demographic Onus." *Asian Population Studies* 1/2: 207–226.

Organisation for Economic Co-operation and Development. 2007. *OECD Economic Surveys: Greece 2007*. Paris: OECD Publishing.

_____. 2013. *Pensions at a Glance 2013: OECD and G20 Indicators*. Paris: OECD Publishing.

_____. 2014. *OECD.Stat*. Available at <http://stats.oecd.org/>, accessed on September 18, 2014.

Reddy, Bheemeshwar. 2014. "Labour Force Participation of Elderly in India." Presentation at Population Association of America Annual Meeting 2014, Boston: May 1–3.

Samorodov, Alexander. 1999. "Ageing and Labour Markets for Older Workers." International Labour Office, Employment and Training Papers No. 33.

Schultz, T. Paul. 1990. "Women's Changing Participation in the Labor Force: A World Perspective." *Economic Development and Cultural Change* 38/3: 457–488.

Skugor, Daniela, Ruud Muffels, and Tom Wilthagen. 2012. "Labour Law, Social Norms and the Early Retirement Decision." Network for Studies on Pensions, Aging and Retirement Discussion Paper 11/2012-046.

Social Security Administration. 2013a. *Social Security Programs Throughout the World: Africa, 2013*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics: SSA Publication 13-11803.

_____. 2013b. *Social Security Programs Throughout the World: Asia and the Pacific, 2012*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11802.

_____. 2014a. *Social Security Programs Throughout the World: The Americas, 2013*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11804.

_____. 2014b. *Social Security Programs Throughout the World: Europe, 2014*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11801.

Transamerica Center for Retirement Studies (TCRS). 2014. *The Retirement Readiness of Three Unique Generations: Baby Boomers, Generation X, and Millennials 15th Annual Transamerica Retirement Survey of Workers*. TCRS 1171-0514.

van Dalen, Hendrik P., Kène Henkens, Wilma Henderikse, and Joop Schippers. 2010. "Do European Employers Support Later Retirement?" *International Journal of Manpower* 31/3: 360–373.

West, Loraine A., Samantha Cole, Daniel Goodkind, and Wan He. 2014. *65+ in the United States: 2010*. Current Population Reports, P23-212, U.S. Census Bureau. Washington, DC: U.S. Government Printing Office.

The World Bank. 2013. *World DataBank, Africa Development Indicators*. Available at <http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=africa-development-indicators>, accessed on May 21, 2014.

World Bank Group. 2014. *Global Economic Prospects, Shifting Priorities, Building for the Future*. A World Bank Group Flagship Report, Volume 9, June.

CHAPTER 7.

Pensions and Old Age Poverty

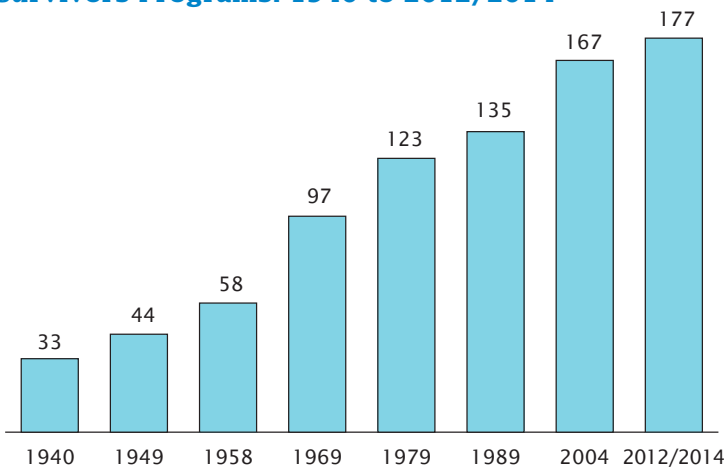
The economic well-being of older populations differs quite markedly throughout the world, as do the sources of income and support that they receive. In most countries, a key source of income for the older population comes from public pension systems that rely on pooled payroll taxes from current workers and employers, a pay-as-you-go (PAYGO) type of financing. A smaller number of countries have systems requiring contributions to personal retirement accounts, Provident Funds, or other pension vehicles earmarked for each individual. Assets can also be accumulated through voluntary saving and investment, sometimes encouraged by government programs that provide favorable tax treatment.

In addition to these income sources, the financial well-being of the older population often depends on other sources, such as families, who may provide both monetary and nonmonetary forms of support. Various frameworks have been developed to organize these elements of old age financial security, such as the World Bank's "5-pillar" approach (Holzmann and Hinz, 2005). A portion of the older people may not have sufficient means to support themselves financially and, as a result, live in poverty.

NUMBER OF COUNTRIES OFFERING A PUBLIC PENSION CONTINUES TO RISE

As of 1940, only 33 countries in the world had public pension programs to support the welfare of the older population. Since then, the number of countries with such programs has steadily increased.

Figure 7-1.
Number of Countries With Public Old Age/Disability/ Survivors Programs: 1940 to 2012/2014



Sources: 1940–2004 from Kinsella and He, 2009; 2012/14 from Social Security Administration, 2013a, 2013b, 2014b, 2014c; Social Security Programs Throughout the World.

The largest increase occurred during the 1960s when the number of countries increased from 58 to 97. Another burst occurred during the 1990s. At present, 177 countries have mandated pension systems of one kind or another for their older populations (Figure 7-1).[1]

The purpose of these public systems is typically two-fold: to help smooth out a stream of income, which would otherwise decline drastically following the transition from work to retirement, and to reduce the incidence of poverty (MacKellar, 2009). A diversity of programs has been developed to meet these common goals.

EARNINGS-RELATED PENSION PROGRAMS ARE STILL THE MOST COMMON

By far the most common public old age pension program involves a periodic payment related to the level of earnings one had while working. Among the 177 countries that mandate a public pension, more than 80 percent have an earnings-related program (Table 7-1). Among the six regions, those with the highest percentage of countries having this type of pension are Latin America and the Caribbean (97 percent), Europe (89 percent), and Africa (85 percent).

These mandated defined-benefit pensions are based on a formula that typically considers factors such as the level of earnings, years of service, and age at retirement, although earnings are usually

[1] According to the U.S. Department of State, there are 195 independent countries in the world and about 60 dependencies and areas of special sovereignty. Some dependencies have pension systems separate from their associated independent country.

Table 7-1.
Number and Percentage of Public Pension Systems by Type of Scheme and World Region

Region	Countries with any public pension system		Earnings related		Flat rate		Means-tested		Provident fund		Occupational retirement scheme		Individual retirement scheme	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All regions	177	100	144	81	46	26	62	35	16	9	9	5	26	15
Africa	47	100	40	85	5	11	3	6	4	9	1	2	1	2
Asia	46	100	28	61	15	33	11	24	12	26	2	4	5	11
Europe	45	100	40	89	19	42	27	60	0	0	4	9	10	22
Latin America and the Caribbean	33	100	32	97	4	12	18	55	0	0	0	0	10	30
Northern America	3	100	2	67	2	67	3	100	0	0	1	33	0	0
Oceania	3	100	2	67	1	33	0	0	0	0	1	33	0	0

Note: Countries may have more than one type of scheme. Data as of latest available year.
Sources: Social Security Administration, 2013a, 2013b, 2014b, 2014c; Social Security Programs Throughout the World.

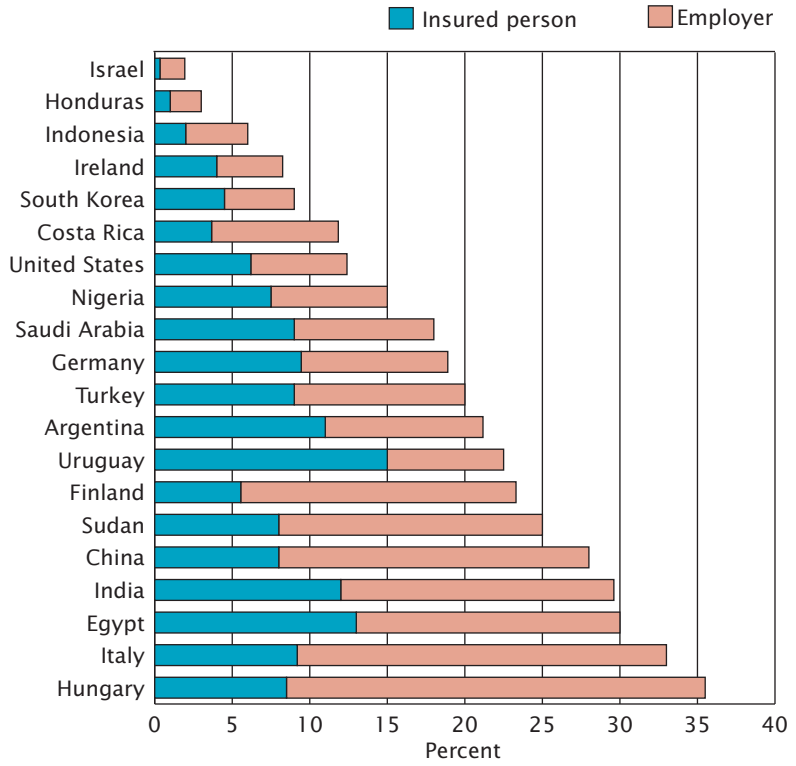
capped in the computation of benefits. The range of pensions paid out tends to be flatter than the range of income among workers.

Less common types of public old age pension programs include flat-rate pensions (a uniform amount or based on years of service or residence), means-tested pensions (paid only to eligible retirees with income or wealth below a designated level), provident funds (benefits paid as a lump sum based on contributions and accrued interest), and individual retirement schemes (benefits paid as an annuity or lump sum based on contributions and investment results). Some countries require that employers in certain industries, such as railroad or mining, contribute to special occupational retirement schemes for their employees.

Countries often have more than one type of program. By region, flat rate and means-tested pension programs are most common in Europe and Northern America, whereas provident funds are most common in Asia.

Regardless of the type of mandatory, old age income security program, funding comes from a combination of worker, employer, and government contributions. Workers typically pay a percentage of covered salary and employers contribute a percentage of covered payroll. The government often contributes by covering administrative costs for the program and, in some cases, by providing general revenue. However, the governments of Bangladesh, Georgia, Botswana, and South Africa, for example, pay the total cost of old age pension programs in their countries

Figure 7-2.
Contribution Rates for Old Age Social Security Programs by Country and Contributor: 2012 and 2013



Note: Old age social security programs includes old age, disability, and survivor's benefits.
Sources: Social Security Administration, 2013a, 2013b, 2014b, 2014c; Social Security Programs Throughout the World.

with no contributions from workers or employers (Social Security Administration, 2013a; 2013b; 2014c).

The required contribution amount varies widely throughout the world, from less than 2 percent in Israel to over 35 percent in Hungary (Figure 7-2).[2] In between the extremes, contribution rates in other countries appear to be fairly evenly distributed. There are also differences in the share of the contribution between the employee and employer. In many countries, the contribution amount is the same for each, although the share for employees is notably higher in some countries such as Uruguay, in contrast to countries such as Finland, Hungary, Italy, and China where the share for employers is higher.

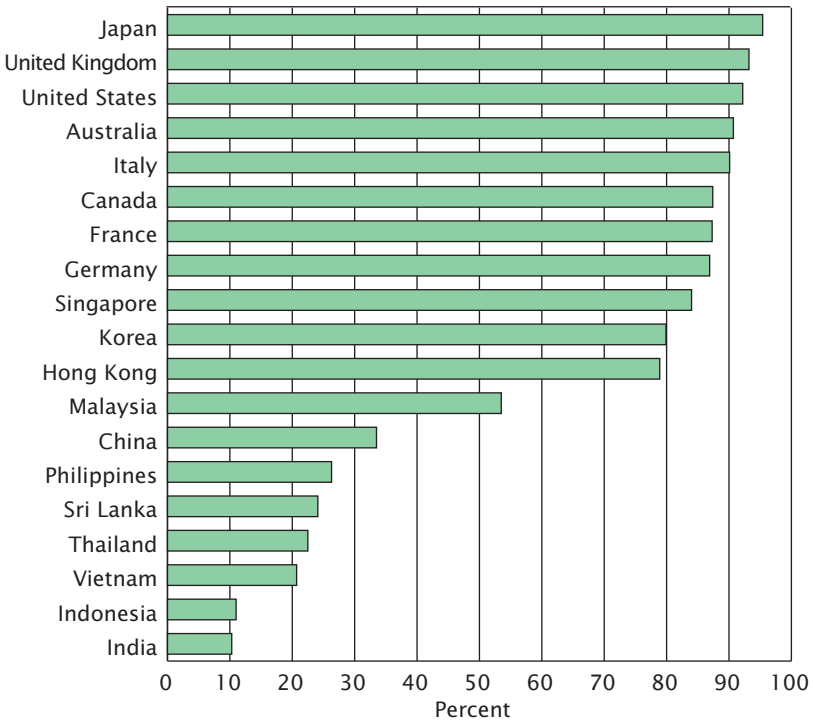
[2] Contribution rates are not directly comparable across countries because the earnings subject to the rate can vary and a ceiling may exist on the earnings subject to the contribution rate.

PUBLIC PENSION COVERAGE GREATER IN HIGH-INCOME COUNTRIES

Although many countries have mandated public pension systems, their coverage of the overall workforce differs markedly. The Organisation for Economic Co-operation and Development (2013b) has calculated coverage based on whether an individual contributed to or accrued pension rights in any major public pension scheme. Based on that definition, high-income countries tend to have greater coverage. Coverage exceeds 90 percent of the labor force in Japan, United Kingdom, United States, Australia, and Italy (Figure 7-3). In contrast, in the world's two population billionaires, public pensions cover only 1 out of 3 in China and 1 out of 10 in India.

Such sharp international differences in coverage rates are often linked to the proportion of people who work in the "informal economy." Those who work outside of the formal sector are far more challenging to cover administratively using the wage-based criteria of traditional social security systems and, because of their lower income levels, they may have little or no resources available to contribute to the system (MacKellar, 2009). In China, public pension schemes are limited to employees in urban enterprises (and urban institutions managed as enterprises); the urban self-employed are covered only in some provinces. The rural population is largely uncovered. In India, the main pension scheme excludes an even larger swath of the population—the self-employed (urban as well as rural), agricultural workers, and members of cooperatives with fewer than 50 workers (Social Security Administration, 2013b). To address this major coverage gap, India launched a new defined contribution pension scheme (Atal Pension Yojana) in 2015 that offers participants flexibility in contribution levels, a guaranteed minimum rate of return, and for those who join in 2015, the government will provide matching funds for the next 5 years (India Ministry of Finance, 2015).

Figure 7-3.
Proportion of Labor Force Covered by Public Pension Systems in Each Country: 2005–2012



Note: Data refer to various years from 2005 to 2012 provided by each country.
Source: Organisation for Economic Co-operation and Development, 2013a.

Box 7-1.

Defined Benefit and Defined Contribution Pensions in Selected African Countries

Unlike the shift from defined benefit to defined contribution systems in some parts of the world, in some African countries such as Ghana, Tanzania, and Zambia, the trend has been away from defined contribution toward defined benefit or toward a combination of both (Stewart and Yermo, 2009). The nascent pension systems set up in former British colonies in Africa following independence were primarily defined benefit plans limited to civil servants and defined contribution provident funds for workers in the formal sector (Kpessa, 2010). Coverage was limited, and family and community were the primary sources of support in old age. However, with changing expectations and concerns about administrative management of large lump sum payouts, the steady stream of pension income under a more traditional defined benefit plan has become a more attractive option. This is especially so given the high fertility in Africa under which PAYGO financing is most viable.

Ghana provides an illustration of such reforms. In years past, the primary mandatory pension system was called the Social Security and National Insurance Trust (SSNIT), which covered most civil servants and some workers in the private sector. The SSNIT relied on a partially funded PAYGO system with features of both defined benefit and defined contribution. A special feature allowed workers to collect 25 percent of their earned pension in a lump sum at the time of retirement (Steward and Yermo, 2009). As in many other African societies, however, coverage under the system is very low, only about 10 percent of the labor force. Although coverage remains very low today, a series of reforms implemented in 2010 helped to address inadequacies in the system for those who are covered. Workers are fully vested in a defined benefits program at age 60 with 15 years of service. Contribution rates are 5.5 percent of wages for employees and 13 percent for employers (Social Security Administration, 2013a). The lump sum payment of 25 percent of the pension at retirement was eliminated. The pension is 37.5 percent of the highest earnings over a 3-year period, with an additional 1.125 percent of earnings for each year worked beyond 15 years. In addition to early retirement provisions, those with insufficient years of service receive a lump sum. A smaller mandatory occupational pension scheme based on defined contributions and offering a lump sum payout covers another portion of workers (Stewart and Yermo, 2009). The Informal Sector Fund, established in 2008, consists of defined contribution schemes that are voluntary, based on individual contributions, and have no fixed contribution rate. These schemes target informal sector workers and as of 2013, there were 2 million participants (Van Dam, 2014).

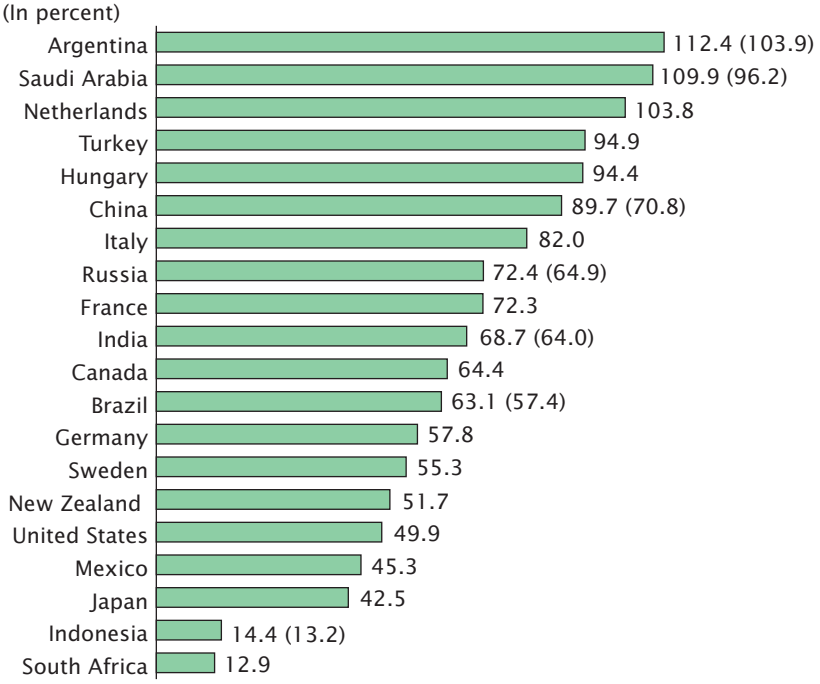
In contrast, Nigeria appears to have moved in the opposite direction, setting up a Chilean style system of mandatory individual retirement accounts in 2004 known as the Contributory Pension Scheme (Social Security Administration, 2013a). However, the new system has suffered problems similar to those experienced in other countries with the Chilean model, such as higher administrative costs compared to PAYGO systems and relatively low payouts (Ojonugwa, Isaiah, and Longinus, 2013). Given the potential drawbacks of both defined benefit and defined contribution systems, as well as the critical need for good governance and administration of both systems, some have suggested that Nigerian authorities consider a "social pension" for the older population based on general tax revenues, much of which would be financed from profits in the oil industry (Casey and Dostal, 2008).

In addition to coverage, another important characteristic of public pension programs is the extent to which the pension "replaces" wages earned during the working years. One formula for calculating the replacement rate divides the total value of net expected pension entitlements by total net earnings (adjusted for differences in income taxes and social security contributions paid by workers and retirees; see Organisation for Economic Co-operation and Development, 2013a). As is the case for coverage, replacement rates tend to vary quite widely. Among the countries shown in Figure 7-4, replacement rates exceed 100 percent in Argentina, the Netherlands, and Saudi Arabia (that is, the median

Figure 7-4.

Public Pension Net Replacement Rate for Median Earners by Country: 2013

(In percent)



Notes: The net replacement rate is defined as the individual net public pension entitlement divided by net pre-retirement earnings, taking account of personal income taxes and social security contributions paid by workers and pensioners. For countries with different net replacement rates for men and women, the bar reflects the rate for men and the rate for women is shown in parentheses.

Source: Organization for Economic Co-operation and Development, 2013a.

earner can expect to receive more back during retirement than what they earned while working), compared to less than 15 percent in Indonesia and South Africa. In 7 of the 20 countries shown, the net replacement rate for women and men is different, and in all cases the net replacement rate is lower for women.

Singapore is unusual in that it has a single-tier pension system consisting of a defined-contribution plan administered by the Central Provident Fund. While Singapore has achieved nearly universal coverage of the citizen and permanent resident labor force, the benefit level is low compared to other countries of similar wealth (Organisation for Economic Co-operation and Development, 2012).[3] As of 2011, the average balance per member was about equal to per capita income, which was viewed as inadequate given the high life expectancy in Singapore (Asher and Bali, 2012). The Singapore government has undertaken multiple initiatives to encourage employment of older residents in recent years with some success. The labor force participation rate for residents aged 55 to 64 rose from 49.5 percent in 2004 to 68.4 percent in 2014, and for residents aged 65 to 69 increased from 18.9 percent in 2004 to 41.2 percent in 2014 (Singapore Ministry of Manpower, 2014). In addition, the government appointed a Central Provident Fund Advisory Panel in 2014 to recommend further reforms to provide greater flexibility and improve retirement adequacy in the face of increases in the cost of living and rising life expectancy.

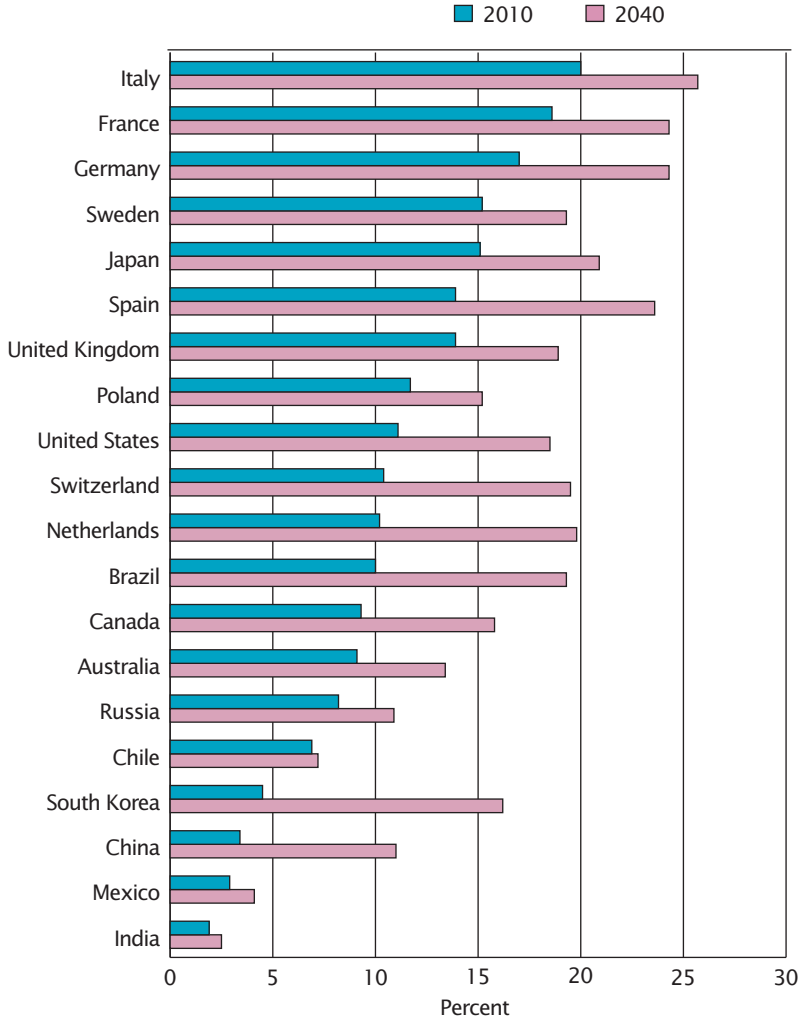
[3] Nonresidents (not citizens or permanent residents) accounted for 25 percent of the population in Singapore in 2009 and 35 percent of the labor force (Asher and Bali, 2012).

OPINIONS DIFFER ON HOW TO IMPROVE SUSTAINABILITY OF PUBLIC PENSION SYSTEMS

Upon first being established, earnings-related pension systems typically generate a surplus because the size of the workforce contributing is generally much larger than the pool of retirees who have qualified to receive benefits. Surplus payroll tax revenues can either be banked for future retirees or used to fund other government spending. When surplus payroll tax revenue is not set aside for future retirees, as often is the case, the system becomes financed on a PAYGO basis. As the population ages, a PAYGO system may run a deficit unless adjustments are made, and such adjustments may provide a drag on the economy (Holzmann, 2012; Organisation for Economic Co-operation and Development, 2014b). For example, based on current pension benefits, the long-term contribution rate required will be over 30 percent of payroll in Pakistan and over 40 percent in China and Vietnam (Organisation for Economic Co-operation and Development, 2013b).

Figure 7-5 provides estimates and projections of the total cost of public benefits provided to the population aged 60 and over—including both pension and health care programs—in 2010 and projected to 2040. Among the 16 countries shown, 5 had pension and health costs equal to 15 percent or more of GDP in 2010, whereas 14 countries are expected to reach that share in 2040. The average cost of such programs is expected to rise from 10 percent of GDP to more than 15 percent by 2040. Among the countries in Figure 7-5, the sharpest increases are projected in South Korea and China, where the share of GDP devoted to public benefits to the 60 and over population will more than triple over the interval, due largely to the historic rapidity of fertility decline. However, China's expenditures on the older population will remain well below the GDP share projected for the United States and other wealthier countries.

Figure 7-5.
Total Public Benefits to Population Aged 60 and Over as a Percentage of GDP: 2010 and 2040 Projection



Note: Total public benefits include both pensions and healthcare.
Source: Jackson, Howe, and Peter, 2013.

With a shrinking share of workers in the population, options to ensure financial solvency of PAYGO systems (including PAYGO-funded health care systems, such as Medicare in the United States) are to:

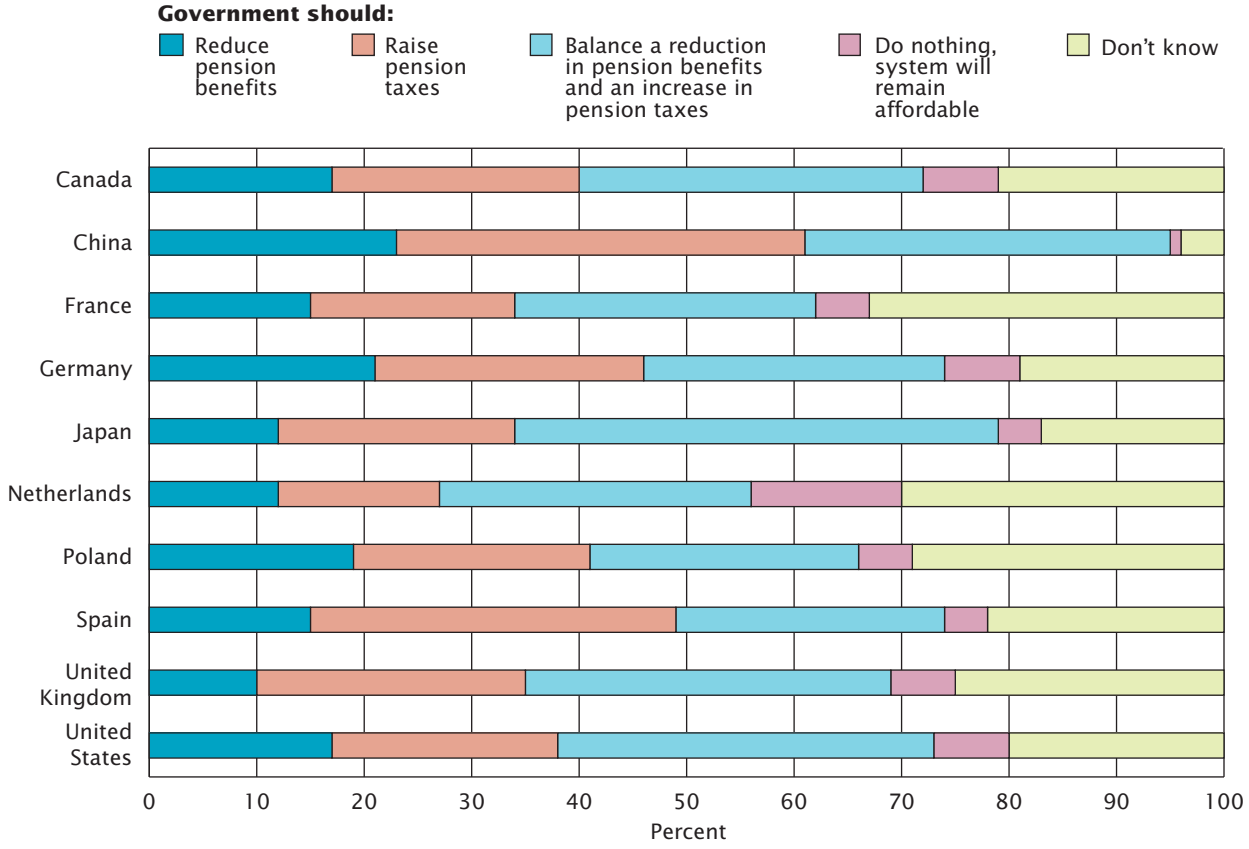
- Raise the minimum age for benefit eligibility.
- Raise the payroll tax for workers and/or employers.
- Reduce benefits for recipients.
- Increase tax-funded subsidies or government borrowing to subsidize the system.

Opinions about which of these options is best for solving the inherent challenges of a PAYGO system may differ among workers and retirees. Public opinion may also play a role in each country's choices regarding the reform of public systems. A recent cross-national survey of workers recorded opinions about possible policy options for reforming public pension systems (Aegon, 2013) with results shown in Figure 7-6. Only a small share

of workers felt that the government should do nothing and that the public pension system would remain affordable (shares ranged from 1 percent in China to 14 percent in the Netherlands). When asked about options to increase the sustainability of government pensions, 4 percent of workers in China said they did not know what the government should do, while one-third of respondents in France did not know. When asked to choose between reducing pension benefits, raising pension taxes, or a combination of reduced pension benefits and increased taxes, the largest share selected the balanced approach of both in Canada, France, Germany, Japan, the Netherlands, Poland, the United Kingdom, and the United States. In both Spain and China, workers favored raising pension taxes alone over reducing pension benefits or a combination of the two policies.

As to the acceptability of reduced benefits, there were also notable differences over specific options for reducing them. For instance, about more than half of respondents in Germany and in Poland (Aegon, 2013) believed that people already work long enough and that the retirement age should not be changed. In contrast, only 17 percent shared that belief in Japan (ibid.).

Figure 7-6.
Favored Options to Increase Sustainability of Government Pensions by Country: 2013



Source: Aegon, 2013.

THE CHILEAN MODEL UNDERGOES FURTHER REFORM AND SOME COUNTRIES ABANDON IT COMPLETELY

The Chilean government in 1981 made a bold decision to abandon its defined benefit public pension system and introduce a defined contribution system administered by the private sector. Following the early success of Chile's reforms, other countries, many in Latin America and the Caribbean and Eastern Europe, followed the Chilean model and established individual retirement accounts to replace or supplement defined benefit public systems. At present, of the 26 countries currently mandating such accounts, 10 are in Latin America and the Caribbean and 10 are in Europe (Table 7-1).

Most of the Latin American and Caribbean countries with mandated individual accounts systems set them up during the 1990s (Table 7-2). Under this system, workers have some choice, albeit limited, regarding the management of their retirement account. The number of investment companies from which individuals may choose ranges from 2 to 15 per country, while the number of investment options offered by each company ranges from 1 to 5 (Kritzer, Kay, and Sinha, 2011). Typically, investment managers are expected to invest in broad categories or indexes of funds.

Between 2004 and 2009, the proportion of the labor force contributing to individual retirement accounts in Latin America increased in 9 of the 10 countries, although a large share of the labor force remained uncovered (Figure 7-7).[4] In 2009, for instance, only Chile and Costa Rica had more than 50 percent of the labor force contributing to individual retirement accounts while less than 20 percent were doing so in Bolivia, Colombia, El Salvador, and Peru.

[4] Argentina was the tenth country, and it abolished individual accounts in 2009.

Table 7-2.
Characteristics of Latin American Individual Account Pensions: 2009

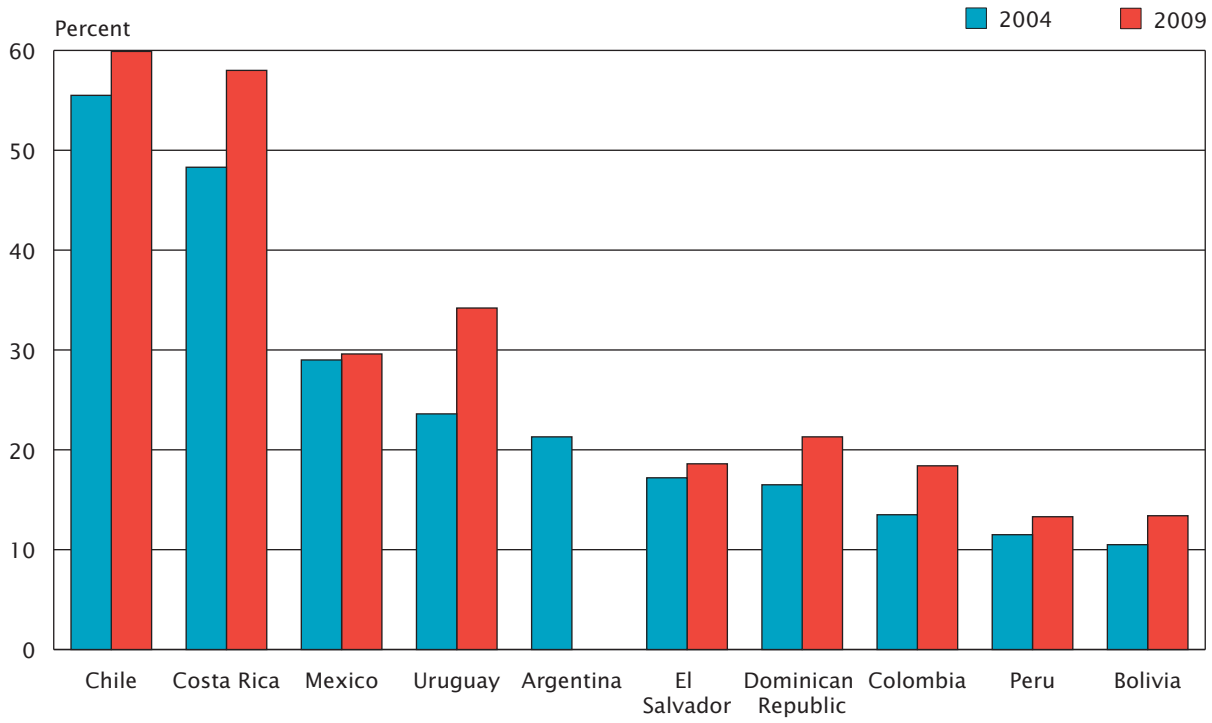
Country	Year system began	Number of pension fund management companies	Allowable investment fund types per company	Minimum rate-of-return requirement	Contribution rates (percent)	
					Employee	Employer
Bolivia	1997	2	1	No	10.000	None
Chile	1981	6	5	Yes	10.000	Voluntary
Colombia	1993	8	3	Yes	3.850	11.625
Costa Rica	1995	5	1	No	1.000	3.250
Dominican Republic	2003	5	1	Yes	2.870	7.100
El Salvador	1998	2	1	Yes	6.250	4.050
Mexico	1997	15	5	No	1.125	5.150
Peru	1993	4	3	Yes	10.000	None
Uruguay	1996	4	1	Yes	15.000	None

Note: Uruguay employee contribution rate applied only to gross monthly earnings above 19,805 pesos.
Source: Kritzer, Kay, and Sinha, 2011.

The maturing Chilean model has faced a number of challenges in Chile and many of the other countries that implemented this model over the past 30 years (Gill, Packard, and Yermo, 2005; Gill et al., 2005; Kritzer, Kay, and Sinha, 2011). It was the lack of financial sustainability inherent in the public PAYGO pension system, low coverage, and the potential higher rate of return to be earned in the private sector on retirement contributions that led Chile and other countries to switch to privately-managed individual accounts. However, coverage remained limited and the pension fund management companies were criticized for high fees and weak competition.

In response to these issues, countries have taken different approaches, ranging from implementing further reforms to weakening the individual accounts to completely abandoning the Chilean model. Both Argentina (2009) and Hungary (2011) closed the individual accounts systems in their countries and transferred all workers back to the PAYGO defined benefit pillar. A number of countries in Eastern Europe, including Estonia, Latvia, Lithuania, Poland, and Slovakia, reduced contributions to the individual accounts, in some cases on a temporary basis. For these countries fiscal deficits, aggravated by the global financial crisis and the Maastricht limits, were a major factor in their decision. Chile, Colombia, Mexico, Peru, and Uruguay have moved forward with a second round of reforms to strengthen their individual accounts systems (Bucheli, Forteza, and Rossi, 2008; Kritzer, Kay, and Sinha, 2011). Chile led the way with a round of reforms implemented in 2008 (see Box 7-2).

Figure 7-7.
Percentage of Labor Force Contributing to Individual Account Pensions by Country: 2004 and 2009



Source: Kritzer, Kay, and Sinha, 2011.

Box 7-2.
Chile's Second Round of Pension Reform

Chile's government appointed a council to review the pension system and recommend new reforms. The series of reforms enacted in 2008 were intended to increase participation rates, lower administrative costs, and improve the adequacy of pension benefits for all (Shelton, 2012). In order to address the issue of coverage, participation of self-employed workers was transitioned from voluntary to mandatory.

Several of the reforms focused on reducing the multiple, high administrative fees that participants faced. Prior to the 2008 reforms, the five pension fund management companies (Administradoras de Fondos de Pension) charged an average of 1.71 percent of earnings and several of the companies also charged fixed monthly fees (Kritzer, 2008). Reforms eliminated the monthly fixed administrative fees. The pension fund management companies now must bid and compete to manage the contributions of new labor force entrants with the selection going to the company submitting the lowest fees. The company must then maintain that fee for 24 months and offer the same low fee to all its account holders. Another change allowed insurance companies to set up fund management companies to compete with the existing companies. Reforms also gradually increased the share of foreign investments allowed to 80 percent of assets, up from 45 percent.

The council concluded that Chile's individual account system was working well for middle- and upper-wage earners who were regular contributors, but those who did not make regular contributions or made minimal contributions did not fare well (James, Edwards, and Iglesias, 2010). Thus, another pillar was added, Pension Basica Solidariato, to provide a basic pension to those who had not contributed to individual accounts or who would receive an inadequate pension based on their individual account balances.

Reforms also sought to address gender inequities. Women had been particularly disadvantaged because of their shorter work history, lower earnings, and greater participation in the informal sector, which is not covered by the pension system. Women's pensions were 30 to 40 percent less than men's (Kritzer, 2008). The 2008 reforms introduced a pension bonus for each child that a woman had and the bonus will be added to her regular retirement pension when she reaches age 65. In addition, all widowers are now eligible for a survivor pension.

THE BIGGER FINANCIAL PICTURE INCLUDES OTHER SOURCES OF INCOME

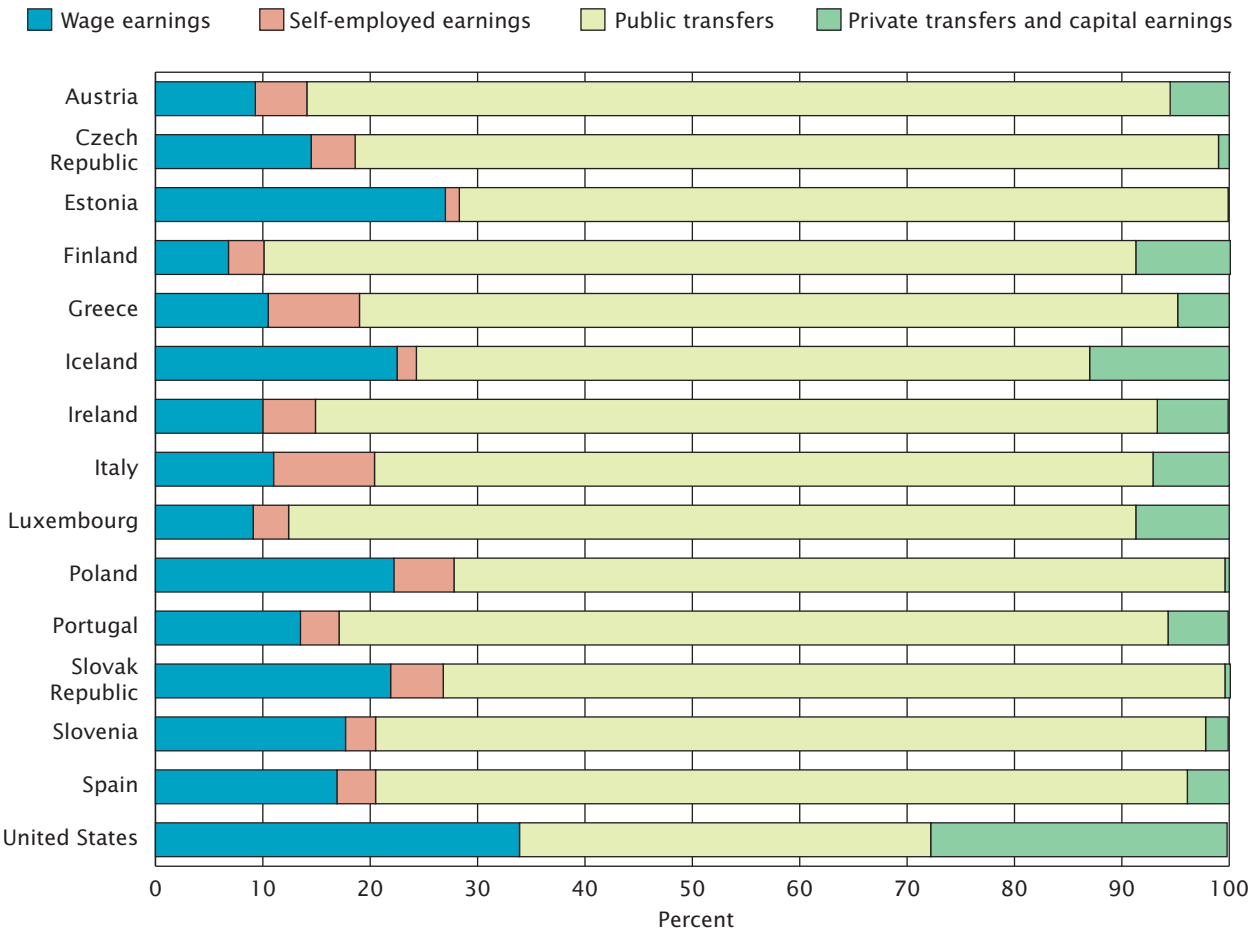
Clearly, every category of pension schemes has its own benefits and limitations (MacKellar, 2009; Holzmann, 2012; Cannon and Tonks, 2013). Defined benefit plans become less viable as populations age. Defined contribution plans tend to have limited coverage and uncertain payouts for a large portion of the older population. Given such limitations, many countries appear to be experimenting with multiple approaches to minimize risk (Organisation for Economic Co-operation and Development, 2013a and 2014b).

Of course, incomes among the older population are not limited to public pensions. In addition to mandatory government savings programs, individuals may save on their own. In some countries, voluntary saving is encouraged through favorable tax treatment, such as 401K-type plans in the United States. There are also multiple ways that individuals may generate an income stream in their older years, including investments in rent-producing property and reverse home mortgages. Some continue to work beyond age 65 (see Chapter 6).

A more complete picture of income sources among the older population is shown for several Organisation for Economic Co-operation and Development (OECD) countries on Figure 7-8. In 2011, public transfers represented over three-quarters of income for the older population in Austria, Czech Republic, Finland, Greece, Ireland, Luxembourg, Portugal, Slovenia, and Spain. In the United States, only 38 percent of income among the older population came from public transfers. The proportion of income from work earnings varies among this grouping, from 10 percent in Finland to 34 percent in the United States. While private pensions and investment earnings constituted 28 percent of income in the United States, they represented

Figure 7-8.

Income Distribution for Population Aged 65 and Over by Source and Country: 2011



Note: U.S. estimates are for 2012 and wage earnings includes self-employed earnings.
Sources: Organisation for Economic Co-operation and Development, 2014a; Social Security Administration, 2014a.

less than 5 percent in the Czech Republic, Estonia, Greece, Poland, Slovakia, Slovenia, and Spain.

One important question is whether the receipt of income from one source may affect the effort to save or earn income from another source, a hypothesis known as "crowding out" (Alessie, 2005). One approach to assess crowding out is to compare expected income streams from mandatory pension plans with the amount of private savings on a country-by-country basis. Using data calculated by the OECD and collected in longitudinal surveys, Hurd, Michaud, and Rohwedder (2012) estimated the mean public pension replacement rate and relative financial wealth for 12 countries. They found that for every extra dollar in expected pension income, the amount of savings at retirement is reduced by 22 cents in the 12 countries (ibid.). Another approach is to examine the effect of pension reforms (involving a change in the expected value of the public pension) on household saving rates (before and after the implementation of the pension reform). Attanasio and Brugiavini (2003) focused on the 1992 pension reforms implemented in Italy that reduced the present discounted value of the public pension fund and found evidence of a displacement effect on private saving. Attanasio and Rohwedder (2003) found substitution between the United Kingdom public pension scheme and financial wealth at the time of reforms from 1975 to 1981.

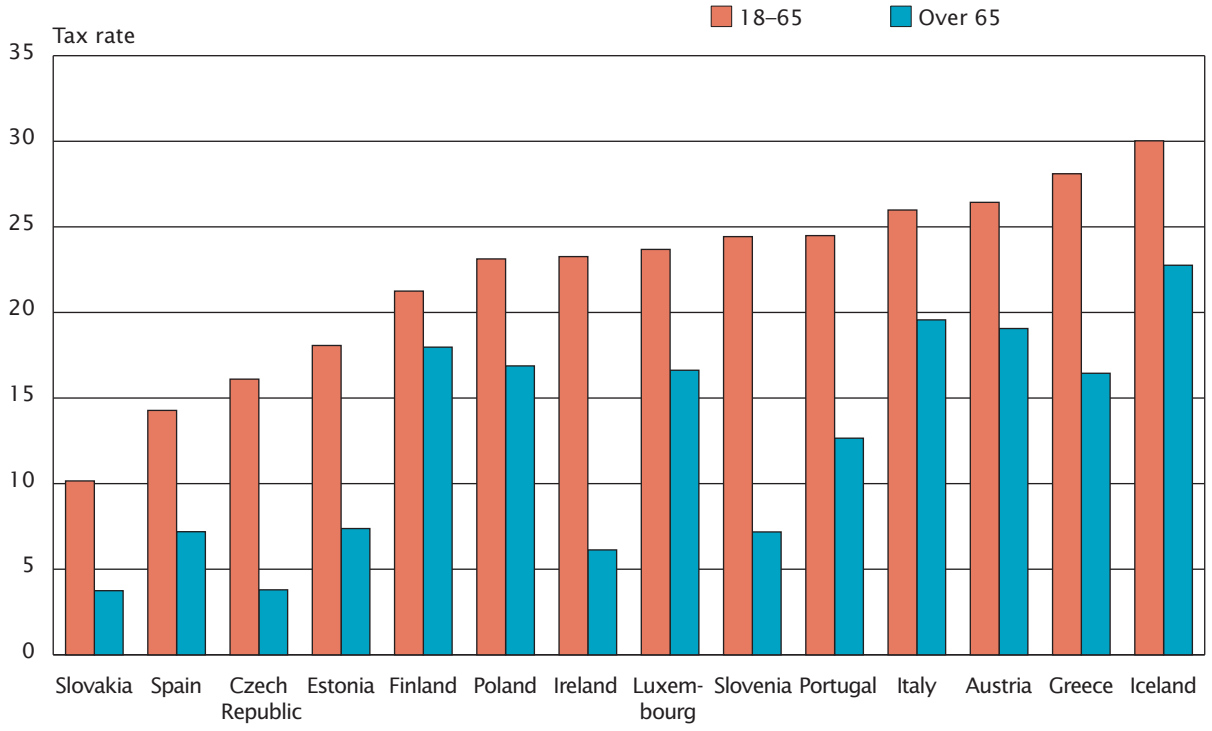
Governments often offer preferential tax treatment for specific sources of income received by the older population, such as pensions; however, tax rates vary substantially across the world. Among the group of OECD countries shown in Figure 7-9, for instance, the average income tax rate paid by those aged 65 and over ranged from below 5 percent in the Czech Republic and Slovakia to above 20 percent in Iceland. In all the countries shown in Figure 7-9, the older population has a lower average tax rate than those at primary working ages. The lower average income tax rate for the older population may reflect the lower income level of this age group in addition to favorable tax treatment.

FAMILIES PLAY A MAJOR SUPPORT ROLE IN MANY SOCIETIES

For generations, families have been key providers of both monetary and nonmonetary support for the older population. In fact, a key strategy in traditional societies for ensuring one's security at older ages was to raise several children to adulthood (Schultz, 1990). However, as populations become more urbanized and fertility rates decline, the forms of family support for the older population are changing.

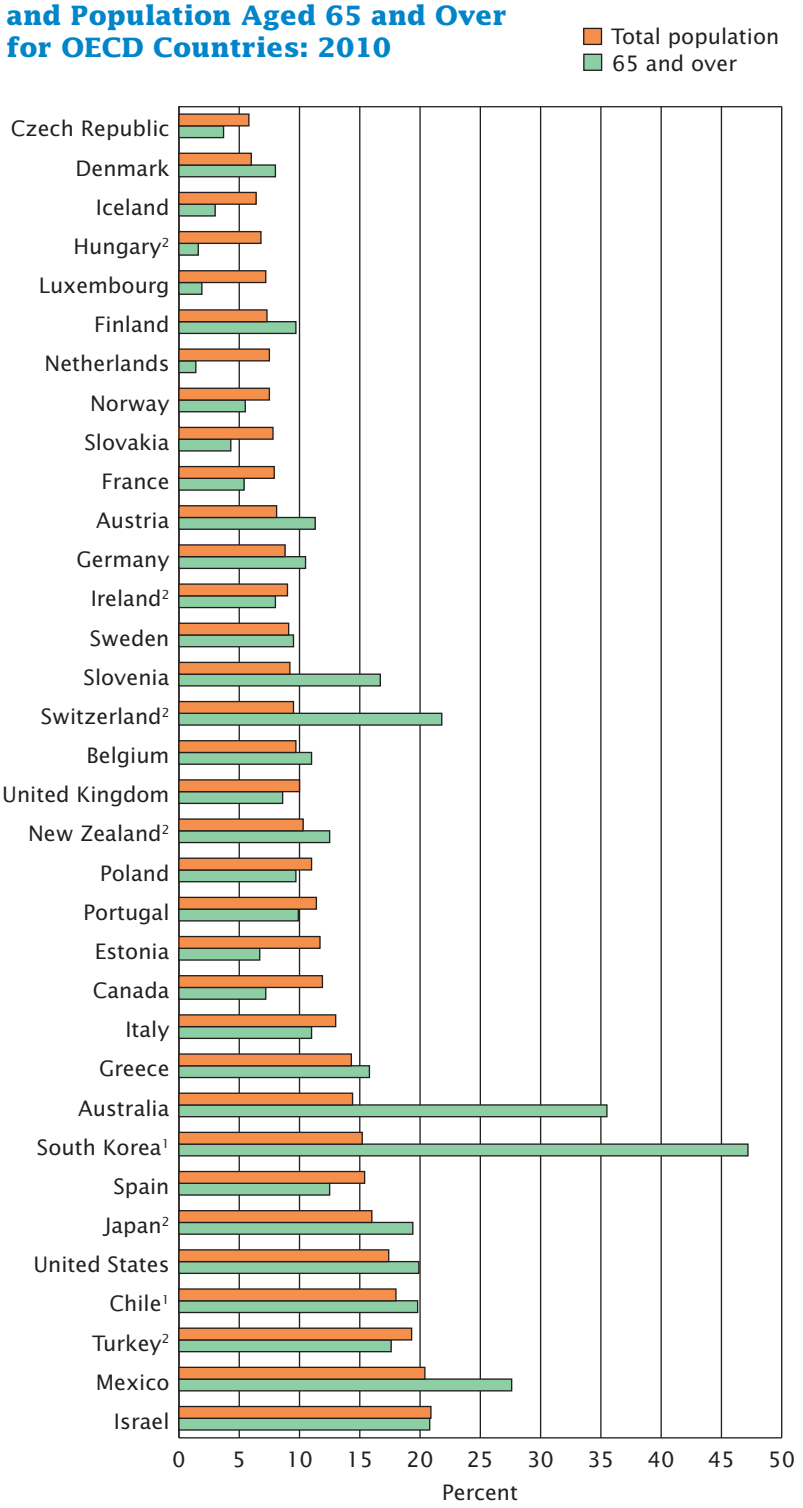
The value of family contributions to the welfare of older people can be challenging to estimate, since this can take the form of in-kind goods and services, such as housing and daily assistance. The interpretation of intergenerational transfers can be rather complicated. For instance, in some societies, they may actually constitute a reverse transfer back to parents who had turned over their assets to one or more children with the expectation that they would receive care in return. Despite these interpretive challenges, one thing is clear—the family provides important protection from poverty for the older population. In India, for instance, over three-quarters of the older population live in three-generation households (Desai et al., 2010), an arrangement ideally suited to the sharing of assets and provision of care for dependents. In the United States, family members often serve as long-distance caregivers for a parent or relative living in another location (Clark, 2014). They may help manage prescriptions,

Figure 7-9.
Average Income Tax Rate for Ages 18–65 and Over Age 65 by Country: 2011



Source: Organisation for Economic Co-operation and Development, 2014a.

Figure 7-10.
Poverty Rate for Total Population and Population Aged 65 and Over for OECD Countries: 2010



[1] Country data for 2011.
[2] Country data for 2009.
Note: Poverty is defined as income less than 50 percent of median equivalized household disposable income. Incomes are measured on a household basis and equivalized to adjust for differences in household size.
Source: Organisation for Economic Co-operation and Development, 2013a.

coordinate health care, ensure that bills are paid, arrange for home services, or assist with legal affairs. Besides the family, societies also sometimes provide nonmonetary sources of support, such as housing subsidies, coupons for basic foodstuffs, and coordinate volunteers providing free services.

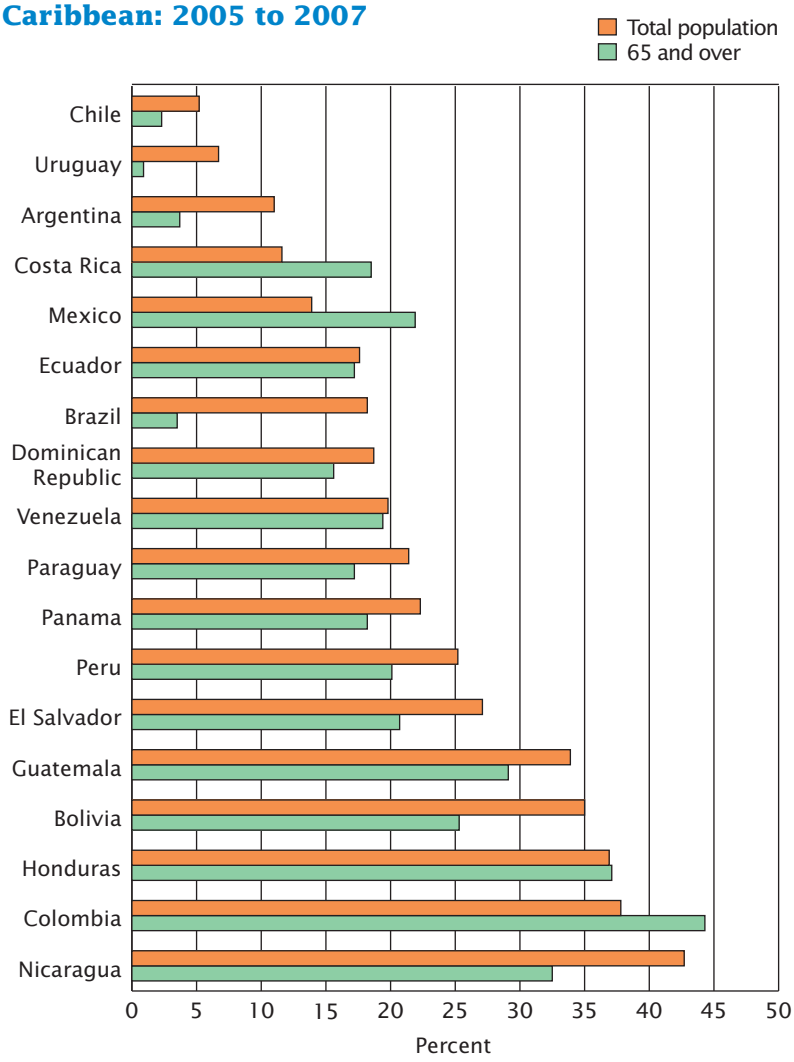
PENSIONS CAN DRASTICALLY LOWER POVERTY RATES FOR THE OLDER POPULATION

As noted earlier, one of the key goals of mandated public pension programs is to alleviate poverty among the older population. Given that older people are less likely to work, they are potentially more vulnerable than those at working age. Comparing poverty rates across countries is challenging given the variation in poverty measures and definitions. Poverty is defined by the World Bank as "the pronounced deprivation in well-being" (Haughton and Khandker, 2009). Typically, poverty is defined in terms of resources needed to cover basic necessities such as food, shelter, and clothing. However, the standard of well-being could also include capability to function in society, which would involve access to education, political rights, and psychological support (ibid.).

The OECD calculated poverty rates for its 34 member countries using a relative poverty level of receiving income less than 50 percent of median equivalized household disposable income (Figure 7-10). Under this poverty measure, 5 of the 34 OECD member countries (Australia, Israel, Mexico, South Korea, and Switzerland) had poverty rates exceeding 20 percent for the older population.

Figure 7-11.

Poverty Rate for Total Population and Population Aged 65 and Over for Latin America and the Caribbean: 2005 to 2007



Note: Poverty line defined as US$2.50 per day purchasing power parity.
Source: Cotlear and Tornarolli, 2011.

In a study of 18 countries in Latin America and the Caribbean, Cotlear, and Tornarolli (2011) calculated poverty rates for the older population using an absolute poverty line defined as daily income of $2.50 in purchasing power parity (Figure 7-11). Poverty rates for the population aged 65 and over exceeded 20 percent for nearly half the countries (Bolivia, Colombia, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Peru). However, in 14 of the countries, the poverty rate for the older population was lower than the poverty rate for the total population suggesting positive support for the older population through government programs.

In Latin America and Caribbean countries, the average poverty rate of those receiving a pension for the 18 countries is 5.3 percent, one-fifth of the average poverty rate of those not receiving pensions (25.8 percent). Colombia shows the most dramatic absolute difference in poverty rates between those receiving a pension and those without a pension (2.4 percent vs. 51.4 percent; Table 7-3). Uruguay shows the least difference (0.5 percent vs. 3.0 percent). In Colombia about 15 percent of the population aged 65 and over were receiving a pension, while 84 percent were in Uruguay. The role of pensions in reducing poverty among the older population can be seen in Figure 7-12, where countries in Latin America and the Caribbean with higher proportions receiving a pension tend to have lower poverty rates overall. While it may come as no surprise that poverty rates among older individuals who receive a pension income stream are lower than for those who do not, the magnitude of the gap in some of these countries is noteworthy.

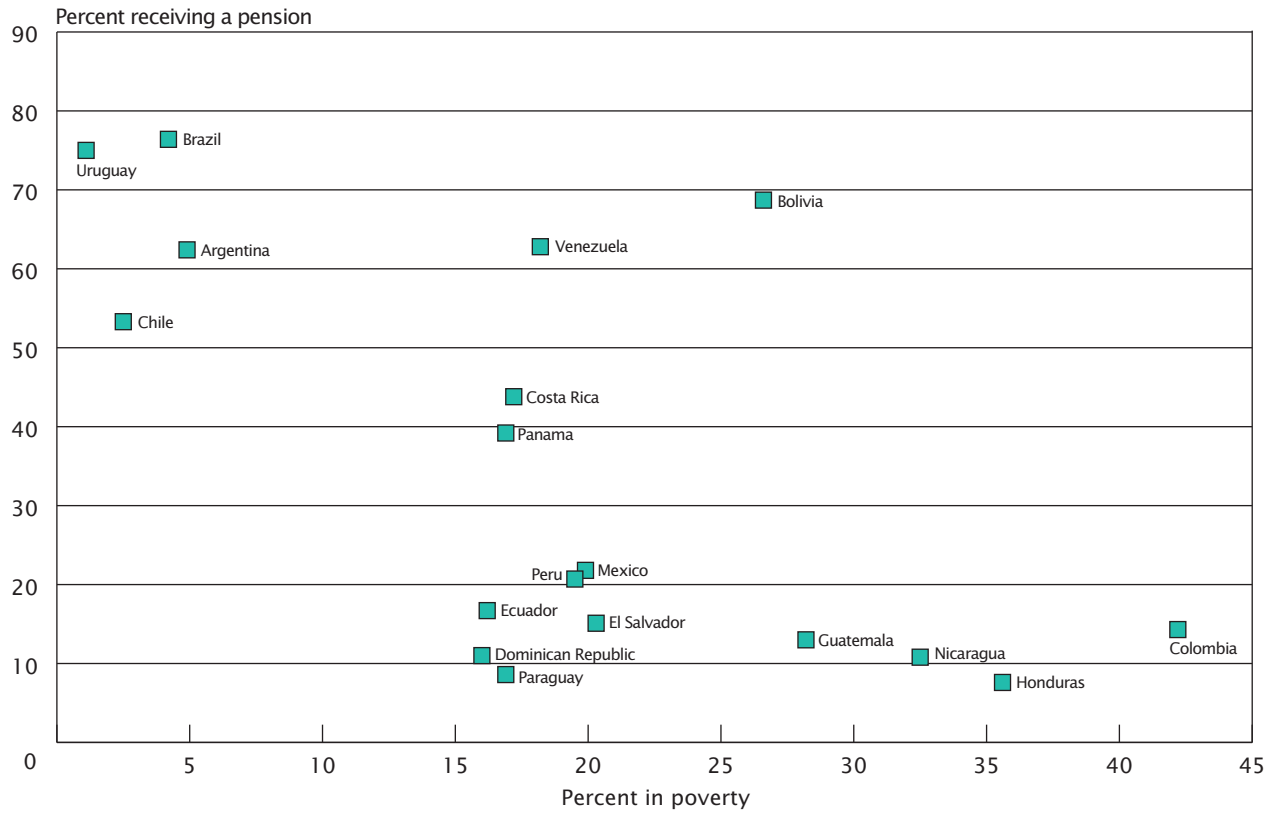
Table 7-3.
Population Aged 65 and Over in Poverty by Pension Status for Selected Countries in Latin America and the Caribbean: 2005 to 2007

(In percent)

Country	Poverty rate			Percent receiving a pension
	Total	Receive a pension	No pension	
Uruguay	0.9	0.5	3.0	84.0
Chile	2.3	1.0	4.3	60.6
Brazil	3.5	1.5	14.3	84.4
Argentina	3.7	1.1	11.3	74.5
Dominican Republic	15.6	6.9	16.8	12.1
Ecuador	17.2	3.2	20.7	20.0
Paraguay	17.2	0.0	18.8	8.5
Panama	18.2	1.9	29.7	41.4
Costa Rica	18.5	16.0	22.2	59.7
Venezuela	19.4	6.3	40.4	61.6
Peru	20.1	0.4	26.0	23.0
El Salvador	20.7	2.2	24.3	16.3
Mexico	21.9	2.7	27.9	23.8
Bolivia	25.3	22.9	46.0	89.6
Guatemala	29.1	8.2	33.0	15.7
Nicaragua	32.5	10.4	35.4	11.6
Honduras	37.1	7.8	39.6	7.9
Colombia	44.3	2.4	51.4	14.5

Note: Poverty line defined as US$2.50 per day purchasing power parity. Percentage receiving pension is derived algebraically from the first three columns.
Source: Cotlear and Tornarolli, 2011.

Figure 7-12.
Poverty Rate Among Those Aged 60 and Over by Percentage Receiving Pension in Latin America and the Caribbean: 2005 to 2007



Note: Poverty line defined as US$2.50 per day purchasing power parity.
Source: Cotlear and Tornarolli, 2011.

Chapter 7 References

Aegon. 2013. *The Changing Face of Retirement: The Aegon Retirement Readiness Survey 2013—Country Reports*. Aegon and the Transamerica Center for Retirement Studies.

Alessie, Rob J.M. 2005. "Does Social Security Crowd out Private Savings?" In Peter De Gijsel and Hans Schenk (eds.), *Multidisciplinary Economic: The Birth of a New Economics Faculty in the Netherlands*. New York, NY: Springer.

Asher, Mukul G. and Azad Singh Bali. 2012. "Singapore." In Donghyun Park (ed.), *Pension Systems in East and Southeast Asia: Promoting fairness and sustainability*. Mandaluyong City, Philippines: Asian Development Bank.

Attanasio, Orazio P. and Agar Brugiavini. 2003. "Social Security and Households' Saving." *The Quarterly Journal of Economics* 118/3: 1075–1119.

Attanasio, Orazio P. and Susann Rohwedder. 2003. "Pension Wealth and Household Saving: Evidence From Pension Reforms in the United Kingdom." *The American Economic Review* 93/5: 1499–1521.

Bucheli, Marisa, Alvaro Forteza, and Ianina Rossi. 2008. *Work History and the Access to Contributory Pensions in Uruguay: Some Facts and Policy Options*. World Bank Social Protection (SP) Discussion Paper 0829, May.

Cannon, Edmund and Ian Tonks. 2013. "The Value and Risk of Defined Contribution Pension Schemes: International Evidence." *The Journal of Risk and Insurance* 80/1: 95–119.

Casey, Bernard H. and Jörg Michael Dostal. 2008. "Pension Reform in Nigeria: How not to 'Learn from Others'." *Global Social Policy* 8/2: 238–266.

Clark. Jane Bennett. 2014. "How to Manage Your Parents' Care From Afar." *Kiplinger's Personal Finance*.

Cotlear, Daniel and Leopoldo Tornarolli. 2011. "Chapter 3, Poverty, the Aging, and the Life Cycle in Latin America." In Daniel Cotlear (ed.), *Population Aging, Is Latin America Ready?* Washington, DC: The World Bank.

Desai, Sonalde B., Amaresh Dubey, Brij Lal Joshi, Mitali Sen, Abusaleh Shariff, and Reeve Vanneman. 2010. *Human Development in India: Challenges for a Society in Transition*. New Delhi: Oxford University Press.

Gill, Indermit Singh, Truman Packard, and Juan Yermo. 2005. *Keeping the Promise of Old Age Income Security In Latin America*. Stanford, CA: Stanford University Press.

Gill, Indermit, Truman Packard, Todd Pugatch, and Juan Yermo. 2005. "Rethinking Social Security in Latin America." *International Social Security Review* 58/2-3: 71–96.

Haughton, Jonathan and Shahidur R. Khandker. 2009. *Handbook on Poverty and Inequality*. Washington: The International Bank for Reconstruction and Development/The World Bank.

Holzmann, Robert. 2012. "Global Pension Systems and Their Reform: Worldwide Drivers, Trends, and Challenges." *Social Protection & Labor,* Discussion Paper 1213, May. Washington, DC: The World Bank.

Holzmann, Robert and Richard Hinz. 2005. *Old-Age Income Support in the 21st Century: An International Perspective on Pension Systems and Reform*. Washington, DC: The World Bank.

Hurd, Michael, Pierre-Carl Michaud, and Susann Rohwedder. 2012. "The Displacement Effect of Public Pensions on the Accumulation of Financial Assets." *Fiscal Studies* 33/1: 107–128.

India Ministry of Finance. 2015. Press Information Bureau, "Prime Minister to Launch Pradhan Mantri Suraksha Bima Yojana (PMSBY), Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) and the Atal Pension Yojana (APY) on 9th May 2015 at Kolkata."

Jackson, Richard, Neil Howe, and Tobias Peter. 2013. *The Global Aging Preparedness Index Second edition*. Center for Strategic and International Studies, Lanham: Rowman & Littlefield.

James, Estelle, Alejandra Cox Edwards, and Augusto Iglesias. 2010. "Chile's New Pension Reforms." *National Center for Policy Analysis Policy Report* 326, March.

Kinsella, Kevin and Wan He. 2009. *An Aging World: 2008*. U.S. Census Bureau, International Population Reports, P95/09-1. Washington, DC: U.S. Government Printing Office.

Kpessa, Michael W. 2010. "Ideas, Institutions, and Welfare Program Typologies: An Analysis of Pensions and Old Age Income Protection Policies in Sub-Saharan Africa." *Poverty & Public Policy* 2/1: 37–65.

Kritzer, Barbara E. 2008. "Chile's Next Generation Pension Reform." *Social Security Bulletin* 68/2: 69–84.

Kritzer, Barbara E., Stephen J. Kay, and Tapen Sinha. 2011. "Next Generation of Individual Account Pension Reforms in Latin America." *Social Security Bulletin* 71/1: 35–76.

MacKellar, Landis (ed.). 2009. *Pension Systems for the Informal Sector in Asia*. Social Protection & Labor Discussion Paper 0903. Washington, DC: The World Bank.

Ojonugwa, Ayegba, James Isaiah, and Odoh Longinus. 2013. "An Evaluation of Pension Administration in Nigeria." *British Journal of Arts and Social Sciences* 15/II: 97–108.

Organisation for Economic Co-operation and Development. 2012. *Pensions at a Glance Asia/Pacific 2011*. Paris: OECD Publishing.

_____. 2013a. *Pensions at a Glance 2013:OECD and G20 Indicators*. Paris: OECD Publishing.

_____. 2013b. *Pensions at a Glance Asia/Pacific 2013*. Paris: OECD Publishing.

_____. 2014a. "OECD Income Distribution Database (IDD): Gini, Poverty, Income, Methods and Concepts." Available at <http://www.oecd.org/social/income-distribution-database.htm>, accessed on October 1, 2014.

_____. 2014b. *OECD Pensions Outlook 2014*. Paris: OECD Publishing.

Schultz, T. Paul. 1990. "Women's Changing Participation in the Labor Force: A World Perspective." *Economic Development and Cultural Change* 38/3: 457–488.

Shelton, Alison M. 2012. *Chile's Pension System: Background in Brief*. Congressional Research Service (CRS) Report for Congress.

Singapore Ministry of Manpower. 2014. "Singapore Workforce, 2014: Employment Rate Rose to New High, Sustained Rise in Incomes." Available at <http://www.mom.gov.sg/newsroom/press-releases/2014/singapore-workforce-2014>, accessed on August 25, 2015.

Social Security Administration. 2013a. *Social Security Programs Throughout the World: Africa, 2013*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11803.

_____. 2013b. *Social Security Programs Throughout the World: Asia and the Pacific, 2012*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11802.

_____. 2014a. *Income of the Aged Chartbook, 2012*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11727.

_____. 2014b. *Social Security Programs Throughout the World: The Americas, 2013*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11804.

_____. 2014c. *Social Security Programs Throughout the World: Europe, 2014*. Office of Retirement and Disability Policy. Office of Research, Evaluation, and Statistics. SSA Publication 13-11801.

Stewart, Fiona and Juan Yermo. 2009. "Pensions in Africa." *OECD Working Papers on Insurance and Private Pensions* 30. Paris: OECD Publishing.

Van Dam, Jaap. 2014. "Towards a Three-Pillar Pensions System in Ghana." *The Actuary*.

CHAPTER 8.

Summary

This report has provided an update on the world's older population as well as the demographic, health, and economic aspects of our aging world. Among all demographic trends underway in the world today, it is population aging—and how societies, families, and individuals prepare for and manage it—that may be the most consequential. As Suzman said (quoted in Holmes, 2015), "Ageing is reshaping our world."

In addition to updating the most recent trends, this latest report in the Census Bureau's series of *An Aging World* featured a variety of special topics, with some contributed by researchers outside the Census Bureau. Below is a summary of select essential points illustrated in this report:

POPULATION GROWTH

- In 2015, 8.5 percent of the world's population is aged 65 and over. This older population of 617 million is projected to increase by an average of 27 million a year over the next 35 years, reaching 1.6 billion in 2050. The older population is expected to represent 16.7 percent of the world total population by then.
- While Europe is still the oldest region today and is projected to remain so by 2050, aging in Asia and Latin America will accelerate and rapidly catch up. Asia is just as notable for leading the world in the size of the older population as speed of aging. At the other end of the spectrum is Africa, exceptionally young in 2015 in terms of proportion of older population, even though some African countries already have a large number of older people.
- The oldest segment (aged 80 and over) of the older population has been growing faster than the younger segments, thanks to increasing life expectancy at older ages. Some countries will experience a quadrupling of their oldest population from 2015 to 2050.
- Declining fertility levels have been the main propeller for population aging and rates of decline vary by region and country. Currently the total fertility rate is near or below the 2.1 replacement level in all regions except Africa.
- Some countries have experienced simultaneous population aging and population decline. The traditionally oldest European countries such as Italy and Spain are no longer experiencing population decline thanks to increases in fertility and major immigration flows. New countries joining the list with projected population declines between now and 2050 include some Asian countries driven by rapid fertility decline such as China, South Korea, and Thailand.
- Although the world's total dependency ratio in 2050 is projected to remain similar to the 2015 ratio, the composition will change considerably, with the share due to the older population (rather than children) projected to almost double, from 20 percent to 38 percent in the next 3 decades.

HEALTH AND HEALTH CARE

- The leading causes of death have been shifting in part due to increasing longevity, with the share due to noncommunicable diseases (NCDs) on the rise. NCDs often occur together and this multimorbidity increases with age. African and other low- and lower-middle income countries continue to face a considerable burden from communicable diseases as well.
- People continue to live longer. Global life expectancy at birth reached 68.6 years and is projected to rise to 76.2 years in 2050. Regions and countries vary drastically, with current life expectancy exceeding 80 years in 24 countries but less than 60 years in 28 countries. Among those reaching older ages, remaining life expectancy also varies notably. In several countries, males and females at age 65 can expect to live at least 20 years and 25 years, respectively, compared to poorer countries where they may live less than 12 years and 14 years, respectively.
- A portion of one's expected years of life may not be healthy ones. Healthy life expectancy (HALE) measures the number of expected years living in full health and without activity limitations. In 2012, HALE for women at age 65 in European countries ranged from 3 years for Slovakians to 16 years for Norwegians.
- A cluster of risk factors are directly or indirectly responsible for the global burden of disease. For instance, tobacco use has dropped in some high-income

countries, and the majority of smokers worldwide now live in low- and middle-income countries. Increasing obesity, in addition to being underweight, has been associated with increased mortality at older ages.

- The older population has different health care needs than younger adults due to increasing chronic diseases and disability at older ages. Provisions for health care at older ages are more often available in countries with social protection systems or with universal care schemes. Universal health coverage has become a focus for the post-2015 Sustainable Development Goals being set by the United Nations.
- The increasing size and share of the older population in any society drives its long-term care costs. A wide range of funding sources is used for long-term care, and the care provided differs in coverage, degree of cost-sharing, the scope and depth of coverage, and providers' qualifications.
- Older adults are not solely supported by pensions or long-term health insurance. Unpaid caregiving by family members and friends remains the main source of long-term care for older people worldwide. Informal care may substitute for formal long-term care in some circumstances in Europe, particularly when low levels of unskilled care are needed.

WORK, RETIREMENT, AND PENSIONS

- Labor force participation among the older population continues to rise in many developed countries, yet such participation remains far higher in low-income countries.
- Many workers are uncertain about their lifestyle after retirement and many retire earlier than they had expected. Statutory retirement ages vary widely across world regions, yet tend to lump at certain ages, such as 60 and 65. In several OECD countries, the formal retirement age has risen (or is set to increase) to well above 65.
- The Great Recession (2007–2009) had a major impact on unemployment rates and financial assets among many older people in more developed countries. However, the trend of rising labor force participation rates among the population aged 60 and older in these countries was not halted. The Great Recession had a much smaller impact on the majority of less developed countries whose economies were less linked to more developed countries, where the recession originated.
- Among mandatory pension programs, earnings-related public PAYGO systems are still the most common. Several countries that had mandated privatized individual retirement accounts have either abandoned that approach entirely (e.g., Argentina) or supplemented it with public systems (e.g., Chile and Ghana).
- Pension coverage of the older population varies widely throughout the world. More than 90 percent of the older population receives a pension in more developed countries such as Japan, United States, Australia, and Italy. In contrast, in the world's two population billionaires, public pensions cover less than a third of the older population in China and a tenth of those in India.
- The proportion of income that older people received from public pension systems in Organisation for Economic Co-operation and Development countries range from under 40 percent to over 75 percent. The remainder of income comes from a mix of other public transfers, private savings and investments, and family support.
- Public pensions can drastically lower poverty rates for the older population. In Latin America and Caribbean countries, for instance, the average poverty rate of those receiving a pension is 5.3 percent, one-fifth of the average poverty rate of those not receiving pensions (25.8 percent).
- In addition to reducing poverty, public pensions also may reduce incentives for private savings, a phenomenon known as "crowding out." Debates about the size and scope of this phenomenon continue.

Although some of the aforementioned issues, as well as future dynamics of population aging, are well understood today, the story of our aging world may evolve in unexpected ways. The broad institutional response of governments and policymakers to the challenges of aging is difficult to anticipate. So too are the evolving family institutions and social networks that provide the foundation of support for each older person. As these stories continue to unfold, societies throughout the world will choose common and diverse ways to respond to these challenges.

Chapter 8 Reference

Holmes, David. 2015. "Profile: Richard Suzman: Helping the World to Grow Old More Gracefully." *The Lancet* 385/9967: 499.

APPENDIX A.

Country Composition of World Regions

AFRICA

Eastern Africa

- Burundi
- Comoros
- Djibouti
- Eritrea
- Ethiopia
- Kenya
- Madagascar
- Malawi
- Mauritius
- Mozambique
- Rwanda
- Seychelles
- Somalia
- Tanzania
- Uganda
- Zambia
- Zimbabwe

Middle Africa

- Angola
- Cameroon
- Central African Republic
- Chad
- Congo (Brazzaville)
- Congo (Kinshasa)
- Equatorial Guinea
- Gabon
- Sao Tome and Principe

Northern Africa

- Algeria
- Egypt
- Libya
- Morocco
- South Sudan
- Sudan
- Tunisia
- Western Sahara

Southern Africa

- Botswana
- Lesotho
- Namibia
- South Africa
- Swaziland

Western Africa

- Benin
- Burkina Faso
- Cabo Verde
- Cote d'Ivoire
- Gambia, The
- Ghana
- Guinea
- Guinea Bissau
- Liberia
- Mali
- Mauritania
- Niger
- Nigeria
- Saint Helena
- Senegal
- Sierra Leone
- Togo

ASIA

Eastern Asia

- China
- Hong Kong
- Japan
- Korea, North
- Korea, South
- Macau
- Mongolia
- Taiwan

South-Central Asia

- Afghanistan
- Bangladesh
- Bhutan
- India
- Iran
- Kazakhstan
- Kyrgyzstan
- Maldives
- Nepal
- Pakistan
- Sri Lanka
- Tajikistan
- Turkmenistan
- Uzbekistan

South-Eastern Asia

- Brunei
- Burma
- Cambodia
- Indonesia
- Laos
- Malaysia
- Philippines
- Singapore
- Thailand
- Timor-Leste
- Vietnam

Western Asia

- Armenia
- Azerbaijan
- Bahrain
- Cyprus
- Gaza Strip
- Georgia
- Iraq
- Israel
- Jordan
- Kuwait
- Lebanon
- Oman
- Qatar
- Saudi Arabia
- Syria
- Turkey
- United Arab Emirates
- West Bank
- Yemen

EUROPE

Eastern Europe

- Belarus
- Bulgaria
- Czech Republic
- Hungary
- Moldova
- Poland
- Romania
- Russia
- Slovakia
- Ukraine

Northern Europe

Denmark
Estonia
Faroe Island
Finland
Guernsey
Iceland
Ireland
Isle of Man
Jersey
Latvia
Lithuania
Norway
Sweden
United Kingdom

Southern Europe

Albania
Andorra
Bosnia and Herzegovina
Croatia
Gibraltar
Greece
Italy
Kosovo
Macedonia
Malta
Montenegro
Portugal
San Marino
Serbia
Slovenia
Spain

Western Europe

Austria
Belgium
France
Germany
Liechtenstein
Luxembourg
Monaco
Netherlands
Switzerland

LATIN AMERICA AND THE CARIBBEAN

Anguilla
Antigua and Barbuda
Argentina
Aruba
Bahamas, The
Barbados
Belize
Bolivia
Brazil
Cayman Islands
Chile
Colombia
Costa Rica
Cuba
Curacao
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Montserrat
Nicaragua
Panama
Paraguay
Peru
Puerto Rico
Saint Barthelemy
Saint Kitts and Nevis
Saint Lucia
Saint Martin
Saint Vincent and the Grenadines
Sint Maarten
Suriname
Trinidad and Tobago
Turks and Caicos Islands
Uruguay
Venezuela
Virgin Islands, British
Virgin Islands, U.S.

NORTHERN AMERICA

Bermuda
Canada
Greenland
Saint Pierre and Miquelon
United States

OCEANIA

American Samoa
Australia
Cook Islands
Fiji
French Polynesia
Guam
Kiribati
Marshall Islands
Micronesia, Federated States of
Nauru
New Caledonia
New Zealand
Northern Mariana Islands
Palau
Papua New Guinea
Samoa
Solomon Islands
Tonga
Tuvalu
Vanuatu
Wallis and Futuna

APPENDIX B.

Detailed Tables

Table B-1.

Total Population, Percentage Older, and Percentage Oldest Old: 1950, 1980, 2015, and 2050

(Numbers in thousands)

Country	1950				1980			
	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over
Africa								
Egypt	21,834	3.0	0.2	6.7	43,674	3.9	0.4	10.3
Kenya	6,077	3.9	0.3	7.7	16,282	3.0	0.3	10.0
Malawi	2,881	3.1	0.2	6.5	6,215	2.8	0.3	10.7
Morocco	8,953	2.9	0.2	6.9	19,567	4.2	0.6	14.3
South Africa	13,683	3.6	0.3	8.3	29,074	3.1	0.4	12.9
Tunisia	3,530	5.7	0.9	15.8	6,458	3.8	0.3	7.9
Uganda	5,158	3.0	0.3	10.0	12,661	2.6	0.2	7.7
Zimbabwe	2,747	3.2	0.2	6.3	7,285	2.9	0.3	10.3
Asia								
Bangladesh	43,852	5.1	0.6	11.8	88,855	2.9	0.3	10.3
China	554,760	4.5	0.3	6.7	998,877	4.7	0.4	8.5
India	371,857	3.1	0.4	12.9	688,575	3.6	0.3	8.3
Indonesia	79,538	4.0	0.3	7.5	151,108	3.4	0.3	8.8
Israel	1,258	3.9	0.3	7.7	3,764	8.6	1.2	14.0
Japan	83,625	4.9	0.4	8.2	116,807	9.0	1.4	15.6
Malaysia	6,110	5.1	0.6	11.8	13,763	3.7	0.5	13.5
Pakistan	36,944	5.3	0.5	9.4	79,222	3.4	0.4	11.8
Philippines	19,996	3.6	0.4	11.1	48,088	3.2	0.3	9.4
Singapore	1,022	2.4	0.4	16.7	2,415	4.7	0.5	10.6
South Korea	18,859	3.0	0.2	6.7	38,124	3.8	0.4	10.5
Sri Lanka	7,339	3.6	0.1	2.8	14,941	4.4	0.5	11.4
Thailand	20,607	3.2	0.4	12.5	46,809	3.8	0.5	13.2
Turkey	21,484	3.2	0.3	9.4	46,316	4.6	0.7	15.2
Europe								
Austria	6,935	10.4	1.2	11.5	7,549	15.4	2.7	17.5
Belgium	8,628	11.0	1.4	12.7	9,828	14.4	2.6	18.1
Bulgaria	7,251	6.7	0.7	10.4	8,862	11.9	1.6	13.4
Czech Republic	8,925	8.3	1.0	12.0	10,284	13.4	1.9	14.2
Denmark	4,271	9.1	1.2	13.2	5,123	14.4	2.9	20.1
France	41,829	11.4	1.7	14.9	53,880	14.0	3.1	22.1
Germany	68,376	9.7	1.0	10.3	78,289	15.6	2.8	17.9
Greece	7,566	6.8	1.0	14.7	9,643	13.1	2.3	17.6
Hungary	9,338	7.3	0.8	11.0	10,707	13.4	2.1	15.7
Italy	47,104	8.3	1.1	13.3	56,434	13.1	2.2	16.8
Norway	3,265	9.7	1.7	17.5	4,086	14.8	3.0	20.3
Poland	24,824	5.2	0.7	13.5	35,574	10.1	1.5	14.9
Russia	102,702	6.2	0.9	14.5	138,655	10.2	1.4	13.7
Sweden	7,014	10.3	1.5	14.6	8,310	16.3	3.2	19.6
United Kingdom	50,616	10.7	1.5	14.0	56,314	14.9	2.7	18.1
Ukraine	37,298	7.6	1.2	15.8	50,044	11.9	1.7	14.3

Table B-1.

Total Population, Percentage Older, and Percentage Oldest Old: 1950, 1980, 2015, and 2050—Con.

(Numbers in thousands)

Country	1950				1980			
	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over
Latin America/Caribbean								
Argentina	17,150	4.2	0.5	11.9	28,094	8.1	1.1	13.6
Brazil	53,975	3.0	0.3	10.0	121,615	4.1	0.5	12.2
Chile	6,082	4.3	0.5	11.6	11,174	5.5	0.9	16.4
Colombia	12,568	3.1	0.3	9.7	28,356	3.8	0.5	13.2
Costa Rica	966	4.8	0.5	10.4	2,347	4.7	0.8	17.0
Guatemala	3,146	2.5	0.2	8.0	7,013	2.9	0.4	13.8
Jamaica	1,403	3.9	0.2	5.1	2,133	6.7	1.5	22.4
Mexico	27,741	3.5	0.6	17.1	69,325	3.7	0.6	16.2
Peru	7,632	3.5	0.3	8.6	17,325	3.6	0.4	11.1
Uruguay	2,239	8.2	1.4	17.1	2,914	10.5	1.7	16.2
Northern America/Oceania								
Australia	8,219	8.1	1.1	13.6	14,638	9.6	1.7	17.7
Canada	13,737	7.7	1.1	14.3	24,516	9.4	1.8	19.1
New Zealand	1,908	9.0	1.1	12.2	3,113	10.0	1.7	17.0
United States	157,813	8.3	1.1	13.3	230,917	11.2	2.4	21.4

Country	2015				2050			
	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over
Africa								
Egypt	88,487	5.2	0.7	13.2	137,873	13.1	2.8	21.4
Kenya	45,925	2.9	0.4	14.3	70,755	9.2	1.5	16.6
Malawi	17,715	2.7	0.3	10.8	37,407	4.2	0.6	14.0
Morocco	33,323	6.4	1.4	21.0	42,026	18.6	4.9	26.4
South Africa	48,286	6.5	1.0	16.1	49,401	11.4	3.3	28.6
Tunisia	11,037	8.0	1.6	20.3	12,180	24.3	6.8	27.9
Uganda	37,102	2.0	0.3	15.7	93,476	3.4	0.5	15.6
Zimbabwe	14,230	3.5	0.7	19.6	25,198	6.9	1.2	16.9
Asia								
Bangladesh	168,958	5.1	0.7	14.0	250,155	14.6	2.9	20.2
China	1,361,513	10.1	1.8	18.2	1,303,723	26.8	8.7	32.7
India	1,251,696	6.0	0.8	13.2	1,656,554	14.7	3.2	21.7
Indonesia	255,994	6.6	1.1	16.1	300,183	19.0	4.8	24.9
Israel	7,935	10.9	3.0	27.3	10,828	18.1	5.7	31.4
Japan	126,920	26.6	8.0	29.9	107,210	40.1	18.3	45.7
Malaysia	30,514	5.6	0.9	15.4	42,929	16.0	4.3	26.8
Pakistan	199,086	4.3	0.6	14.4	290,848	11.3	2.2	19.5
Philippines	109,616	4.6	0.7	15.4	171,964	11.7	2.7	22.9
Singapore	5,674	8.9	2.0	22.9	8,610	23.9	9.1	38.0
South Korea	49,115	13.0	2.8	21.2	43,369	35.9	14.0	39.1
Sri Lanka	22,053	9.0	1.8	19.4	25,167	21.2	6.5	30.6
Thailand	67,976	9.9	1.9	18.9	66,064	27.4	8.7	31.9
Turkey	82,523	6.9	1.1	16.4	100,955	19.3	4.8	24.9

Table B-1.

Total Population, Percentage Older, and Percentage Oldest Old: 1950, 1980, 2015 and 2050—Con.

(Numbers in thousands)

Country	2015				2050			
	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over	Total population	Percent 65 and over of total population	Percent 80 and over of total population	Percent 80 and over of 65 and over
Europe								
Austria	8,224	19.5	5.3	27.1	7,521	30.1	12.8	42.4
Belgium	10,454	19.3	5.8	30.1	9,883	27.7	11.1	40.2
Bulgaria	6,867	19.8	4.7	23.7	4,651	33.8	10.7	31.6
Czech Republic	10,645	18.0	4.1	22.6	10,210	29.0	9.0	30.9
Denmark	5,582	18.7	4.3	23.1	5,575	24.6	9.7	39.3
France	66,554	18.7	5.9	31.4	69,484	25.8	10.3	40.1
Germany	80,854	21.5	5.8	27.2	71,542	30.1	13.3	44.3
Greece	10,776	20.5	6.2	30.4	10,036	32.1	11.6	36.1
Hungary	9,898	18.2	4.5	24.6	8,490	29.9	9.5	31.9
Italy	61,855	21.2	6.4	30.4	61,416	31.0	11.9	38.5
Norway	5,208	16.3	4.2	26.0	6,364	23.0	8.3	36.2
Poland	38,302	15.5	4.0	25.8	32,085	31.7	9.9	31.1
Russia	142,424	13.6	3.2	23.7	129,908	25.7	7.7	30.1
Sweden	9,802	20.0	5.1	25.3	12,011	22.3	8.3	37.1
Ukraine	44,009	16.2	3.5	21.4	33,574	29.3	9.1	31.1
United Kingdom	64,088	17.7	4.8	27.2	71,154	23.6	9.1	38.7
Latin America/Caribbean								
Argentina	43,432	11.6	3.0	26.1	53,511	18.9	5.6	29.3
Brazil	204,260	7.8	1.4	17.8	232,304	21.1	5.8	27.4
Chile	17,508	10.2	2.1	20.6	19,688	23.2	8.0	34.7
Colombia	46,737	6.9	1.2	17.6	56,228	19.1	5.9	30.8
Costa Rica	4,814	7.3	1.3	18.4	6,066	20.7	6.2	30.1
Guatemala	14,919	4.3	0.6	14.6	22,995	10.3	2.1	20.4
Jamaica	2,950	7.9	2.0	25.0	3,555	14.5	3.9	26.6
Mexico	121,737	6.8	1.3	19.7	150,568	18.0	5.1	28.2
Peru	30,445	7.0	1.2	16.7	36,944	17.1	4.5	26.7
Uruguay	3,342	14.0	3.9	28.0	3,495	21.6	7.0	32.3
Northern America/Oceania								
Australia	22,751	15.5	4.1	26.3	29,013	22.5	8.1	36.1
Canada	35,100	17.7	5.0	28.2	41,136	26.3	10.6	40.5
New Zealand	4,438	14.6	3.7	25.5	5,199	23.0	8.9	38.5
United States	321,369	14.9	3.8	25.3	398,328	22.1	8.2	37.1

Sources: United Nations Department of Economic and Social Affairs, 2007, *World Population Prospects. The 2006 Edition*; and U.S. Census Bureau, 2013, 2014a, 2014b; International Data Base, U.S. population estimates, and U.S. population projections.

Table B-2.

Percentage Change in Population for Older Age Groups by Country: 2010 to 2030 and 2030 to 2050

Country	Percent change 2010–2030				Percent change 2030–2050			
	55–64	65–79	80 and over	65 and over	55–64	65–79	80 and over	65 and over
Africa	**86.2**	**98.2**	**136.2**	**103.2**	**89.7**	**106.3**	**157.8**	**114.2**
Algeria	125.3	151.9	133.2	148.3	46.1	102.9	197.1	120.1
Angola	83.1	93.5	158.3	100.0	105.3	110.7	144.1	115.0
Benin	125.7	109.2	188.5	117.8	102.3	144.8	176.3	149.4
Botswana	47.2	75.8	96.3	80.3	81.0	70.7	90.9	75.5
Burkina Faso	133.4	86.0	120.1	89.4	101.6	148.5	190.2	153.4
Burundi	94.5	140.7	130.3	139.4	123.6	118.8	194.4	127.7
Cameroon	82.4	89.8	139.6	95.6	116.0	119.1	145.0	122.7
Cape Verde	193.0	110.8	46.4	96.9	87.7	83.5	233.3	107.5
Central African Republic	92.4	46.6	50.9	47.2	89.5	97.3	139.9	103.1
Chad	50.3	63.7	101.7	67.8	112.4	82.0	116.4	86.4
Comoros	112.1	75.2	148.8	84.1	67.7	143.4	137.5	142.5
Congo (Brazzaville)	150.2	116.8	88.6	112.8	51.2	129.0	226.8	141.2
Congo (Kinshasa)	98.5	92.2	137.5	96.9	125.0	135.4	171.6	139.8
Cote d'Ivoire	81.1	75.0	230.6	89.0	89.5	142.7	139.8	142.3
Djibouti	102.3	113.9	197.3	122.8	122.8	138.0	192.4	145.7
Egypt	60.9	137.4	272.3	152.4	73.5	91.1	164.4	103.1
Equatorial Guinea	112.8	66.7	113.8	72.3	85.3	113.2	169.6	121.4
Eritrea	116.2	59.8	155.2	71.8	82.1	162.4	135.3	157.4
Ethiopia	89.1	107.2	175.7	114.4	115.6	119.3	170.9	126.3
Gabon	41.4	53.1	69.8	55.7	66.9	38.3	116.7	51.5
Gambia, The	107.5	110.7	183.8	119.1	113.8	133.7	158.1	137.4
Ghana	103.9	101.6	120.1	104.4	70.5	104.0	167.5	114.2
Guinea	78.6	90.2	164.4	98.8	90.4	96.9	154.2	105.6
Guinea-Bissau	59.0	74.1	148.0	81.2	77.1	93.7	111.9	96.1
Kenya	112.2	128.2	152.5	131.6	110.4	154.5	185.6	159.2
Lesotho	–2.4	13.3	35.2	17.4	94.0	57.6	34.8	52.6
Liberia	73.1	97.5	205.4	107.0	84.1	118.1	154.2	122.8
Libya	230.8	148.1	119.9	143.1	33.6	187.0	284.3	202.5
Madagascar	113.3	129.2	116.2	127.3	105.9	115.3	202.7	127.5
Malawi	62.4	73.5	141.1	80.3	124.7	109.1	117.9	110.3
Mali	78.7	78.3	85.9	79.2	114.3	105.7	132.3	109.1
Mauritania	93.8	104.5	160.7	111.1	92.0	110.7	165.2	118.6
Mauritius	34.1	154.2	131.6	149.6	11.9	20.7	140.6	43.3
Morocco	100.9	119.3	101.2	115.8	33.3	70.5	180.4	90.1
Mozambique	54.7	48.4	86.2	53.4	118.0	89.5	99.5	91.1
Namibia	20.7	49.1	140.8	61.9	78.8	44.5	62.9	48.3
Niger	101.7	97.0	111.5	98.9	108.0	112.3	138.4	115.9
Nigeria	79.1	77.0	135.4	82.9	88.1	110.4	132.8	113.3
Rwanda	110.9	152.8	112.1	147.3	108.0	144.3	211.5	152.0
Saint Helena	49.9	78.6	118.7	87.4	–36.9	14.9	93.8	35.1
Sao Tome and Principe	126.9	70.5	15.6	61.2	94.0	155.8	238.2	165.8
Senegal	113.1	112.5	117.6	113.1	108.0	122.7	197.7	132.5
Seychelles	147.4	130.8	67.9	117.6	9.7	65.2	222.4	90.6
Sierra Leone	91.5	49.3	160.1	60.4	74.7	129.7	141.0	131.5
Somalia	154.2	117.8	53.0	110.5	64.2	93.9	293.8	110.2
South Africa	1.7	54.6	131.0	66.1	58.8	12.6	71.7	24.9
South Sudan	206.9	168.6	75.5	155.0	104.0	157.8	296.2	171.6
Sudan	137.2	98.1	30.7	85.7	81.4	118.8	235.6	133.9
Swaziland	26.1	55.9	131.8	66.3	111.7	51.0	79.8	56.5
Tanzania	105.0	91.6	161.8	100.3	108.5	147.9	144.1	147.3
Togo	101.3	116.6	188.0	125.0	110.2	124.6	178.0	132.6
Tunisia	105.8	116.8	109.7	115.5	8.3	56.0	173.1	77.2
Uganda	144.1	90.2	72.8	87.7	149.7	136.8	189.6	143.8
Western Sahara	120.5	139.2	156.5	141.5	92.8	108.5	187.7	119.6
Zambia	106.8	68.1	88.8	70.7	109.6	136.9	123.6	135.0
Zimbabwe	44.4	55.0	98.0	62.8	180.3	153.4	81.2	137.4
Asia	**71.7**	**97.5**	**126.5**	**102.4**	**19.0**	**47.9**	**144.2**	**66.0**
Afghanistan	84.4	93.6	134.5	97.1	110.4	100.0	163.0	106.4
Armenia	19.9	84.3	44.4	76.3	30.3	1.0	140.9	23.9
Azerbaijan	100.6	141.7	46.1	123.0	44.0	32.6	267.5	62.6
Bahrain	148.7	231.8	149.1	216.1	35.4	93.3	276.6	120.8

Table B-2.

Percentage Change in Population for Older Age Groups by Country: 2010 to 2030 and 2030 to 2050—Con.

Country	Percent change 2010–2030				Percent change 2030–2050			
	55–64	65–79	80 and over	65 and over	55–64	65–79	80 and over	65 and over
Asia—Con.								
Bangladesh	113.6	130.3	177.8	136.5	61.5	105.3	184.2	117.5
Bhutan	81.4	62.3	170.1	77.6	92.6	131.8	134.4	132.4
Brunei	96.9	274.6	247.1	270.4	53.6	73.7	260.7	100.3
Burma	98.7	117.7	110.0	116.6	36.7	75.2	205.7	92.9
Cambodia	116.0	137.2	125.5	135.6	89.1	90.7	223.9	108.2
China	62.1	105.9	116.1	107.7	–6.2	19.6	168.1	46.1
Cyprus	52.1	97.1	151.8	107.4	26.7	39.4	105.3	54.4
Gaza Strip	164.0	175.9	128.1	167.5	139.4	143.8	259.2	161.2
Georgia	6.1	38.4	26.9	35.4	26.8	–3.2	61.6	13.1
Hong Kong	21.7	131.2	81.3	117.4	–15.5	–11.2	110.3	17.0
India	83.8	98.0	162.4	105.9	34.1	75.2	162.3	88.8
Indonesia	95.3	99.0	158.7	107.1	12.6	65.6	169.4	83.2
Iran	125.5	127.5	81.7	118.4	70.6	122.6	203.4	136.0
Iraq	165.6	154.0	113.8	146.7	72.5	167.2	248.7	180.0
Israel	41.8	75.4	76.2	75.6	25.3	44.6	70.6	51.9
Japan	–6.8	4.1	110.5	33.6	–29.1	6.6	15.3	10.4
Jordan	157.2	86.9	174.1	101.2	45.4	119.3	170.7	130.8
Kazakhstan	49.9	109.7	79.9	104.5	44.5	33.5	160.2	53.1
Korea, North	93.4	45.0	180.6	60.3	–4.9	34.1	130.7	53.2
Korea, South	55.7	102.8	182.5	117.0	–20.6	5.6	124.5	33.2
Kuwait	96.5	198.9	352.6	215.2	49.4	82.5	244.4	107.2
Kyrgyzstan	57.2	122.8	20.3	101.0	64.8	44.7	226.7	67.9
Laos	107.7	101.8	106.2	102.3	90.9	104.9	197.6	116.8
Lebanon	61.5	66.1	133.0	76.8	18.6	47.7	119.1	62.7
Macau	85.7	232.6	115.6	199.8	5.3	17.7	200.0	54.5
Malaysia	91.3	165.8	202.1	171.2	27.8	62.3	201.3	85.2
Maldives	128.3	103.8	116.9	105.9	107.4	120.2	223.7	138.0
Mongolia	156.3	158.8	113.8	151.9	50.9	93.0	286.1	118.2
Nepal	90.1	91.9	169.8	100.7	98.2	111.8	168.3	120.4
Oman	100.3	94.8	204.2	110.6	139.9	218.3	135.5	201.1
Pakistan	105.2	97.0	115.0	99.4	97.2	100.5	190.0	113.3
Philippines	91.7	127.5	175.0	134.4	60.6	90.0	175.7	104.5
Qatar	125.0	276.4	269.6	275.7	35.4	94.5	279.5	111.9
Saudi Arabia	150.2	161.1	172.6	162.7	87.8	140.6	259.1	157.8
Singapore	62.2	188.9	226.0	197.5	65.7	54.9	178.8	86.3
Sri Lanka	42.6	109.7	151.3	117.6	9.8	35.4	112.2	52.3
Syria	137.3	130.0	125.4	129.3	83.7	129.4	231.8	146.6
Taiwan	37.0	121.0	93.8	114.4	–9.1	9.6	121.8	34.2
Tajikistan	157.6	141.2	50.9	128.3	87.3	106.8	362.1	131.1
Thailand	63.5	111.3	143.1	116.7	–9.1	24.0	146.1	47.3
Timor-Leste	85.9	118.5	253.9	131.2	80.3	70.5	185.8	87.0
Turkey	79.3	115.3	151.7	120.7	23.7	65.9	171.4	83.7
Turkmenistan	101.9	180.1	79.0	163.3	68.9	65.1	281.7	89.5
United Arab Emirates	99.2	164.2	230.3	171.2	34.1	100.3	225.9	116.4
Uzbekistan	110.2	165.1	51.6	139.7	76.0	72.6	254.0	98.3
Vietnam	118.0	159.8	65.2	139.3	39.2	66.9	242.2	93.1
West Bank	184.1	148.0	118.1	142.5	85.1	126.5	241.5	145.6
Yemen	96.5	136.5	96.3	130.2	168.1	158.8	183.8	162.2
Europe	**10.7**	**37.6**	**48.9**	**40.5**	**–7.5**	**2.7**	**50.9**	**16.1**
Albania	23.7	71.3	126.9	80.7	54.1	2.9	94.0	22.3
Andorra	70.8	122.7	66.2	105.4	–53.3	7.1	116.2	34.1
Austria	24.6	38.7	48.5	41.4	–18.2	–12.7	56.9	7.5
Belarus	6.4	45.7	22.5	40.0	6.4	6.2	76.0	21.2
Belgium	3.8	41.2	38.0	40.3	–9.5	–11.3	45.4	5.1
Bosnia and Herzegovina	26.1	67.3	122.6	75.5	–15.8	–0.6	117.8	21.7
Bulgaria	–14.6	5.5	44.8	14.3	–23.4	2.6	19.9	7.5
Croatia	–6.2	34.5	49.9	38.3	–7.3	–3.7	43.7	9.1
Czech Republic	–0.1	33.6	88.1	46.6	–9.5	23.2	25.6	23.9
Denmark	4.9	31.0	75.1	42.1	–9.2	–6.9	33.7	5.7
Estonia	–11.1	10.8	39.8	17.9	–10.8	–5.7	26.3	3.6
Faroe Islands	8.8	47.6	59.2	50.8	14.2	–12.5	47.4	5.1

Table B-2.

Percentage Change in Population for Older Age Groups by Country: 2010 to 2030 and 2030 to 2050—Con.

Country	Percent change 2010–2030				Percent change 2030–2050			
	55–64	65–79	80 and over	65 and over	55–64	65–79	80 and over	65 and over
Europe—Con.								
Finland	–21.6	39.7	76.5	49.6	0.7	–14.4	21.3	–3.0
France	5.8	49.4	50.7	49.8	–9.8	–3.1	37.6	9.9
Germany	12.0	22.1	51.6	29.5	–17.5	–22.2	49.3	–1.2
Gibraltar	–12.0	13.1	86.6	30.7	31.7	34.2	8.3	25.4
Greece	24.6	20.3	43.0	26.5	–24.6	13.0	43.3	22.4
Guernsey	12.2	48.1	55.1	50.2	–6.6	–3.7	45.9	11.7
Hungary	–2.1	20.3	58.4	29.4	–13.5	13.1	29.0	17.7
Iceland	20.9	83.5	64.5	78.0	9.4	8.1	70.5	24.7
Ireland	50.3	73.5	97.0	79.2	–0.0	49.3	79.3	57.3
Isle of Man	19.5	49.2	65.3	53.9	–11.8	–3.4	43.6	11.4
Italy	32.7	25.7	43.0	30.8	–24.2	7.6	43.8	19.1
Jersey	8.3	60.1	70.2	62.9	28.7	–19.2	66.8	5.4
Kosovo	74.3	76.6	93.7	79.4	49.4	59.2	147.2	74.6
Latvia	4.7	10.8	37.9	16.6	–5.5	–2.2	42.9	9.3
Liechtenstein	21.9	86.2	133.0	97.4	–7.7	–3.9	64.9	15.5
Lithuania	18.9	30.7	41.4	33.6	–2.3	2.2	47.4	15.2
Luxembourg	28.9	61.1	57.2	60.0	14.6	8.3	72.3	25.6
Macedonia	18.4	54.9	114.0	64.9	2.7	17.6	85.2	32.3
Malta	–12.1	55.2	126.6	71.3	10.5	3.9	28.9	11.3
Moldova	–17.4	42.9	41.2	42.6	2.6	–9.3	63.6	4.6
Monaco	4.5	57.2	154.5	90.6	–36.5	–12.9	48.9	15.4
Montenegro	20.8	64.6	23.7	51.9	–11.8	21.3	82.5	36.7
Netherlands	6.2	54.4	88.7	63.2	–7.4	–11.9	47.0	5.6
Norway	22.6	58.7	57.7	58.4	11.1	14.0	51.9	25.4
Poland	–10.0	63.7	62.3	63.3	1.3	11.1	47.8	20.4
Portugal	24.9	24.7	45.6	30.5	–20.4	15.3	38.1	22.3
Romania	22.2	19.0	52.9	26.2	–17.8	29.4	62.2	37.9
Russia	0.0	52.3	34.0	48.2	9.1	5.3	76.3	19.8
San Marino	44.5	55.3	66.6	58.6	–24.2	–0.0	62.9	19.6
Serbia	–11.6	22.0	42.0	26.3	–8.9	–1.4	46.3	10.3
Slovakia	7.2	65.1	69.3	66.1	–2.0	19.0	61.5	29.5
Slovenia	0.2	40.7	64.6	46.4	–22.3	–2.4	49.4	11.6
Spain	60.8	45.8	48.3	46.5	–21.9	31.2	68.7	42.1
Sweden	8.4	23.6	62.7	34.5	18.1	7.2	23.8	12.8
Switzerland	26.9	46.3	60.8	50.4	2.0	7.5	54.1	21.6
Ukraine	–5.7	22.6	28.2	23.8	–0.7	0.9	51.4	12.6
United Kingdom	15.6	39.5	53.9	43.6	4.0	1.4	45.9	15.0
Latin America and the Caribbean	**70.9**	**104.8**	**126.0**	**108.9**	**29.4**	**52.4**	**128.6**	**68.4**
Anguilla	142.1	202.5	119.4	183.3	16.8	39.0	236.4	74.2
Antigua and Barbuda	85.6	161.6	95.1	146.5	14.6	34.8	190.3	62.7
Argentina	27.6	47.7	62.1	51.4	31.9	44.9	57.4	48.3
Aruba	25.8	119.5	204.4	133.1	23.7	9.0	108.3	29.8
Bahamas, The	86.7	130.4	182.5	138.8	5.8	40.7	159.8	63.6
Barbados	39.9	131.6	68.6	115.5	–13.9	0.2	133.9	27.0
Belize	128.7	145.8	111.2	139.5	83.7	98.7	236.4	120.7
Bolivia	73.7	112.6	106.2	111.3	86.9	96.8	126.8	102.6
Brazil	67.0	113.1	148.6	119.2	20.9	53.6	137.8	70.1
Cayman Islands	56.4	191.1	236.3	199.7	21.3	14.9	144.6	42.5
Chile	58.3	111.2	132.2	115.4	16.6	17.9	125.2	41.3
Colombia	81.7	148.3	163.0	150.7	28.4	35.8	181.3	61.5
Costa Rica	86.5	157.1	174.2	160.2	34.8	49.6	172.5	73.1
Cuba	61.2	60.2	97.5	67.7	–28.4	–2.3	102.2	22.6
Curacao	–11.4	78.6	131.2	89.1	29.9	–21.7	59.7	–1.8
Dominica	64.7	69.2	41.5	62.2	6.5	25.2	137.2	50.0
Dominican Republic	84.7	117.5	153.2	124.1	35.3	49.6	146.0	69.5
Ecuador	78.1	116.4	126.1	118.5	50.5	64.4	129.3	78.6
El Salvador	66.1	79.0	104.0	83.8	45.6	62.9	119.3	75.0
Grenada	53.2	91.0	108.6	93.9	32.3	12.6	123.5	32.2
Guatemala	63.1	113.6	159.5	120.6	130.5	100.0	135.9	106.4
Guyana	53.6	129.6	96.8	123.8	41.2	37.0	170.6	57.8

Table B-2.

Percentage Change in Population for Older Age Groups by Country: 2010 to 2030 and 2030 to 2050—Con.

Country	Percent change 2010–2030				Percent change 2030–2050			
	55–64	65–79	80 and over	65 and over	55–64	65–79	80 and over	65 and over
Latin America and the Caribbean—Con.								
Haiti	71.2	71.1	132.7	78.1	82.6	97.9	149.2	105.5
Honduras	115.8	131.7	163.8	136.9	85.0	105.2	181.3	118.9
Jamaica	55.5	37.8	57.2	42.5	80.5	68.8	68.4	68.7
Mexico	98.1	109.4	138.0	114.7	28.5	64.0	147.5	81.3
Montserrat	183.7	98.2	2.6	76.8	–6.6	107.8	286.3	131.0
Nicaragua	118.4	124.5	136.1	126.5	78.2	98.5	185.7	113.9
Panama	84.9	104.5	148.2	113.1	25.6	57.8	125.6	73.4
Paraguay	90.3	130.6	127.6	130.0	63.9	65.3	147.6	81.9
Peru	73.2	95.0	158.4	104.6	39.6	54.8	139.4	70.9
Puerto Rico	–1.5	34.7	97.8	49.8	–0.6	0.4	30.8	10.0
Saint Barthelemy	3.0	107.4	267.4	133.5	–26.0	–21.0	67.6	1.7
Saint Kitts and Nevis	95.2	190.2	46.5	150.7	8.9	30.4	210.0	59.2
Saint Lucia	98.5	140.7	84.0	122.5	–0.0	44.7	161.5	75.7
Saint Martin	23.5	124.3	207.0	139.9	12.7	19.5	82.6	34.7
Saint Vincent and the Grenadines	67.3	111.6	60.2	100.0	–1.8	21.1	153.3	45.0
Sint Maarten	67.8	446.1	595.6	462.9	–4.0	–20.9	280.0	20.9
Suriname	140.3	125.0	93.8	119.6	22.1	77.0	243.1	102.1
Trinidad and Tobago	19.0	118.7	129.3	120.6	3.3	12.7	115.8	31.8
Turks and Caicos Islands	351.3	265.9	144.7	238.4	22.0	189.1	330.8	212.3
Uruguay	20.8	29.8	34.1	30.9	20.5	19.3	51.8	28.1
Venezuela	76.4	148.0	129.0	144.5	42.2	56.6	151.8	73.3
Virgin Islands, British	100.9	243.9	206.8	236.4	38.9	49.9	197.9	76.9
Virgin Islands, U.S	0.7	50.5	220.5	80.1	–33.2	–15.7	35.5	0.2
Northern America	**7.7**	**81.3**	**68.5**	**77.7**	**16.9**	**2.6**	**68.7**	**20.2**
Bermuda	–1.4	90.3	114.8	96.2	–4.3	–31.1	66.9	–5.3
Canada	5.8	84.0	81.7	83.3	12.2	–5.2	57.0	12.9
Greenland	14.1	123.2	179.9	130.5	4.5	–37.8	168.4	–5.8
Saint Pierre and Miquelon	16.5	42.6	83.2	53.3	–57.9	–11.5	48.2	7.3
United States	5.6	82.7	72.2	79.8	19.6	–1.0	59.0	15.1
Oceania	**32.4**	**77.5**	**87.1**	**80.0**	**20.2**	**23.9**	**65.3**	**35.4**
American Samoa	85.5	198.7	163.1	193.5	26.8	31.2	301.1	66.9
Australia	21.2	70.3	82.0	73.6	14.9	15.6	54.3	27.1
Cook Islands	8.5	21.7	77.0	30.1	–36.7	–22.8	97.3	1.8
Fiji	49.2	125.9	280.0	141.1	33.8	49.7	164.8	67.5
French Polynesia	90.6	141.9	241.6	156.3	20.8	42.3	172.0	67.3
Guam	41.2	117.9	189.5	130.4	19.6	15.8	123.9	39.6
Kiribati	81.8	120.4	146.2	123.5	75.7	71.3	229.0	92.1
Marshall Islands	85.7	209.4	183.8	205.4	71.7	113.6	216.6	128.9
Micronesia, Federated States of	29.9	112.7	57.8	105.5	18.9	34.6	131.7	44.4
Nauru	64.0	339.4	213.3	326.5	67.1	98.4	444.7	124.4
New Caledonia	87.2	92.4	206.7	110.8	24.1	66.5	124.5	80.1
New Zealand	27.0	77.2	78.3	77.5	4.9	4.2	68.9	22.2
Northern Mariana Islands	114.1	457.2	394.3	449.3	48.6	59.1	403.2	98.1
Palau	65.3	181.9	108.0	160.2	–3.1	–4.7	202.1	43.9
Papua New Guinea	104.7	125.7	222.7	136.6	49.6	98.2	182.4	111.0
Samoa	90.1	95.6	96.0	95.6	52.8	52.1	171.8	72.7
Solomon Islands	155.8	111.0	169.1	120.3	70.7	147.1	180.6	153.6
Tonga	73.5	31.7	79.7	40.0	4.1	56.6	133.5	73.7
Tuvalu	–6.1	107.7	51.7	98.9	118.2	–5.5	160.0	14.3
Vanuatu	119.4	158.6	232.8	167.6	72.5	104.2	250.8	126.2
Wallis and Futuna	42.5	99.6	171.8	113.4	31.0	51.1	97.8	62.5

Source: U.S. Census Bureau, 2013; International Data Base.

Table B-3.

Median Age: 2015, 2030, and 2050

(In years)

Country	2015	2030	2050
Africa			
Algeria	27.5	31.8	37.0
Angola	18.0	19.5	22.6
Benin	17.9	20.8	26.1
Botswana	23.1	25.6	29.0
Burkina Faso	17.1	18.6	21.7
Burundi	17.0	17.9	20.4
Cameroon	24.5	31.3	38.6
Cape Verde	18.4	20.4	24.3
Central African Republic	19.5	21.3	24.8
Chad	17.4	20.9	24.8
Comoros	19.4	25.1	33.4
Congo (Brazzaville)	19.8	20.7	23.5
Congo (Kinshasa)	18.1	22.1	28.8
Cote d'Ivoire	20.5	24.5	30.4
Djibouti	23.2	28.0	33.3
Egypt	25.3	28.8	34.1
Equatorial Guinea	19.5	22.6	28.4
Eritrea	19.3	23.7	30.1
Ethiopia	17.7	19.8	24.3
Gabon	18.6	19.4	21.6
Gambia, The	20.5	24.9	31.8
Ghana	20.9	22.8	26.0
Guinea	18.8	20.3	23.8
Guinea-Bissau	19.9	22.3	26.7
Kenya	19.3	25.2	33.9
Lesotho	23.8	26.5	32.5
Liberia	18.1	21.6	26.8
Libya	28.0	34.2	40.2
Madagascar	19.4	22.6	28.8
Malawi	17.5	19.4	23.7
Mali	16.1	18.2	23.7
Mauritania	20.1	23.2	28.5
Mauritius	34.4	39.3	44.4
Morocco	28.5	34.0	39.4
Mozambique	17.0	18.5	21.6
Namibia	23.1	28.5	34.1
Niger	15.2	17.7	23.0
Nigeria	18.2	20.0	23.1
Rwanda	18.8	21.7	24.3
Saint Helena	41.0	46.7	49.6
Sao Tome and Principe	17.9	23.0	31.1
Senegal	18.5	21.6	26.8
Seychelles	34.4	41.5	49.2
Sierra Leone	19.0	20.0	22.2
Somalia	17.8	19.5	23.2
South Africa	25.9	29.3	33.4
South Sudan	17.0	20.7	26.7
Sudan	19.3	24.6	31.5
Swaziland	21.2	25.0	29.6
Tanzania	17.5	19.8	23.5
Togo	19.6	21.4	25.1
Tunisia	31.9	38.8	44.0
Uganda	15.6	17.4	21.9
Western Sahara	20.9	23.9	28.8
Zambia	16.7	17.6	19.8
Zimbabwe	20.5	22.0	25.9
Asia			
Afghanistan	18.4	20.7	25.6
Armenia	34.2	42.4	51.3
Azerbaijan	30.5	37.4	42.3
Bahrain	31.8	34.1	36.9
Bangladesh	24.7	30.8	37.7

Table B-3.
Median Age: 2015, 2030, and 2050—Con.
(In years)

Country	2015	2030	2050
Asia—Con.			
Bhutan	26.7	33.6	41.7
Brunei	29.6	33.9	38.1
Burma	28.3	33.4	38.0
Cambodia	24.5	29.3	35.2
China	37.0	42.9	48.9
Cyprus	36.1	41.8	48.7
Gaza Strip	18.4	23.9	32.9
Georgia	37.9	41.8	45.1
Hong Kong	43.6	49.5	54.1
India	27.3	31.8	37.2
Indonesia	29.6	34.4	40.9
Iran	28.8	36.9	42.5
Iraq	21.8	26.5	33.2
Israel	30.1	32.9	38.2
Japan	46.5	52.6	56.4
Jordan	23.0	26.0	30.7
Kazakhstan	30.0	34.9	38.4
Korea, North	33.6	37.3	41.8
Korea, South	40.8	48.3	55.1
Kuwait	29.0	31.0	33.9
Kyrgyzstan	26.0	29.3	34.5
Laos	22.3	27.8	34.2
Lebanon	31.9	39.2	46.8
Macau	38.2	46.2	55.0
Malaysia	27.9	31.9	36.7
Maldives	27.4	35.0	42.3
Mongolia	27.5	33.7	39.2
Nepal	23.4	30.3	36.6
Oman	25.1	28.4	33.2
Pakistan	23.0	29.0	35.9
Philippines	23.7	27.4	32.5
Qatar	32.8	34.8	35.2
Saudi Arabia	26.8	31.9	36.5
Singapore	34.0	39.2	47.0
Sri Lanka	32.1	36.5	41.3
Syria	23.5	29.5	36.9
Taiwan	39.7	47.5	54.9
Tajikistan	23.9	28.2	34.4
Thailand	36.7	42.8	48.5
Timor-Leste	18.6	21.7	28.6
Turkey	30.0	35.2	41.4
Turkmenistan	27.1	33.3	38.1
United Arab Emirates	30.3	30.3	30.8
Uzbekistan	27.6	35.1	42.3
Vietnam	29.6	36.6	43.3
West Bank	22.7	28.6	36.0
Yemen	18.9	24.2	32.0
Europe			
Albania	32.0	39.4	49.8
Andorra	43.0	52.2	54.2
Austria	44.6	47.6	49.6
Belarus	39.6	44.8	48.3
Belgium	43.3	45.5	47.2
Bosnia and Herzegovina	41.2	47.2	53.0
Bulgaria	42.8	48.4	53.0
Croatia	42.3	46.4	49.7
Czech Republic	41.3	46.6	47.8
Denmark	41.8	42.4	45.0
Estonia	41.5	46.3	51.7
Faroe Islands	37.7	38.0	40.1
Finland	43.3	45.3	46.8
France	41.1	42.8	44.0

Table B-3.
Median Age: 2015, 2030, and 2050—Con.
(In years)

Country	2015	2030	2050
Europe—Con.			
Germany	46.5	48.5	49.1
Gibraltar	34.2	38.6	43.0
Greece	43.8	48.8	50.3
Guernsey	43.4	45.8	47.6
Hungary	41.4	46.7	49.5
Iceland	36.6	40.4	44.1
Ireland	36.1	40.1	42.1
Isle of Man	43.7	45.4	47.0
Italy	44.8	49.0	49.4
Jersey	39.0	40.1	44.3
Kosovo	28.2	34.1	41.1
Latvia	41.7	46.4	52.3
Liechtenstein	42.7	44.8	45.9
Lithuania	41.5	46.6	53.4
Luxembourg	39.6	39.9	41.4
Macedonia	37.2	42.5	47.6
Malta	41.2	46.2	50.3
Moldova	36.0	42.5	47.5
Monaco	51.7	63.4	71.7
Montenegro	39.7	46.9	50.8
Netherlands	42.3	43.2	44.4
Norway	39.1	41.1	43.6
Poland	39.9	46.6	51.9
Portugal	41.5	46.6	49.4
Romania	40.2	46.6	51.5
Russia	39.1	44.0	45.7
San Marino	43.9	46.7	48.6
Serbia	42.1	46.1	49.6
Slovakia	39.2	45.7	50.1
Slovenia	43.8	49.4	52.7
Spain	42.0	47.2	49.2
Sweden	41.2	41.5	42.1
Switzerland	42.1	44.1	45.0
Ukraine	40.8	45.8	50.4
United Kingdom	40.4	41.9	43.3
Latin America and the Caribbean			
Anguilla	34.3	38.6	41.6
Antigua and Barbuda	31.4	35.4	40.4
Argentina	31.4	34.9	39.7
Aruba	39.0	42.1	44.5
Bahamas, The	31.5	36.1	41.0
Barbados	38.0	42.8	46.1
Belize	22.1	26.7	32.8
Bolivia	23.7	28.6	35.1
Brazil	31.1	36.9	43.4
Cayman Islands	39.7	41.7	43.8
Chile	33.7	39.2	44.5
Colombia	29.3	35.1	41.6
Costa Rica	30.4	36.7	42.4
Cuba	40.4	44.3	49.2
Curacao	36.1	39.3	43.3
Dominica	32.6	40.1	50.1
Dominican Republic	27.4	32.6	38.4
Ecuador	27.0	32.6	39.7
El Salvador	26.1	34.1	44.3
Grenada	30.4	38.1	42.9
Guatemala	21.4	26.8	34.0
Guyana	25.4	31.9	40.2
Haiti	22.5	28.1	34.6
Honduras	22.3	27.8	34.5
Jamaica	25.3	30.9	38.2
Mexico	27.6	32.7	39.3

Table B-3.

Median Age: 2015, 2030, and 2050—Con.

(In years)

Country	2015	2030	2050
Latin America and the Caribbean—Con.			
Montserrat	31.9	38.3	49.7
Nicaragua	24.7	32.4	41.6
Panama	28.6	33.1	39.3
Paraguay	27.3	34.4	42.0
Peru	27.3	33.0	39.5
Puerto Rico	39.1	44.3	51.1
Saint Barthelemy	43.0	48.4	47.7
Saint Kitts and Nevis	34.0	41.2	48.5
Saint Lucia	33.5	43.8	55.8
Saint Martin	32.0	34.9	36.4
Saint Vincent and the Grenadines	32.5	40.3	46.6
Sint Maarten	40.4	41.3	44.8
Suriname	29.1	34.6	41.7
Trinidad and Tobago	35.0	44.0	47.7
Turks and Caicos Islands	32.4	38.1	42.3
Uruguay	34.5	38.1	43.7
Venezuela	27.2	32.0	37.0
Virgin Islands, British	35.9	39.7	41.9
Virgin Islands, U.S.	44.9	53.7	59.4
Northern America			
Bermuda	43.1	44.3	45.6
Canada	41.8	44.3	45.4
Greenland	33.7	36.9	40.6
Saint Pierre and Miquelon	45.2	54.3	57.8
United States	37.7	39.6	40.6
Oceania			
American Samoa	28.8	38.0	46.9
Australia	38.4	40.7	42.7
Cook Islands	35.2	42.3	46.4
Fiji	28.2	33.4	39.3
French Polynesia	31.0	37.8	44.2
Guam	30.1	34.3	39.9
Kiribati	23.9	29.5	35.1
Marshall Islands	22.6	27.7	36.0
Micronesia, Federated States of	24.2	30.5	37.3
Nauru	25.7	29.3	33.2
New Caledonia	31.4	36.2	41.8
New Zealand	37.7	40.1	42.9
Northern Mariana Islands	32.1	40.5	48.8
Palau	33.2	36.5	41.2
Papua New Guinea	22.6	27.0	32.6
Samoa	23.5	29.7	36.8
Solomon Islands	21.9	26.9	33.9
Tonga	22.3	28.6	43.6
Tuvalu	25.2	28.8	32.2
Vanuatu	21.4	26.8	34.3
Wallis and Futuna	30.9	39.8	48.4

Source: U.S. Census Bureau, 2013; International Data Base.

Table B-4.

Sex Ratio for Population 35 Years and Over by Age: 2015, 2030, and 2050

(Men per 100 women)

Country	2015				2030				2050			
	35–49	50–64	65–79	80 and over	35–49	50–64	65–79	80+	35–49	50–64	65–79	80 and over
Africa												
Algeria	102.3	102.5	89.4	73.8	102.8	100.8	95.5	72.6	104.1	101.9	93.0	72.7
Angola	101.9	94.4	87.5	75.2	102.6	98.4	86.2	72.5	101.6	99.5	90.7	67.5
Benin	103.2	81.6	65.7	66.0	102.0	100.1	76.0	53.1	101.9	98.9	91.4	66.3
Botswana	132.0	90.9	69.5	56.3	135.7	142.8	77.4	51.1	149.3	155.1	128.4	71.5
Burkina Faso	105.0	83.7	60.6	58.9	101.2	99.1	74.6	44.5	98.5	95.3	86.0	59.0
Burundi	100.0	90.8	76.0	61.3	98.2	97.0	83.8	63.9	97.9	94.3	88.3	67.0
Cameroon	101.5	96.2	88.8	75.9	100.9	98.6	88.1	72.0	98.7	97.0	90.0	67.7
Cape Verde	91.5	80.9	62.7	54.9	95.5	89.6	74.6	48.1	95.4	93.2	83.0	56.3
Central African Republic	99.6	88.7	65.1	59.7	101.3	94.9	80.1	50.5	99.8	97.0	85.6	62.7
Chad	78.8	80.7	71.9	62.8	89.1	74.2	72.3	57.3	96.1	88.0	68.9	53.2
Comoros	91.3	82.6	87.6	90.3	89.1	88.9	77.2	68.8	91.1	86.8	79.5	62.5
Congo (Brazzaville)	110.7	103.7	80.9	60.2	93.3	107.7	96.7	67.6	99.9	93.1	89.6	79.1
Congo (Kinshasa)	99.6	92.0	75.1	57.1	99.5	94.7	81.1	57.9	99.4	95.5	83.9	61.1
Cote d'Ivoire	107.6	102.9	93.6	88.8	103.4	102.7	89.4	70.0	103.0	99.9	89.2	65.7
Djibouti	67.3	81.3	84.1	63.3	71.6	63.4	68.8	60.8	82.2	70.0	56.2	40.5
Egypt	101.8	96.7	86.7	56.9	105.0	98.5	83.4	54.3	103.1	101.0	92.1	51.7
Equatorial Guinea	99.5	78.8	72.2	73.5	102.1	96.3	72.0	56.0	101.8	99.5	89.2	61.3
Eritrea	99.1	82.1	74.9	75.9	98.1	94.6	74.4	55.5	99.5	94.9	83.6	62.0
Ethiopia	99.4	95.8	84.2	66.5	96.6	94.5	82.8	61.6	97.0	92.1	82.2	58.2
Gabon	98.0	95.7	79.9	52.9	110.3	86.3	77.5	56.4	112.5	103.1	76.9	48.9
Gambia, The	96.4	93.2	89.5	76.4	96.2	93.3	82.0	64.7	98.5	93.3	82.1	57.2
Ghana	93.2	96.0	87.6	79.5	93.6	90.4	86.8	67.9	94.8	89.9	80.6	62.1
Guinea	100.3	93.3	81.5	63.9	101.3	96.2	84.3	63.8	100.7	97.6	88.6	64.2
Guinea-Bissau	101.6	70.9	60.5	58.4	98.6	93.8	62.6	42.3	98.5	92.1	79.0	54.2
Kenya	106.0	87.9	77.6	72.2	101.4	103.2	79.2	59.9	99.8	99.5	92.2	64.8
Lesotho	105.3	113.0	109.9	81.1	95.8	127.2	113.3	90.7	97.7	116.3	121.1	96.5
Liberia	100.5	94.4	97.9	87.7	96.4	95.8	82.3	72.5	99.7	91.5	84.9	59.6
Libya	110.1	101.2	104.1	87.3	111.2	108.2	92.4	77.1	103.6	105.6	102.0	69.8
Madagascar	99.6	96.1	83.3	80.0	99.1	97.7	91.3	70.4	99.0	96.5	90.4	71.9
Malawi	107.7	87.0	74.5	63.3	103.7	103.0	74.9	55.9	103.2	100.1	89.8	59.3
Mali	90.5	100.2	101.6	89.8	84.3	93.7	95.3	81.8	89.8	84.9	81.7	70.1
Mauritania	84.1	83.6	75.3	63.4	87.3	80.9	75.8	58.9	91.0	85.4	73.4	54.5
Mauritius	99.5	92.3	74.0	47.4	100.7	94.7	78.9	49.8	102.6	97.2	84.0	53.6
Morocco	92.2	97.0	86.7	65.8	94.7	90.6	88.2	59.6	97.0	93.2	83.3	57.5
Mozambique	90.2	92.5	86.7	75.1	89.5	89.8	86.3	70.0	100.3	92.4	78.2	60.6
Namibia	116.8	84.9	77.3	65.3	121.9	114.1	68.8	52.7	127.3	133.4	108.8	49.9
Niger	102.8	106.8	104.4	99.0	100.4	106.3	106.4	93.3	97.8	99.2	99.3	84.9
Nigeria	107.0	97.6	92.1	82.7	104.8	102.7	88.6	74.5	102.6	101.3	92.4	71.0
Rwanda	102.1	93.6	71.4	60.5	97.8	99.1	85.8	59.5	98.7	94.6	87.7	69.8
Saint Helena	98.4	103.8	122.6	54.6	99.9	95.7	92.5	83.5	103.4	99.1	87.2	60.7
Sao Tome and Principe	94.9	87.2	82.1	78.5	96.9	94.8	79.8	62.9	99.6	95.8	86.9	66.1
Senegal	79.7	76.9	82.9	76.5	87.4	76.4	69.7	64.5	92.5	86.3	71.0	51.6
Seychelles	112.3	105.2	76.1	33.0	124.7	110.2	88.0	41.2	135.6	127.0	100.9	52.1
Sierra Leone	91.9	87.8	72.7	77.3	91.1	87.3	78.4	53.8	95.2	87.2	77.3	56.7
Somalia	112.5	101.1	64.0	61.8	102.9	108.6	93.4	48.3	95.2	97.2	89.1	76.5
South Africa	112.7	78.4	68.1	52.8	125.7	106.8	64.6	46.4	119.8	123.2	106.3	46.8
South Sudan	88.2	112.2	127.7	118.9	100.7	85.9	100.5	97.5	102.6	103.9	75.3	67.0
Sudan	90.1	107.6	119.7	118.2	97.8	85.8	97.2	93.7	98.5	97.7	75.9	66.9
Swaziland	112.1	71.3	64.8	61.4	120.1	109.7	58.3	44.0	120.0	122.6	108.6	46.4
Tanzania	102.9	84.1	75.8	68.8	99.2	99.7	76.3	60.9	100.5	96.3	88.1	66.2
Togo	99.6	91.2	79.2	58.3	98.5	95.1	79.0	55.1	98.5	95.0	84.1	54.7
Tunisia	94.1	101.8	99.3	86.5	89.3	97.3	100.4	79.0	85.5	91.2	91.1	73.0
Uganda	101.0	95.4	79.4	74.7	100.7	98.2	86.5	65.2	97.6	96.4	87.9	68.1
Western Sahara	95.8	89.4	80.1	68.2	97.5	91.8	81.0	63.8	98.4	94.1	83.0	60.9
Zambia	104.1	91.7	78.3	64.7	99.7	99.2	76.9	63.1	99.2	95.1	84.9	60.3
Zimbabwe	133.0	65.7	62.0	72.3	108.0	125.0	56.1	43.5	114.4	106.2	101.0	55.4

Table B-4.

Sex Ratio for Population 35 Years and Over by Age: 2015, 2030, and 2050—Con.

(Men per 100 women)

Country	2015				2030				2050			
	35–49	50–64	65–79	80 and over	35–49	50–64	65–79	80+	35–49	50–64	65–79	80 and over
Asia												
Afghanistan	104.2	98.8	87.7	73.5	102.5	98.7	87.3	67.9	100.6	97.0	86.6	65.0
Armenia	92.0	84.0	69.6	57.2	102.5	98.5	78.2	53.9	102.5	112.7	101.4	60.8
Azerbaijan	92.7	85.8	66.3	48.0	102.4	87.8	71.8	43.7	113.5	100.7	80.6	47.8
Bahrain	200.8	180.8	98.5	80.8	175.6	164.3	105.9	72.7	177.3	142.6	113.0	73.2
Bangladesh	93.1	99.7	100.3	76.8	101.2	99.6	90.9	76.6	99.9	101.6	94.9	62.7
Bhutan	120.2	115.4	111.7	101.5	106.3	118.7	108.4	92.7	103.2	101.4	108.3	86.4
Brunei	92.9	102.7	100.7	66.5	86.4	81.2	90.0	73.0	88.5	78.5	70.3	56.8
Burma	99.0	90.7	79.7	62.4	99.3	94.5	79.9	58.5	100.3	95.6	84.1	58.0
Cambodia	95.0	74.8	61.8	51.4	95.8	91.3	69.2	48.7	98.0	91.8	83.3	59.1
China	104.1	102.5	96.8	72.8	106.4	101.0	91.3	68.7	112.5	106.2	90.7	64.7
Cyprus	108.9	93.0	82.3	55.5	114.5	103.4	82.9	57.1	115.4	111.6	96.9	58.9
Gaza Strip	105.0	105.5	74.0	58.3	103.8	102.7	96.6	57.7	104.4	101.9	93.0	72.1
Georgia	94.4	81.9	71.4	50.0	98.8	87.8	70.2	48.4	108.6	98.6	78.1	48.7
Hong Kong	68.6	90.5	100.5	65.9	82.5	67.0	82.4	71.4	94.7	88.3	64.1	49.9
India	105.1	101.6	92.8	74.2	108.9	101.3	91.2	71.8	112.0	107.3	92.6	68.5
Indonesia	106.1	88.1	80.2	61.4	105.0	102.1	78.1	55.9	105.8	102.0	90.4	59.8
Iran	104.1	97.1	87.8	78.1	104.6	101.5	87.8	64.6	104.2	102.3	92.7	65.7
Iraq	105.5	97.2	88.5	78.5	102.2	103.0	90.5	73.9	102.3	99.8	93.1	74.9
Israel	104.6	98.2	86.2	63.1	103.8	102.5	90.5	65.7	103.5	101.7	94.3	68.6
Japan	97.5	100.6	89.2	54.1	99.0	95.6	92.3	61.8	106.1	103.7	88.9	63.8
Jordan	100.8	96.5	93.2	85.3	94.0	95.6	90.3	71.3	96.7	90.7	84.7	71.4
Kazakhstan	93.8	80.1	59.2	26.7	97.7	85.5	63.4	30.2	95.6	92.3	73.1	37.4
Korea, North	99.7	92.6	60.2	17.0	101.4	95.1	72.5	29.5	100.8	97.0	79.0	43.4
Korea, South	102.2	98.1	79.9	45.5	111.5	98.9	87.9	57.7	106.9	109.1	93.3	64.8
Kuwait	176.0	144.7	91.5	74.3	162.5	127.7	72.4	54.6	152.7	117.5	68.8	45.9
Kyrgyzstan	94.7	80.0	66.3	48.3	95.9	84.0	65.1	45.0	99.6	89.1	73.1	44.5
Laos	96.3	95.7	84.7	70.5	98.3	93.0	85.6	64.4	99.0	94.2	85.0	60.0
Lebanon	90.8	85.2	86.5	71.2	95.8	90.0	79.5	64.3	93.0	94.4	85.8	59.3
Macau	82.4	100.5	93.9	73.9	79.3	81.4	92.2	70.9	93.9	91.2	65.2	63.8
Malaysia	103.5	104.3	95.8	64.8	101.0	101.4	92.8	67.6	102.6	98.8	89.6	64.1
Maldives	131.9	105.4	88.3	90.8	101.8	92.7	77.1	63.0	102.9	99.4	88.0	57.5
Mongolia	93.5	86.7	73.7	50.3	92.7	85.2	69.6	46.0	95.8	87.7	71.3	45.6
Nepal	92.2	95.2	86.6	79.2	102.2	97.8	88.1	67.3	99.6	100.4	91.6	66.0
Oman	147.4	126.8	100.2	93.2	125.9	113.8	87.4	73.5	124.1	106.5	94.0	66.5
Pakistan	108.7	102.9	89.4	77.0	106.6	105.0	93.0	66.5	104.4	102.5	94.2	68.5
Philippines	101.5	88.7	79.3	58.1	102.9	97.4	78.5	56.4	103.9	100.1	88.7	57.7
Qatar	578.8	387.7	185.2	79.6	546.3	532.8	197.3	89.8	472.9	416.3	232.0	88.5
Saudi Arabia	136.7	125.5	106.1	96.6	122.4	113.0	102.1	72.9	125.1	108.7	96.6	70.5
Singapore	96.5	101.0	88.2	69.1	94.2	96.0	91.2	70.0	94.3	94.3	87.9	70.8
Sri Lanka	94.5	87.7	77.2	62.2	98.9	89.8	76.1	55.4	102.4	96.7	81.4	53.8
Syria	102.7	99.7	87.1	67.9	103.1	99.9	89.7	62.1	103.3	100.3	91.1	65.5
Taiwan	99.3	96.8	86.5	83.7	98.3	94.9	86.4	62.8	98.7	95.7	85.7	61.0
Tajikistan	96.4	86.5	78.6	45.4	99.4	90.6	73.5	46.6	100.8	95.1	81.0	46.4
Thailand	97.5	89.7	81.7	63.5	99.5	92.6	79.4	60.3	101.9	96.7	83.8	56.8
Timor-Leste	97.0	99.5	93.3	75.6	86.6	93.6	88.1	68.8	89.6	85.7	80.1	59.5
Turkey	101.7	98.9	87.2	74.1	102.4	98.6	88.3	66.5	103.2	100.1	89.2	64.4
Turkmenistan	98.9	89.9	82.0	56.7	98.6	95.0	78.6	56.9	99.5	95.2	83.9	55.2
United Arab Emirates	360.3	335.6	180.4	106.4	337.1	281.3	123.1	91.6	293.2	226.8	107.4	60.9
Uzbekistan	97.8	91.1	79.8	59.1	99.8	92.9	78.9	58.2	103.4	96.8	83.7	56.2
Vietnam	100.4	87.9	68.7	44.7	104.4	97.1	78.1	46.0	109.5	102.9	89.6	57.1
West Bank	106.2	103.3	77.5	57.1	104.3	103.6	93.8	58.2	104.1	101.7	93.7	69.2
Yemen	105.7	86.6	88.0	78.1	102.8	100.8	75.9	63.9	100.2	95.9	93.7	54.3
Europe												
Albania	85.4	96.9	96.2	62.3	98.0	83.1	88.2	62.6	111.1	100.6	78.1	55.3
Andorra	104.3	113.8	109.2	85.5	103.7	101.9	104.5	88.3	104.1	104.3	91.5	76.8
Austria	99.4	99.5	84.8	51.8	99.1	95.5	89.0	59.9	99.0	96.2	85.4	62.7
Belarus	95.0	81.9	53.7	29.2	100.4	85.9	60.5	29.8	104.3	95.3	72.7	35.2
Belgium	101.5	99.1	85.4	50.5	103.1	98.5	88.0	56.6	102.6	100.4	89.1	59.3
Bosnia and Herzegovina	100.2	94.8	73.0	34.1	102.9	96.4	82.3	41.2	105.7	101.9	85.2	52.6

Table B-4.

Sex Ratio for Population 35 Years and Over by Age: 2015, 2030, and 2050—Con.

(Men per 100 women)

Country	2015				2030				2050			
	35–49	50–64	65–79	80 and over	35–49	50–64	65–79	80+	35–49	50–64	65–79	80 and over
Europe—Con.												
Bulgaria	98.3	87.7	73.1	51.0	101.7	92.7	73.7	48.2	102.4	97.0	83.3	48.9
Croatia	97.2	94.0	78.2	48.9	100.1	92.7	81.4	56.8	102.5	97.2	83.4	55.7
Czech Republic	105.4	96.5	77.8	49.0	107.6	101.1	82.7	55.5	110.6	104.5	90.2	58.8
Denmark	98.8	99.8	90.5	55.3	96.9	95.7	90.5	63.0	100.3	96.0	85.4	62.1
Estonia	92.2	79.0	56.0	35.1	90.8	84.2	61.6	35.8	90.5	85.2	69.3	41.7
Faroe Islands	116.8	108.2	104.9	67.1	116.1	113.8	98.2	75.9	106.1	105.5	110.7	70.8
Finland	103.8	98.0	83.9	47.4	105.0	99.5	85.2	56.6	104.1	101.1	90.2	56.4
France	101.5	94.4	87.0	54.5	102.7	98.2	85.3	61.9	102.9	100.3	90.7	60.2
Germany	102.4	100.0	86.8	57.6	98.6	97.8	90.1	64.5	97.4	94.0	86.5	65.8
Gibraltar	105.6	82.9	112.1	57.9	106.2	102.9	70.3	76.6	103.2	105.1	92.7	52.8
Greece	99.8	97.0	85.0	63.3	97.7	97.6	87.5	61.7	97.2	95.6	88.4	63.1
Guernsey	99.1	99.5	93.8	59.2	105.5	97.5	94.3	69.3	97.3	99.7	98.4	66.8
Hungary	101.3	87.5	66.6	42.9	102.2	95.0	72.3	45.3	104.1	98.5	82.5	50.5
Iceland	101.7	101.2	94.2	67.3	100.6	99.8	92.9	70.6	99.1	97.8	91.5	66.6
Ireland	102.6	100.8	94.0	62.6	100.1	102.0	92.9	69.2	101.6	100.4	92.7	67.8
Isle of Man	98.4	102.3	96.5	66.2	100.7	99.0	96.0	76.2	110.9	103.4	91.3	71.8
Italy	98.1	95.0	84.9	56.4	97.0	95.4	86.6	60.8	99.0	94.9	86.6	62.6
Jersey	98.7	95.8	81.6	56.8	106.1	96.3	85.3	57.2	107.9	102.8	93.7	60.2
Kosovo	111.6	103.7	75.1	59.8	111.5	107.6	91.9	54.5	106.6	106.6	96.8	67.8
Latvia	100.3	83.5	56.1	29.1	98.9	93.0	66.3	31.5	100.9	94.9	78.0	42.7
Liechtenstein	98.6	95.3	93.9	56.4	100.7	94.2	85.1	73.9	109.2	94.2	85.0	64.6
Lithuania	100.2	86.8	62.8	35.7	101.6	93.8	72.6	39.1	105.2	98.4	81.6	49.4
Luxembourg	99.8	100.4	87.0	46.9	97.9	96.8	88.0	56.0	99.3	96.2	85.4	58.7
Macedonia	103.1	97.1	79.1	59.7	104.2	99.2	85.0	55.4	105.9	102.2	89.6	59.1
Malta	104.6	99.4	88.6	58.9	105.6	102.9	92.3	67.2	105.5	104.0	96.8	65.3
Moldova	101.0	85.9	69.9	38.7	108.0	98.2	75.6	43.6	112.6	110.0	94.7	47.5
Monaco	96.1	100.6	90.6	64.9	143.6	85.5	86.8	62.2	242.4	129.4	74.7	54.7
Montenegro	119.1	100.6	66.8	64.3	113.9	115.8	86.7	53.0	92.2	92.2	108.5	66.1
Netherlands	100.2	99.9	92.5	56.3	101.2	97.6	91.4	66.7	101.7	98.9	88.8	64.5
Norway	106.3	103.4	94.1	59.4	108.0	105.7	96.3	71.4	105.6	105.8	99.5	70.4
Poland	101.7	91.7	71.7	45.0	101.5	96.3	76.6	48.4	103.5	98.0	84.5	51.6
Portugal	101.0	89.2	75.7	55.5	109.9	97.1	79.1	54.0	110.9	108.3	89.8	56.6
Romania	102.4	90.2	72.0	55.9	104.2	96.3	75.1	51.3	104.9	99.9	84.8	54.9
Russia	95.8	79.0	51.3	26.6	97.3	85.0	58.0	28.6	102.2	90.9	69.0	34.7
San Marino	87.3	96.1	90.8	62.5	90.1	87.2	88.7	66.3	103.2	91.8	80.9	62.0
Serbia	101.5	95.0	74.9	55.9	102.9	96.9	80.4	53.3	104.8	100.7	85.3	56.2
Slovakia	101.4	92.4	69.6	41.8	102.5	96.0	77.4	45.9	103.5	98.6	84.6	51.6
Slovenia	102.4	97.5	79.2	43.0	103.0	98.6	82.6	52.2	104.7	100.3	88.2	54.4
Spain	103.1	96.6	83.6	56.6	105.2	99.7	86.6	58.9	104.7	101.8	91.3	62.4
Sweden	103.0	101.5	94.8	60.9	101.6	100.5	95.2	71.3	102.0	98.8	93.7	68.5
Switzerland	100.6	101.0	88.2	55.7	100.0	98.8	92.7	65.0	100.8	98.4	90.3	66.9
Ukraine	92.6	78.0	54.9	30.5	99.7	82.6	59.9	30.2	104.3	94.8	71.4	35.2
United Kingdom	104.9	98.3	89.3	62.0	105.1	102.8	90.5	66.8	105.1	102.8	95.6	66.8
Latin America and the Caribbean												
Anguilla	78.3	84.8	104.1	79.0	75.3	73.5	79.5	85.5	80.7	73.4	67.6	56.0
Antigua and Barbuda	82.5	82.2	78.8	63.3	83.2	79.3	74.0	60.0	87.1	82.7	71.3	53.9
Argentina	99.2	95.1	79.2	52.2	101.0	95.9	82.1	55.6	103.2	99.4	85.6	57.6
Aruba	93.7	86.9	68.0	49.5	92.5	88.0	76.4	46.8	94.4	89.3	79.5	50.3
Bahamas, The	100.4	85.4	66.3	45.4	102.6	96.0	74.1	46.4	103.1	99.9	85.9	56.0
Barbados	99.8	90.8	72.7	47.9	99.0	95.9	80.8	53.0	95.9	95.0	86.3	59.0
Belize	101.6	97.6	93.4	72.2	106.3	97.2	85.9	66.3	106.9	103.3	90.0	60.6
Bolivia	92.5	86.7	82.9	64.3	98.4	88.5	77.5	62.3	100.5	95.4	82.7	54.9
Brazil	97.6	91.0	78.6	55.6	98.8	92.8	80.2	55.8	100.5	95.4	83.5	56.0
Cayman Islands	94.7	92.0	94.0	69.0	94.4	94.1	85.7	69.2	96.7	94.6	87.0	62.4
Chile	98.9	90.7	78.6	50.1	101.7	95.8	81.4	53.8	102.2	99.6	88.0	57.6
Colombia	96.9	90.1	74.5	58.6	100.5	93.2	81.1	51.6	103.2	98.5	85.7	56.9
Costa Rica	100.6	95.7	91.9	63.2	102.1	98.2	87.7	64.5	102.6	99.7	91.9	61.7
Cuba	101.4	94.3	86.5	62.3	102.6	98.0	87.3	60.2	103.1	99.6	90.4	64.4
Curacao	93.5	77.3	74.3	56.9	105.7	91.6	69.7	53.3	102.5	104.2	92.1	48.9

Table B-4.

Sex Ratio for Population 35 Years and Over by Age: 2015, 2030, and 2050—Con.

(Men per 100 women)

Country	2015				2030				2050			
	35–49	50–64	65–79	80 and over	35–49	50–64	65–79	80+	35–49	50–64	65–79	80 and over
Latin America and the Caribbean—Con.												
Dominica	101.5	112.1	88.1	55.8	105.5	99.6	100.7	60.2	109.7	106.1	93.8	63.6
Dominican Republic	104.9	102.1	90.8	67.5	105.2	102.7	92.9	65.8	103.8	102.8	94.7	66.6
Ecuador	92.7	95.4	94.3	80.5	97.4	89.7	87.9	73.1	101.2	96.4	83.7	63.0
El Salvador	81.6	78.6	82.6	67.7	91.3	78.2	72.2	61.5	96.8	90.6	76.0	48.1
Grenada	110.7	106.2	89.2	67.3	100.4	109.4	94.9	67.4	106.4	97.7	94.1	66.0
Guatemala	86.4	90.5	90.1	68.3	93.7	84.1	81.3	67.6	97.5	93.1	78.6	56.1
Guyana	110.1	87.1	74.0	56.9	109.2	104.5	74.7	48.2	101.4	102.4	92.5	55.2
Haiti	99.4	94.4	82.6	67.8	99.4	96.7	86.1	64.4	100.2	97.3	87.4	65.4
Honduras	101.7	90.8	79.1	69.2	104.6	98.1	82.6	60.0	105.9	102.7	90.6	64.4
Jamaica	97.3	95.1	87.6	63.9	101.3	95.6	85.9	63.5	102.4	100.5	88.5	62.6
Mexico	91.1	85.4	83.7	74.6	94.7	87.9	79.0	67.0	96.2	93.0	81.9	60.1
Montserrat	89.4	85.7	130.4	392.9	95.4	90.2	86.5	196.3	105.5	102.5	89.8	89.6
Nicaragua	87.1	86.3	84.6	68.1	92.9	84.0	77.3	60.0	100.4	93.2	77.2	53.7
Panama	101.9	99.2	91.2	65.6	102.8	99.4	91.1	63.6	102.5	100.4	91.7	64.4
Paraguay	100.1	104.5	94.0	66.6	100.5	100.1	96.1	68.7	101.2	99.9	91.6	67.5
Peru	91.0	94.0	92.8	77.4	91.0	87.4	86.8	72.6	94.2	89.4	79.5	62.2
Puerto Rico	90.9	84.0	80.1	63.9	96.5	90.0	78.1	62.2	97.5	100.5	86.5	61.3
Saint Barthelemy	119.6	119.2	106.1	72.3	120.2	115.4	107.7	77.7	120.3	117.0	106.1	74.5
Saint Kitts and Nevis	106.1	103.2	92.0	61.9	106.1	106.5	95.3	71.5	103.9	105.1	97.5	71.4
Saint Lucia	93.0	87.3	87.4	72.7	93.1	89.3	84.9	74.2	97.9	91.8	86.7	71.0
Saint Martin	83.6	88.8	86.6	56.9	94.6	83.6	78.6	59.1	91.9	92.7	76.6	53.0
Saint Vincent and the Grenadines	109.5	107.3	95.5	62.1	106.3	109.1	101.4	71.3	102.5	103.4	99.1	74.4
Sint Maarten	96.0	91.9	98.0	58.7	98.9	94.0	83.5	72.8	109.9	97.2	88.0	59.6
Suriname	103.1	97.9	79.0	64.8	104.2	99.9	88.2	58.0	103.1	100.7	91.6	64.2
Trinidad and Tobago	110.3	100.9	83.8	49.3	111.2	107.9	87.6	54.3	109.0	110.1	96.8	57.7
Turks and Caicos Islands	106.2	115.1	83.1	72.6	96.4	104.8	103.0	62.3	100.7	95.2	92.3	74.3
Uruguay	96.1	90.5	74.3	49.0	100.8	92.8	78.2	49.8	101.9	98.6	83.8	54.0
Venezuela	95.8	91.3	82.8	61.1	97.5	91.9	80.4	57.5	101.3	94.9	82.0	54.1
Virgin Islands, British	87.0	95.2	99.2	75.8	86.6	85.0	87.7	77.9	85.9	84.2	78.5	63.1
Virgin Islands, U.S.	84.3	92.5	87.9	62.0	72.2	88.3	85.1	64.1	70.2	70.1	75.7	60.0
Northern America												
Bermuda	101.3	91.2	80.7	53.3	101.8	98.3	82.1	56.8	102.0	98.1	90.7	57.4
Canada	102.2	99.2	89.5	59.8	103.7	100.8	89.3	64.5	104.2	102.4	91.6	62.5
Greenland	114.1	121.4	126.8	63.9	104.8	112.1	104.6	89.3	105.2	101.1	89.2	69.1
Saint Pierre and Miquelon	96.1	108.9	85.7	40.8	89.0	93.3	87.9	57.4	98.8	86.6	76.2	62.7
United States	99.0	94.4	86.1	60.7	102.5	96.0	87.0	68.5	104.3	101.0	90.1	68.5
Oceania												
American Samoa	112.0	92.2	90.8	55.6	106.4	108.4	77.5	57.3	85.5	99.3	102.7	53.2
Australia	103.7	99.5	95.0	64.8	105.0	102.5	91.7	70.2	106.3	103.9	95.5	66.3
Cook Islands	96.5	119.2	108.6	56.8	94.0	103.5	117.1	57.8	106.8	100.9	85.4	72.5
Fiji	105.4	102.5	88.9	59.5	105.1	104.5	91.6	59.0	103.5	102.5	93.9	60.6
French Polynesia	106.3	106.8	99.0	73.5	104.5	104.1	96.4	74.1	107.5	104.1	93.7	71.6
Guam	104.2	103.7	89.8	61.5	101.8	101.1	93.4	61.4	104.2	102.1	89.5	64.4
Kiribati	92.0	84.6	68.7	44.4	92.9	83.9	66.9	44.7	89.3	84.4	70.4	45.0
Marshall Islands	106.1	101.4	101.0	71.8	102.7	103.4	90.1	75.0	102.8	100.1	94.0	61.6
Micronesia, Federated States of	91.6	96.8	86.8	47.0	91.9	88.4	77.6	47.0	89.1	87.9	72.2	38.2
Nauru	101.3	70.7	64.6	45.5	104.2	90.6	51.0	30.6	72.2	97.0	77.9	35.4
New Caledonia	101.3	96.5	86.5	56.6	102.4	97.3	82.8	54.2	103.7	100.0	86.0	55.4
New Zealand	102.2	95.6	92.4	69.1	99.7	100.7	88.5	71.4	101.1	99.0	92.1	66.7
Northern Mariana Islands	85.1	112.6	99.5	49.0	74.6	82.6	100.1	68.0	123.8	123.8	45.6	67.7
Palau	178.9	67.5	38.5	32.2	174.4	87.6	34.2	20.4	174.1	83.5	48.1	20.8
Papua New Guinea	108.1	106.8	105.3	110.8	102.8	103.1	93.9	74.6	103.9	100.1	88.0	67.4
Samoa	111.5	104.5	82.1	57.7	98.8	108.9	90.7	53.5	101.0	95.2	92.5	66.2
Solomon Islands	103.4	104.1	95.6	76.4	103.7	102.0	96.9	68.6	105.5	103.0	92.5	71.1
Tonga	101.0	98.7	86.1	73.9	95.5	106.0	95.6	62.2	95.5	100.4	97.3	76.2
Tuvalu	83.1	71.1	69.7	64.8	120.0	76.3	58.1	51.7	105.3	111.7	77.3	47.5
Vanuatu	94.3	99.8	104.7	100.7	95.7	91.9	91.9	82.8	94.9	93.4	85.4	68.1
Wallis and Futuna	92.0	93.3	104.8	49.2	116.9	91.3	86.1	73.8	116.3	113.2	95.9	55.9

Source: U.S. Census Bureau, 2013; International Data Base.

Table B-5.

Dependency Ratios: 2015, 2030, and 2050

Country	Total[1]			Youth[2]			Older[3]		
	2015	2030	2050	2015	2030	2050	2015	2030	2050
Africa									
Algeria	71	75	76	62	59	45	9	16	30
Angola	134	119	99	127	112	90	7	7	9
Benin	134	107	82	127	100	71	7	7	11
Botswana	91	80	75	83	70	60	8	10	15
Burkina Faso	141	125	103	135	119	95	6	6	8
Burundi	142	135	115	136	128	106	6	7	9
Cameroon	84	70	72	75	56	45	9	15	27
Cape Verde	129	112	91	122	104	81	7	8	10
Central African Republic	120	105	88	112	97	78	8	8	10
Chad	142	106	86	135	99	78	7	7	9
Comoros	122	79	69	114	70	52	9	9	16
Congo (Brazzaville)	115	111	101	108	103	88	6	9	13
Congo (Kinshasa)	131	96	69	125	90	59	6	6	10
Cote d'Ivoire	110	83	69	103	75	56	7	7	13
Djibouti	88	69	65	81	61	50	7	8	16
Egypt	85	77	76	76	63	53	10	14	23
Equatorial Guinea	122	98	75	113	89	63	9	9	13
Eritrea	123	88	71	114	80	57	8	8	14
Ethiopia	137	116	89	130	109	79	7	7	10
Gabon	131	125	105	122	115	96	9	9	9
Gambia, The	110	82	67	103	74	53	7	8	15
Ghana	110	101	91	102	90	76	9	11	15
Guinea	128	115	94	120	106	84	8	9	11
Guinea-Bissau	115	98	79	108	90	68	7	8	11
Kenya	118	73	67	112	65	51	6	8	15
Lesotho	92	79	67	82	68	51	10	11	16
Liberia	132	102	79	125	95	68	7	8	11
Libya	65	58	78	58	46	44	7	12	34
Madagascar	120	98	74	113	89	61	7	9	13
Malawi	139	118	89	132	112	81	7	6	8
Mali	157	132	89	149	125	81	8	7	8
Mauritania	115	95	78	107	86	64	8	9	14
Mauritius	58	67	79	44	40	37	14	27	42
Morocco	71	68	79	60	50	45	11	18	33
Mozambique	148	127	101	141	121	94	7	6	7
Namibia	90	65	58	81	55	43	9	10	15
Niger	168	137	92	161	131	85	7	7	8
Nigeria	130	115	96	123	108	87	7	7	9
Rwanda	122	101	96	116	93	84	6	7	12
Saint Helena	59	68	98	36	32	36	22	36	62
Sao Tome and Principe	134	90	68	127	83	54	7	7	13
Senegal	127	103	81	121	95	69	7	8	12
Seychelles	53	53	71	41	32	26	11	21	44
Sierra Leone	125	115	105	117	107	94	8	8	11
Somalia	130	119	94	124	111	85	5	7	9
South Africa	79	75	69	68	58	50	12	16	19
South Sudan	141	106	77	136	100	67	5	6	10
Sudan	120	83	67	113	75	53	7	8	14
Swaziland	105	80	67	97	71	56	8	9	11
Tanzania	138	116	95	131	109	85	7	7	10
Togo	117	106	91	110	98	79	7	9	12
Tunisia	62	70	86	49	46	41	13	23	45
Uganda	163	138	99	158	133	92	5	5	7
Western Sahara	108	92	77	100	82	63	8	10	14
Zambia	146	136	116	140	130	109	6	6	7
Zimbabwe	110	101	87	103	93	74	7	8	13

See notes at end of table.

Table B-5.
Dependency Ratios: 2015, 2030, and 2050—Con.

Country	Total[1]			Youth[2]			Older[3]		
	2015	2030	2050	2015	2030	2050	2015	2030	2050
Asia									
Afghanistan	129	107	80	123	101	72	6	6	8
Armenia	57	70	84	40	37	32	17	33	52
Azerbaijan	57	64	70	47	43	37	10	21	33
Bahrain	42	42	50	38	34	33	4	8	17
Bangladesh	88	67	71	78	54	46	10	13	25
Bhutan	74	58	65	63	45	37	11	13	28
Brunei	57	58	65	51	43	39	7	15	26
Burma	68	64	71	59	49	45	9	15	27
Cambodia	81	71	67	73	60	47	7	11	20
China	50	62	82	35	34	33	15	28	49
Cyprus	50	59	75	33	32	30	17	27	45
Gaza Strip	126	85	64	120	77	50	6	8	14
Georgia	64	77	81	39	40	36	26	37	44
Hong Kong	48	81	101	25	31	30	23	50	71
India	76	67	70	66	53	45	10	15	25
Indonesia	70	65	74	59	47	41	11	18	33
Iran	57	57	70	49	43	37	8	14	34
Iraq	100	76	71	93	67	52	7	9	19
Israel	85	80	77	65	55	45	20	24	32
Japan	80	91	121	32	30	33	48	62	89
Jordan	97	88	86	87	74	63	10	13	23
Kazakhstan	65	73	72	53	52	43	12	21	29
Korea, North	64	64	72	47	43	38	16	21	34
Korea, South	50	66	100	30	27	28	20	40	72
Kuwait	51	48	49	48	41	37	4	7	12
Kyrgyzstan	77	80	74	68	64	51	9	16	23
Laos	96	73	65	89	63	48	7	10	17
Lebanon	64	67	84	48	42	37	16	25	46
Macau	42	59	86	28	25	24	14	34	63
Malaysia	75	72	77	65	55	49	10	17	28
Maldives	53	58	63	47	45	35	7	13	28
Mongolia	65	64	69	58	51	40	7	14	28
Nepal	88	65	64	80	54	44	9	11	20
Oman	75	69	63	70	62	46	6	7	17
Pakistan	93	68	64	84	58	45	8	11	18
Philippines	92	80	75	83	67	55	9	13	20
Qatar	21	24	29	20	22	23	1	2	5
Saudi Arabia	65	56	61	60	47	41	5	9	20
Singapore	41	51	68	29	28	28	13	23	40
Sri Lanka	69	71	80	54	46	42	15	25	38
Syria	89	69	69	82	58	46	8	11	23
Taiwan	48	64	93	30	26	26	18	38	68
Tajikistan	84	73	68	78	62	49	6	10	19
Thailand	52	62	85	37	33	34	15	29	51
Timor-Leste	130	107	74	121	97	62	9	10	13
Turkey	68	63	73	56	45	39	12	18	33
Turkmenistan	66	66	70	59	52	44	7	15	26
United Arab Emirates	37	40	41	36	38	37	1	2	5
Uzbekistan	63	60	65	55	45	36	8	15	30
Vietnam	61	60	72	52	42	36	9	18	35
West Bank	92	72	65	85	61	44	7	11	21
Yemen	123	82	65	117	75	52	6	7	13
Europe									
Albania	64	70	72	45	39	31	19	30	41
Andorra	53	71	126	30	26	37	22	45	89
Austria	62	79	94	31	32	35	32	46	58
Belarus	53	69	86	31	34	34	22	35	52
Belgium	68	81	88	35	36	36	32	45	52
Bosnia and Herzegovina	50	66	92	29	29	31	20	38	62
Bulgaria	63	72	102	30	30	34	32	42	68
Croatia	63	76	91	33	33	34	30	43	56
Czech Republic	60	69	90	31	31	35	29	38	55

See notes at end of table.

Table B-5.

Dependency Ratios: 2015, 2030, and 2050—Con.

Country	Total[1]			Youth[2]			Older[3]		
	2015	2030	2050	2015	2030	2050	2015	2030	2050
Europe—Con.									
Denmark	72	80	83	40	39	38	32	41	45
Estonia	65	80	104	34	36	38	31	44	66
Faroe Islands	77	87	80	48	50	44	29	37	36
Finland	72	87	88	37	39	37	35	49	51
France	76	88	89	43	44	40	33	44	49
Germany	65	84	94	29	33	35	35	51	58
Gibraltar	74	74	77	47	45	38	27	29	39
Greece	64	72	99	31	29	35	34	43	64
Guernsey	63	76	86	33	34	35	31	42	51
Hungary	62	71	92	33	32	35	30	39	57
Iceland	67	78	83	44	43	39	23	35	44
Ireland	67	71	84	46	43	41	21	29	43
Isle of Man	72	84	89	38	39	36	34	45	52
Italy	66	75	96	31	31	35	35	45	61
Jersey	63	78	73	37	41	35	26	37	38
Kosovo	72	62	66	60	46	38	12	17	28
Latvia	56	70	94	29	31	33	27	39	60
Liechtenstein	61	78	82	34	36	35	27	42	48
Lithuania	56	71	94	29	30	32	27	41	62
Luxembourg	65	74	75	40	40	39	26	33	36
Macedonia	59	67	82	39	36	35	20	31	48
Malta	65	80	90	34	35	34	31	45	56
Moldova	55	72	86	37	39	36	18	33	49
Monaco	86	130	183	30	22	16	57	108	167
Montenegro	52	69	102	30	32	36	22	37	65
Netherlands	68	82	84	38	39	38	30	43	46
Norway	69	75	79	41	40	38	28	35	41
Poland	54	70	95	30	31	33	24	39	62
Portugal	67	72	94	36	32	35	32	40	60
Romania	55	61	93	31	28	33	24	32	61
Russia	53	70	81	32	36	35	21	34	47
San Marino	69	78	95	36	34	36	32	44	58
Serbia	61	71	87	32	31	33	28	40	54
Slovakia	54	67	92	32	31	34	22	35	58
Slovenia	57	75	103	28	29	34	29	46	69
Spain	61	68	97	32	31	36	29	37	62
Sweden	73	82	79	39	43	39	35	40	40
Switzerland	62	74	81	33	36	36	29	38	45
Ukraine	54	67	87	29	30	32	25	37	55
United Kingdom	69	79	80	39	41	38	30	38	42
Latin America and the Caribbean									
Anguilla	63	72	82	49	46	44	14	26	38
Antigua and Barbuda	68	70	75	55	48	42	13	22	33
Argentina	79	74	77	58	50	43	21	24	33
Aruba	59	74	78	39	39	37	20	35	41
Bahamas, The	63	66	75	51	45	40	12	21	35
Barbados	55	72	88	38	38	38	17	34	50
Belize	97	79	70	90	68	52	7	11	18
Bolivia	92	73	69	83	61	48	10	12	20
Brazil	65	62	74	52	41	38	13	21	37
Cayman Islands	56	74	78	38	39	38	18	34	40
Chile	62	70	78	46	41	37	17	29	41
Colombia	69	67	71	57	46	38	12	21	33
Costa Rica	63	66	74	51	44	38	12	22	36
Cuba	55	65	87	35	32	34	20	33	53
Curacao	71	86	77	47	46	39	24	40	38
Dominica	67	72	90	49	44	37	18	28	53
Dominican Republic	79	74	76	66	54	46	13	20	31
Ecuador	81	69	70	68	51	41	13	18	29
El Salvador	82	65	70	69	47	36	13	18	33
Grenada	72	75	75	56	47	38	17	28	37
Guatemala	105	78	66	96	67	49	9	11	17

See notes at end of table.

Table B-5.

Dependency Ratios: 2015, 2030, and 2050—Con.

Country	Total[1]			Youth[2]			Older[3]		
	2015	2030	2050	2015	2030	2050	2015	2030	2050
Latin America and the Caribbean—Con.									
Guyana	82	62	61	72	46	38	10	16	23
Haiti	95	69	65	87	60	48	8	10	17
Honduras	97	74	68	89	63	49	8	11	20
Jamaica	87	69	64	72	53	40	15	16	24
Mexico	77	71	74	65	53	43	12	18	31
Montserrat	62	48	75	52	32	31	10	16	44
Nicaragua	80	62	64	71	48	37	9	13	27
Panama	78	72	74	64	52	42	14	20	32
Paraguay	73	65	69	62	47	39	12	18	30
Peru	76	69	70	64	51	41	12	18	29
Puerto Rico	73	81	93	43	38	35	30	44	58
Saint Barthelemy	54	75	83	31	28	29	23	47	54
Saint Kitts and Nevis	58	68	86	45	40	37	13	28	50
Saint Lucia	66	72	108	48	37	32	18	34	76
Saint Martin	63	70	76	51	49	48	12	21	29
Saint Vincent and the Grenadines	65	67	83	50	39	36	15	28	47
Sint Maarten	52	82	79	40	44	38	12	38	42
Suriname	68	59	70	59	43	38	10	16	32
Trinidad and Tobago	54	70	90	39	37	36	15	33	54
Turks and Caicos Islands	50	51	76	43	38	37	6	13	38
Uruguay	75	71	75	50	42	37	25	29	38
Venezuela	76	71	73	66	54	46	11	17	26
Virgin Islands, British	46	58	72	34	35	38	12	24	34
Virgin Islands, U.S.	72	94	131	39	33	35	34	61	96
Northern America									
Bermuda	67	94	89	39	42	39	28	52	50
Canada	64	83	87	35	38	38	29	46	49
Greenland	60	77	70	47	47	39	14	30	31
Saint Pierre and Miquelon	66	84	135	35	30	36	31	54	100
United States	68	82	81	43	45	43	25	37	38
Oceania									
American Samoa	61	66	78	52	44	38	8	21	41
Australia	65	74	78	40	40	38	26	34	40
Cook Islands	74	79	92	54	42	41	20	37	51
Fiji	74	70	73	63	52	43	11	19	30
French Polynesia	63	64	75	51	42	36	12	22	38
Guam	76	77	74	60	51	41	16	26	32
Kiribati	86	68	66	78	57	47	8	11	19
Marshall Islands	99	75	70	91	63	48	7	12	22
Micronesia, Federated States of	84	69	68	78	57	47	6	11	21
Nauru	75	72	78	72	61	57	4	10	21
New Caledonia	68	63	71	53	43	38	15	20	33
New Zealand	70	80	82	45	44	40	25	36	42
Northern Mariana Islands	60	64	74	52	39	30	8	25	44
Palau	57	67	79	45	41	40	11	26	39
Papua New Guinea	96	77	71	88	66	52	8	11	18
Samoa	95	73	69	84	58	46	11	16	23
Solomon Islands	102	77	71	93	67	50	8	10	20
Tonga	108	78	76	95	63	42	13	15	34
Tuvalu	81	86	69	71	69	53	10	17	16
Vanuatu	104	78	70	97	67	50	8	11	19
Wallis and Futuna	68	65	79	53	40	33	16	25	46

[1] Total dependency ratio is the number of people aged 0 to 19 years and 65 years and over per 100 people aged 20 to 64. Youth and older ratios may not sum to total ratio due to rounding.

[2] Youth dependency ratio is the number of people aged 0 to 19 per 100 people aged 20 to 64.

[3] Older dependency ratio is the number of people aged 65 and over per 100 people aged 20 to 64.

Source: U.S. Census Bureau, 2013; International Data Base.

Table B-6.

Life Expectancy at Birth, Age 65, and Age 80 by Sex for Selected Countries: 2015 and 2050

(In percent)

Country	Life expectancy at birth						Life expectancy at 65				Life expectancy at 80			
	2015			2050			2015		2050		2015		2050	
	Both sexes	Male	Female	Both sexes	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Japan	84.7	81.4	88.3	91.6	88.4	95.0	20.0	25.2	25.0	30.6	9.4	12.6	12.6	16.8
Singapore	84.7	82.1	87.5	91.6	88.7	94.6	20.6	24.5	25.5	30.3	11.5	12.9	14.1	16.9
Macau	84.5	81.6	87.6	85.1	82.2	88.1	20.2	24.9	20.7	25.3	10.1	13.4	10.5	13.8
Hong Kong	82.9	80.2	85.8	84.4	81.6	87.4	18.9	23.1	20.1	24.6	8.5	10.9	9.8	12.8
Switzerland	82.5	80.2	84.9	84.2	81.6	87.0	19.0	22.4	20.1	24.3	8.4	10.4	9.7	12.6
Australia	82.2	79.7	84.7	84.1	81.4	86.9	19.0	22.5	20.1	24.3	8.9	11.0	9.9	12.8
Italy	82.1	79.5	84.9	84.1	81.3	87.0	18.6	22.4	20.0	24.3	8.7	10.7	9.8	12.7
Sweden	82.0	80.1	84.0	84.0	81.5	86.6	18.6	21.5	20.0	23.9	7.9	9.8	9.5	12.3
Canada	81.8	79.2	84.5	83.9	81.1	86.8	18.9	22.7	20.1	24.4	9.4	11.6	10.1	13.0
France	81.8	78.7	85.0	83.9	80.9	87.0	18.9	22.9	20.0	24.5	8.6	10.8	9.7	12.7
Norway	81.7	79.7	83.8	83.9	81.4	86.5	18.5	21.3	19.9	23.8	8.1	9.8	9.6	12.3
Spain	81.6	78.6	84.8	83.8	80.9	86.9	18.2	22.2	19.8	24.2	8.3	10.1	9.6	12.5
Israel	81.4	79.1	83.7	83.8	81.1	86.5	18.4	21.4	19.9	23.9	8.6	10.3	9.8	12.5
Netherlands	81.2	79.1	83.5	83.7	81.1	86.4	17.9	21.4	19.7	23.9	8.0	10.0	9.6	12.3
New Zealand	81.1	79.0	83.2	83.6	81.1	86.3	18.6	21.4	19.9	23.8	8.9	10.4	9.9	12.5
Ireland	80.7	78.4	83.1	83.4	80.8	86.2	17.7	21.0	19.6	23.7	8.1	9.8	9.6	12.3
Germany	80.6	78.3	83.0	83.4	80.7	86.2	17.9	20.9	19.6	23.6	8.3	9.6	9.7	12.2
Jordan	80.5	79.1	82.1	83.4	81.1	85.8	18.0	20.2	19.5	23.2	7.8	9.0	9.3	11.8
United Kingdom	80.5	78.4	82.8	83.4	80.8	86.1	18.0	20.9	19.7	23.6	8.4	10.1	9.7	12.4
Greece	80.4	77.8	83.2	83.3	80.6	86.3	17.6	20.9	19.5	23.7	8.3	10.1	9.6	12.4
Austria	80.3	77.4	83.4	83.3	80.3	86.4	17.5	21.3	19.4	23.8	8.1	10.0	9.5	12.3
Belgium	80.1	76.9	83.4	83.2	80.1	86.3	16.9	21.4	19.2	23.8	7.8	10.3	9.4	12.5
Korea, South	80.0	77.0	83.3	84.2	81.5	87.1	17.1	21.1	20.2	24.4	7.8	9.8	10.1	13.0
Taiwan	80.0	76.9	83.3	83.1	80.1	86.3	17.7	21.4	19.5	23.8	8.4	10.4	9.6	12.5
Rwanda	59.7	58.1	61.3	72.0	69.6	74.4	13.0	14.1	15.2	17.6	5.5	6.1	6.9	8.3
Congo (Brazzaville)	58.8	57.6	60.0	71.1	69.0	73.2	13.2	14.3	15.4	17.7	5.6	6.0	7.0	8.4
Liberia	58.6	56.9	60.3	70.7	68.3	73.2	12.0	13.5	14.5	17.2	5.1	5.7	6.6	8.1
Cote d'Ivoire	58.3	57.2	59.5	69.7	68.0	71.4	12.2	13.8	15.0	17.8	5.3	6.0	6.9	8.6
Cameroon	57.9	56.6	59.3	72.0	69.7	74.4	12.9	14.0	15.3	17.6	5.5	6.0	6.9	8.3
Sierra Leone	57.8	55.2	60.4	70.2	67.1	73.3	12.5	13.9	14.7	17.4	5.3	5.9	6.6	8.1
Zimbabwe	57.1	56.5	57.6	67.2	66.9	67.5	14.4	17.0	17.4	21.0	6.9	8.2	8.6	11.0
Congo (Kinshasa)	56.9	55.4	58.5	70.2	67.8	72.7	11.7	13.1	14.2	16.7	5.0	5.6	6.4	7.8
Angola	55.6	54.5	56.8	69.2	67.1	71.5	12.4	13.4	14.5	16.5	5.2	5.7	6.5	7.6
Mali	55.3	53.5	57.3	68.4	65.7	71.1	11.7	12.8	13.7	16.0	4.8	5.3	6.0	7.2
Burkina Faso	55.1	53.1	57.2	67.8	65.1	70.5	11.7	13.1	13.8	16.5	4.9	5.5	6.1	7.6
Niger	55.1	53.9	56.4	68.2	66.1	70.5	12.3	13.1	14.3	16.1	5.1	5.5	6.3	7.3
Uganda	54.9	53.5	56.4	67.8	65.6	70.0	13.4	14.4	15.1	17.4	5.7	6.2	6.6	8.0
Botswana	54.2	56.0	52.3	61.6	64.8	58.4	15.1	18.3	18.5	21.7	8.2	10.0	10.1	12.7
Malawi	53.5	52.7	54.4	65.3	64.0	66.5	12.0	13.4	14.0	16.5	5.1	5.8	6.5	8.0
Nigeria	53.0	52.0	54.1	68.1	66.0	70.3	12.1	13.1	14.2	16.2	5.2	5.6	6.3	7.5
Lesotho	52.9	52.8	53.0	72.3	71.5	73.2	12.8	14.9	15.9	18.5	5.9	6.9	7.7	9.7
Mozambique	52.9	52.2	53.7	70.8	69.0	72.7	12.0	13.5	14.7	17.2	5.3	6.0	6.8	8.4
Zambia	52.2	50.5	53.8	64.5	62.5	66.7	12.4	13.7	14.0	16.2	5.3	5.8	6.0	7.3
Gabon	52.0	51.6	52.5	62.1	61.6	62.6	12.4	14.7	15.4	19.0	5.7	6.8	7.5	9.7
Somalia	52.0	49.9	54.1	65.5	62.6	68.5	11.7	12.8	13.5	15.6	4.9	5.4	5.9	7.1
Central African Republic	51.8	50.5	53.2	65.5	63.5	67.7	12.0	13.2	14.0	16.2	5.2	5.8	6.4	7.7
Namibia	51.6	52.1	51.2	57.8	60.1	55.5	13.0	15.6	15.3	18.6	6.2	7.4	7.9	10.3
Swaziland	51.1	51.6	50.5	61.4	63.0	59.8	12.9	15.4	15.3	18.2	6.0	7.1	7.6	9.8
Afghanistan	50.9	49.5	52.3	64.5	62.2	66.9	11.0	12.1	13.0	15.0	4.6	5.1	5.7	6.8
Guinea-Bissau	50.2	48.2	52.3	63.5	61.0	66.2	11.4	12.9	13.5	16.2	5.0	5.7	6.1	7.7
Chad	49.8	48.6	51.0	63.4	61.7	65.1	11.7	12.8	13.8	15.7	5.0	5.5	6.2	7.3
South Africa	49.7	50.7	48.7	63.2	64.1	62.3	13.0	15.7	16.3	20.0	6.2	7.7	8.2	10.7

Source: U.S. Census Bureau, International Data Base; unpublished lifetables.

Table B-7.

Deficits in Universal Health Protection: Share of Total Population Without Health Protection by Country

Region or country	Percent of total population	Year of estimate
Africa		
Algeria	14.8	2005
Angola	100.0	2005
Benin	91.0	2009
Burkina Faso	99.0	2010
Burundi	71.6	2009
Cabo Verde	35.0	2010
Cameroon	98.0	2009
Central African Republic	94.0	2010
Comoros	95.0	2010
Congo (Kinshasa)	90.0	2010
Cote d'Ivoire	98.8	2008
Djibouti	70.0	2006
Egypt	48.9	2008
Eritrea	95.0	2011
Ethiopia	95.0	2011
Gabon	42.4	2011
Gambia	0.1	2011
Ghana	26.1	2010
Guinea	99.8	2010
Guinea Bissau	98.4	2011
Kenya	60.6	2009
Lesotho	82.4	2009
Libya	0.0	2004
Madagascar	96.3	2009
Mali	98.1	2008
Mauritania	94.0	2009
Mauritius	0.0	2010
Morocco	57.7	2007
Mozambique	96.0	2011
Namibia	72.0	2007
Niger	96.9	2003
Nigeria	97.8	2008
Rwanda	9.0	2010
Sao Tome and Principe	97.9	2009
Senegal	79.9	2007
Seychelles	10.0	2011
Sierra Leone	100.0	2008
Somalia	80.0	2006
South Africa	0.0	2010
Sudan	70.3	2009
Swaziland	93.8	2006
Tanzania	87.0	2010
Togo	96.0	2010
Tunisia	20.0	2005
Uganda	98.0	2008
Zambia	91.6	2008
Zimbabwe	99.0	2009
Latin America and the Caribbean		
Antigua and Barbuda	48.9	2007
Argentina	3.2	2008
Aruba	0.8	2003
Bahamas	0.0	1995
Barbados	0.0	1995
Belize	75.0	2009
Bolivia	57.3	2009
Brazil	0.0	2009
Chile	6.9	2011
Colombia	12.3	2010
Costa Rica	0.0	2009
Cuba	0.0	2011
Dominica	86.6	2009

Table B-7.

Deficits in Universal Health Protection: Share of Total Population Without Health Protection by Country—Con.

Region or country	Percent of total population	Year of estimate
Latin America and the Caribbean—Con.		
Dominican Republic	73.5	2007
Ecuador	77.2	2009
El Salvador	78.4	2009
Guatemala	70.0	2005
Guyana	76.2	2009
Haiti	96.9	2001
Honduras	88.0	2006
Jamaica	79.9	2007
Mexico	14.4	2010
Nicaragua	87.8	2005
Panama	48.2	2008
Paraguay	76.4	2009
Peru	35.6	2010
Saint Kitts and Nevis	71.2	2008
Saint Lucia	64.5	2003
Saint Vincent and the Grenadines	90.6	2008
Uruguay	2.8	2010
Venezuela	0.0	2010
Northern America		
Canada	0.0	2011
United States	16.0	2010
Asia		
Armenia	0.0	2009
Azerbaijan	97.1	2006
Bahrain	0.0	2006
Bangladesh	98.6	2003
Bhutan	10.0	2009
Brunei	0.0	2010
Cambodia	73.9	2009
China	3.1	2010
Cyprus	35.0	2008
Georgia	75.0	2008
Hong Kong	0.0	2010
India	87.5	2010
Indonesia	41.0	2010
Iran	10.0	2005
Israel	0.0	2011
Japan	0.0	2010
Jordan	25.0	2006
Kazakhstan	30.0	2001
Korea, South	0.0	2010
Kuwait	0.0	2006
Kyrgyzstan	17.0	2001
Laos	88.4	2009
Lebanon	51.7	2007
Malaysia	0.0	2010
Maldives	70.0	2011
Mongolia	18.1	2009
Nepal	99.9	2010
Oman	3.0	2005
Pakistan	73.4	2009
Philippines	18.0	2009
Qatar	0.0	2006
Saudi Arabia	74.0	2010
Singapore	0.0	2010
Sri Lanka	0.0	2010
Syria	10.0	2008
Tajikistan	99.7	2010
Thailand	2.0	2007
Turkey	14.0	2011
Turkmenistan	17.7	2011

Table B-7.

Deficits in Universal Health Protection: Share of Total Population Without Health Protection by Country—Con.

Region or country	Percent of total population	Year of estimate
Asia—Con.		
United Arab Emirates	0.0	2010
Uzbekistan	0.0	2010
Vietnam	39.0	2010
Yemen	58.0	2003
Europe		
Albania	76.4	2008
Austria	0.7	2010
Belarus	0.0	2010
Belgium	1.0	2010
Bosnia and Herzegovina	40.8	2004
Bulgaria	13.0	2008
Croatia	3.0	2009
Czech Republic	0.0	2011
Denmark	0.0	2011
Estonia	7.1	2011
Finland	0.0	2010
France	0.1	2011
Germany	0.0	2010
Greece	0.0	2010
Hungary	0.0	2010
Iceland	0.0	2010
Ireland	0.0	2011
Italy	0.0	2010
Latvia	30.0	2005
Liechtenstein	5.0	2008
Lithuania	5.0	2009
Luxembourg	2.4	2010
Macedonia	5.1	2006
Malta	0.0	2009
Moldova	24.3	2004
Montenegro	5.0	2004
Netherlands	1.1	2010
Norway	0.0	2011
Poland	2.5	2010
Portugal	0.0	2010
Romania	5.7	2009
Russia	12.0	2011
Serbia	7.9	2009
Slovakia	5.2	2010
Slovenia	0.0	2011
Spain	0.8	2010
Sweden	0.0	2011
Switzerland	0.0	2010
Ukraine	0.0	2011
United Kingdom	0.0	2010
Oceania		
Australia	0.0	2011
Fiji	0.0	2010
New Zealand	0.0	2011
Vanuatu	0.0	2010

Source: Scheil-Adlung, Xenia (ed.) 2015. *Global Evidence on Inequities in Rural Health Protection: New Data on Rural Deficits in Health Coverage for 174 Countries*. International Labour Office Extension of Social Security (ESS) Document 47, Statistical Annex. Geneva: International Labour Organization.

Table B-8.

Labor Force Participation Rates by Age, Sex, and Country: Selected Years, 1980 to 2012

(In percent)

Country	Year	Male					Female				
		45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
Africa											
Egypt	1986	94.2	91.3	88.8	68.3	25.5	6.0	4.3	3.4	2.0	0.7
	1995	[8]98.1	N	[4]97.9	76.4	36.5	[8]25.5	N	[4]16.0	6.6	2.1
	1999	[8]98.1	N	[4]97.9	63.5	32.1	[8]22.3	N	[4]14.2	5.6	2.3
	2012	[7]95.0	N	[9]69.1	N	21.5	[7]28.1	N	[9]15.5	N	2.4
Morocco	1982	96.6	93.3	89.5	68.9	42.1	14.1	14.6	14.6	11.2	5.3
	1990	[10]90.3	N	N	N	[5]38.1	[10]17.1	N	N	N	[5]8.9
	1999	[10]90.0	N	N	N	[5]43.7	[10]30.1	N	N	N	[5]13.0
	2005	[10]87.6	N	N	N	[5]40.0	[10]30.4	N	N	N	[5]12.5
	2012	95.3	89.1	79.8	51.1	28.7	31.6	31.2	27.9	19.2	8.5
Mozambique	1997	89.9	89.8	90.0	88.4	[11]87.2	91.9	89.9	89.0	85.4	[11]83.0
	2012	79.8	81.9	81.6	81.5	75.3	90.5	86.9	81.7	81.1	68.9
South Africa	1980	N	N	[9]77.3	N	34.7	N	N	[9]24.1	N	5.9
	1991	N	N	[9]70.5	N	21.3	N	N	[9]28.5	N	5.2
	2003	80.8	73.7	63.5	40.6	25.6	62.6	50.9	38.4	15.2	9.6
	2012	82.6	75.6	66.1	31.8	N	62.1	54.3	42.9	18.7	N
Tunisia	1984	96.2	92.8	82.1	59.2	38.5	12.9	11.6	9.8	4.4	3.5
	1994	95.6	90.1	78.3	54.6	31.5	17.6	12.6	9.6	7.3	3.3
	1997	95.6	90.4	78.4	54.1	34.0	21.6	14.4	12.2	7.7	3.5
	2012	94.1	88.2	70.1	34.4	15.4	23.5	16.6	11.5	4.8	1.9
Zambia	1980	98.4	97.7	97.8	96.5	[11]65.3	41.5	46.8	49.5	57.0	[11]23.6
	2008	97.2	95.2	90.5	88.5	72.0	85.6	85.3	83.5	79.4	56.3
	2012	96.9	96.8	88.9	89.6	71.2	84.1	84.3	77.8	74.3	52.2
Zimbabwe	1982	93.9	92.5	90.4	N	[5]69.1	52.4	50.6	50.7	N	[5]31.5
	1992	95.1	92.2	88.8	77.5	52.0	54.0	49.7	47.1	40.0	21.7
	1999	95.6	94.2	87.8	84.1	74.1	83.0	84.4	78.8	77.8	60.7
	2011	94.1	96.8	94.6	88.9	72.6	89.3	87.0	86.0	84.3	63.0
Asia											
Bangladesh	1981	93.6	90.6	90.7	84.7	68.7	4.4	4.7	4.4	4.5	3.6
	1986	99.7	99.3	98.0	93.4	70.4	10.3	10.8	9.8	9.0	10.9
	2003	99.5	99.2	97.3	87.8	66.1	22.6	19.9	17.1	13.4	8.7
	2010	97.4	94.1	88.5	77.2	57.9	50.1	9.4	10.5	6.6	8.3
China	1982	97.5	91.4	83.0	63.7	30.1	70.6	50.9	32.9	16.9	4.7
	1990	97.9	93.5	83.9	63.7	33.6	81.1	62.0	45.1	27.4	8.4
	2000	94.2	89.3	79.6	60.2	33.7	78.5	66.8	54.5	38.9	17.2
	2010	95.1	89.8	80.4	58.3	N	80.1	62.4	53.8	40.6	N
India	1981	[8]98.1	N	[4]93.8	N	[5]65.5	[8]37.0	N	[4]30.3	N	[5]14.3
	1991	[8]96.9	N	[4]92.6	[11]71.4	[12]42.3	[8]41.5	N	[4]35.5	[11]20.8	[12]8.2
	2001	[8]97.0	N	[4]92.0	[11]69.7	[12]45.4	[8]47.3	N	[4]40.9	[11]26.3	[12]12.0
	2012	98.5	96.0	91.5	73.4	46.3	41.1	37.5	33.3	26.2	11.5
Indonesia	1982	97.2	93.0	87.4	76.8	57.9	56.7	51.1	50.4	39.3	23.2
	1992	97.6	93.8	89.6	79.7	56.8	60.5	57.7	52.2	42.7	25.1
	1999	98.0	95.7	87.6	N	[5]66.5	62.2	60.0	54.3	N	[5]34.0
	2005	98.6	97.0	91.2	N	[5]68.5	61.8	59.9	57.4	N	[5]36.6
	2010	97.6	95.0	88.4	78.9	69.0	63.7	61.4	58.3	47.3	39.8
Israel	1983	91.5	89.1	84.2	78.2	32.2	51.1	43.2	36.7	22.0	9.2
	1996	[7]87.4	N	75.9	59.0	16.9	[7]65.8	N	44.7	19.9	5.1
	2006	[7]84.0	N	76.5	60.2	16.5	70.6	N	58.3	32.6	5.2
	2012	87.3	84.4	79.3	71.1	24.8	75.6	74.9	66.4	48.2	10.4
Japan	1980	98.0	97.3	94.0	81.5	46.0	62.3	58.7	50.7	38.8	16.1
	1989	97.6	96.0	91.6	71.4	35.8	70.7	64.2	52.2	39.2	15.7
	1999	97.5	97.1	94.7	74.1	35.5	71.8	67.9	58.7	39.8	14.9
	2006	96.9	95.7	93.2	70.9	29.3	74.0	70.5	60.3	40.2	13.0
	2012	96.1	95.0	92.2	75.4	28.7	75.7	73.4	64.6	45.8	13.4

See notes at end of table.

Table B-8.

Labor Force Participation Rates by Age, Sex, and Country: Selected Years 1980 to 2012—Con.

(In percent)

Country	Year	Male					Female				
		45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
Asia—Con.											
Malaysia	1980	96.1	92.2	78.1	69.5	49.7	42.3	37.7	32.6	26.7	19.0
	1991	92.4	87.1	65.0	53.3	31.8	35.8	29.6	20.6	14.6	6.7
	2000	98.0	93.4	75.1	61.6	N	49.6	40.6	28.5	23.2	N
	2012	96.9	92.5	76.8	57.4	N	55.3	48.3	34.6	21.2	N
Pakistan	1981	93.9	92.0	90.4	N	[5]75.7	2.7	3.1	2.4	N	[5]2.3
	1994	97.2	96.5	91.5	78.8	52.7	15.6	13.9	15.3	11.8	7.4
	2006	97.6	95.8	90.7	77.5	49.3	26.5	22.5	22.8	19.1	11.5
	2011	97.8	96.6	92.2	78.0	41.6	28.6	28.1	26.3	21.0	10.6
Philippines	1989	[7]97.4	N	[9]88.9	N	59.0	[7]58.2	N	[9]50.7	N	29.4
	1999	[7]96.8	N	[9]88.1	N	54.5	[7]64.0	N	[9]55.8	N	29.8
	2006	[7]93.8	N	[9]80.6	N	50.6	[7]63.3	N	[9]54.1	N	28.7
	2010	95.0	91.7	86.1	73.4	62.4	65.5	63.9	59.9	49.6	40.6
Singapore	1980	95.7	89.6	70.7	52.5	28.6	26.5	20.4	14.5	11.3	6.4
	1989	96.1	89.2	66.6	48.2	20.7	41.3	30.7	19.4	11.0	5.0
	2000	96.3	91.3	74.4	49.6	18.5	57.4	46.7	29.6	15.3	4.1
	2006	96.5	93.3	81.9	62.5	22.0	66.2	59.5	44.6	26.2	8.3
	2012	95.6	93.8	88.5	74.6	32.4	73.4	65.6	56.2	41.7	13.7
South Korea	1989	93.6	89.7	82.4	65.6	39.0	63.5	60.4	52.7	41.6	18.1
	1999	93.0	89.9	81.0	65.5	40.2	62.8	55.4	51.2	46.3	21.4
	2006	93.1	89.7	79.9	68.5	42.0	64.4	58.5	49.7	43.8	22.7
	2012	93.0	91.4	84.7	72.3	41.6	67.7	62.5	54.8	43.9	23.0
Sri Lanka	1981	92.3	87.4	74.3	56.6	35.7	25.2	19.3	13.2	6.9	3.8
	1996	91.9	91.8	73.0	N	[5]38.6	39.0	32.3	27.2	N	[5]7.8
	2000	95.6	88.8	76.8	N	[5]40.6	47.1	36.4	31.6	N	[5]10.2
	2012	94.4	90.5	81.0	64.9	35.5	45.3	41.8	36.6	22.4	9.3
Thailand	1980	93.7	90.7	84.4	67.8	39.3	73.5	68.6	59.1	43.1	19.0
	1994	[8]97.5	N	[4]92.8	N	[5]47.2	[8]76.7	N	[4]63.8	N	[5]23.5
	2006	[8]96.7	N	[4]92.0	N	[5]52.2	[8]83.6	N	[4]71.3	N	[5]27.3
	2012	96.9	95.0	90.5	73.7	38.8	83.6	77.7	70.9	52.0	19.9
Turkey	1980	91.1	84.9	76.8	67.4	43.9	48.3	46.1	42.4	36.3	20.8
	1988	89.2	82.7	71.5	59.2	33.8	36.3	36.4	29.4	20.9	10.9
	1996	83.0	71.0	60.3	54.0	33.6	29.7	29.3	30.4	23.4	13.3
	2006	82.0	65.4	51.3	39.8	22.0	24.8	21.8	18.5	14.5	6.6
	2012	86.1	68.7	53.7	41.9	20.1	33.1	26.2	20.0	16.0	6.4
Europe											
Austria	1981	96.3	91.5	77.3	23.3	3.1	57.3	53.5	32.4	9.5	1.8
	1991	95.1	89.8	63.1	12.3	1.7	65.1	56.3	23.1	4.9	0.7
	1998	93.6	88.4	63.2	13.2	4.4	72.6	63.6	24.8	8.4	1.9
	2006	93.1	87.6	69.1	21.9	5.5	82.6	75.0	41.9	10.1	2.2
	2012	93.1	90.4	76.4	29.7	7.3	85.8	80.0	53.9	14.3	3.5
Belgium	1981	90.8	85.7	70.7	32.3	3.3	38.2	30.7	17.3	5.7	1.0
	1997	90.5	81.6	49.2	18.4	1.9	59.5	44.2	21.8	4.6	0.7
	2006	91.4	85.2	58.3	22.6	2.7	72.8	61.1	36.2	10.3	1.0
	2012	90.8	86.6	66.8	26.8	4.0	78.8	69.7	51.0	17.2	1.1
Bulgaria	1985	94.6	88.1	80.9	39.2	15.2	91.0	83.6	32.0	16.5	4.3
	2006	84.1	79.2	66.1	38.6	4.6	82.8	76.5	53.4	11.7	1.5
	2012	83.4	81.2	69.8	44.4	4.5	85.1	80.7	69.5	22.7	1.9
Czech Republic	1980	96.0	92.7	84.2	46.3	19.5	88.1	79.9	40.8	21.5	6.5
	1991	95.5	91.5	80.0	28.4	11.6	93.4	85.7	31.1	16.2	4.9
	1999	94.9	90.1	77.1	27.5	7.2	90.8	81.5	33.2	12.9	2.7
	2006	94.6	90.6	83.1	36.1	6.6	91.8	88.2	51.2	13.1	2.5
	2012	95.6	93.8	86.4	41.0	6.8	93.8	90.0	66.5	17.2	3.3

See notes at end of table.

Table B-8.

Labor Force Participation Rates by Age, Sex, and Country: Selected Years 1980 to 2012—Con.

(In percent)

Country	Year	Male					Female				
		45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
Europe—Con.											
Denmark	1981	93.5	91.4	87.8	60.0	23.2	76.1	67.4	55.8	31.5	6.3
	1993	93.9	90.2	80.6	45.5	10.1	87.7	79.4	63.6	27.1	3.4
	2006	92.2	89.2	85.3	46.7	[1]20.7	87.2	83.4	77.0	28.2	[1]8.4
	2012	92.2	88.6	86.6	52.4	10.2	87.1	83.8	79.5	38.3	4.1
France	1984	95.0	90.8	70.0	29.9	4.3	61.0	54.1	41.4	18.0	2.1
	1996	95.0	92.6	70.4	16.4	2.3	80.9	71.5	51.7	15.2	2.0
	2005	94.1	90.3	62.5	15.4	1.6	83.2	77.3	53.4	13.4	0.8
	2012	94.0	91.1	77.0	25.1	3.1	85.1	81.9	68.3	21.2	1.7
Germany	1980	96.8	93.3	82.3	44.2	7.4	52.2	47.2	38.7	13.0	3.0
	1988	96.4	93.2	79.8	34.5	4.9	60.9	53.7	41.1	11.1	1.8
	1996	94.5	90.4	73.9	28.7	4.4	74.7	67.4	50.5	11.3	1.6
	2006	94.3	91.2	82.0	42.3	5.0	83.5	78.7	65.6	24.4	2.2
	2012	93.9	91.6	85.7	58.9	7.1	85.3	81.9	73.3	41.1	3.3
Greece	1981	95.1	90.0	81.1	61.7	26.2	28.9	25.8	20.0	13.4	5.0
	1987	98.0	84.2	74.3	53.5	14.0	43.9	37.2	29.3	22.0	5.1
	1997	95.2	89.2	75.0	47.8	10.7	49.9	39.3	30.7	20.3	3.4
	2006	95.6	89.4	74.0	45.2	7.4	64.0	51.3	33.5	21.8	2.1
	2012	93.8	88.7	73.0	37.4	4.5	72.1	56.4	40.7	18.8	1.5
Hungary	1980	92.9	86.2	72.2	13.2	4.0	77.5	67.4	18.8	8.7	2.9
	1996	83.1	70.0	46.1	9.2	[2]4.3	76.1	55.4	15.5	6.0	[2]2.1
	2006	82.5	74.4	61.3	19.6	[2]4.3	78.9	71.7	44.1	9.4	[2]1.6
	2012	87.6	82.0	68.4	18.6	3.5	84.9	80.0	54.9	11.8	1.3
Italy	1981	93.2	85.7	65.1	29.1	6.9	36.2	30.2	16.9	8.0	1.5
	1989	95.6	87.5	67.8	35.2	7.9	44.7	34.1	20.2	9.8	2.2
	1996	93.1	79.3	58.9	30.6	6.0	49.0	37.1	21.5	8.2	1.8
	2006	94.0	89.0	58.0	28.9	6.1	62.3	54.0	32.8	10.2	1.2
	2012	91.6	89.5	74.1	32.7	6.2	66.7	61.3	48.4	15.9	1.4
Norway	1980	94.0	90.9	88.7	74.1	[2]34.3	76.0	67.5	58.1	39.8	[2]13.0
	1990	93.9	89.2	82.0	64.2	[2]21.2	83.5	74.5	62.0	46.5	[2]12.0
	2000	91.7	89.9	84.8	60.6	[2]13.5	86.0	80.8	71.8	48.4	[2]8.5
	2006	90.7	87.7	82.9	63.0	[2]17.8	84.1	81.5	71.2	51.2	[2]10.6
	2012	90.1	87.2	83.8	67.5	23.1	84.2	83.5	76.3	58.0	14.6
Poland	1988	89.6	82.4	72.0	53.6	32.5	81.2	71.1	50.6	34.3	19.0
	1996	85.1	76.8	55.2	33.4	15.3	79.1	63.1	35.0	19.2	8.5
	2006	84.7	75.7	51.6	26.8	8.2	77.9	59.8	25.3	12.4	3.3
	2012	86.7	81.0	68.5	35.7	7.7	82.5	73.1	46.6	14.2	3.0
Russia	1989	95.8	91.7	79.3	35.4	14.2	93.7	83.8	34.8	20.4	6.4
	1992	N	93.9	80.5	38.1	13.3	N	83.6	43.0	21.0	5.7
	1999	88.6	85.3	65.2	29.2	6.4	86.8	78.9	33.7	16.0	2.5
	2006	89.0	84.8	70.2	39.7	9.4	88.2	80.6	47.0	23.6	4.6
	2012	92.6	88.7	77.8	38.5	14.1	90.6	84.3	52.9	24.9	8.9
Sweden	1980	92.0	89.8	84.4	65.9	8.1	82.9	77.8	66.4	41.4	2.6
	1990	91.6	89.5	84.1	63.9	10.6	89.8	85.8	76.8	53.1	3.7
	2000	90.6	89.9	83.8	56.2	N	87.2	85.7	79.4	48.2	N
	2006	90.9	89.8	84.9	66.2	N	87.2	85.4	80.0	58.3	N
	2012	94.4	91.9	89.2	72.8	19.1	89.7	87.8	83.2	63.1	11.3
Ukraine	1989	95.6	89.9	78.2	32.0	10.9	93.3	86.0	29.5	15.3	4.5
	1999	86.3	76.4	69.7	28.3	[2]9.8	84.3	70.1	33.4	16.7	[2]6.0
	2005	84.3	79.1	67.6	32.2	[6]22.7	81.1	72.9	37.6	24.7	[6]17.3
	2012	85.2	78.2	66.7	32.2	20.5	83.2	73.5	34.7	25.9	16.7
United Kingdom	1981	97.3	95.7	91.5	74.6	10.7	68.5	63.5	52.0	22.5	3.7
	1993	92.8	88.1	75.7	52.2	7.4	77.9	70.0	54.5	24.7	3.5
	2000	N	[3]68.9	N	N	7.4	N	[4]64.0	N	N	[5]8.4
	2006	N	[3]72.3	N	N	9.7	N	[4]68.6	N	N	[5]11.4
	2012	91.4	88.1	80.0	58.9	12.4	82.1	80.2	69.0	36.8	6.6

See notes at end of table.

Table B-8.

Labor Force Participation Rates by Age, Sex, and Country: Selected Years 1980 to 2012—Con.

(In percent)

Country	Year	Male					Female				
		45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
Latin America/Caribbean											
Argentina	1980	92.4	87.6	77.6	51.9	17.9	30.2	25.4	17.6	9.8	3.2
	1989	95.0	90.6	79.4	56.1	23.5	31.9	27.8	19.8	11.2	3.7
	1995	93.6	90.0	82.8	63.2	27.6	53.2	46.6	35.4	22.6	8.9
	2006	95.3	92.6	87.3	76.8	28.3	67.2	62.1	55.6	38.7	10.7
	2012	94.6	91.4	86.8	75.7	22.2	67.7	63.4	53.8	33.7	7.5
Brazil	1980	91.5	85.7	77.9	67.0	32.4	28.1	23.5	18.6	12.6	4.8
	1990	[8]94.5	N	[4]82.3	N	[5]46.0	[8]49.5	N	[4]34.5	N	[5]11.5
	2000	88.2	N	[4]76.8	[11]49.8	[12]20.1	54.6	N	[4]39.0	[11]15.5	[12]4.6
	2004	92.1	85.8	77.6	64.9	35.1	65.4	57.3	45.5	30.9	14.1
	2012	91.6	86.1	78.2	62.0	30.0	67.4	58.8	45.5	30.0	11.7
Chile	1982	90.1	82.8	72.8	61.5	25.5	26.0	21.9	16.2	10.1	4.5
	1992	94.9	92.4	82.1	66.6	31.5	39.7	39.3	28.2	19.2	6.3
	1999	95.9	91.3	83.4	69.2	27.4	47.1	42.9	32.4	21.0	6.5
	2006	95.3	91.4	86.1	73.2	26.9	51.9	48.4	40.1	25.3	7.7
	2012	93.6	93.8	90.1	80.5	35.0	66.2	61.1	56.0	38.3	12.0
Colombia	1985	[10]86.0	N	N	N	[5]58.4	[10]31.4	N	N	N	[5]16.7
	1999	[8]96.0	N	[4]88.2	[11]55.4	[12]25.2	[8]69.1	N	[4]43.7	[11]19.3	[12]5.4
	2010	96.6	94.0	87.8	74.5	61.5	69.6	62.3	49.1	35.2	25.0
Costa Rica	1984	92.3	88.7	83.0	69.6	38.9	20.9	15.5	11.6	6.9	3.1
	1996	[8]94.4	N	[4]85.4	[11]51.4	[12]21.1	[8]44.2	N	[4]22.2	[11]9.1	[12]2.8
	2006	95.7	92.5	87.2	71.1	29.1	54.3	42.0	35.0	20.3	6.8
	2012	94.0	92.0	85.8	67.5	26.5	55.0	50.3	39.8	27.3	6.8
Guatemala	1981	93.2	91.7	90.3	85.8	66.9	12.2	11.6	10.1	9.0	6.5
	1987	98.0	95.2	95.0	88.5	63.3	31.3	26.6	23.7	20.6	13.7
	1998–99	97.7	95.1	94.1	87.2	71.4	56.4	46.9	45.1	41.0	28.8
	2004	91.4	93.8	92.5	92.2	66.7	53.2	44.6	39.7	30.3	23.7
	2012	96.2	96.5	92.9	90.0	66.4	56.0	51.8	44.7	36.3	15.0
Jamaica	1988	[7]94.6	N	[9]90.5	N	52.4	[7]73.7	N	[9]65.4	N	24.9
	1998	[7]95.1	N	[9]81.6	N	46.4	[7]75.5	N	[9]53.5	N	18.4
	2004	[7]93.7	N	[9]81.8	N	41.4	[7]72.6	N	[9]50.1	N	17.3
	2010	[7]90.6	N	[9]80.8	N	54.8	[7]75.9	N	[9]55.7	N	16.6
Mexico	1980	95.3	93.8	91.4	85.6	68.6	29.1	27.5	24.6	24.1	18.6
	1988	96.9	91.9	85.5	77.5	58.4	38.2	31.7	24.6	23.2	16.9
	1996	95.6	91.9	85.6	74.1	52.0	41.3	35.0	31.2	23.8	14.1
	2006	95.4	92.5	88.2	74.0	45.8	50.4	44.0	35.3	28.5	14.7
	2012	94.9	91.8	85.4	71.5	42.8	55.4	50.2	41.5	32.8	15.5
Peru	1972	97.1	95.5	92.8	83.9	61.5	19.5	17.9	16.1	13.4	8.5
	1981	98.7	97.3	94.9	88.5	63.2	26.9	26.0	23.6	23.4	12.5
	1989	94.4	88.3	83.2	75.0	34.6	54.4	42.9	38.8	23.9	12.0
	1999	96.8	93.3	85.6	72.5	41.1	68.1	57.2	47.5	38.2	19.2
	2006	98.7	94.6	87.0	65.5	28.8	67.0	56.2	39.2	34.9	15.3
	2012	97.0	94.9	91.0	83.5	56.9	77.8	73.6	65.2	57.8	36.1
Uruguay	1985	94.3	89.4	80.0	51.8	16.2	46.4	37.5	25.3	13.3	3.6
	1995	96.4	94.3	89.3	59.3	19.4	64.6	59.5	41.0	23.9	6.7
	2006	97.9	96.4	91.2	68.8	19.7	75.9	69.4	58.7	39.0	8.4
	2012	96.3	94.6	89.0	65.4	24.5	78.4	73.3	67.0	43.1	10.4
Northern America											
Canada	1981	93.6	90.9	84.4	68.8	17.3	59.6	52.1	41.9	28.3	6.0
	1991	93.1	89.5	78.3	54.1	14.4	76.3	66.4	49.9	28.1	5.7
	2001	91.1	86.4	72.2	46.5	9.4	79.8	72.7	53.3	27.4	3.4
	2006	90.8	87.8	76.1	53.3	12.1	82.6	78.1	62.3	37.1	5.2
	2012	89.9	87.8	78.9	58.0	17.1	84.4	80.9	69.4	45.7	8.8

See notes at end of table.

Table B-8.

Labor Force Participation Rates by Age, Sex, and Country: Selected Years 1980 to 2012—Con.

(In percent)

Country	Year	Male					Female				
		45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
Northern America—Con.											
United States	1980	92.0	88.5	80.6	60.4	19.3	61.5	56.3	48.4	34.0	8.2
	1991	92.2	88.4	79.0	54.8	15.8	75.4	67.8	55.7	35.1	8.6
	2000	90.1	86.8	77.1	54.8	17.5	79.1	74.1	61.2	40.1	9.4
	2006	[7]85.7	N	76.3	57.5	19.7	[7]64.7	N	64.7	45.4	10.7
	2012	88.1	84.1	78.0	60.5	23.6	75.6	73.7	67.3	50.4	14.4
Oceania											
Australia	1981	92.5	89.4	81.3	53.1	12.3	56.5	46.3	32.8	15.5	4.9
	1991	[7]89.6	N	73.8	50.0	8.9	[7]62.8	N	36.0	15.2	2.5
	1999	89.5	85.1	72.5	46.7	9.6	73.8	65.0	44.6	18.3	3.1
	2006	89.2	86.1	75.7	56.4	12.1	78.3	73.4	57.9	33.5	4.3
	2012	89.2	86.7	80.0	62.6	16.8	78.5	76.3	65.7	44.5	7.8
New Zealand	1981	95.8	94.1	87.5	45.7	10.9	52.5	43.7	30.9	11.7	1.9
	1992	94.2	89.5	80.0	33.5	8.8	79.7	65.7	49.9	15.7	2.9
	1999	90.7	88.4	81.2	57.4	10.4	79.9	73.6	60.1	32.5	3.9
	2006	92.6	91.6	87.2	73.1	16.8	81.9	80.0	71.7	50.0	8.0
	2012	91.5	90.9	88.2	77.6	25.5	82.3	82.8	77.4	64.1	15.0

N Not available.
[1] Refers to ages 65 to 66 years.
[2] Refers to ages 65 to 74 years.
[3] Refers to ages 50 to 64 years.
[4] Refers to ages 50 to 59 years.
[5] Refers to ages 60 years and over.
[6] Refers to ages 65 to 70 years.
[7] Refers to ages 45 to 54 years.
[8] Refers to ages 40 to 49 years.
[9] Refers to ages 55 to 64 years.
[10] Refers to ages 45 to 59 years.
[11] Refers to ages 60 to 69 years.
[12] Refers to ages 70 years and over.

Notes:

For some countries in this table, data are derived from labor force surveys as well as population censuses. Labor force surveys are more focused on economic activity than are general census enumerations and, therefore, may yield more comprehensive information on various aspects of economic activity. The user should recognize that temporal differences in labor force participation rates within a country may, in part, reflect different modes of data collection.

Czech Republic: Data prior to 1991 refer to the former Czechoslovakia.

Germany: Data prior to 1996 refer to the former West Germany.

United Kingdom: Data for 2000 and 2006 are averages of reported quarterly rates.

Sources: U.S. Census Bureau, Population Division data files; various issues of the International Labour Office Yearbook of Labour Statistics; and the International Labour Office electronic data base accessible at <www.ilo.org/ilostat/faces/home/statisticaldata>.

APPENDIX C.

Sources and Limitations of the Data

This report includes data compiled by the International Programs area in the Population Division of the Census Bureau, from publications and electronic files of national statistical offices, various agencies of the United Nations, and other international organizations (e.g., the Organisation for Economic Co-operation and Development, the European Union, the World Health Organization, and the International Labour Organization). It also includes cross-national information from sources such as the Global Burden of Disease Project, the Survey of Health, Ageing and Retirement in Europe, the Study on Global Ageing and Adult Health, and other university-based research projects.

The majority of demographic projections in Chapter 2, Chapter 3, and Appendix B come from the International Data Base (IDB), maintained and updated by Census Bureau's Population Division. The Census Bureau has been preparing estimates and projections of the populations of foreign countries since the 1960s. In the 1980s, the Census Bureau released its first comprehensive set of estimates and projections for over 200 countries and areas of the world. Since then, the Census Bureau has routinely updated estimates and projections for countries as new data have become available. Estimates and projections for countries, as well as for regions and the world, are made available to the public through the Census Bureau's International Data Base (IDB), located at <www.census.gov/population/international/data/idb>.

The Census Bureau's IDB estimates and projections have several distinguishing features. For countries and areas recognized by the U.S. Department of State and which have populations of 5,000 or more, population size and components of change are provided for each calendar year beyond the initial or base year, through 2050. Within this time series, sex ratios, population, and mortality measures are developed for single-year ages through age 100-plus. As a result of single-year age and calendar-year accounting, IDB data capture the timing and demographic impact of important events such as wars, famine, and natural disasters, with a precision exceeding that of other online resources for international demographic data.

The estimation and projection process involves data collection, data evaluation, parameter estimation, making assumptions about future change, and final projection of the population for each country. The Census Bureau begins the process by collecting demographic data from censuses, surveys, vital registration, and administrative records from a variety of sources. Available data are evaluated, with particular attention to internal and temporal consistency.

Estimation and projection procedures make use of a variety of demographic techniques and incorporate assumptions formed by consulting the social science and health science literature. In addition to using demographic data, Census Bureau demographers consider information on public health efforts, sociopolitical circumstances, and historical events such as natural disasters and civil conflict in preparing the assumptions feeding into population projections. Regional and world populations are obtained by projecting each country's population separately and then combining the results to derive aggregated totals. For more details on methodology, see International Data Base Population Estimates and Projections Methodology located at <www.census.gov/population/international/data/idb/estandproj.pdf>.