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The Growing Gap in Life Expectancy by Income: Recent Evidence and Implications for the Social Security Retirement Age

Katelin P. Isaacs
Analyst in Income Security

Sharmila Choudhury
Section Research Manager

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Summary

Life expectancy is a population-level measure that refers to the average number of years an individual will live. Although life expectancy has generally been increasing over time in the United States, researchers have long documented that it is lower for individuals with lower socioeconomic status (SES) compared with individuals with higher SES. Recent studies provide evidence that this gap has widened in recent decades. For example, a 2015 study by the National Academy of Sciences (NAS) found that for men born in 1930, individuals in the highest income quintile (top 20%) could expect to live 5.1 years longer at age 50 than men in the lowest income quintile. This gap has increased significantly over time. Among men born in 1960, those in the top income quintile could expect to live 12.7 years longer than men in the bottom income quintile. This NAS study finds similar patterns for women: the life expectancy gap between the bottom and top income quintiles of women expanded from 3.9 years for the 1930 birth cohort to 13.6 years for the 1960 birth cohort.

Gains in life expectancy are generally heralded as good news by lawmakers and others, signifying improved well-being in the population. Yet widening differentials in life expectancy are more troubling. Congress may be interested in recent research on this topic for many reasons, including the implications for Social Security benefits as well as Social Security reform proposals.

Social Security provides monthly benefits to retired and disabled workers and their dependents, and to dependents of deceased workers. A key goal of the Social Security program is redistribution of income from the high earner to the low earner by way of a progressive benefit formula. Widening gaps in life spans by SES pose a challenge to meeting this goal. When Social Security benefits are measured on a lifetime basis, low earners, who show little to no gains in life expectancy over time, are projected to receive increasingly lower benefits than those with high earnings. For instance, in the 2015 NAS study, men in the lowest earnings quintile saw little or no improvement in the value of their lifetime Social Security retirement benefits between the 1930 and 1960 birth cohorts (roughly $125,000 in 2009 dollars in lifetime benefits for both birth cohorts). Due to gains in life expectancy for higher earners, however, men in the highest earnings quintile born in 1930 had lifetime Social Security benefits of $229,000, and men in the highest earnings quintile born in 1960 had estimated lifetime benefits of $295,000. Thus, according to this 2015 NAS analysis, differential gains in life expectancy increased the disparity in the lifetime value of Social Security retirement benefits between the top and bottom earnings quintiles by about $70,000 (in 2009 dollars) for the later birth cohort.

In response to rising life expectancy, some commonly discussed Social Security reform proposals involve increasing the retirement age. Yet these proposals would affect low earners disproportionately (i.e., reductions in their lifetime Social Security benefits would be considerably larger than for high earners). Congress may be interested in policy proposals that mitigate the uneven effects of increasing the retirement age and protect the interests of lower-earning, shorter-lived workers.

This report provides a brief overview of the concept of life expectancy, how it is measured, and how it has changed over time in the United States. While life expectancy may be studied in a variety of contexts, this report focuses on the link between life expectancy and SES, as measured by lifetime income. In particular, this report synthesizes recent research on (1) the life expectancy gap by income and (2) the relationship between this gap and Social Security benefits. Finally, this report discusses the implications of this research for one type of Social Security reform proposal: increasing the Social Security retirement age.

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Introduction

Demographers have established that the rich live longer, on average, than the poor. In recent years, a substantial body of research has also demonstrated that the gap in average life spans between the rich and the poor is growing significantly. For example, a recent study by the National Academy of Sciences (NAS)[1] finds that among male workers born in 1930, those in the bottom lifetime earnings quintile can expect to live to age 77, on average, while male workers in the top quintile can expect to live to 82. For the later 1960 cohort, this same study estimates that male workers in the bottom quintile show no gains in life expectancy as compared with those born three decades earlier, while men at the top quintile of lifetime earnings can expect to live more than seven years longer, to age 89.[2]

Current interest in the growing gap in life expectancy by income has been fueled by several recent, high-profile studies on this issue. In addition to the NAS work (*The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses, 2015*), in 2016 the Government Accountability Office (GAO; *Retirement Security: Shorter Life Expectancy Reduces Projected Lifetime Benefits for Lower Earners*), the Brookings Institution (*Later Retirement, Inequality in Old Age, and the Growing Gap in Longevity Between Rich and Poor*), and Stanford economist Raj Chetty and colleagues (*The Association Between Income and Life Expectancy in the United States, 2001-2014*) all published new evidence on the growing gap in life expectancy. These studies also discuss the policy implications of these findings.

While policymakers and others may view increases in life expectancy as a positive outcome, they may be concerned with widening differentials in longevity. For instance, Congress may be interested in the connection between the growing gap in life expectancy between the rich and the poor and federal expenditures on programs like Social Security. Social Security provides monthly benefits to retired and disabled workers and their dependents, and to dependents of deceased workers. The goals of Social Security, a redistributive program, may be compromised by widening gaps in life spans. The program is designed to be progressive by redistributing income from those with high lifetime earnings to those with low lifetime earnings. When Social Security retirement benefits are measured on a lifetime basis, low earners, who show little to no gains in life expectancy over recent decades, are projected to receive relatively smaller benefits when compared with high earners. A commonly discussed Social Security reform proposal in the United States involves increasing the retirement age, which would affect low earners' lifetime benefits disproportionately.[3] Congress may wish to reevaluate this type of reform proposal in light of the growing gap in life expectancy by income and may be interested in policy proposals that protect the interests of lower-earning, shorter-lived workers, for example.

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[1] According to its website, the National Academy of Sciences (NAS) is "a private, nonprofit organization of the country's leading researchers. The NAS recognizes and promotes outstanding science through election to membership; publication in its journal, PNAS; and its awards, programs, and special activities." For more background, see http://nationalacademyofsciences.org.

[2] National Academies of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015).

[3] Other options exist to address the financing challenges posed by increasing longevity. For example, a number of other countries have adopted automatic adjustments of life expectancy indexing in their public pension programs to address an aging population. J. A. Turner, *Longevity Policy: Facing Up to Longevity Issues Affecting Social Security, Pensions, and Older Workers* (Kalamazoo, MI: Upjohn Institute Press, 2011).

This report provides a brief overview of the concept of life expectancy, how it is measured, and how it has changed over time in the United States.[4] While life expectancy may be studied in a variety of contexts, this report focuses on the link between life expectancy and socioeconomic status (SES), as measured by lifetime income. In particular, this report synthesizes recent research on (1) the life expectancy gap by income and (2) the relationship between this gap and Social Security retirement benefits. Finally, this report discusses the implications of this research for one type of Social Security reform proposal: raising the Social Security retirement age.

Life Expectancy in the United States

Life expectancy is a measure of population longevity that refers to the average number of years an individual will live, given survival to a particular age and subject to age-specific mortality rates. Life expectancy has an inverse relationship with mortality rates (also referred to as death rates):[5] as mortality rates decline, life expectancy increases.[6] These measures can be studied in the aggregate (i.e., full population) or separately across demographic subgroups. Differential mortality rates across groups—for example, age, sex, or race—result in differential life expectancy estimates.

Life expectancy is commonly presented as life expectancy at birth as well as at age 65. It can, however, be calculated at any age. When calculated at birth, life expectancy represents the average life span. Alternatively, life expectancy may refer to additional years of life when it is calculated for ages after birth (e.g., a life expectancy of 10 years at age 75, which indicates an expected age at death of 85).[7] According to data from the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), in 2014, life expectancy at age 65 in the United States was estimated to be 19.3 years (meaning individuals would be expected to live to age 84.3), whereas life expectancy at birth was 78.8 years.[8]

[4] This report focuses on life expectancy in the United States. It does not discuss international trends in life expectancy. There is, however, a large, comparative literature on international life expectancy, including differences in life expectancy in the United States versus other affluent countries. See, for instance, National Research Council, *Panel on Understanding Divergent Trends in Longevity in High-Income Countries*, ed. Eileen M. Crimmins, Samuel H. Preston, and Barney Cohen (Washington, DC: National Academies Press, 2011).

[5] Mortality rates are calculated by dividing the number of deaths that occur in a given time period by the number of person-years lived in that same time period. Mortality rates are age-specific when they refer to deaths occurring among a particular age group.

[6] At the same time, differential patterns in mortality decline across age groups are also reflected in life expectancy estimates.

[7] Life expectancy estimates generally indicate greater longevity when estimated at older ages (e.g., at age 65 versus at birth). For instance, life expectancy at age 65 presents a higher expected age at death than life expectancy calculated at birth because someone who lives to 65 has already survived to a later age (i.e., having experienced lower mortality risk) and has a higher chance of living to 90, for example, than someone at a younger age.

[8] Based on final mortality data for 2014. See Kenneth D. Kochanek et al., *Deaths: Final Data for 2014*, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics Reports, vol. 65, no. 4 (June 30, 2016), https://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_04.pdf.

Throughout this report, including in **Figure 1** and **Figure 2**, 2014 data are provided, as they are the most recent final data available from the CDC/NCHS (and are available by race). Recently, however, some preliminary 2015 data on life expectancy at birth and at age 65 were released (see Jiaquan Xu et al., *Mortality in the United States, 2015*, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, NCHS Data Brief, no. 267, December 2016, https://www.cdc.gov/nchs/data/databriefs/db267.pdf). These 2015 data show no change in life expectancy at age 65 from the previous year. But they reveal a decrease in life (continued...)

Life expectancy is often broken out by sex and race due to observed differences in sex-specific and race-specific death patterns. For example, in 2014, life expectancy at birth in the United States was estimated to be 76.4 years for men and 81.2 years for women. The comparable figures for life expectancy at birth by race were 75.6 years for blacks and 79.0 years for whites. In 2014, life expectancy at age 65 in the United States was estimated to be 18.0 years for men (so an expected age of death of 83.0 years [65+18.0=83.0]) and 20.5 years for women (so an expected age of death at 85.5 years [65+20.5=85.5]). Life expectancy at age 65 in 2014 was 18.2 years for blacks (so an expected age of death at 83.2 [65+18.2=83.2]) and 19.3 years for whites (so an expected age of death at 84.3 years [65+19.3=84.3]).[9]

For more background on the data and methods used to estimate life expectancy, see **Box 1**. The recent research discussed throughout this report uses life expectancy estimates calculated at various ages (e.g., at age 50, age 65, or at the various ages of sample participants). For ease of comparison, these study estimates will be referred to as "life expectancy," although in some cases they may represent expected age of death (or total years of life expected to be lived).

(...continued)

expectancy at birth in 2015 of 0.1 years from the previous year (78.8 years in 2015 versus 78.9 years in 2014). Life expectancy at birth for men was 76.3 in 2015 (down from 76.5 in 2014), whereas life expectancy at birth for women was 81.2 in 2015 (down from 81.3 in 2014). This source does not provide life expectancy data by race. The increased mortality rates that led to this decrease in life expectancy at birth are the first, significant, population-wide increase since 1999, according to the *Mortality in the United States* report cited above.

[9] Other types of race/ethnic differences in life expectancy exist as well (e.g., Hispanic/non-Hispanic). They are not discussed in this report.

Box 1. Estimating Life Expectancy: Data and Methods

To estimate life expectancy, researchers first require raw data on the number and timing of deaths in a population. Sources for this information on the U.S. population include the CDC National Vital Statistics (NVS) and the Social Security Administration (SSA) Death Master File. Next, researchers use these raw mortality data to calculate age-specific mortality rates and then apply well-established mathematical techniques to produce a life table that includes estimates of life expectancy.[10]

Life expectancy may be calculated using a "period" or "cohort" approach. Period life expectancy estimates are based on mortality observed in a given year (i.e., time period); therefore, period life expectancy is derived by assuming that a population experiences the most recent, annual, age-specific mortality rates throughout their lives. For example, period estimates assume that individuals who are 65 years old will today face the same mortality rates in 10 years (when they are 75 years old) as those who are 75 years old today. Life tables produced by the CDC NCHS provide estimates of period life expectancy.[11]

In the cohort approach, however, either observed mortality rates or projected estimates for a particular birth cohort are used.[12] For example, cohort estimates assume that individuals who are 65 years old today, will face different mortality rates in 10 years (when they are 75 years old) than mortality rates for 75-year-olds today (i.e., mortality rates that are observed or estimated—and are likely to be lower than mortality rates for 75-year-olds today). SSA's Office of the Chief Actuary (OACT) produces estimates of cohort life expectancy.[13]

Life expectancy estimates are typically constructed using period life tables. At least in part, this preference is due to convenience: period mortality rates for a current year are readily available (e.g., via CDC's NVS), whereas cohort mortality rates require either observing a cohort from birth until death—which involves a considerable time lag—or producing estimated (rather than observed) cohort mortality rates based on assumptions and modeling techniques.

Period life expectancy estimates tend to be lower than cohort life expectancy estimates due to the overall trend of decreasing mortality rates over time. For instance, based on cohort life tables, SSA estimated that, in 2012, life expectancy at birth was 86.6 for women and 82.9 for men. SSA's estimates for cohort life expectancy at age 65 in 2012 result in an expected age of death at 86.4 for women (life expectancy at age 65 of 21.4 years) and 84.1 for men (life expectancy at age 65 of 19.1 years).[14] In comparison, NCHS estimated that, in 2012, period life expectancy at birth was 81.2 for women and 76.4 for men, and estimates based on period life expectancy at age 65 result in an expected age of death at 85.5 for women (life expectancy at age 65 of 20.5 years) and 82.9 for men (life expectancy at age 65 of 17.9 years).[15]

Figure 1 and **Figure 2** provide CDC's recent estimates of period life expectancy in the United States over 1950-2014 (see **Box 1** for a discussion of period life expectancy).[16] **Figure 1** presents life expectancy trends over this period for men and women at birth as well as expected ages of death based on life expectancy at age 65. **Figure 2** graphs the same data broken out for whites and blacks. Two key observations may be drawn from these figures. First, life expectancy has increased over time for all groups. These increases in life expectancy have been driven by decreases in mortality rates. In particular, during the second half of the 20th century, improvements in the prevention and control of chronic disease (e.g., heart disease and

[10] Samuel H. Preston, Patrick Heuvenline, and Michael Guillot, *Demography: Measuring and Modeling Population Processes* (Malden, MA: Blackwell Publishing, 2001).

[11] See http://www.cdc.gov/nchs/products/life_tables.htm#life.

[12] A cohort is a group of individuals who experience the same event at the same time. A birth cohort is a group of individuals born in the same year (or during the same years).

[13] See https://www.ssa.gov/oact/TR/2015/V_A_demo.html#221776. (SSA's OACT also provides period life expectancy estimates. See https://www.ssa.gov/oact/TR/2015/V_A_demo.html#226697.)

[14] See Table V.A4 (Intermediate), https://www.ssa.gov/oact/TR/2015/V_A_demo.html#221776.

[15] See Centers for Disease Control and Prevention (CDC), National Vital Statistics, http://www.cdc.gov/nchs/products/life_tables.htm#life/.

[16] Available at http://www.cdc.gov/nchs/products/life_tables.htm#life.

cerebrovascular diseases) have contributed to reduced adult mortality rates. Additionally, advances and innovations in medical technology (such as vaccines and antibiotics) as well as public health measures (for instance, clean water and sanitation initiatives and antismoking campaigns) have also contributed to mortality declines.[17] (See **Box 2** for a discussion of recent research, including recent work by Case and Deaton,[18] that complicates this finding.)

Second, there are gaps in life expectancy across sex and race that—despite evidence of narrowing over recent periods—have persisted over time. Worldwide, life expectancy is generally higher for women than for men. Researchers have proposed biological as well as behavioral and social factors to explain this differential in life expectancy by sex.[19] In terms of race, in the United States, whites tend to live longer, on average, than blacks—although the longevity gap, as calculated at birth, has decreased over time. To explain this racial differential, researchers point to higher mortality for blacks due to health disparities as well as interactions among factors such as inequalities in socioeconomic status, behavioral factors, access to health care, and environmental surroundings.[20]

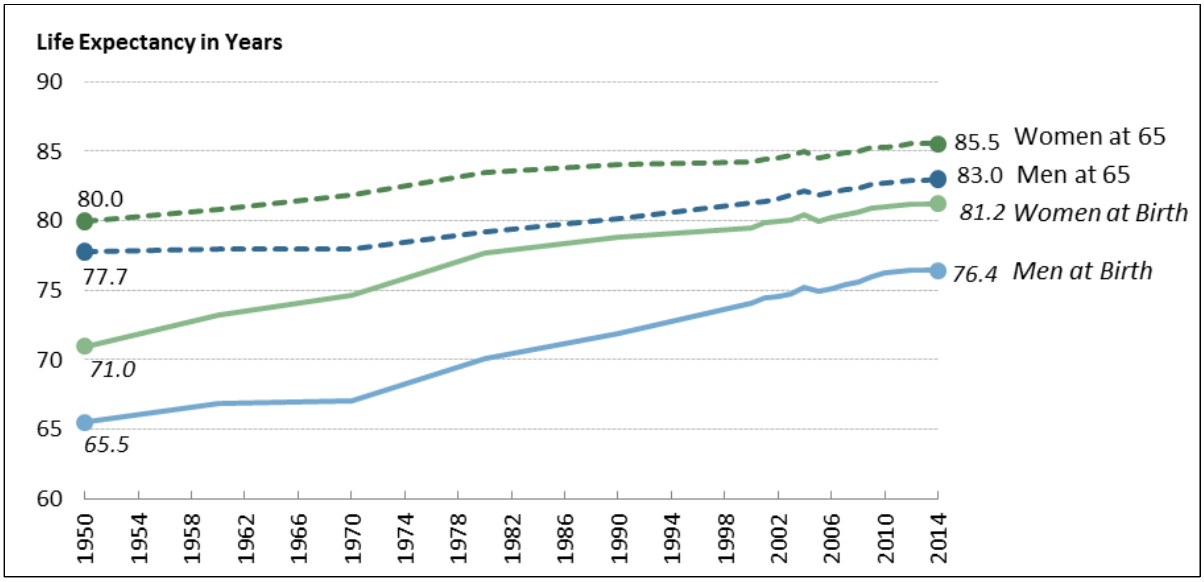
[17] For a longer discussion of improvements in life expectancy, see CRS Report RL32792, *Life Expectancy in the United States*.

[18] Anne Case and Angus Deaton, "Rising Morbidity and Mortality in Midlife among White Non-Hispanic Americans in the 21st Century," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 112, no. 49 (2015), pp. 15078-83; Anne Case and Angus Deaton, *Mortality and Morbidity in the 21st Century*, Brookings Institution, Brookings Paper on Economic Activity; Prepared for the Brookings Panel on Economic Activity, March 17, 2017.

[19] These trends of decreasing mortality/increasing life expectancy as well as the sex differential in life expectancy are not unique to the United States; they have been observed internationally as well. In general, life expectancy in the United States is higher than the global average, which includes less-developed countries, but only slightly higher than in comparable, developed countries. See international data on life expectancy from the Organisation for Economic Co-operation and Development (OECD), which are available at https://data.oecd.org/healthstat/life-expectancy-at-birth.htm and https://data.oecd.org/healthstat/life-expectancy-at-65.htm#indicator-chart.

[20] For more information on differentials in life expectancy by race and sex, including a discussion of causal mechanisms, see CRS Report RL32792, *Life Expectancy in the United States*.

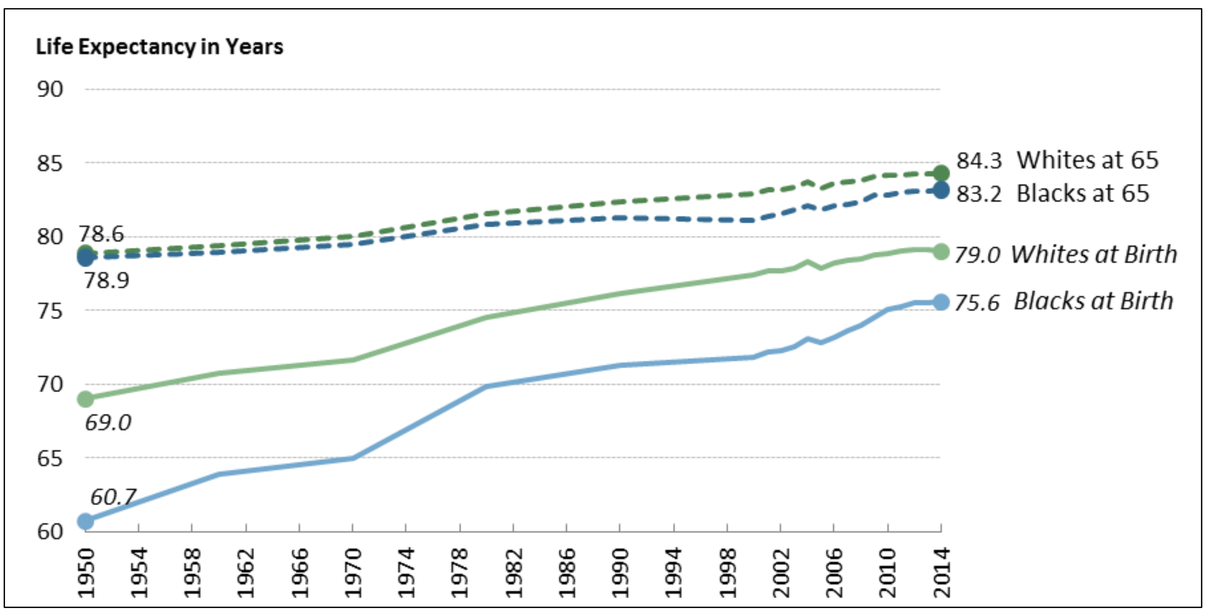
Figure 1. Life Expectancy by Sex at Birth and Age 65, 1950-2014



Source: Centers for Disease Control and Prevention (CDC), National Vital Statistics.

Note: Period life expectancy estimates based on period mortality rates. Life expectancy at age 65 refers to expected age of death.

Figure 2. Life Expectancy by Race at Birth and Age 65, 1950-2014



Source: Centers for Disease Control and Prevention (CDC), National Vital Statistics.

Note: Period life expectancy estimates based on period mortality rates. Life expectancy at age 65 refers to expected age of death.

Box 2. Recent Increases in Mortality Among U.S. Middle-Aged, Non-Hispanic Whites

Researchers have documented increasing life expectancy and decreasing mortality rates over time for the entire U.S. population. A 2015 study by Anne Case and Angus Deaton,[21] however, disaggregates mortality rates by age and race. Their findings contradict this overall trend of declining mortality rates for a specific subpopulation: middle-aged, non-Hispanic whites. In particular, Case and Deaton conclude that for white, non-Hispanic Americans aged 45-54, mortality rates have increased over 1999-2013, while mortality rates have fallen over this same period for all other age and race groups. Additionally, the mortality increases for this group result largely from increased death rates among individuals with a high school degree or less. According to Case and Deaton, the increased mortality for middle-aged, non-Hispanic whites in recent years is due to deaths from drug and alcohol poisoning, suicide, and chronic liver diseases and cirrhosis (what the authors refer to as "deaths of despair").

Other researchers have pointed out that Case and Deaton do not adjust for the changing age composition of the 45-54 age group over the time period in question. For example, Andrew Gelman points out that with the aging of the population—particularly that of the large baby boom cohort (born 1946-1964)—the mean age within the 45-54 age bracket increased between 1989 (49.1 years) and 2013 (49.6 years). And higher age is associated with higher mortality, which could affect the results. For example, Gelman finds that using age-adjusted mortality rates in the analysis reduces by half the observed increase in mortality found by Case and Deaton, and confines this observed mortality increase to the 1999-2005 period.[22]

Additionally, Laudan Aron et al. are critical of Case and Deaton for not analyzing mortality trends separately for men and women. In their analysis of the same data, Aron et al. find that the average increase in age-specific mortality over this recent period is more than three times higher for women than men, with important implications: "By lumping women and men together, the study ... missed the important point that the increases in mortality are affecting women of reproductive and childrearing ages, a finding that has huge implications for children, families, and communities."[23]

More recently, Case and Deaton have confirmed their 2015 findings in a conference paper that builds on their earlier work and examines mortality in the United States through 2015.[24] In this paper, Case and Deaton propose that the recent increases in mortality for middle-aged, non-Hispanic whites with a high school education or less may be due to cumulative disadvantages for these individuals over time and across a number of social and economic dimensions, including the labor market, health, and family structure.

[21] Anne Case and Angus Deaton, "Rising Morbidity and Mortality in Midlife Among White Non-Hispanic Americans in the 21st Century," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 112, no. 49 (2015), pp. 15078-83.

[22] Gelman is a professor of statistics and political science and director of the Applied Statistics Center at Columbia University. See Andrew Gelman, "Correcting statistical biases in 'Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century': We need to adjust for the increase in average age of people in the 45-54 category," November 6, 2015, http://andrewgelman.com/2015/11/06/correcting-rising-morbidity-and-mortality-in-midlife-among-white-non-hispanic-americans-in-the-21st-century-to-account-for-bias-in/; "Age adjustment mortality update," November 6, 2015, http://andrewgelman.com/2015/11/06/age-adjustment-mortality-update/; "What happened to mortality among 45-54-year-old white non-Hispanics? It declined from 1989 to 1999, increased from 1999 to 2005, and held steady after that," November 6, 2015, http://andrewgelman.com/2015/11/06/what-happened-to-mortality-among-45-54-year-old-white-non-hispanic-men-it-declined-from-1989-to-1999-increased-from-1999-to-2005-and-held-steady-after-that/; and "Death rates have been increasing for middle-aged white women, decreasing for men," November 10, 2015, http://andrewgelman.com/2015/11/10/death-rates-have-been-increasing-for-middle-aged-white-women-decreasing-for-men.

[23] Laudan Aron et al., "To Understand Climbing Death Rates Among Whites, Look To Women Of Childbearing Age," Health Affairs Blog, November 10, 2015, http://healthaffairs.org/blog/2015/11/10/to-understand-climbing-death-rates-among-whites-look-to-women-of-childbearing-age/.

[24] Anne Case and Angus Deaton, *Mortality and Morbidity in the 21st Century*, Brookings Institution, Brookings Paper on Economic Activity, prepared for the Brookings Panel on Economic Activity, March 17, 2017.

Measuring Gaps in Life Expectancy

In addition to documenting differences in life expectancy across sex and race, researchers have also focused on disparities in life expectancy by socioeconomic status. SES serves as a measure of class, or an individual's economic and social position in society relative to others. It is a common indicator of social stratification and inequality.[25] Policymakers may be particularly interested in gaps in life expectancy by SES because, unlike sex and race, SES is a measure of inequality that could potentially be addressed by policy interventions.[26] Although gaps in life expectancy by sex and race have narrowed over time, there is evidence that the gap in life expectancy by SES has been growing over time, particularly across recent decades, as this report will discuss in detail below.

SES is commonly measured by income, education, occupation, or some interaction of these concepts. In the field of life expectancy research, there are a variety of ways to operationalize SES. The two most common approaches are to measure SES with education or with income. The positive relationship between education and life expectancy—or the negative relationship between education and mortality—has been well-documented.[27] Additionally, studies have found a growing gap in life expectancy by education over time, although this trend may not be uniform across sex and race.[28]

While education is a useful measure of SES because it is often stable by middle age, there are several drawbacks to this measure. First, education is subject to reporting error (e.g., misreported data), particularly in death record files.[29] Second, it is a comparatively gross measure of SES; there are large components of the population that have attained each level of education (e.g., high school and college).[30] Using such broad educational categories could gloss over disparities in life expectancy between population subgroups. Finally, there have been significant shifts in educational attainment in the United States over the last century (e.g., increasing rates of high school completion). Such shifts in educational attainment over this period make drawing

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[25] David B. Grusky, ed., *Social Stratification: Class, Race, and Gender in Sociological Perspective*, 4th ed. (Boulder, CO: Westview Press, 2014).

[26] The racial gap in life expectancy reflects, in part, differences in SES. According to the United States Department of Health and Human Services (HHS), "These [racial] disparities [in life expectancy] are believed to be the result of the complex interaction among genetic variations, environmental factors, and specific health behaviors." See HHS, *Tracking Healthy People 2010*, p. 12, http://www.healthypeople.gov/2010/document/pdf/uih/2010uih.pdf.

[27] Evelyn M. Kitigawa and Philip M. Hauser, *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology* (Cambridge, MA: Harvard University Press, 1973); Gregory Pappas et al., "The Increasing Disparity in Mortality Between Socioeconomic Groups in the United States, 1960 and 1986," *New England Journal of Medicine*, vol. 329 (1993), pp. 103-109; Samuel H. Preston and Irma T. Elo, "Are Education Differentials in Adult Mortality Increasing in the United States?" *Journal of Health and Aging*, vol. 7, no. 4 (1995), pp. 476-496; Robert A. Hummer and Elaine M. Hernandez, *The Effect of Educational Attainment on Adult Mortality in the United States*, Population Reference Bureau, Population Bulletin No. 68 (1), Washington, DC, 2013.

[28] Ellen R. Meara, Seth Richards, and David M. Cutler, "The Gap Gets Bigger: Changes in Mortality and Life Expectancy, by Education," *Health Affairs*, vol. 27, no. 2 (2008), pp. 350-360; S. Jay Olshansky et al., "Differences in Life Expectancy Due to Race and Educational Differences Are Widening, and Many May Not Catch Up," *Health Affairs*, vol. 31, no. 8 (2012), pp. 1803-1813; Jennifer K. Montez and Anna Zajacova, "Explaining the Widening Education Gap in Mortality Among U.S. White Women," *Journal of Health and Social Behavior*, vol. 54, no. 2 (2013), pp. 165-181.

[29] See Brian Reston et al., "Education Reporting and Classification on Death Certificates in the United States," *Vital and Health Statistics*, series 2, no. 151 (2010), pp. 1-16.

[30] Additionally, the categories of "some college" or "college attainment" may mask differences in the quality of education. And this dimension of quality could also have implications for SES.

conclusions about time trends in life expectancy challenging. That is, high-school-educated individuals today are a different, more disadvantaged group than high-school-educated individuals born at the beginning of the 20th century, when high school completion rates were significantly lower.[31]

This report presents recent evidence on life expectancy gaps by income, another measure of SES. Income is chosen for several reasons. First, unlike education, income may be measured in more detail. It can also be expressed as a relative measure, which allows researchers to compare where an individual's income falls in a population distribution. While income may suffer from reverse causality in the sense that poor health—and, therefore, exposure to higher mortality risk—may lead to lower earnings, this problem can be at least partially addressed by measuring income over a period of time (e.g., during prime working years). In other words, using a measure of average lifetime income attempts to capture adult SES. Finally, income—particularly lifetime earnings, which is a component of lifetime income and, therefore, correlated with total income—is chosen because it is a measure of SES that is directly linked to the calculation of Social Security benefits.[32]

The Growing Gap in Life Expectancy by Income: Recent Evidence

There is a rich literature on differences in life expectancy by socioeconomic groups in the United States. This section highlights a selection of significant, recent studies on the relationship between life expectancy and SES, as measured by income.[33] Using high-quality datasets and various quantitative methods, the authors of these studies find consistent evidence of a growing gap in life expectancy by income. **Table A-1** provides summary information for each of the studies discussed in the section.

In her 2007 research, Hilary Waldron[34] makes a significant contribution to understanding trends in life expectancy by earnings (i.e., labor income). A major strength of the study is its use of a rich and large longitudinal data set. Waldron uses Social Security administrative data on taxable wages matched with benefits records and official death records.[35] She analyzes earnings for males aged 60 or older for 30 successive birth year cohorts (1912-1941), and the available official data allow her to observe deaths at ages 60-89 (1972-2001).[36] For her measure of SES, Waldron uses positive earnings from ages 45 through 55 for each individual in her sample relative to the

[31] Jennifer B. Dowd and Amar Hamoudi, "Is Life Expectancy Really Falling for Groups of Low Socio-Economic Status? Lagged Selection Bias and Artefactual Trends in Mortality," *International Journal of Epidemiology*, vol. 43, no. 4 (2014), pp. 983-988.

[32] Additionally, measuring earnings over prime working years captures individuals who are likely to have survived long enough to qualify and/or receive Social Security benefits.

[33] Most of the studies discussed in this report measure income using earnings, often Social Security-covered earnings. Earnings, or labor income, is only one component of an individual's or household's income.

[34] Hilary Waldron, "Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status," *Social Security Bulletin*, vol. 67, no. 3 (2007), pp. 1-28.

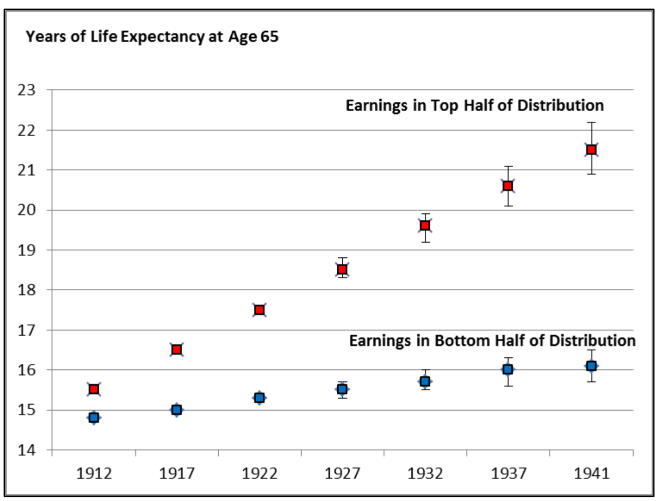
[35] SSA's Continuous Work History Sample (CWHS) is a longitudinal 1% sample of issued Social Security numbers that contains Social Security taxable wages from 1951 to the most recent year. Waldron matches the 2001 CWHS with a 1% sample of SSA's Master Beneficiary Record file and a 1% sample of the Numident (death) file.

[36] Waldron focuses on male earnings and excludes female earnings because women's increasing participation in the labor market during the time period of her data would likely lead to improper classification of women's relative earnings groupings.

national average wage in a given year (i.e., percentile). An individual's annual relative earning values are then averaged over years of nonzero earnings to create a measure of peak lifetime earnings, which she describes as a "rough proxy for socioeconomic status."[37] Men with zero earnings during that time are dropped because Social Security is not able to distinguish between periods of unemployment and earnings not covered by Social Security.

Figure 3 provides Waldron's estimates of cohort life expectancy at age 65 for male Social Security-covered workers for the 1912-1941 birth cohorts over two segments of the earnings distribution: the bottom half and the top half. The research does not address significant observed changes in the income distribution itself, which implies that the top half of the income distribution may be quite different in composition now than it was before. That is, those who are in the bottom half now may be poorer compared with those in the top half of the earnings distribution. The box-and-whisker plot depicts the 95% confidence interval surrounding the estimates of life expectancy; the widening whiskers show the increasing variance (uncertainty) in later birth cohorts. The life expectancy gap by relative earnings over time is growing. For men born in 1912, those in the top half of the income distribution could expect to live about a year longer than those in the bottom half. For men born in 1941, those in the top half could expect to live 5.3 years longer than those in the bottom half. The bottom half of the income distribution from the 1912 birth year cohort to the 1941 birth year cohort will see little improvement in life expectancy (1.3 years), while the top half will see a considerably larger improvement (6.0 years). Waldron also shows life expectancies at ages 60-90 by year of birth and earnings group.[38] The results reinforce the findings in **Figure 3** of stronger gains in life expectancy at all ages made by those in the top half of the income distribution.

Figure 3. Life Expectancy at Age 65 for Male Workers, by Birth Year and Earnings



Source: Hilary Waldron, "Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status," *Social Security Bulletin*, vol. 67, no. 3 (2007), Chart 3.

Note: This box-and-whisker plot depicts the 95% confidence interval surrounding the estimates of life expectancy.

[37] Hilary Waldron, "Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status," *Social Security Bulletin*, vol. 67, no. 3 (2007), p. 1.

[38] Table 4 of Waldron's 2007 study provides detailed results by ages 60, 65, 70, 75, 80, 85, and 90, for the top and bottom half of the income distribution.

Waldron asserts that her contribution lies in being able to show that a wide swath of the earnings distribution (the bottom half) is experiencing very small gains in life expectancy, a phenomenon not relegated to an extreme low end of the earnings distribution. This finding is consistent with other research that shows that it is not just those at the lowest end of the income distribution who experience small gains in life expectancy.[39] This disaggregation of the earnings distribution into two broad groups is insightful; it shows the existence of a gap, with life expectancy increasing continuously with lifetime earnings.

Among the limitations of this study, Waldron acknowledges that her final results may not be representative of the population for various reasons. For instance, her sample of men must be healthy in order for them to have positive, Social Security-covered earnings from ages 45 to 55.[40] Additionally, the gross income comparison groups used by Waldron—the top half compared with the bottom half of the earnings distribution—do not allow for nuanced conclusions about life expectancy trends (i.e., they may conceal heterogeneity within these groups). Waldron also employs assumptions in her life expectancy projections that more recent birth cohorts follow recent mortality patterns, which may or may not be accurate.

Expanding on the work of Waldron, Julian Cristia's 2009 study[41] analyzes the lifetime earnings of both men and women during the 1983-2003 period when the sample is aged 35-75.[42] This study defines lifetime earnings in a given year as the average of each individual's earnings over a period of time, using a time lag.[43] This work also finds increases in life expectancy differentials across lifetime earnings groups during the period of study. Cristia uses data from the U.S. Census Bureau's 1984, 1993, 1996, and 2001 Survey of Income and Program Participation (SIPP)[44] panels matched to earnings, benefit, and mortality data from SSA and earnings data from the Internal Revenue Service (IRS). He estimates life expectancy at various ages using a period approach that is based on sample mortality rates as well as estimates of mortality after age 75.

Cristia finds a substantial increase in the differentials in life expectancy between top and bottom lifetime earnings quintiles. For men, this top-to-bottom life expectancy differential increased over this period by about 30%, from 2.7 years to 3.6 years. For women, it doubled, from 0.7 years to 1.5 years. This study is subject to some of the same limitations as Waldron (2007), including the use of assumptions regarding future mortality patterns as well as just two income comparison groups. Additionally, Cristia particularly worries that the exclusion of unhealthy individuals—who are out of the labor force and, thus, not included in his sample due to lack of earnings—might bias the relationship between lifetime earnings and life expectancy. For example, Cristia notes that "[g]iven the post-1964 expansion of transfer programs, a reasonable supposition is that

[39] Waldron's 2007 study cites other research, which finds the link between SES and health to be a gradient (see p. 49).

[40] Although most workers are covered by Social Security, not all workers are. Certain state and local government workers, who have coverage under their employers' retirement systems, comprise the largest group of noncovered workers.

[41] Julian Cristia, *Rising Mortality and Life Expectancy Differentials by Lifetime Earnings in the United States*, Inter-American Development Bank, Working Paper 665, Washington, DC, January 2009, http://www.iadb.org/res/publications/pubfiles/pubWP-665.pdf.

[42] Cristia's sample contains 130,000 individuals, aged 35 to 75, observed annually over a 26-year period (1978-2003).

[43] As Cristia notes, the average earnings calculation varies depending on age: "For individuals older than 53, earnings from age 41 to 50 are used to capture years when the person was most closely attached to the labor market. For younger individuals, averages ranging from 5 to 10 years were computed without including the immediately preceding three years (e.g., for individuals aged 43, earnings from age 31 to 40 are used)" (see p. 11).

[44] For information on the SIPP, see http://www.census.gov/sipp/.

such programs siphoned off from the labor force chronically ill persons with a higher than average probability of death."[45]

The Congressional Budget Office (CBO) has also studied the life expectancy income gap. For example, a 2014 CBO study[46] uses a detailed model, the Congressional Budget Office Long-Term (CBOLT) microsimulation model, with data on a representative sample of individuals that simulates demographic and economic outcomes for that population over time. This model also incorporates SSA administrative data, with additional demographic and economic data matched using the SIPP, the Health and Retirement Study (HRS),[47] and the Current Population Survey (CPS).[48] Like the other research discussed here, results of the CBOLT microsimulation model depend on the accuracy of its underlying assumptions; for example, assumptions about future mortality patterns.

Based on this CBOLT modeling and analysis, CBO estimates that period life expectancy at age 65 will continue to increase, but at a higher rate for those individuals with higher lifetime earnings. CBO compares today's life expectancy and lifetime earnings to life expectancy and earnings in the year 2039, and determines that, in 2014, a 65-year-old man in the upper lifetime earnings quintile is expected to live more than three years longer than someone with the same observable characteristics in the lowest lifetime earnings quintile. A similar trend exists for women: in 2014, a 65-year-old woman in the upper lifetime earnings quintile would be expected to live more than one year longer than this same woman in the lowest lifetime earnings quintile. In the year 2039, CBO projects that a 65-year-old man with higher lifetime earnings will live around six years longer than a 65-year-old man in the lower income quintiles, while a 65-year-old, high-earning woman will live around three years longer than a 65-year-old, low-earning woman.

Another recent study of life expectancy in the United States, conducted by the National Academy of Sciences (NAS), draws the same general conclusions about a growing gap in life expectancy for both men and women. This 2015 NAS study[49] uses biennial waves of HRS data over 1992-2008, matched to SSA records to compare life expectancy between the cohort born in 1930 and the cohort born in 1960. This study defines lifetime earnings as average, nonzero, Social Security-reported household earnings for individuals aged 41-50. This NAS study estimates cohort life expectancy at age 50 for the two birth cohorts studied. Projections are used to calculate life expectancy when mortality cannot be observed for younger individuals in the sample (i.e., after 2008), which means that morality is estimated for the 1930 birth cohort after age 78 and for the entire 1960 birth cohort. As with Waldron's 2007 study, because individuals must be healthy in order to have positive earnings from ages 41-50, the results of this analysis may not be generalizable to the entire population.

According to the NAS, for both the 1930 and 1960 birth cohorts, life expectancy, when calculated at age 50, for men increased as income rose—and the gap between the bottom and top income quintiles more than doubled between the two cohorts. (See **Figure 4**.)[50] The study finds that men

[45] Julian Cristia, *Rising Mortality and Life Expectancy Differentials by Lifetime Earnings in the United States*, Inter-American Development Bank, Working Paper 665, Washington, DC, January 2009, http://www.iadb.org/res/publications/pubfiles/pubWP-665.pdf, p.21.

[46] Congressional Budget Office, *The 2014 Long-Term Budget Outlook*, July 2014, https://www.cbo.gov/publication/45471.

[47] For information on the HRS, see http://hrsonline.isr.umich.edu/.

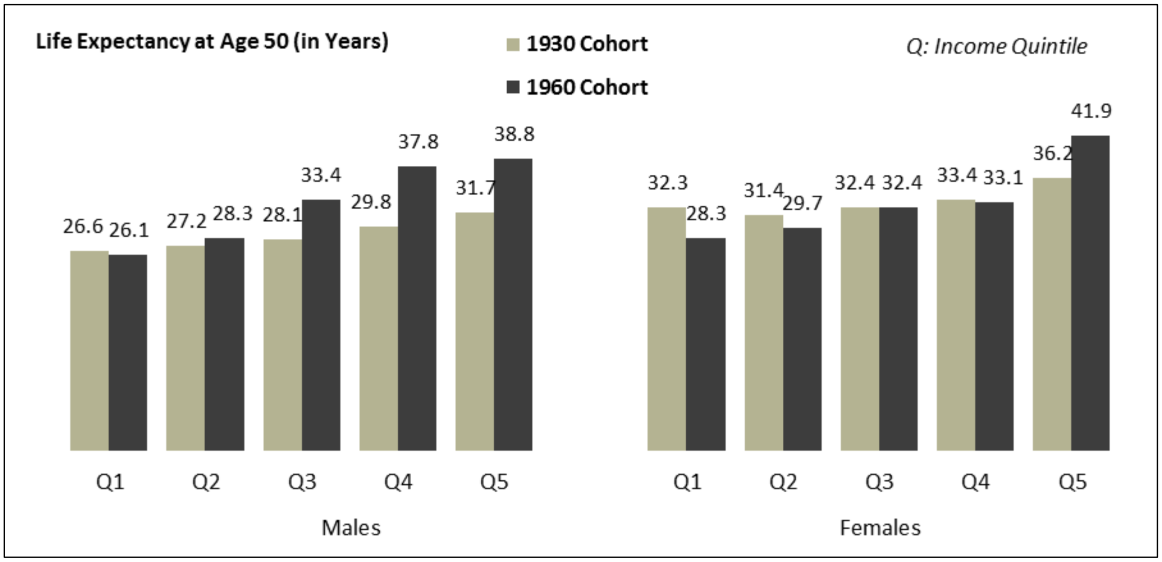
[48] For information on the CPS, see http://www.census.gov/programs-surveys/cps.html.

[49] National Academies of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015).

[50] The study's authors acknowledge the increasing dispersion in income in the United States in recent decades, but note (continued...)

in the bottom income quintile born in 1930 could expect to live an average of 26.6 additional years at age 50 (an expected age of death at 76.6), yet there has been no gain in life expectancy for men in the bottom quintile born in the 1960 cohort (life expectancy at age 50 is 26.1 years, so an expected age of death at 76.1). The top income quintile of men, however, has experienced increases in life expectancy: for the 1930 cohort, life expectancy at age 50 was 31.7 additional years, while for the 1960 cohort, it rises to 38.8 additional years. Thus, the gap in life expectancy at age 50 between men in the lowest and highest income quintiles has risen from 5.1 years for the 1930 cohort to 12.7 years for the 1960 cohort. Growth in the life expectancy gap over this time period is driven primarily by longevity gains among men in the top income quintile, but a small decline in longevity among men in the bottom quintile is also a contributing factor.[51]

Figure 4. Life Expectancy at Age 50 for Males and Females Born in 1930 and 1960, by Income Quintile



Source: National Academy of Sciences, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015), Figure 3-2.

Notes: Cohort life expectancy estimates calculated using observed sample mortality where possible and projected mortality for younger sample individuals (i.e., older than age 78 for the 1930 birth cohort and for the entire 1960 birth cohort).

For women, the pattern is generally similar: across the two cohorts, the life expectancy gap between the bottom and top income quintiles also increased, and there was evidence of a decline in life expectancy for the lowest two income quintiles. (See **Figure 4**.) The NAS authors estimate that the life expectancy gap between the bottom and top income quintiles of women expanded

(...continued)

that they do not discuss what bearing this may have on the widening gap in life expectancy. See CRS Report R44705, *The U.S. Income Distribution: Trends and Issues*, for a description and analysis of the changes in the income distribution.

[51] The NAS authors propose several possible explanations for this trend, including (1) greater relative deprivation for individuals in the bottom quintile over time due to increases in income inequality over time; (2) inequality itself negatively impacting health and leading to higher mortality for lower quintiles; and (3) education as a factor driving both disparities in income as well as disparities in health. See discussion on pp. 53-55 of National Academies of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015).

from 3.9 years in the 1930 birth cohort to 13.6 years in the 1960 birth cohort. The authors note that, although the findings for women are more pronounced than those for men, these results are less reliable (i.e., because significant changes in women's labor force participation over this period affected the composition of the female sample).[52]

A 2016 study by the Brookings Institution[53] also analyzes income inequality among the 50-and-older population and the growing longevity gap between income groups. This study analyzes demographic data from two large public use surveys, the HRS and the SIPP, that have been matched to Social Security administrative data on earnings, benefits, and dates of death.[54] The authors calculate study cohort life expectancy given survival to age 50 based on mortality risk projections for the sample. Like other research, this study employs simplifying assumptions about future mortality risks, which may or may not be accurate. Additionally, like the previously discussed Waldron study, the sample includes only years of positive, Social Security-covered earnings, which has the potential to exclude workers with poor health and higher mortality risk.

Figure 5 shows life expectancy by income decile for men and women as observed in the SIPP dataset. According to **Figure 5**, men in the lowest income decile born in 1920 could expect to live to be about 74.3 years old, compared with about 79.3 years for men in the top income decile. The life expectancy gap by income grows with time. For men born in 1940, those in the lowest income decile could expect to live to be about 76, compared with 88 for those in the topmost income decile. Thus, among men the gap in life expectancy between the bottom and top income deciles grew from five years for those born in 1920 to 12 years for those born in 1940.[55]

For women, the results from the Brookings study show no rise at all in life expectancy for those in the lowest income decile. For example, women in the lowest income decile born in 1920 could expect to live to 80.4, whereas those in the highest income decile could expect to live to 84.1 (**Figure 5**). For the 1940 birth cohort, women in the lowest income decile show no gains in life expectancy relative to the 1920 cohort, whereas those in the top income decile could expect to live to 90.5, gaining 6.4 years.[56] In tables (not shown here) in the Brookings study, one can examine other deciles in the income distribution, not just the two ends. Results for both men and women confirm that the gains in life expectancy are skewed toward those with higher incomes.

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[52] Ibid, p. 52. For the birth cohorts used in this analysis, in comparison with men, women's lower levels of labor force participation, as well as variations in labor force participation across subgroups of women (e.g., marital status, income, and race), complicate interpretation of results. For a general discussion of trends in women's labor force participation, see CRS Report R44055, *An Overview of the Employment-Population Ratio*.

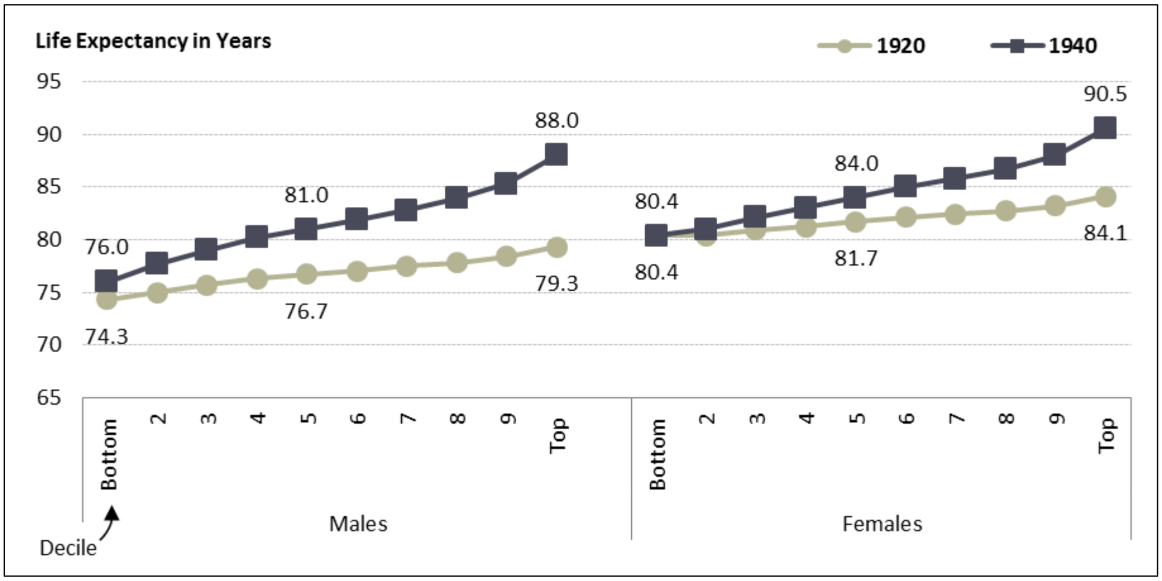
[53] Barry Bosworth, Gary Burtless, and Kan Zhang, *Later Retirement, Inequality in Old Age, and the Growing Gap in Longevity Between Rich and Poor*, Brookings Institution, Washington, DC, 2016.

[54] The sample used for this study includes individuals born between 1910 and 1950 (SIPP) or 1957 (HRS). The authors construct an average measure of past earnings based on each worker's real nonzero earnings in the age range of 41-50. They then impute workers' earnings above the Social Security taxable wage base and construct a relative earnings measure by measuring individual earnings relative to the average midcareer earnings of adjacent birth year cohorts. They combine the earnings of husbands and wives to produce a household earnings measure; for individuals without a spouse, they use individual earnings.

[55] Similar results are shown with the HRS, although the changes are a bit smaller in magnitude than the SIPP results. In the HRS sample, although men's overall life expectancy, given survival to age 50, was slightly lower for both birth cohorts than in the SIPP sample, the life expectancy gap grows to be quite large. The gap in life expectancy between men, given survival to age 50, at the bottom and top income deciles grew from six years for the 1920 cohort to 11 years for the 1940 cohort.

[56] The HRS sample shows a slight drop in life expectancy, given survival to age 50, for women in the lowest income decile and a gain of four years for those in the top decile.

Figure 5. Life Expectancy for Males and Females Born in 1920 and 1940, by Income Decile



Source: Barry Bosworth, Gary Burtless, and Kan Zhang, *Later Retirement, Inequality in Old Age, and the Growing Gap in Longevity Between Rich and Poor*, Brookings Institution, Washington, DC, 2016, Table IV-4.

Note: Cohort life expectancy estimates calculated assuming survival to age 50 and using projected mortality risks.

In a 2016 study, Raj Chetty et al.[57] also examine life expectancy across time in the United States. The authors examine federal income tax data matched with SSA records for individuals aged 40-76 during the 1999-2014 period. They calculate life expectancy using a period approach with mortality rates for ages 40-76 estimated based on sample mortality as well as mortality rates for older ages that are projected using modeling techniques. They document that higher income (as measured by pretax household earnings at age 61 for individuals aged 63 and older) is associated with higher period life expectancy throughout the income distribution. For the 2001-2014 period, they find a life expectancy gap between the bottom 1% and top 1% of 14.6 years for men and 10.1 years for women. They categorize this life expectancy gap as increasing in size above the lowest two percentiles, but with smaller gains in life expectancy at higher income levels.[58]

In addition, Chetty et al. conclude that this life expectancy gap increased over the 2001-2014 time period: life expectancy for the top 5% of men increased by 2.34 years (2.91 years for the top 5% of women), but for the bottom 5% of men life expectancy increased only by 0.32 years (0.04 years for the bottom 5% of women).

Among the limitations of this study, the authors rely on assumptions about future mortality patterns. The authors also recognize that the relationship between income and life expectancy is

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[57] Raj Chetty, Michael Stepner, and Sarah Abraham, et al., "The Association Between Income and Life Expectancy in the United States, 2001-2014," *Journal of the American Medical Association*, vol. 315, no. 16 (2016), pp. 1750-1766.

[58] For instance, Chetty et al. provide the following illustration of this concept: "For example, increases in income from $14,000 to $20,000 (the 10th vs the 14th income percentiles), $161,000 to $224,000 (the 90th vs the 95th income percentiles), and $224,0000 to $1.95 million (the 95th vs the 100th income percentiles) were all associated with approximately the same difference in life expectancy (i.e., an increase of 0.7-0.9 years, averaging men and women)" (p. 1753).

likely confounded by other unmeasured factors that affect health; this relationship may thus be overstated.

Implications for Social Security Benefits

The Social Security program provides monthly benefits to retired workers and their dependents, disabled workers and their dependents, and survivors of workers. Benefits available to dependents of retired, disabled, or deceased workers are known as "auxiliary benefits." All benefits are inflation-adjusted for life. Approximately 94% of workers are covered, and their earnings (up to a taxable maximum) are subject to the Social Security payroll tax. Workers and their employers pay these taxes over their working years. After meeting eligibility requirements, Social Security beneficiaries may claim benefits.[59]

In February 2017, roughly 61 million beneficiaries received a total of $76 billion in Social Security benefit payments, and the average monthly benefit was $1,250.[60] Approximately 42 million were retired workers receiving an average monthly benefit of $1,364. Life expectancy—which can vary by year of birth and by income, as just shown—is a key factor in both the number of years a worker paid taxes into the system and the number of years of benefit receipt. This section discusses the impact of gaps in life expectancy by income on lifetime receipt of Social Security retirement benefits, which includes retired worker and dependent benefits available at retirement.[61]

Full monthly benefits are payable at the full retirement age (FRA), which is age 66 for those born between 1943 and 1954 and will rise to 67 for later cohorts. Individuals are eligible for retired worker benefits if they have 10 years of covered earnings. Retired worker benefits may be claimed as early as age 62, known as the earliest eligibility age (EEA). Benefits are permanently reduced if claiming before the FRA. Benefits are increased (i.e., delayed retirement credits [DRC] apply) if claiming past the FRA, up to age 70. There is no additional increase in benefits if claiming past age 70. For example, for a person with a FRA of 67, claiming at age 62 brings a 30% reduction of the unreduced monthly benefit. Conversely, for those who claim at age 70, benefits increase by 24% of the unreduced monthly benefit. The adjustments to claiming before and after the FRA are designed to be actuarially equivalent for those with average life expectancy. These are calculated to provide approximately the same total value of lifetime benefits for those with average life expectancy regardless of the age when one claims benefits.

Social adequacy is a key goal of the Social Security program. It entails providing basic income support to all covered workers and their dependents, helping to mitigate the financial impacts of retirement, disability, and death. A long-standing objective of the program in this context is to be progressive by awarding higher replacement rates of lifetime earnings for low-earning workers than for high-earning workers. The underlying rationale for this progressivity is that higher earners typically have greater access to other forms of retirement savings by way of employer pensions and private savings.

The other key goal of the Social Security program is individual equity. The program serves this goal by tying benefits to a worker's earnings history and being available to beneficiaries without evidence of need. Also, the benefit formula provides higher benefits to higher earners. Whether

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[59] See CRS Report R42035, *Social Security Primer,* for a description of the Social Security program.

[60] See https://www.ssa.gov/policy/docs/quickfacts/stat_snapshot/index.html?qs#table2, accessed on April 11, 2017.

[61] Some studies include retired worker benefits only and exclude dependent spouse and survivor benefits. See the 2011 study by Shah, Shoven, and Slavov discussed later in the section.

the program maintains a fine balance in meeting the twin goals of social adequacy and individual equity has been a matter of debate.[62]

Progressivity is built into the Social Security benefit formula—that is, monthly Social Security benefits replace less of lifetime career average monthly earnings for higher earners than for lower earners. In order to calculate the full monthly benefit amount, known as the Primary Insurance Amount (PIA), past earnings are indexed to wages, and then converted to a monthly average known as the Average Indexed Monthly Earnings (AIME). A progressive formula converts the AIME into the PIA. In 2017,

> PIA = 0.90 (first bend point of $885) + 0.32 (second bend point of $5,336) + 0.15 (AIME greater than $5,336).

The formula provides individuals with lower career-average earnings monthly benefits that replace a higher percentage of their career-average earnings than for those with higher career-average earnings.[63] The dollar values are called "bend points" because when the PIA formula in shown in a graph, there are three line segments, and the dollar values represent the bends. These bend points are adjusted annually to the average wage index. A worker with AIME of $885 will have her monthly retired worker benefits replace 90% of her monthly earnings. As AIME rises, the replacement rate declines, as seen in the formula, which has a replacement, rate of 32% of monthly earnings that fall between $885 and $5,336. For earnings above $5,336, benefits replace only 15% of monthly earnings. Redistribution occurs because the rate of return on lifetime contributions to Social Security declines, the higher the earnings. There is a cap on earnings subject to Social Security tax, limiting the amount of benefits received. For a worker retiring at FRA in 2017, the maximum retired worker benefit is $2,687.[64]

One measure of adequacy of the program is this replacement rate, or the percentage of career-average earnings that Social Security benefits will replace. SSA's Office of the Chief Actuary calculates replacement rates for five hypothetical worker profiles: those with very low earnings, low earnings, medium earnings, high earnings, and maximum earnings.[65] The replacement rates for workers born in 1950 who retire at the FRA, for example, are 76%, 55%, 41%, 34%, and 27% for the lowest- to highest-earning workers, respectively. These reflect the progressivity in the design of the benefit formula.

However, the Social Security program includes both contributions and benefits. Therefore, when researchers measure whether the program is progressive, they typically compare lifetime benefits to lifetime payroll taxes. Common measures include the ratio of lifetime benefits to lifetime taxes; net benefits or the net present value (NPV),[66] which is the difference between the present

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[62] *Social Adequacy and Individual Equity in Social Security*, Issue Brief, American Academy of Actuaries, January 2004.

[63] The unreduced benefit, called the Primary Insurance Amount (PIA), for a worker with average indexed monthly earnings of $6,000, for example, is calculated as follows: [0.9(885) + 0.32(5,336-885) + 0.15(6,000-5,336)]=$2,320.42. The PIA would be rounded down to $2,320.40. See CRS Report R43542, *How Social Security Benefits Are Computed: In Brief*. The maximum monthly benefit amount for a worker who claims benefits at FRA and who had steady earnings at the taxable maximum for his full work history is $2,687 in 2017.

[64] See https://www.ssa.gov/news/press/factsheets/colafacts2017.pdf.

[65] Social Security Administration, Office of the Chief Actuary, *Replacement Rates for Hypothetical Retired Workers*, Actuarial Note Number 2016.9, June 2016, Table C. The levels of earnings are a percentage of the Average Wage Index (AWI; $49,121 for 2016). The medium earner is at the AWI, whereas the very low, low, and high earners are at 25%, 45%, and 160% of the AWI, respectively. The maximum earner has earnings at or above the contribution base (the taxable maximum was $118,500 in 2016) for her earnings history.

[66] Present value is defined as the current worth of a future sum of money or stream of cash flows given a specified rate (continued...)

value of lifetime benefits and lifetime payroll taxes; and the internal rate of return (IRR), which can be described as the rate of return on lifetime payroll taxes. If any of these measures—the lifetime benefit to lifetime tax ratio, NPV, or IRR—is higher for lower earners than for higher earners, then the program is considered to be progressive.

Variation in life expectancy can weaken the basic progressivity built into the Social Security benefit formula. Life expectancy determines the number of years a person receives benefits, and this varies significantly by worker. Consider, for example, workers of the same age with identical lifetime earnings profiles who claim benefits at the same age. They will receive identical initial monthly Social Security benefits. However, the value of their lifetime *gross* Social Security benefits can be quite different depending on their individual life expectancies. Individual life expectancy also affects *net* Social Security benefits, which account for taxes paid into the program. For example, the rate of return on one's contributions that compares the present value of a stream of benefits received to the present value of taxes paid during one's working years will be affected by life expectancy, which determines the number of years in which benefits are claimed. Social Security currently makes no adjustments in its initial benefit formula for any variation in individual life expectancy. If life expectancy varies by income, then lifetime Social Security benefits will vary as well. Progressivity that is based on the value of lifetime Social Security benefits and contributions may be undermined. A life expectancy gap by income that is growing will further undermine the redistributive nature of the current Social Security benefit formula.

Research from a few decades ago looked at the question of whether gaps in life expectancy have a significant impact on progressivity of Social Security lifetime benefits. Although it was common knowledge that life expectancy tends to be higher for higher-income groups, lack of data limited research on the size of the impact of differential mortality. In an early study, researchers using Social Security earnings and benefit records found that higher life expectancy for higher-income individuals indeed does reduce progressivity but does not reverse the broad conclusion that Social Security retirement benefits continue to be strongly progressive. For example, without any adjustments for mortality, men in the low-income group earned a rate of return on their lifetime contributions to Social Security that was 1.24 percentage points higher than that of men in the highest-income group. With adjustments for mortality, this difference shrank to just 1.13 percentage points.[67]

Recent Evidence

Using newer evidence on mortality differentials that have continued to widen, researchers in recent years have been able to provide estimates of how these differentials affect receipt of Social Security benefits. Each of the studies discussed below makes specific assumptions about how earnings, Social Security benefits, life expectancy, and other related variables are measured and projected. Their results are contingent upon their assumptions and methods. Despite the limitations and drawbacks that these assumptions and methods pose, there is general consensus among these studies that higher earners, with their greater gains in life expectancy, can expect to

(...continued)

of return.

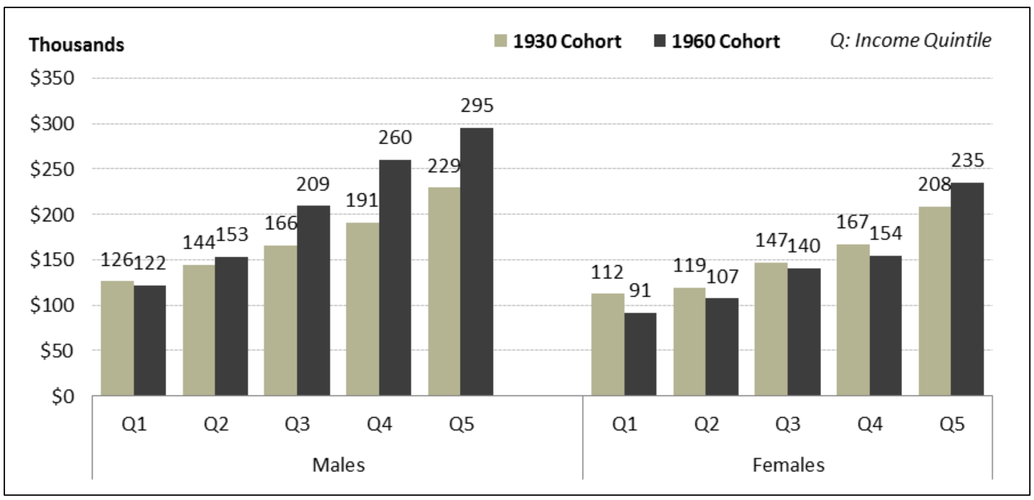
[67] For a discussion of earlier research and estimates of impact of differential mortality on an early cohort of Social Security beneficiaries born between 1917 and 1922, see James E. Duggan, Robert Gillingham, and John S. Greenlees, *Progressive Returns to Social Security: An Answer from Social Security Records*, U.S. Treasury, Research Paper No. 9501, November 1995, https://www.treasury.gov/resource-center/economic-policy/Documents/rp9501.pdf.

collect higher monthly benefits over an increasingly longer period of time, compared with the lower-earning, shorter-lived segments of the population.

The NAS study discussed previously[68] provides estimates of the distribution of lifetime Social Security benefits. These estimates consider only gross lifetime benefits and not contributions to Social Security. Individuals are assigned to lifetime income quintiles based on an average measure of midcareer earnings. The earnings measure is the average of nonzero earnings over ages 41 to 50.[69] Earnings above the taxable maximum are estimated based on the month in which the cap is reached. Lifetime income is adjusted for married couples. For individuals who are part of a couple, their lifetime income is adjusted for a two-person household by dividing the sum of their earnings by an equivalence scale.[70] The study compares outcomes for the 1930 birth cohort with those of the 1960 cohort. Social Security benefits are simulated for each cohort—assuming benefits are claimed at the EEA and taking into account their estimated life expectancies—and their present values are estimated at age 50 for each individual. (Present value, or present discounted value, is the current worth of a future stream of benefits.) As described earlier, in estimated life expectancy, mortality projections are used for younger individuals in the sample (i.e., for the 1930 birth cohort after age 78 and for the entire 1960 birth cohort).

Figure 6. Average Lifetime Social Security Benefits for Males and Females Born in 1930 and 1960, by Income Quintile

(in thousands of real 2009 dollars)



Source: National Academies of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015), Figures 4-5 and 4-6.

Note: Underlying cohort life expectancy estimates calculated using observed sample mortality where possible and projected mortality for younger sample individuals (i.e., older than age 78 for the 1930 birth cohort and for the entire 1960 birth cohort).

[68] National Academies of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015).

[69] The authors note that their choice of earnings is reasonable given that their goal is not to estimate rates of return, but to assess how changing life expectancy gaps affect receipt of lifetime benefits.

[70] For married persons, household earnings are summed and adjusted for household equivalence by dividing by the square root of 2. The needs of a household grow with its size but not in direct proportion. Equivalence scales allow for assigning the needs of a household to its size. One scale used by the Organisation for Economic Co-operation and Development divides household income by the square root of household size.

Figure 6 shows the present value of Social Security benefits at age 50, adjusted for life expectancy for males and females, by earnings quintiles. For both the 1930 and 1960 cohorts, benefits increase with earnings. Although the Social Security benefit computation formula allows for lower earners to earn a higher replacement rate than higher earners, their dollar value of benefits received is lower because benefits increase with earnings. From **Figure 6**, males born in 1930 who are in the bottom earnings quintile receive $126,000 (in 2009 dollars) in lifetime benefits, compared with $229,000 for males in the highest earnings quintile, a difference of $103,000. The lowest earnings groups in the NAS study have seen little or no improvements in life expectancy. As a result, males born in 1960 who are in the bottom earnings quintile see their benefits stay flat at about $122,000, roughly the same as the 1930 cohort. Males in the highest earnings quintile—who can expect to live about seven years longer than those in the 1930 cohort—can expect to receive $295,000 in benefits, almost $173,000 more than those in the lowest earnings quintile. In short, gains in life expectancy increase the difference between the top and bottom earnings quintiles from $103,000 for the 1930 cohort to $173,000 for the 1960 cohort. The increase in benefits is not confined to the highest earnings quintile. For men, the third and fourth earnings quintiles also see significant gains in benefits compared to those in the two lowest earnings quintiles.

Figure 6 shows the same general pattern in lifetime benefits for females.[71] These benefits include dependent spouse and survivor benefits. Like males, the difference in lifetime Social Security benefits for females between the lowest and highest income quintiles is larger for the 1960 cohort than for the 1930 cohort. The gains in benefits are most pronounced at the highest earnings quintile—from the 1930 cohort to the 1960 cohort, females in the top quintile see their benefits increase from $208,000 to $235,000.

These NAS figures show that Social Security retirement benefit differentials by earnings have grown between the 1930 and 1960 cohorts for both men and women, driven by gains in life expectancy skewed to those with higher earnings. The increased differential is not just concentrated at the very top earnings quintile. Rather, it is observed at all but the bottom two-fifths of the earnings distribution. These two bottom quintiles have experienced either a tiny decline or very small life expectancy gains.

Another prominent study, the 2016 Brookings report discussed earlier,[72] looks at the impact of estimated differences in life expectancy for the 1920 and 1940 birth cohorts on the distribution of lifetime Social Security retirement benefits. The results reported here are based on Brookings's tabulations of data from the Census Bureau's SIPP, which are matched to Social Security earnings and benefit records.[73] Similar to the NAS study discussed earlier, individuals are assigned to household earnings deciles based on midcareer earnings, and adjustments to earnings are made for married couples. As described earlier, in this study males in the top earnings decile in 1940 gain about 8.7 years in life expectancy, given survival to age 50, compared with the 1920 cohort. Those in the lowest earnings decile gain only about 1.7 years. The steep lines in **Figure 7** show the strong positive relationship between life expectancy gains and increases in expected

[71] A. J. Auerbach, et al., *How the Growing Gap in Life Expectancy May Affect Retirement Benefits and Reforms*, National Bureau of Economic Research, W23329, April 2017, summarizes many of the NAS study findings. The study states that it does not discuss the results on females because estimates of mortality differences by income for females are often seen as less reliable.

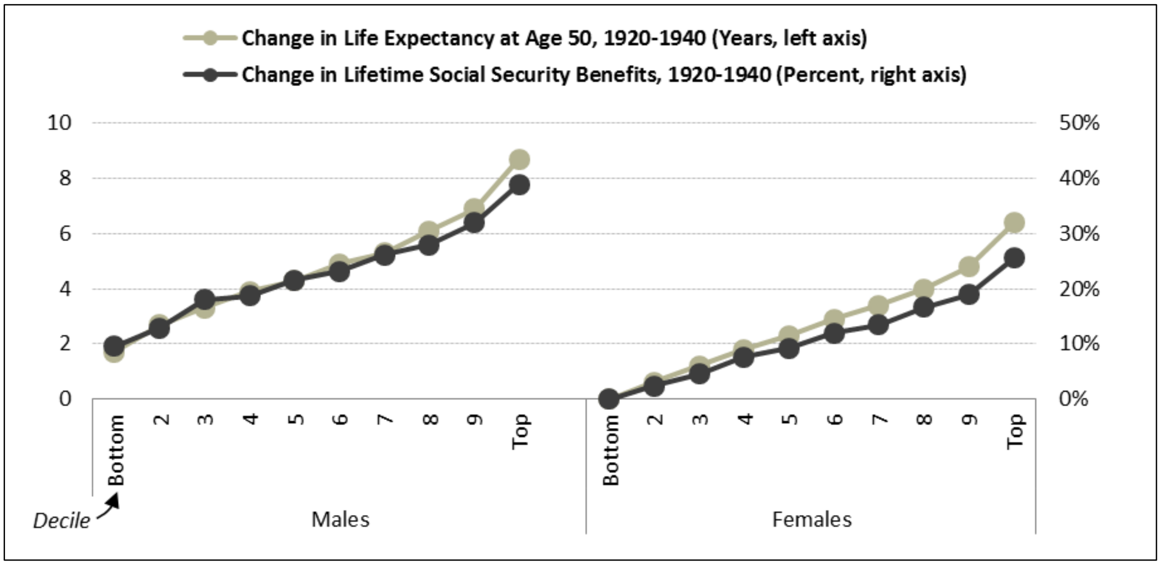
[72] Barry Bosworth, Gary Burtless, and Kan Zhang, *Later Retirement, Inequality in Old Age, and the Growing Gap in Longevity Between Rich and Poor*, Brookings Institution, Washington, DC, 2016.

[73] The authors also report results from the Health and Retirement Study (HRS), which are similar to those based on the SIPP. HRS-based results are not discussed here.

lifetime Social Security retirement benefits. Comparing males born in 1940 with those born in 1920, expected Social Security lifetime benefits increase by 10% for the bottom earnings decile, about 24% for the sixth earnings decile, and 40% for the topmost earnings decile. Females in the top earnings decile in 1940 gain about six years compared with the 1920 cohort. There is no increase in life expectancy for women in the lowest earnings decile. Thus, there are no expected Social Security lifetime benefit increases for this decile. Benefits for females increase by 12% for the sixth earnings decile and 26% for the topmost earnings decile.

The underlying data in the study show that the highest earnings decile of the 1940 male cohort receives 3.3 times the Social Security benefits of the lowest earnings decile, compared with the highest earnings decile in the 1920 cohort receiving 2.6 times the Social Security benefits of the lowest earnings decile. (All benefit amounts are in 2005 dollars.) For females, the gains in benefits are compressed. The highest earnings decile in the 1940 cohort receives 1.9 times the benefits of the lowest earnings decile, compared with a disparity of 1.5 times for the 1920 cohort. Like the NAS findings, **Figure 7** shows longevity gains resulting in a widening of differentials in Social Security lifetime retirement benefits by earnings.

Figure 7. Change in Life Expectancy and Percentage Change in Lifetime Social Security Benefits for the 1920 and 1940 Birth Cohorts, by Earnings Deciles



Source: Barry Bosworth, Gary Burtless, and Kan Zhang, *Later Retirement, Inequality in Old Age, and the Growing Gap in Longevity Between Rich and Poor*, Brookings Institution, Washington, DC, 2016, Table IV-6.

Notes: Numbers based on Brookings authors' tabulations using data from the Survey of Income and Program Participation panels (1984, 1993, 1996, 2001, and 2004) matched to SSA earnings and benefit data. Earnings deciles are based on distribution of midcareer household earnings. Cohort life expectancy estimates calculated assuming survival to age 50 and using projected mortality risks. Lifetime Social Security benefits are the product of remaining life expectancy at age of first benefit receipt and average of the benefit values reported in the SSA benefit records. Benefits are measured in 2005 dollars.

A 2016 GAO study[74] reports similar results of widening differentials in Social Security retirement benefits by earnings. The authors use the SSA "Quick Calculator" to estimate lifetime retirement benefits (excluding survivor benefits) for hypothetical individuals using SSA's average life

[74] Government Accountability Office, *Shorter Life Expectancy Reduces Projected Lifetime Benefits for Lower Earners*, GAO-16-354, March 2016.

expectancy estimates and compare them with benefits based on life expectancies for males estimated by Waldron's 2007 study.[75] Income percentiles are based on the 2015 CPS, and Social Security benefits are initially unadjusted for present value. GAO finds that lower-income (25th-percentile) males see a projected reduction in lifetime Social Security benefits of about 11% to 14% compared to what they would have received if they had average life expectancy. Higher-income (75th-percentile) males see an increase in lifetime Social Security benefits of about 16% to 18% compared to those with average life expectancy. Differential life expectancy results in smaller (bigger) estimated lifetime Social Security benefits for lower- (higher-) income groups relative to those with average life expectancy with present value adjustments as well.

In a 2011 study, Gopi Shah Goda, John Shoven, and Sita Slavov[76] examine the progressivity of Social Security explicitly for retired worker benefits when differential mortality patterns are taken into account. They use two metrics: (1) the net present value (NPV), which is the difference between the present discounted value of expected Social Security cash inflow and outflow, assuming a "safe" rate of return (e.g., 2%); and (2) the internal rate of return (IRR), which can be interpreted as the rate of return earned in the aggregate by individuals within a cohort.[77] Higher NPVs and IRRs represent more favorable outcomes. They use SSA's Benefits and Earnings Public-Use File, 2004, which has earnings histories and other data on a 1% sample of December 2004 beneficiaries.[78]

The authors find that (1) women generally have higher IRRs and NPVs than men because of their longer life expectancies and lower earnings and (2) later cohorts (e.g., 1931 to 1939) have higher IRRs and NPVs than earlier cohorts (e.g., 1915 and 1923). Additionally, although differential mortality makes a relatively small difference to the IRRs/NPVs among older cohorts, it produces a significantly larger effect for younger cohorts due to greater inequality in mortality, even reversing progressivity, as measured in this study.[79] For instance, the authors find that men in the 75th percentile in the 1931 and 1938 cohorts attain higher IRRs than men in the 25th percentile, when differential gains in life expectancy are taken into account. According to the study, "At least in terms of rates of return, an apparently progressive system becomes regressive."[80] The authors demonstrate that Social Security is no longer progressive for later birth cohorts (i.e., 1931 and 1939) of men due to increases in mortality inequality, while Social Security remains progressive for women.[81]

Research discussed here provides evidence that uneven gains in life expectancy have a significant impact on lifetime Social Security retirement benefits. If the life expectancy gap by income

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[75] Hilary Waldron, "Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status," *Social Security Bulletin*, vol. 67, no. 3 (2007), pp. 1-28. See report section on "The Growing Gap in Life Expectancy by Income: Recent Evidence" for a discussion of Waldron's study.

[76] Gopi Shah Goda, John Shoven, and Sita Slavov, "Differential Mortality by Income and Social Security Progressivity," in *Explorations in the Economics of Aging*, ed. David A. Wise (Chicago: University of Chicago Press, 2011).

[77] Ibid, p. 197. This is the interest rate at which the NPV of Social Security benefits equals zero.

[78] They construct stylized earnings profiles of individuals with earnings at the 25th, 50th, and 75th percentiles, and also study the actual earnings histories of individuals born in 1931-1939. Stylized earnings need to be created because of lack of Social Security annual earnings data from 1937 to 1950.

[79] The authors' findings using SSA data on actual workers are consistent with the results from stylized workers.

[80] Gopi Shah Goda, John Shoven, and Sita Slavov, "Differential Mortality by Income and Social Security Progressivity," in *Explorations in the Economics of Aging*, ed. David A. Wise (Chicago: University of Chicago Press, 2011), p. 199.

[81] Among the limitations of this study are the broad categories used for income (e.g., top half versus bottom half of income distribution), as well as the lack of data on more recent birth cohorts (e.g., baby boomers).

continues to grow, the gap in lifetime benefits between low earners and high earners will continue to widen. The total value of lifetime retirement benefits will continue to increase for high earners, as will their returns to contributions made to the Social Security program, in contrast to the lifetime benefits and rates of return for low earners. Thus, progressivity that considers both lifetime benefits and contributions will likely erode. It is important to note that the discussion here has focused only on retirement benefits (benefits available to workers and their dependents at retirement). The previously discussed 2006 CBO study examined three components of Social Security benefits separately—retired worker, disability, and auxiliary (for dependents of retired, disabled, or deceased workers)—and found that disability and survivor benefits continue to be strongly progressive.[82]

Policy Considerations for Proposals That Increase the Retirement Age

Increasing longevity is an unmistakable sign of progress in a population. Nevertheless, as people live longer, the policy challenge of how to pay for these additional years must be confronted.[83] Increased time spent in retirement exerts immense upward pressure on costs for various public programs. According to the Social Security Chief Actuary,[84] the permanent shift in the age distribution between 2010 and 2030 (primarily because of lower birth rates as well as increased life expectancy) remains the dominant factor accounting for the increased Social Security program cost for the next several decades. Several options exist that would address Social Security's financing challenges. Prominent among these are proposals that slow the growth in benefit expenditures. These include changing the benefit formula, changing how initial benefits are indexed for price changes, and/or changing the retirement age. Other options aim to increase Social Security program revenue by changing the taxation of earnings; these include increasing the payroll tax rate or the taxable maximum. CBO[85] lists various other options commonly proposed by policymakers and analysts to address Social Security's financial imbalance.[86] This CRS report focuses on one kind of proposal; specifically, it discusses options to increase the early or full retirement age.

In the area of retirement policy, a common public policy response to the fiscal pressures of a population living longer and healthier is to propose increases in the retirement ages. A suggested option is to increase the Full Retirement Age beyond 67 given that the population may be able to

[82] Noah Meyerson and John Sabelhaus, "Is Social Security Progressive?" CBO, Economic and Budget Issue Brief, 2006.

[83] A common measure of the overall impact of aging populations on societies is the dependency ratio, which measures the total number of dependents (aged 0-14 and over 65) to the working-age population (aged 16-64). See CRS Report RL32981, *Age Dependency Ratios and Social Security Solvency*.

[84] Stephen C. Goss, "The Future Financial Status of the Social Security Program," *Social Security Bulletin*, vol. 70, no. 3 (2010). The permanent upward shift in Social Security's program cost rate is due mostly to a permanent drop in the birth rate that followed the birth of the baby boomers, and therefore increasing the FRA is not seen as the principal solution to address Social Security funding issues.

[85] CBO, *Social Security Policy Options*, 2015.

[86] Although Social Security is a self-financing program, the Social Security Trust Funds (from which benefits are paid) are expected to be exhausted in 2034, as per the 2016 *Annual Report of the Social Security Board of Trustees* (https://www. ssa.gov/OACT/TR/2016/tr2016.pdf.) If no action is taken to address this impending exhaustion, the Social Security Actuaries project that only approximately three-fourths of full benefits under current law can be paid with incoming payroll tax revenue and income from taxation of Social Security benefits. See CRS Report R42035, *Social Security Primer*.

work to older ages in the future. For those who claim at the FRA, an increase in the FRA results in fewer months of benefits and a reduction in the total amount of lifetime Social Security benefits received. An increase in the FRA reduces benefits.[87] The 1983 Social Security amendments, for example, increased the FRA but not the earliest eligibility age.[88] They increased the penalty for claiming benefits at the EEA. Increases to the FRA were phased-in to allow individuals to adjust by making behavioral responses, such as delaying claiming benefits.

CBO routinely considers a set of changes in the FRA and EEA in its study of Social Security policy options. Various entities have proposals on how to implement a change in the retirement ages, which include increasing the FRA and/or the EEA.[89] For example, most recently, in its 2016 report, the Bipartisan Policy Center Commission on Retirement Security and Personal Savings recommended gradually raising the FRA (to 69) and the maximum benefit age (to 72), both by one month every two years.[90] In the 112th Congress, the Dollar for Dollar Act of 2012 (S. 3673) and the Fiscal Sustainability Act of 2013 (S. 11) proposed increasing the FRA to 69 and the EEA to 64. In the 114th Congress, the Social Security Reform Act of 2016 (H.R. 6489) proposed increasing the FRA to 69 as one in a set of proposals to reform the program. The 2010 National Commission on Fiscal Responsibility and Reform[91] (commonly referred to as the Simpson-Bowles Commission, after its co-chairs) also proposed increasing both the EEA and FRA, adjusting future increases to changes in longevity, and allowing for a hardship exemption, thereby protecting workers from the effects of an increase in retirement ages. By about 2070, under their proposal, the EEA would reach 64 and the FRA would reach 69 for most workers.

Estimated Impacts of Policy to Increase Earliest Eligibility Age and Full Retirement Age

This section describes recent research that estimates the impact that the growing gap in life expectancy can have on policy proposals that would increase retirement ages. It briefly discusses the limitations of a hardship threshold that is often suggested in these proposals to mitigate the effects of the growing gap on the low earner who has made little to no gains in life expectancy.

The 2015 NAS study,[92] for example, simulates the policy impact of increasing both Social Security's EEA and the FRA. It considers two mechanisms by which a policy change can affect

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[87] *Distributional Effects of Accelerating and Extending the Increase in the Full Retirement Age*, Social Security Policy Brief 2011-01, January 2011.

[88] See CRS Report R41962, *The Social Security Retirement Age: In Brief*.

[89] Automatic indexing—increasing the FRA automatically with increases in average life expectancy—is another proposed option to confront rising longevity. These proposals can automatically adjust both benefits and taxes paid; however, implementation can be difficult. See Peter Diamond and Peter Orszag, *Saving Social Security: A balanced approach* (Washington, DC: Brookings Press, 2004), for a description of their automatic indexing proposal. In 1998, Sweden implemented life expectancy indexing with automatic adjustments. It incorporated improvements in life expectancy at age 65 into the benefit formula. Germany had life expectancy adjustments indirectly built into its benefit formula. J. A. Turner, *Longevity Policy: Facing Up to Longevity Issues affecting Social Security, Pensions, and Older Workers* (Kalamazoo, MI: Upjohn Institute Press, 2011), provides examples of international experiences with indexing.

[90] Bipartisan Policy Center: *Securing our Financial Future: Report of the Commission on Retirement Security and Personal Savings*, June 2016, http://bipartisanpolicy.org/library/retirement-security/.

[91] National Commission on Fiscal Responsibility and Reform, *The Moment of Truth: Report of the National Commission on Fiscal Responsibility and Reform*, December 1, 2010, http://www.fiscalcommission.gov/news/moment-truth-report-national-commission-fiscal-responsibility-and-reform.

[92] National Academies of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015).

benefits. One is the pure mechanical effect that is a direct outcome of the proposed change (a worker will see a reduction in full benefits if benefits are claimed before the new full retirement age), and the other is a behavioral effect that measures changes in behavior in response to a new policy. For example, a higher retirement age may induce a person to work longer, claim later, or, if eligible, claim disability benefits earlier.

Effect of Proposals to Increase the Earliest Eligibility Age

The first policy simulation discussed in the NAS study (a summary of the data is provided in **Table A-1**) increases the EEA from age 62 to 64. Note that claiming at the EEA reduces one's monthly benefit; however, the longer stream of benefits that begin at the EEA is actuarially fair, on average, when compared to the shorter stream of benefits calculated at the FRA. Under current law, an individual claiming at the EEA of 62 would see a 30% reduction in her monthly benefit compared to what she could have received had she claimed at a FRA of 67. The monthly benefit reduction is smaller the closer one claims to the FRA. Assuming no change in behavior, raising the EEA would have no significant effect on lifetime benefits for most people. Individuals who would otherwise claim at ages 62 or 63 before the policy change would now claim at age 64, the higher EEA, but receive higher monthly benefits (i.e., less reduced benefit) for fewer years when compared with the earlier EEA. Note that this policy change will not affect those who claim at the FRA or higher. However, when life expectancy varies by income, the outcomes of an EEA policy change will not be neutral. When the EEA is increased from the current age of 62 to 64, NAS finds that for both the 1930 and 1960 cohorts, after the policy change, the average lifetime Social Security benefit for the lowest income quintile rises by a modest amount and is close to being actuarially fair. That is, there is no significant change to lifetime benefits for the lowest earnings quintile. Although a majority of those who claim at the EEA tend to have low education (high school or less) and are low earners, a much smaller but sizable group is made up of high earners who also claim at the EEA.[93] For these high earners, the change in expected lifetime benefits is somewhat larger. They receive higher lifetime benefits due to their higher life expectancy. It is not implausible to assume that higher earners are better able to accommodate delaying claiming than the lower earners in the population.[94] Thus, for higher earners, changes in the EEA may allow for higher monthly benefits due both to delayed claiming and increased years of benefit receipt due to high gains in life expectancy.

Increasing the EEA from age 62 to 64 increases the difference in Social Security benefits between the lowest and highest earnings quintiles across the two cohorts. For example, in 1960 for males (females), the gap between the high and low earners was 142% (158%). After simulating the EEA policy change, the gap stood at 145% (162%). This policy simulation shows that an increase in the EEA would skew the distribution of Social Security benefits in favor of high earners.

In her 2013 study, Waldron[95] examines the effects of increasing the EEA using 2008 SSA data files on earnings for individuals born between 1937 and 1945. She discusses policy proposals (for example, the hardship exemption in the Simpson-Bowles Commission's plan) that score an income threshold of hardship. These thresholds are constructed so that workers who fall below

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[93] Melissa Knoll and Anya Olsen, "Incentivizing Delayed Claiming of Social Security Retirement Benefits Before Reaching the Full Retirement Age," *Social Security Bulletin*, vol. 74, no. 15 (2014).

[94] For a discussion of how today's older workers are relatively better educated than earlier generations, see Gary Burtless, *The Impact of Population Aging and Delayed Retirement on Workforce Productivity*, Center for Retirement Research, Boston College, May 2013.

[95] Hilary Waldron, "Mortality Differentials by Lifetime Earnings Decile: Implications for Evaluations of Proposed Social Security Law Changes," *Social Security Bulletin*, vol. 73, no. 1 (2013), pp. 1-37.

this income threshold are expected to be adversely affected by an increase in the EEA and are thus exempted from any change in their EEA. This threshold generally falls at the bottom 20% of the income distribution, with the implicit assumption that only workers below the threshold are not expected to experience gains in life expectancy. Waldron rejects the idea of an income threshold model. She finds that income and mortality are strongly linked even above these hardship thresholds.[96] She estimates mortality differentials at ages 63-71 by lifetime earnings decile and reports that for at least the bottom 80% of the male earnings distribution, the higher the earnings, the lower the mortality risk. Only in the top 20% of the income distribution does the link between mortality and earnings weaken. If an income threshold is to effectively protect individuals who experience relatively modest to no gains in life expectancy from adverse effects of EEA increases, mortality risk must be roughly constant above the hardship income threshold. A simple cutoff of a low income hardship threshold will protect only those who experience almost no gains in life expectancy from EEA policy changes. A graduated income threshold that phases in changes in the EEA may be one potential remedy.

Effect of Proposals to Increase the Full Retirement Age

The rationale for another popular policy proposal, an increase in the FRA, is that with increasing life expectancy, not all the additional years of life should be spent in retirement. Absent any change in claiming behavior, an increase in the FRA would result in a reduction in lifetime benefits for all retirees. NAS, in a second policy experiment in its 2015 study, simulated an increase in the FRA to age 70.[97] The study found that for the 1930 cohort of males, for the lowest income quintile, the increase in the FRA reduces benefits by 25% of baseline benefits, and for the highest income quintile, benefits are reduced by 22%. The ratio of Social Security benefits for the topmost to the lowest quintile rises from 1.82 to 1.88. For the 1960 cohort of males, benefits too fall by 25% for the lowest income quintile and 20% for the topmost quintile, and the ratio of benefits of the topmost quintile to the lowest increases from 1.42 to 1.57. This simulation is able to capture behavioral responses to an increase in the FRA, and the authors find that higher earners are able to delay claiming retirement benefits longer than lower earners, and their longer life expectancy in post-benefit years results in a smaller drop in lifetime benefits. Thus, an increase in the FRA would increase the gap in lifetime benefits by income quintiles.

In their 2016 analysis, Chetty et al.[98] examine IRS income data on individuals aged 40-76 years for the period 2001-2014 to study the association between income and life expectancy. As discussed previously, this study finds that men in the top 1% of the income distribution lived 14.6 years longer than men in the bottom 1% (averaged across years and ages), and life expectancy gaps increased over time. Their most relevant finding for Social Security reform is that life expectancy increased continuously with income and that, according to them, "[t]here was no dividing line above or below which higher income was not associated with higher life expectancy."[99] At increasingly higher levels of income, they report that an increase in income of a given dollar amount produced positive but smaller gains in life expectancy.

Policy proposals that increase the retirement age will tend to skew Social Security benefits toward higher earners. Even if a threshold were adopted that protects very low earners who have

[96] The 2016 Chetty et al. study discussed earlier in the report makes the same claim.

[97] The results for females, not reported here, are not as dramatic.

[98] Raj Chetty, Michael Stepner, and Sarah Abraham, et al., "The Association between Income and Life Expectancy in the United States, 2001-2014," *Journal of the American Medical Association*, vol. 315, no. 16 (2016), pp. 1750-1766.

[99] Ibid., p. 1762.

experienced little to no longevity gains, research discussed here finds that the positive association between life expectancy and income weakens only around the top fifth of the income distribution. It is important to note that women, who on average tend to live longer than men, typically have lower lifetime earnings than men. If a low earnings hardship threshold were adopted to protect low earners from a change in the FRA, this could have the perverse effect of protecting women with a life expectancy advantage while failing to protect many men with somewhat higher earnings but lower life expectancy. Thus, a simple hardship threshold based on low earnings in policy proposals that increase the retirement age will likely not adequately protect all affected by the uneven gains in life expectancy. One potential solution is for proposals to focus on a graduated income threshold that phases out at higher levels of earnings.

The Bipartisan Policy Center, in its 2016 report on retirement security,[100] provides an array of Social Security reform proposals. One of these increases the FRA. The report acknowledges that longevity increases have not been evenly shared across the income distribution, and states that their other policy recommendations of changes to the benefit formula and minimum benefits would more than offset the disproportionately negative impact of raising the FRA on those with lower lifetime earnings.

Conclusion

Recent research documents a substantial and growing gap in life expectancy by income. In comparison with individuals born earlier in the 20th century, cohorts of Americans born more recently are experiencing wider such gaps in life expectancy. That is, individuals with lower lifetime earnings are living shorter lives, on average, than their counterparts with higher lifetime earnings—and this gap has continued to widen over recent decades.

The studies discussed in this report use specific assumptions and methods to measure earnings, Social Security benefits, life expectancy, and other related variables, and necessarily have limitations. Still, the evidence clearly indicates that this growing gap in life expectancy has important implications for Social Security. Specifically, recent evidence shows that higher earners, with their higher-than-average gains in life expectancy, can expect to collect Social Security benefits over increasingly longer periods of time than the lowest-earning groups, who have experienced little to no gains in additional years lived. Public policy proposals that increase the retirement age in response to rising life expectancy and also improve Social Security's financing are quite common. However, these policies would further erode the progressivity of retirement benefits, a long-standing goal of the program, which aims for low lifetime earners to receive a higher return on their lifetime contributions than high lifetime earners. Additionally, life expectancy is found to increase continuously with income, with the link weakening only at the very top of the income distribution. A hardship income threshold, often recommended in retirement age increase proposals to protect the low earner with limited gains in life expectancy, may need to be constructed carefully. There appears to be no simple income cutoff point above which life expectancy gains do not increase with income. Alternatively, other policies may have to be considered simultaneously to mitigate the effects of a higher FRA on low lifetime earners.

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[100] Bipartisan Policy Center, *Securing Our Financial Future: Report of the Commission on Retirement Security and Personal Savings*, June 2016, http://cdn.bipartisanpolicy.org/wp-content/uploads/2016/06/BPC-Retirement-Security-Report.pdf.

Appendix. Summary of Selected Studies on the Life Expectancy Gap by Income

Table A-1. Selected Studies on the Life Expectancy Gap by Income

Study	Data and Key Measures Used	Main Results
Waldron (2007)	**Data:** SSA data that include taxable wages matched with benefits records and official death records for men born 1912-1941 **Measure of income:** Average of men's positive earnings from ages 45-55 **Income comparison groups:** Earnings relative to the national average wage (i.e., bottom or top half of earnings distribution) **Type of life expectancy measure:** Cohort life expectancy (mortality projections used for more recent birth cohorts; other results not discussed in this report use period life expectancy)	• The life expectancy gap by earnings over time is substantial and growing. • For men born in 1912, those in the top half of the distribution could expect to live about a year longer than those in the bottom half. • For men born in 1941, those in the top half could expect to live 5.3 years longer than those in the bottom half.
Cristia (2009)	**Data:** 1984, 1993, 1996, and 2001 SIPP panels matched to earnings, benefit and mortality data from SSA, and earnings data from IRS **Measure of income:** Average earnings lagged by three years (e.g., if older than 52, then average of earnings from age 41-50; if 52 or younger, then average of five to 10 years of earnings) **Income comparison groups:** Quintiles of lifetime earnings distribution **Type of life expectancy measure:** Period life expectancy (mortality projections used for individuals older than 75)	• For both men and women, differentials in life expectancy between top and bottom lifetime earnings quintiles increased substantially during the period of study (1983-2003).

Study	Data and Key Measures Used	Main Results
Congressional Budget Office (2014)	**Data:** SSA data, with additional demographic and economic data matched using SIPP, HRS, and CPS **Measure of income:** Lifetime earnings **Income comparison groups:** Income quintiles **Type of life expectancy measure:** Period life expectancy (mortality projections used for future years)	• In 2014, a 65-year-old man in the upper lifetime earnings quintile would be expected to live more than three years longer than that same man in the lowest lifetime earnings quintile. • In 2014, a 65-year-old woman in the upper lifetime earnings quintile would be expected to live more than one year longer than this same woman in the lowest lifetime earnings quintile. • By 2039, 65-year-old men with higher lifetime earnings are expected to live around six years longer than 65-year-old men in the lower income quintiles, while high-earning, 65-year-old women will live around three years longer than low-earning, 65-year-old women.
National Academy of Sciences (2015)	**Data:** Biennial waves of HRS data, 1992-2008, matched to SSA records and employer pension plans **Measure of income:** Average nonzero Social Security-reported household earnings for ages 41-50 **Income comparison groups:** Quintiles of lifetime earnings distribution **Type of life expectancy measure:** Cohort life expectancy (mortality projections used for younger sample individuals (i.e., for the 1930 birth cohort after age 78 and for the entire 1960 birth cohort)	• For the 1930 and 1960 birth cohorts, life expectancy at age 50 for men rose as income increased. The life expectancy gap between the bottom and top income quintiles increased across these cohorts from 5.1 years for men born in 1930 to 12.7 years for men born in 1960. • For women, the pattern is generally similar: for the two cohorts, higher income quintiles experienced higher life expectancy at age 50, except for the second quintile born in 1930. The life expectancy gap between the bottom and top income quintiles for women also increased—from 3.9 years for the 1930 cohort to 13.6 years for the 1960 cohort—and there was evidence of a decline in life expectancy for the lowest two income quintiles for women across birth cohorts.
Brookings (2016)	**Data:** SIPP data on individuals born 1910-1950 and HRS data on individuals born in 1957 matched to SSA data on earnings, benefits, and dates of death **Measure of income:** Average of nonzero earnings for ages 41-50 (household earnings used for married individuals; individual earnings for single individuals) **Income comparison groups:** Income decile **Type of life expectancy measure:** Cohort life expectancy (mortality projections used for more recent birth cohorts)	• At age 50, men in the lowest income decile born in 1920 can expect to live to be about 74 years old, compared with about 79 years for men in the top income decile. • The life expectancy gap by income grew with time. For men born in 1940, at age 50 those in the lowest income decile can expect to live to be about 76, compared with 88 for those in the topmost income decile. • For women, the results show no rise at all in life expectancy for those in the lowest income decile.

Study	Data and Key Measures Used	Main Results
Chetty et al. (2016)	**Data:** IRS tax data matched with SSA records for individuals for the years 1999-2014; mortality data from NLMS; U.S. Census data to weight racial/ethnic composition of income percentiles **Measure of income:** Pretax household earnings; income for individuals aged 63 and older measured at age 61 **Income comparison groups:** Percentile ranks (1-100) based on age- and sex-specific household earnings for each year **Type of life expectancy measure:** Period life expectancy (mortality projections used for ages older than 76)	• Over 2001-2014, the average longevity gap between the bottom 1% and top 1% was 14.6 years for men and 10.1 years for women. • For the 2001-2014 period, those with higher incomes have longer life expectancy; the life expectancy gap by income increases across time. • Among low-income individuals, life expectancy varies by geographic area.

Source: Analysis by Congressional Research Service of Hilary Waldron, "Trends in Mortality Differentials and Life Expectancy for Male Social Security-Covered Workers, by Socioeconomic Status," *Social Security Bulletin*, vol. 67, no. 3 (2007), pp. 1-28; Julian Cristia, *Rising Mortality and Life Expectancy Differentials by Lifetime Earnings in the United States*, Inter-American Development Bank, Working Paper 665, Washington, DC, January 2009; Congressional Budget Office, *The 2014 Long-Term Budget Outlook*, July 2014; National Academy of Sciences, Engineering, and Medicine, *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses* (Washington, DC: The National Academies Press, 2015); Barry Bosworth, Gary Burtless, and Kan Zhang, *Later Retirement, Inequality in Old Age, and the Growing Gap in Longevity Between Rich and Poor*, Brookings Institution, Washington, DC, 2016; and Raj Chetty, Michael Stepner, and Sarah Abraham, et al., "The Association between Income and Life Expectancy in the United States, 2001-2014," *Journal of the American Medical Association*, vol. 315, no. 16 (2016), pp. 1750-1766.

Notes: CPS = Current Population Survey. HRS = Health and Retirement Study. IRS = Internal Revenue Service. NLMS = National Longitudinal Mortality Study. SIPP = Survey of Income and Program Participation. SSA = Social Security Administration.

Author Contact Information

Katelin P. Isaacs
Analyst in Income Security
kisaacs@crs.loc.gov, 7-7355

Sharmila Choudhury
Section Research Manager
schoudhury@crs.loc.gov, 7-4895

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