How much longer do people need to work?

Authors: Alicia Haydock Munnell, Anthony Webb, Anqi Chen

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Alicia H. Munnell, Anthony Webb, and Anqi Chen

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Center for Retirement Research at Boston College
Hovey House
140 Commonwealth Avenue
Chestnut Hill, MA 02467
Tel: 617-552-1762 Fax: 617-552-0191
http://crr.bc.edu

All of the authors are with the Center for Retirement Research at Boston College (CRR). Alicia H. Munnell is the Peter F. Drucker Professor of Management Sciences at Boston College's Carroll School of Management and director of the CRR. Anthony Webb is a senior research economist at the CRR. Anqi Chen is a research associate at the CRR. The research reported herein was pursuant to a grant from the Alfred P. Sloan Foundation. The findings and conclusions expressed are solely those of the authors and do not represent the views of the Alfred P. Sloan Foundation or Boston College.

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Abstract

Working longer is a powerful lever to enhance retirement security. Individuals should be able to extend the number of years they work because, *on average,* they are healthier, live longer, and face less physically demanding jobs. But averages are misleading when discrepancies in health, job prospects, and life expectancy have widened between individuals with low and high socioeconomic status (SES). To understand the magnitude of the problem, this paper, using data from the *Health and Retirement Study* (HRS), specifies how much longer households in each SES quartile would need to work to maintain their pre-retirement standard of living and compares those optimal retirement ages with their planned retirement ages to calculate a retirement gap. It then uses regression analysis to explore whether the gaps reflect poor circumstances or poor planning – that is, the extent to which the retirement gap results from health, employment, and marital shocks that occur before the HRS interview but too late for the household to adjust saving (between ages 50 and 58), as opposed to a gap resulting from inadequate foresight. The analysis shows that households in lower-SES quartiles have larger retirement gaps, and this pattern remains true even after controlling for late-career shocks. In short, the most vulnerable have the largest retirement gaps, and these gaps arise from poor planning rather than late-career shocks.

Introduction

Working longer is a powerful lever to enhance retirement security. Individuals, *on average,* are healthier, live longer, and face less physically demanding jobs, so they should be able to extend the number of years worked. But averages are misleading when discrepancies have widened between individuals with low and high socioeconomic status (SES) in areas such as health, job prospects, and life expectancy. This paper explores the need to work longer for various SES groups by quantifying the degree to which households *plan* to retire before they have saved enough and whether those of lower SES are more likely to do so.

This analysis relies on education as the SES metric. Of course, many characteristics contribute to SES, including income and wealth, race and ethnicity, parents' income and education, health, poverty status, neighborhood attributes, and occupation. Education, however, has particular advantages. First, nearly every survey includes the respondent's educational attainment, unlike characteristics of one's parents or neighborhood. Second, unlike occupation, education is a valid measure for individuals out of the labor force, including retirees. Third, with few exceptions, educational attainment is determined early in life and affects, but is unaffected by, the focus of our research: late-career labor market activity and retirement savings. More contemporaneous factors like income, wealth, health, and poverty status are more likely to have an endogenous relationship with SES.

The focus of this paper is the *planned* retirement age, because the fact that someone retires prematurely is not necessarily evidence of poor decision making. Some households who plan to work well into their sixties will retire prematurely due to a misfortune such as a health shock or involuntary job loss. In contrast to actual retirement ages, which can be buffeted by these unforeseen events, planned retirement ages reveal individual preferences and their consumption and saving behavior without the influence of unexpected health or employment shocks. Households should *plan* to retire at ages that will permit them to maintain their pre-retirement standard of living. Previous research has identified a close relationship between planned and actual retirement ages (Loughran et al. 2001), which suggests that many households that retire prematurely are not mainly influenced by shocks and, therefore, are more likely to be making a suboptimal decision.

Using data from the *Health and Retirement Study* (HRS), this paper first identifies those older working Americans who plan to retire prior to the age at which they would be able to

maintain their pre-retirement standard of living. This information is then used to calculate the retirement gap, the number of years each household would have to delay retirement in order to meet its replacement rate target. The retirement gap is then tallied for each SES quartile.

The second part of the project uses regression analysis to determine the extent to which the retirement gap results from health, employment, and marital shocks that occur before the interview but too late for the household to adjust its saving (between ages 50 and 58), as opposed to a gap resulting from inadequate foresight. The dependent variable is the retirement gap, and the explanatory variables include the SES quartile, demographic characteristics, and a number of late-career shock variables that unexpectedly limit the capacity to work or reduce the resources available to finance post-retirement consumption.

The analysis shows that households in lower-SES quartiles are less prepared for retirement than higher-SES groups; lower-SES groups will meet their targets at later ages and will, on average, have larger retirement gaps. Furthermore, households with lower SES are more likely to experience shocks and are particularly adversely affected by wealth shocks (a decline in total financial and housing wealth of 20 percent or more). They are also more likely to experience employment shocks, but surprisingly, employment shocks reduce the retirement gap. The explanation may be that unemployment reduces the target replacement rate or that those forced to find a new job in their fifties recognize that they will have to work longer to make ends meet in retirement and adjust their plans. Health and marital shocks do not have a statistically significant effect on retirement gaps at any SES level. In short, the most vulnerable have the largest retirement gaps, and these gaps arise more from poor planning than late-career shocks.

Literature Review

This study builds on four strands of prior research. The first strand is the life-cycle model. This model postulates that households should smooth the marginal utility of consumption over their lifetimes. Although households may optimally plan for lower consumption at ages to which they are less likely to survive, under reasonable assumptions regarding preference parameters, utility maximization requires that households maintain their pre-retirement consumption into retirement. The literature documents that more than 50 percent of today's working-age households face a retirement savings gap, meaning they will be unable to maintain their customary standard of living, if they retire at traditional ages (Mitchell and Moore

1998; Munnell, Orlova, and Webb 2013). Furthermore, almost half of American households outlive their financial assets (Poterba, Venti, and Wise 2012).[1] Importantly, those with lower SES are even less likely than the average to be prepared for retirement (Butrica, Iams, and Smith 2007). The issue is not that households will fall into poverty but that their savings and labor supply outcomes are suboptimal.

The second strand in the literature documents that, while retirement expectations are generally predictive of the age of retirement (Loughran et al. 2001), a significant minority retires prematurely as a result of health or employment shocks (Bernheim 1989; Dwyer and Hu 1999). This research indicates that households either plan their retirement or are, at the very least, able to forecast the age beyond which they will be unable to work. However, their suboptimal outcomes appear to be, at least in part, the result of suboptimal choices. Households are choosing to save too little and planning to retire too soon.

The third strand documents SES disparities both in financial preparedness for retirement and in average retirement ages. Butrica, Iams, and Smith (2007) found that lower-SES households are increasingly likely to be in poverty and less likely than the average to be prepared for retirement. Those in lower-SES groups are also less likely to be in good health (Smith, 2005), and those with lower educational attainment retire earlier than their counterparts with higher education levels (Burtless 2013). It may be optimal for low-SES households to retire early if their disutility of work increases more rapidly with age than that of their high-SES counterparts or if they face more constrained labor market opportunities. But the combination of weak financial preparedness for retirement and early retirement ages for low-SES groups indicates that they are more likely to face substantial declines in consumption at retirement and are therefore making more suboptimal labor supply and saving choices.

The fourth strand documents strong relationships between financial literacy, the ability to plan, and wealth accumulation (for a review, see Rooij, Lusardi, and Alessie 2012). The

[1] Some economists question the seriousness of the retirement savings gap (e.g., Scholz and Seshadri 2008; Scholz, Seshadri, and Khitatrakun 2006). But their findings are sensitive to their assumptions regarding household preferences. They assume that households optimally choose quite rapid declines in consumption during retirement and reduce consumption once children leave home. Neither assumption appears to closely match actual household preferences and behavior. Financial planning tools assume a goal of level consumption throughout retirement, and Coe and Webb (2010) find no evidence that consumption declines when children leave home. Other studies find little evidence of a significant decline in consumption as households transition into retirement (Hurst 2008; Hurd and Rohwedder 2013), but the larger unanswered question is whether pre-retirement consumption is sustained *throughout* retirement.

retirement planning decision is particularly difficult because the household must jointly determine both consumption and labor supply but faces uncertainty in both the financial and labor markets. This project will extend this strand of research by uncovering the relationship between retirement intentions and retirement preparedness, as well as how it varies by SES. To our knowledge, no previous study has compared *planned* retirement ages with the ages at which households are projected to be financially prepared for retirement.

Data and Methodology

The data for the analysis come from waves 5 to 10 of the HRS linked to U.S. Social Security Administration earnings records. The HRS is a panel survey of household heads over the age of 50 and their spouses, irrespective of age, that has been administered every two years since 1992. The survey collects in-depth information on income, work histories, assets, pensions, health insurance, disability, physical health and functioning, cognitive function, and health care expenditures.

To calculate the extent to which households plan to retire prematurely, the first step is to identify the ages at which households plan to retire. The second step is to calculate a target retirement income for each household. This target equals average household earnings for the 10 calendar years ending immediately prior to the HRS interview at which the household head turned age 58, multiplied by the 2008 Georgia State RETIRE Project target for the household type. The third step is to calculate the retirement incomes that households would achieve if they retired at each age from their current age onwards. The fourth and final step is to compare the age at which each household will achieve its target income with the age at which it plans or expects to retire and to tabulate our proxy for SES, their quartile of educational attainment.

The following subsections discuss the sample size and sample selection, the HRS questions on planned or expected retirement ages, the validity of the replacement rate targets, the methodologies used to project retirement income and the procedure for reassigning educational status.

Sample Size and Selection

The original sample consists of 3,876 households in which the household head turned 58 between waves 5 and 10 (2000 to 2010) of the HRS.[2] For couples, the male is identified as the head. In the case of same-sex couples, the higher-earning spouse is the head or, if earnings are equivalent, the older respondent is the head. From the original sample, we exclude 751 households whose head was not working for pay at the age 58 wave and 76 households with missing or inconsistent data. These two exclusions reduce the final sample to 3,049 households. Participants were asked about their retirement plans at 58, an age at which households will have begun to consider the question of when to retire but few have already retired. The focus is on the head of the household; the spouse's planned retirement age is not considered. For the cohorts under consideration, the spouse generally makes only a modest contribution to household earnings, and including data on the spouse would significantly complicate the analysis.

Planned and Expected Retirement Ages

In each wave, participants who are working or looking for work are asked about their retirement plans. They are allowed to give multiple responses, including that they plan to "stop work altogether." Those who include "stop work altogether" as one of their plans are asked to indicate the age or year at which they plan to stop working. We refer to these households as *planners*. Those who do not say that they plan to "stop work altogether," but indicate that they have "not given much thought" to the subject or have "no current plans," are asked the age or year at which they think they will stop working.[3] We refer to these households as *thinkers*. Participants who, when asked about their retirement plans, respond that they plan to "never stop work" are not asked when they plan or think they will stop working. However, some of the planners and thinkers also respond "never" when they are asked when they anticipate stopping work. Of the sample, 22 percent specify an age at which they plan to stop working, 19 percent specify an age at which they think they will stop working, 4 percent state that they plan to never

[2] Households are selected if they have turned 58 but have not yet turned 60 in the next interview wave, so the sample includes some 59 year olds.

[3] Participants who state that they plan to reduce work hours (22 percent of the sample), change the kind of work they do (3 percent of the sample), or become self-employed (1 percent of the sample) are asked the age or year at which they plan to make these changes. We do not make use of these responses. These changes may result in reductions in income that would necessitate the household delaying retirement in order to meet its replacement rate target, but we have no means of estimating the likely reduction in income.

stop working, while the remaining 55 percent either don't know or give other responses that resulted in them not being asked when they anticipated stopping work.[4]

Although some participants die without ever stopping work, most households stop work at some point, whether by choice or as a result of declining health or an inability to find work. Our presumption is that the "never-stop-work" households would, if pressed, acknowledge that they would eventually stop work if they survived long enough and might be able to estimate an age at which this outcome might occur. Similarly, those who do not know when they will stop work or were not asked the question might also be able to provide an age, if pressed. We therefore impute anticipated ages for individuals who, for whatever reason, did not provide an estimated retirement age, using those who did provide ages as the donor pool. In making these estimates, we use birth cohort, education level, race, pension type, marital earnings status, and health status as covariates.

A potential concern is that the unobserved anticipated retirement ages of individuals who do not provide responses may differ from the reported anticipated retirement ages of either the planners or the thinkers. We address this concern in part by comparing the actual retirement ages of the planners and thinkers with those of individuals who stated that they would never stop work or who did not answer the question. If the planners and thinkers have similar retirement ages to the never- and non-respondents, and if we assume that the differences between their planned and actual retirement ages are similar, then using information from those who answered will yield unbiased estimates for those who did not. The data are censored in the sense that retirements are observable up to 2010.

As shown in Table 1, those who say they plan to never stop working have the highest actual retirement age, on average, and the highest proportion still working. Interestingly, the average retirement age and the proportion still working for those who plan to never stop working are comparable to the thinkers. Those who provided no answer are comparable to the average of both the planners and thinkers. Reflecting this pattern, we use thinkers as the donor pool for those who state that they will never stop working, and we use all respondents as the donor pool for non-respondents. Again, in both cases, the assumption is that the difference between planned and actual retirement ages is similar across groups

[4] This situation might occur if their only responses were that they planned to work until their health failed, reduce hours, change their kind of work, or work for themselves.

Replacement Rate Targets

According to the life-cycle model of saving behavior, households should accumulate wealth during their working years and draw down that wealth during retirement. Specifically, households select a saving and drawdown plan that maximizes expected discounted lifetime utility, subject to the household's budget constraint. Utility will depend on both consumption and leisure. Mathematically, the household chooses a consumption plan that maximizes:

$$E_t \sum_{t=0}^{T} \beta^t U(C_t L_t)$$

where β is a rate of time preference, C is consumption, and L is leisure. The budget constraint is:

$$c_t + a_{t+1} = (1 + r_t)a_t + y_t$$

where a_t and y_t are assets and income at time *t*.

Assuming that consumption and leisure are separable in the utility function,[5] and ignoring mortality risk, the optimal consumption path is one that satisfies the following first-order condition:

$$u'(c_t) = \beta E_t[(1 + r_{t+1})u'(c_{t+1})]$$

where *r* is the rate of interest. The household will choose a consumption path such that the marginal utility of this period's consumption equals the expected marginal utility of next period's consumption, discounted by a rate of time preference, and multiplied by 1 plus the rate of interest. The intuition is that the household cannot increase total utility by shifting consumption from one period to another. If the rate of interest equals the rate of time preference, then the household, in the absence of uncertainty, would choose level consumption. In reality, households face uncertain labor income and investment returns. If the second derivative of the utility function is positive, so that bad outcomes decrease marginal utility more than good outcomes increase marginal utility, households will engage in precautionary saving. On average,

[5] Separability implies that the marginal utility of consumption does not depend on the amount of leisure.

consumption will increase with age, though some households – those that experience bad capital and labor market outcomes – will have lower consumption at older ages.[6]

The model developed by the Georgia State RETIRE project can be thought of as a special case of the life-cycle model that assumes no risk. The project therefore likely understates optimal replacement rate targets. In theory, this problem could be addressed by constructing an intertemporal optimization model that incorporates risk, but models of this type are computationally challenging, and the HRS data lack detailed information on many sources of risk. Thus, the Georgia State targets are a reasonable option.

Table 2 reports the Georgia State targets. They are less than 100 percent of pre-retirement income, because households, once retired, no longer pay Social Security and Medicare payroll taxes or contribute to 401(k) plans, and federal income taxes are lower because – at most – only a portion of their Social Security benefits are taxable. The calculations also assume that households have paid off their mortgage by the time they stop working. The Georgia State Project uses information from the *Consumer Expenditure Survey* released by the U.S. Department of Labor's Bureau of Labor Statistics to estimate age- and work-related expenses. Targets are higher for lower earners, reflecting lower taxes and higher Social Security replacement rates.[7]

Projecting Retirement Income

Retirement income is projected separately for Social Security, defined benefit and defined contribution plans, and financial assets, with an adjustment for existing mortgages.

Social Security. Projected Social Security benefits are calculated using the HRS and Social Security earnings records, which are available to qualified researchers on a restricted basis. When such records were not available, earnings histories were imputed using current earnings, earnings at the first HRS interview, and final earnings from the previous job. Nominal wages are projected to grow at 4 percent annually. The entire wage history is then indexed by the Average Wage Index (U.S. Social Security Administration 2013), and the highest 35 years of

[6] Households who retire prematurely may still be behaving optimally if they choose low consumption levels prior to and after retirement. However, a correlation test found no relationship between retirement gap and the ratio of consumption to income. As such, households that retire prematurely are not ones behaving optimally based on their strong tastes for leisure.

[7] For an array of pre-retirement earnings levels, they calculate federal, state, and local income taxes and Social Security taxes before and after retirement.

indexed wages are used to calculate Average Indexed Monthly Earnings (AIME). The benefit formula is then applied to the AIME to derive the individual's Primary Insurance Amount (PIA). Cost-of-living adjustments as well as early or delayed retirement credits are applied to the PIA. Final household benefit levels are calculated depending on marital status and work tenures.

Pension Income. The starting point for the projection of income from defined benefit pension plans is to project pension wealth from these plans at ages 60 through 70 using the 1998 and 2004 HRS imputations for employer-sponsored pension wealth from current jobs. The two datasets differ slightly. The 2004 dataset includes values for retirement ages 60, 62, 65 and 70. For the 1998 dataset, pension values are available only for ages 60, 62, and 65. The 2004 dataset discounts defined benefit pension wealth to the survey year, while the 1998 dataset projects defined benefit wealth to the retirement age. The 1998 values are extrapolated to age 70 based on the average increase in retirement wealth from 65 to 70 in the 2004 data. For both datasets, values for ages 61, 63, 64, and 66 through 69 are interpolated based on the reported numbers. Defined benefit pension wealth is then converted into pension income using the interest and inflation-rate assumptions embedded in the pension wealth calculations.[8] Pensions from the 2004 dataset are assigned to households reaching age 58 in waves 7 through 10 (2004, 2006, 2008, 2010) and pensions from the 1998 dataset are assigned to those attaining age 58 in waves 5 and 6 (2000 and 2002).

For defined contribution pensions, the starting point is the account balance. Balances then grow as participants contribute an assumed 6 percent of salary, receive a 50-percent employer match, and earn a 4.6-percent real return until retirement. For simplicity, people who started their jobs after 1998 (waves 5 and 6) or 2004 (waves 7, 8, 9, and 10) are assumed to receive no additional pension benefits on their new jobs. The conversion of defined contribution wealth to income is discussed in the next section on financial assets.

Financial Assets. Household financial wealth invested in stocks, bonds, and short-term deposits is assumed to earn real returns of 6.5 percent, 3.0 percent, and 1.0 percent, respectively, from the date of the interview until retirement. These rates approximate the long-run average rates of return for each asset class. Importantly, these assumptions are used throughout for projecting asset returns rather than incorporating any actual fluctuations. The objective is to

[8] The interest rate assumption is irrelevant, provided that the same assumption is used to both calculate pension wealth from respondents' estimates of their pension income and then recover pension income from pension wealth.

assess whether households are on track to meet their replacement rate targets, not whether they actually succeeded in meeting them.

At retirement, households are assumed to use all of their financial assets, including 401(k) and IRA balances, to purchase a nominal joint- or single-life annuity. Currently, annuity rates are extremely low, reflecting depressed interest rates. The objective of this exercise is to calculate financial preparedness for retirement, given the beliefs of respondents at the time of their HRS interviews. Therefore, we assume some improvement in annuity rates, reflecting a return of interest rates to historic norms, partially offset by projected mortality improvements based on Social Security Administration cohort mortality tables.[9] If a household takes a reverse mortgage, we assume that it uses the proceeds to purchase a nominal annuity.

Mortgage Adjustments. One caveat about the Georgia State study is that it does not model mortgage payments and mortgage debt outstanding after retirement, but rather, as noted, assumes the mortgage is paid off before retirement. Our projections assume that any mortgage debt outstanding at retirement will be discharged using financial assets. If financial assets are insufficient to discharge the entire mortgage debt, mortgage payments are reduced in proportion to the reduction in debt, and the replacement rate targets are adjusted accordingly.

The *Consumption and Activities Mail Survey* (CAMS) is the only data source for mortgage payments in the HRS, but, even then, the remaining term on a mortgage is not asked and only the mortgage balance outstanding is known. We derive the remaining mortgage term using data on mortgage balances and annual payments and assume a nominal interest rate of 6 percent, approximating to the average interest rate on a 30-year fixed mortgage during the survey period.[10]

The next step is to estimate mortgage payments and terms for people not included in the CAMS. An attempt was made to impute mortgage payments based on data for the CAMS subsample. Initial tabulations showed that the ratio of mortgage payments to debt was tightly

[9] Specifically, we calculate current annuity money's worths (the expected present value of the income stream divided by the premium paid), given current interest and mortality rates and then calculate annuity prices assuming the same money's worths, projected mortality improvements, and 2004 interest rates, deeming 2004 rates to approximate to a long-run equilibrium.

[10] The remaining term was bottom-coded to one year if the reported annual payment exceeded the debt. If the ratio of payments to outstanding balance was less than or equal to the interest or if the term was greater than 30 years, we top-coded the term to 30 years.

clustered around the median of 0.12, implying a median remaining mortgage term of about 12 years. An econometric model, in which the ratio of mortgage payments to mortgage balance outstanding was the dependent variable and explanatory variables included house value, age, and socioeconomic characteristics, produced statistically insignificant coefficients. Therefore, we assumed that all non-CAMS households had a remaining term of 12 years.

Measuring Socioeconomic Status

Educational attainment is used as a proxy for SES, because it is highly correlated with other markers of SES and is, with few exceptions, determined early in life and is unaffected by later labor market or retirement saving decisions. In contrast, contemporaneous markers of SES such as income and wealth are more likely to be influenced by such decisions.

Initially, educational attainment naturally falls into four categories: less than high school, high school, some college, and college. However, the percentage of individuals with less than a high school education has become much smaller over time (see Table 3) and represents a more disadvantaged SES group than in the past, making it necessary to create quartiles of people ranked by their educational attainment.

Making the proportions equal in each quartile requires moving some households from the top SES group (college) into the second-highest group (some college), then from the second-highest group to the third SES group (high school), and finally into the lowest SES group (less than high school). In contrast to Bound, Rodriguez, and Waidmann (2014), who reassigned people at random, the probability of being selected and moved is proportional to the probability that someone with that individual's characteristics would not have graduated from college, so that marginal college graduates are more likely to be reassigned.

The methodology for this reassignment is as follows. The first step is to estimate the following ordered probit model:

$$y^* = x\beta + e$$

where $y = 0$ if y^* (the exact but unobserved dependent variable) is $\leq \alpha_1$, the dividing line between less than high school and high school education; y = 1 if $\alpha_1 < y^* \leq \alpha_2$, the dividing line between high school and some college; y = 2 if $\alpha_2 < y^* \leq \alpha_3$, the dividing line between some

college and college graduation; y = 3 if $\alpha_3 < y^*$; and $\boldsymbol{x}$ is a vector of correlates of educational attainment. These correlates include gender, race, census division, industry and occupation dummies, and income percentile.

The procedure allows for the possibility that a college graduate may be reassigned all the way to the less than high school category. As shown in Table 4, all of the households who had less than a high school degree remained in the lowest SES quartile. However, 21 percent of households with a college degree were moved into the second highest SES quartile, 4 percent were moved into the third SES quartile and 2 percent were moved all the way down to the lowest SES quartile.[11] A concern may be that our approach for reassigning individuals to educational quartiles may understate the relationship between SES and plans for retirement. If we omit factors predictive of the probability of failing to graduate from high school, we may not identify the most likely candidates for reassignment to that category. We address this concern in the regression analysis by conducting a sensitivity test in which, instead of reassigning individuals to create equally sized quartiles, we divide individuals among the four reported education categories. As will be shown below, the results are quite similar using the quartile data and using the educational attainment originally reported.

Results

The following discussion presents the results for retirement preparedness and the size of the retirement gap by SES and the regression analysis that determines the extent to which this retirement gap results from shocks as opposed to inadequate foresight.

Retirement Preparedness

A household is deemed prepared for retirement if their projected retirement income at a given age is equal to or greater than their target retirement income at that age. Tables 5a and 5b show the percentage of households who are unprepared for retirement at each age from 60 through 70 in both a base case and a case in which the proceeds of a reverse mortgage based on their home values are added to their total wealth.

[11] A perfectly even reallocation between SES quartiles was not possible because each household had different weights. The procedure reassigned households by the unit and not weighted unit.

At age 62, three-quarters of households do not meet their targets, and even when the proceeds from a reverse mortgage are included, 70 percent would be unprepared it they retired at 62. Even at age 65, over half of households cannot meet their targets even with a reverse mortgage. This finding is consistent with the results of the 2013 National Retirement Risk Index (Munnell, Hou, and Webb 2014). One-fifth of households would fall short even if they were to delay retirement until age 70 and take a reverse mortgage. Conditioning on age, those in lower-SES quartiles are more likely to be unprepared.

Retirement Gap

The above statistics would not be a cause for concern if households planned to work until advanced ages and acted on those intentions. But the ages at which households plan to retire are often earlier than the ages at which they will be financially prepared for retirement. Table 6 reports the median age at which households in each SES group will be financially prepared for retirement and reports the median retirement gap by SES – that is, the median difference between the age at which each household will be financially prepared and the age at which it plans to stop work. On average, households in the top SES quartile plan to retire on time, even if they do not take a reverse mortgage, whereas households in the bottom quartile plan to retire two years too soon, or one year too soon if they take a reverse mortgage. These averages, however, may hide considerable heterogeneity, if some households plan to retire much too soon and others plan to work beyond the ages at which they would be able to hit their replacement rate targets. Table 7 reports the percentage of households who plan to retire prematurely and the average retirement gap of those who plan to retire prematurely. Low-SES households are more likely to plan to retire prematurely, but conditional on planning to retire prematurely, the average retirement gap is similar across SES quartiles – four to five years.

A potential concern is that reporting errors may inflate our estimates of the percentage planning to stop work prematurely. If everyone planned to retire on time, but everyone also reported wealth with a mean zero error term, then one-half of households would appear to plan to retire prematurely. We conduct a sensitivity analysis by assuming that all households appearing to plan premature retirement understate their housing and financial wealth by 20 percent. This adjustment has almost no effect on the percentage planning to stop work prematurely or on the

average retirement gap. And reporting error cannot explain the relationship between SES and retirement gap.

Another potential concern is that the imputation of expected retirement ages to those who failed to respond is affecting the results. Redoing the exercise and eliminating households with imputations produces a very similar picture (see Tables 8 and 9).

Inadequate Foresight or Shocks

From the above discussion, it is evident that households in lower-SES quartiles are more likely to retire "too soon" and are less likely to delay retirement. Planning to retire prematurely may reflect short-sightedness. But it might also result from late-career economic shocks, to which low-SES households may be particularly vulnerable. The question becomes to what extent is the larger retirement gap among low-SES households reflective of greater vulnerability to shocks and a reduced capacity to smooth consumption over their lifetimes versus inadequate planning or knowledge about how long to work.

We define a household as having experienced a particular type of shock if it occurred in any wave of the observed window at or prior to the wave in which they attained age 58. We define employment and spousal employment shocks as any periods of unemployment; self and spousal health shocks as substantial declines in self-reported health status;[12] marital shocks as any change from a couple household to a non-couple household; and wealth shocks as any wave-to-wave decline of 20 percent or more in total financial and housing wealth, including secondary residences. The incidence of shocks is tabulated in Table 10.[13] Households in the lowest SES quartile have a statistically significant higher incidence of all of the above shocks than those in the top quartile.

To investigate the relationships between shocks, SES, and the retirement gap, we estimate the following OLS regression:

$$R_{h,t} = \beta_0 + \beta_1 SES_t + \beta_2 D_t + \beta_3 S_t + \beta_7 C_{it} + \varepsilon_{it}$$

[12] Self-reported health status in the HRS is measured on a five-point scale. We treat declines of two or more points as substantial.

[13] The high incidence of wealth shocks across all SES quartiles is because total financial wealth includes housing assets, which were exposed to the housing market collapse.

The dependent variable, $R_{h,t}$, the retirement gap, takes a zero if the household plans to retire at the age at which it will meet its target, a negative value if the household plans to work beyond that age, and a positive value if the household plans to delay retirement. Explanatory variables include SES_t, the household's SES quartile, D_t, a vector of demographic and economic characteristics , S_t, a vector of shocks, and C_t, controls for different birth cohorts.

Two regressions are estimated, one excluding potential income from reverse mortgages and one including it (see Table 12).[14] A positive coefficient indicates that the explanatory variable is associated with an increase in the retirement gap. The demographic and economic variables have the expected coefficients. Being black, having poor health, and being a one-earner couple all increase the gap between the age of planned retirement and the age of financial readiness. Households that participate in both defined benefit and defined contribution pension plans have a retirement gap that is 0.86 years less than those that are not covered in any pension plan. Unsurprisingly, the retirement gap of households whose financial planning horizon is 10 years or more is 0.85 years less than other households.

The focus of the equation is to determine whether late-career shocks increase the retirement gap. Indeed, wealth shocks are associated with a statistically significant increase in the retirement gap of 0.51 years. Interestingly, households that experience employment shocks (becoming unemployed) have a retirement gap that is 1.9 years less than those that have never become unemployed. Two explanations are possible. One is that periods of unemployment decrease the denominator in the replacement rate calculation, which likely contributes to the unanticipated sign on the coefficient. The other is that those forced to find a new job in their fifties recognize that they will have to work longer to make ends meet in retirement, so they adjust their plans.

The bottom line, however, is that, even after controlling for both shocks and household characteristics, households in the top two SES quartiles have significantly smaller retirement gaps than those in the bottom quartile, 0.7 and 1.0 years, respectively, in the first specification.

[14] Two additional regressions are also estimated that control for the potential impact of spousal employment and health shocks, since the coefficient on these variables was insignificant and their inclusion had no effect on the rest of the equation, they are not reported.

Conclusion

Working longer is a powerful way to improve retirement security for Americans who are retiring prematurely – that is, before they acquire enough income to maintain their pre-retirement standard of living. This paper documents the disparities across SES quartiles both in the ages at which households will meet their retirement income targets and in their planned retirement ages. It also shows that the larger retirement gaps for low-SES households are due to poor planning – planning to retire before they are financially prepared – rather than late-career shocks. The analysis involves imputations of planned retirement ages for those who say "never" or do not respond, and it involves grouping households by educational quartile rather than educational attainment, but sensitivity analyses show that these procedures are not driving the results.

These results have important policy implications, because they suggest that the big problem is premature retirement among low-SES households. This same group has seen little improvement in health and life expectancy and faces poor job prospects. It may well be that their retirement shortfalls cannot be bridged by working longer and that other solutions will be needed.

References

Bernheim, B.D. 1989. "The Timing of Retirement: A Comparison of Expectations and Realizations." In *The Economics of Aging*, edited by David A. Wise, 335-355. Chicago: University of Chicago Press.

Burtless, Gary. 2013. "The Impact of Population Aging and Delayed Retirement on Workforce Productivity." Working Paper 2013-11. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Butrica, A. Barbara, Howard M. Iams, and Karen E. Smith. 2007. "Understanding Baby Boomer Retirement Prospects." In *Redefining Retirement: How Will Boomers Fare?*, edited by Brigitte Madrian, Olivia S. Mitchell, and Beth J. Soldo, 70-94. New York, NY: Oxford University Press.

Coe, Norma B. and Anthony Webb. 2010. "Children and Household Utility: Evidence from Kids Flying the Coop." Working Paper 2010-16. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Dwyer, D.S., and J. Hu. 1999. "The Relationship Between Retirement Expectations and Realizations: The Role of Health Shocks," in *Forecasting Retirement Needs and Retirement Wealth*, edited by Olivia Mitchell, P. Brett Hammond, and Anna M. Rappaport. Philadelphia, PA: University of Pennsylvania Press.

Hall, Arden and Terry R. Johnson. 1980. "The Determinants of Planned Retirement Age". *Industrial and Labor Relations Review* 33(2): 241-254.

Hurd, Michael D. and Susann Rohwedder. 2013. "Heterogeneity in Spending Change at Retirement." *Journal of the Economics of Ageing* 1(2): 60-71.

Hurst, Erik. 2008. "The Retirement of a Consumption Puzzle." Working Paper 13789. Cambridge, MA: National Bureau of Economic Research.

Loughran, David, Constantijn Panis, Michael Hurd, and Monika Reti. 2001. "Retirement Planning." Manuscript. Santa Monica, CA: RAND Corporation.

Mitchell, Olivia S. and James Moore.1998. "Can Americans Afford to Retire? New Evidence on Retirement Saving Adequacy." *Journal of Risk and Insurance* 65: 371-400.

Munnell, Alicia. H., Wenliang Hou, and Anthony Webb. 2014. "NRRI Update Shows Half Still Falling Short." *Issue in Brief* 14-20. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Munnell, Alicia H., Natalia Orlova, and Anthony Webb. 2012. "How Important Is Asset Allocation to Financial Security in Retirement?" Working Paper 2012-13. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Munnell, Alicia H., Matthew S. Rutledge, and Anthony Webb. 2014. "Are Retirees Falling Short? Reconciling the Conflicting Evidence." Working Paper 2014-16. Chestnut Hill, MA: Center for Retirement Research at Boston College.

Poterba, James M., Steven F. Venti, and David A. Wise. 2012. "Were They Prepared for Retirement? Financial Status at Advanced Ages in the HRS and AHEAD Cohorts." Working Paper 17824. Cambridge, MA: National Bureau of Economic Research.

Scholz, John Karl and Ananth Seshadri. 2008. "Are All Americans Saving 'Optimally' for Retirement?" Presented at the 10th Annual Joint Conference of the Retirement Research Consortium in Washington, DC, August 7-8.

Scholz, J. K., A. Seshadri, and S. Khitatrakun. 2006. "Are Americans Saving 'Optimally' for Retirement?" *Journal of Political Economy* 114(4): 607-643.

Smith, James P. 2005. "Unravelling the SES Health Connection," published in *Aging, Health, and Public Policy: Demographic and Economic Perspectives,* a supplement to Population and Development Review 30: 108-132. New York: Population Council.

University of Michigan. *Health and Retirement Study*, 2000-2010. Ann Arbor, MI.

Van Rooij, Maarten, Annamaria Lusardi, and Rob Alessie. 2012. "Financial Literacy, Retirement Planning and Household Wealth." *The Economic Journal* 122(560): 449-478.

Table 1. *Average Retirement Age and Percentage Retired by Retirement Plan Response*

	Average retirement age	% retired
Answered	63.1	74.3%
Planners	62.7	81.2
Thinkers	63.6	67.6
Never	63.8	66.2
Non-response	63.3	71.8

Source: Authors' calculations from the University of Michigan, *Health and Retirement Study* (HRS), 2000-2010.

Table 2. *Target Replacement Rates by Income Level and Household Type*

	$20,000	$30,000	$40,000	$50,000	$60,000	$70,000	$80,000	$90,000
One-earner married couple; age 65 worker, age 62 spouse	94%	90%	85%	81%	78%	77%	77%	78%
One-earner married couple; age 65 worker and spouse	94	90	85	81	78	77	76	76
Two-earner married couple; age 65 higher earner, age 62 spouse	94	90	85	81	80	78	78	78
Single worker; age 65	88	84	83	80	79	81	82	81

Source: Palmer (2008).

Table 3. *Weighted Percentage of Households by Educational Attainment*

Educational attainment	% of household heads
Less than high school	10%
High school or GED	31
Some college	27
College	33

Source: Authors' calculations from the 2000-2010 HRS.

Table 4. *Percentage of Households Reassigned in Each SES Quartile, by Educational Attainment*

SES quartile	Lowest	Second	Third	Highest	Total
Less than high school	100%	0%	0%	0%	100%
High school / GED	40	60	0	0	100
Some college	14	21	64	0	100
College	2	4	21	74	100
Total	27	25	24	24	100

Source: Authors' calculations from the 2000-2010 HRS.

Tables 5a and 5b. *Percentage of Households Aged 60 to 70 Unprepared for Retirement, by SES Quartile With and Without Reverse Mortgage*

5a. *Without Reverse Mortgage*

Age	Lowest	Second	Third	Highest	Total
60	95%	93%	89%	86%	91%
61	95	93	89	85	91
62	83	76	71	68	75
63	80	72	65	63	70
64	75	66	62	60	66
65	69	61	55	54	60
66	64	54	49	49	54
67	56	49	44	43	48
68	47	43	38	37	41
69	39	32	32	31	34
70	31	27	25	26	27

5b. *With Reverse Mortgage*

Age	Lowest	Second	Third	Highest	Total
60	95 %	93 %	89 %	86 %	91 %
61	95	93	89	85	91
62	78	71	67	64	70
63	75	66	60	57	65
64	68	61	55	51	59
65	61	53	49	46	52
66	54	46	42	41	46
67	46	40	37	36	40
68	38	32	31	32	33
69	31	25	24	26	27
70	22	21	19	21	21

Source: Authors' calculations from the 2000-2010 HRS.

Table 6. *Median Age Households Meet Target and Median Retirement Gap, by SES*

SES	Median age meets target		Retirement gap (years)	
	Base case	Including reverse mortgage	Base case	Including reverse mortgage
Lowest	67	67	2	1
Second	66	66	1	0
Third	66	65	1	0
Highest	65	64	0	-1

Source: Authors' calculations from the 2000-2010 HRS.

Table 7. *Median Retirement Gap of Households That Retire Prematurely, by SES*

SES	Percentage		Retirement gap (years)	
	Base case	Including reverse mortgage	Base case	Including reverse mortgage
Lowest	64%	57%	5	5
Second	57	51	5	5
Third	55	48	5	4
Highest	51	44	5	5

Source: Authors' calculations from the 2000-2010 HRS.

Table 8. *Median Age Households Meet Target and Median Retirement Gap, by SES for Non-Imputed Responses*

SES	Median age meets target		Retirement gap (years)	
	Base case	Including reverse mortgage	Base case	Including reverse mortgage
Lowest	67	67	2	1
Second	66	66	2	1
Third	66	65	0	0
Highest	65	64	0	0

Source: Authors' calculations from the 2000-2010 HRS.

Table 9. *Median Retirement Gap of Households That Retire Prematurely, by SES for Non-Imputed Responses*

SES	Percentage		Retirement gap (years)	
	Base case	Including reverse mortgage	Base case	Including reverse mortgage
Lowest	68%	61%	4	4
Second	59	53	6	6
Third	52	47	5	5
Highest	50	44	5	4

Source: Authors' calculations from the 2000-2010 HRS.

Table 10. *Percentage of Households That Experience Various Shocks, By SES*

SES	Employment shock		Health shock		Marital shock	Wealth shock
	Respondent	Spouse	Respondent	Spouse		
Lowest	6.7%	4.2%	15.0%	8.2%	7.8%	58.2%
Second	5.4	4.2	11.5	4.3	5.7	48.4
Third	5.4	2.5	11.2	5.3	5.2	49.4
Highest	4.9	3.2	6.3	4.6	4.6	45.5
Total	5.6	3.5	10.8	5.4	5.7	49.9

Notes: The difference between the lowest and highest SES quartile for employment, health, spousal health, marital, and wealth shocks are statistically significant at the 15-percent, 1-percent, 5-percent, 5-percent and 1-percent levels respectively. Spousal employment shocks were not statistically significant.
Source: Authors' calculations from the 2000-2010 HRS.

Table 11. *Regression Results for Retirement Gap by SES (Standard Errors in Parentheses)*

Retirement gap	(1)	(2)
SES		
Second	-0.08	-0.15
	(0.34)	(0.35)
Third	-0.71***	-0.66***
	(0.33)	(0.33)
Highest	-1.02***	-1.05***
	(0.36)	(0.37)
Demographics/health		
Male	-0.09	0.07
	(0.40)	(0.40)
Black	1.04***	0.99***
	(0.37)	(0.37)
Hispanic	0.40	-0.03
	(0.43)	(0.46)
Other	0.35	0.37
	(0.69)	(0.73)
Number of kids	0.12**	0.11*
	(0.07)	(0.07)
10+ year planning horizon	-0.85***	-0.69***
	(0.28)	(0.28)
Poor health	1.01***	1.13***
	(0.32)	(0.33)
Pension type		
DB only	-0.30	0.07
	(0.35)	(0.35)
DC only	0.09	0.11
	(0.29)	(0.29)
DB and DC	-0.86***	-0.47
	(0.42)	(0.42)
Marital/earning status		
Married one-earner	1.09***	1.36***
	(0.38)	(0.39)
Married two-earner	-0.56	-0.33
	(0.50)	(0.51)

-Continued-

Table 11. *Regression Results for Retirement Gap by SES (Standard Errors in Parentheses)* (cont'd)

Retirement gap	(1)	(2)
Shocks		
Employment shock	-1.90 ***	-1.76 ***
	(0.72)	(0.71)
Health shock	0.01	0.09
	(0.45)	(0.45)
Marital shock	0.27	0.03
	(0.60)	(0.62)
Financial shock	0.51 ***	0.78 ***
	(0.25)	(0.25)
Wave	0.16 ***	0.05
	(0.08)	(0.08)
Constant	-1.16 **	-1.42 ***
	(0.66)	(0.66)
R-squared	0.05	0.05

(1) Retirement gap, excluding spousal health and employment shocks.
(2) Retirement gap including reverse mortgages, excluding spousal health and employment shocks.
Notes: *** significant at the 5-percent level, ** significant at the 10-percent level, *significant at the 15-percent level. Spousal health and employment shocks were also estimated but did not have a statistically significant effect.
Source: Authors' calculations from the 2000-2010 HRS.

Table 12. *Retirement Gap Relative to Lowest SES Group, by SES Definition and Group*

Education quartile	Base	Reverse mortgage	Reported attainment	Base	Reverse mortgage
Second	-0.08	-0.15	High school	-0.07	-0.13
	(0.34)	(0.35)		(0.42)	(0.42)
Third	-0.71***	-0.66***	Some college	-0.67*	-0.66 **
	(0.33)	(0.33)		(0.43)	(0.42)
Highest	-1.02***	-1.05***	College	-1.26***	-1.35 ***
	(0.36)	(0.37)		(0.44)	(0.44)

Notes: *** significant at the 5-percent level, ** significant at the 10-percent level, *significant at the 15-percent level. The education definition is based on reported educational attainment while the quartile definition reassigns households into SES quartiles.
Source: Authors' calculations from the 2000-2010 HRS.

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