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Abstract

Objectives Persistent and substantial disparities in old-age mortality suggest that there may be great inequalities in the length of retirement life. This study aims to assess gender and educational differences in the average retirement lifespan and the variation in retirement lifespan, taking into account individual labor-force exit and re-entry dynamics.

Methods We used longitudinal data from the Health and Retirement Study in 1996–2016, focusing on respondents aged 50 and above (*N* = 32,228). Multistate life tables were estimated using discrete-time event history models. The average retirement lifespan, as well as absolute and relative inequalities in retirement lifespan, were calculated analytically.

Results We found that among women there was a persistent educational gradient in average retirement lifespan over the whole period studied; among men, the relationship between education and retirement expectancy was different across periods. Women and the lower-educated had higher absolute inequality in retirement lifespan than men and the higher-educated—yet these relationships were reversed when examined by relative inequality.

Discussion Our multistate approach provides an accurate and comprehensive picture of the retirement lifespan of older Americans in the past two decades. Such findings should be considered in high-level discussions on Social Security. Potential reforms such as raising the eligibility age or cutting benefits may have unexpected implications for different social groups due to their differential impacts on retirement initiation and re-entry dynamics.

Keywords: Retirement, education, work-related issues, gender, inequality

Introduction

Retirement is a stage in life where individuals have more control over both the pace and the content of their lives (Ghilarducci & Webb, 2018). Thus, living long in retirement is a desirable goal to many people. As mortality reductions at ages over 65 have been the main driver of life expectancy (LE) gains since the mid-20th century (Rau et al., 2018), people are expected to live longer in retirement now than in the past.

The lifetime spent in retirement is determined by more than just the time of death (Crimmins et al., 2018; Kibele et al., 2013). Two other factors shape retirement lifespan: first, the variation in the time of withdrawal from the labor force (Bernheim, 1989); second, labor force re-entry after a phase of retirement (Cahill et al., 2015). In 1992–2004, half of the U.S. men and women had exited the labor force by ages 63 and 61, respectively, and one-third of the population returned to work after the initial exit from the labor force (Warner et al., 2010). The actual time spent in retirement is far from self-evident due to the uncertainty in these three factors.

The age at death, the age at initial retirement, and labor force re-entry are known to vary across individuals with different characteristics. First, women tend to live longer and retire earlier than men (Hanson & Wapner, 1994). Second, education not only affects lifespan but also retirement patterns (Hayward et al., 1994). Because of these differences, separate analyses of retirement lifespan by gender and education are required.

In this study, we investigated gender and educational differences in retirement lifespan using data from the Health and Retirement Study (HRS) spanning over two decades (1992–2016). Retirement lifespan is defined as the time spent in retirement beyond the age of 50. Discrete-time event history analysis and multistate life tables were used to model career transitions. We focused on several dimensions of inequalities, including the *average* lifetime spent in retirement and the *variation* in retirement lifespan, and examined how they vary by gender and education.

Within-group variation has largely been overlooked in the context of retirement lifespan, although it has been actively studied in mortality research under the label of *lifespan variation* (LV). Complementary to LE, variation metrics have gained increasing attention among researchers, particularly for studying educational differences in mortality (Brown et al., 2012; Sasson, 2016; van Raalte et al., 2011, 2014, 2018). Variation metrics capture how much individuals of the same group differ in their lifespans, i.e., the within-group heterogeneity in survival.

Similarly, variation metrics can be used to capture within-group inequalities in retirement lifespan. For policymakers, if ensuring fairness in the length of life in retirement is a desirable goal, the within-group variation is another dimension of policy fairness in addition to the average retirement lifespan. Monitoring variation is also useful for policies that aim to distribute resources for the retired population because knowing the average needs is insufficient. Further, variation indicates the level of uncertainty for individuals from a probabilistic perspective (Courgeau, 2012), potentially affecting individual decisions in saving, consumption, and investment.

We contribute to the literature in three ways. First, inequalities in retirement expectancies (RE) have rarely been directly measured, despite mounting concerns that pension reforms could exacerbate current inequalities in years of retirement (Beach & Bedell, 2019). Second, in contrast to earlier literature that focuses on LE at Social Security full retirement age, we measure retirement lifespan more accurately by considering all transitions: retiring, returning-to-work, and dying. Third, we are the first to apply the concept of variation to the study of inequalities in retirement length, bringing together two previously independent strands of literature: research on LV and research on retirement transitions. Our research is fully reproducible; we provide *R* codes, making it straightforward to apply our concepts to other data.

Background

Retirement onset and labor force re-entry in the U.S.

Inequalities in the time spent in retirement have often been gauged by differences in remaining LE at age 65 (LE_{65}; Kibele et al., 2013; Majer et al., 2011). Yet the actual age of initial retirement varies across individuals, especially in the United States. The official Social Security full retirement age in the U.S. increased from 65 to 66 years for cohorts born in 1943–1954, and it will increase further for cohorts born in 1955 and later (Behagel & Blau, 2012). The youngest age at which Social Security pension benefits can be claimed is 62 years. The actual ages at which individuals retire are often below the upper threshold, and sometimes even below the first claiming threshold (Warner et al., 2010).

On average, women retire earlier than men; this observation is consistent across time, yet gender differences in retirement age have narrowed more recently (Quinn et al., 2011). Gender differences in retirement patterns can be partly explained by family circumstances, as women more often quit paid work to take on unpaid domestic and care work (Fisher et al., 2016).

Research across the world has consistently found an effect of education on retirement timing. The self-expectation of working beyond age 65 was found to be higher among higher-educated people than among the lower-educated (Mermin et al., 2007; Szinovacz et al., 2014). Lower education is associated with earlier retirement, while higher education is associated with later retirement (Damman et al., 2011; Zickar, 2013). In the U.S., Venti and Wise (2015) found that lower-educated people claimed Social Security benefits earlier than higher-educated people. One explanation is that higher income and better work conditions attract higher-educated people to work longer (Potočnik et al., 2009). Ill-health has also been found to contribute to the association between low education and early retirement (Jung et al., 2020; Lawless et al., 2015). It is also possible that higher-educated people delay their retirement to compensate for later career onset and to recoup their earlier investment in education (Fisher et al., 2016).

The association between education and retirement may vary over time. During the 2008-2009 Great Recession, the probability of being retired at age 65 increased for both men and women, as older workers were pushed out of the labor market (Dudel & Myrskylä, 2017), but the impact of the recession varied greatly by education, affecting those with less education disproportionally (Hale et al., 2021).

Labor force re-entry after initial retirement is another key factor shaping retirement lifespan. Re-entry is a common phenomenon in the U.S. (Cahill et al., 2015). In 1992–2004, one-third of the U.S. men and women returned to work after their initial exit from the labor force (Warner et al., 2010). Skoog and Cieka (2010) showed that work history predicted one’s propensity to return to work. A 65-year-old man who was still active in the labor market was unlikely to re-enter after the initial exit from the labor force, whereas a man who was inactive at age 65 was much more likely to re-enter after their initial retirement (Skoog & Cieka, 2010). As gender and education are associated with work history, they may influence the probability of re-entering the labor force. In general, women were less likely to engage in post-retirement work than men (Maestas 2010; Pleau 2010). Hayward and colleges (1994) showed that, among all the retirees, lower-educated men were more likely to take part-time jobs after initial retirement than higher-educated men.

Older-adult mortality in the U.S.: Life expectancy and lifespan variation

In addition to the timing of (un)retirement, mortality is another key component determining the retirement lifespan. After a long period of rising, LE in the U.S. plateaued in recent years (Dyer, 2018), prior to the Covid-19 pandemic. This trend has been explained by increasing overdose mortality over younger adult ages and slow declines in mortality related to circulatory diseases at middle to older ages (Mehta et al., 2020). The worrisome trend of LE in the U.S. is also partly attributable to divergent developments in mortality across socioeconomic groups, as studies have found that individuals with lower education and income have experienced declining LE since 1990 (Meara et al., 2008; Sasson, 2016; Chetty et al., 2016; Sasson & Hayward, 2019).

In recent population health research, variation metrics have been increasingly used to examine group differences in within-group lifespan inequality. Researchers find that men and lower SES groups tend to have a shorter LE and a larger LV in the U.S. This occurs when looking at the variation over the full range of adult ages (Sasson, 2016; Sasson & Hayward, 2019). It is also the case when comparing expectancies and variation in ages at death above the mode (Brown et al., 2012). In other words, the health of men and lower SES groups is more heterogeneous than it is for women and higher SES groups. The lifespan variation from a fixed old-age threshold onwards has been found to follow an upward trend for the entire population (Engelman et al, 2014; Myers & Manton, 1984). For SES-specific trends in old-age LV above age 65, findings are mixed across countries, gender, and education (Zarulli et al. 2012).

Hypotheses

Men and more educated individuals tend to retire later, and men and lower educated individuals are more likely to return to work. Therefore, we expect that men have shorter retirement lifespans than women, whereas the relationship between education and retirement lifespan is unclear. On the one hand, more educated people tend to live longer which can lead to longer retirement lifespans. On the other hand, they are more likely to postpone their retirement (Venti & Wise, 2015), thus reducing their retirement lifespans. Since divergence in adult LV has been driven by diverging mortality in working ages (Sasson, 2016), it is less clear whether retirement lifespan variation (RLV) has diverged across educational groups, particularly given the unknown labor-force dynamics at older ages and the potential differences by gender and education.

Methods

Data

We used the Health and Retirement Study (HRS), a biennial cohort-based panel since 1992 that contains a representative sample of non-institutionalized individuals aged 50 and above in the U.S. We created yearly work trajectories using 1996–2016 waves. Analyses were restricted to individuals aged between 50 and 100 at the time of the interview, including respondents and their age-eligible spouses.

Outcome variable

We classify individuals into three mutually exclusive states below the Social Security full retirement age: “employed”, “retired", and “out of the labor force (but not retired) or unemployed” (i.e., not employed, not retired; NENR), using self-reported information (Dudel & Myrskylä, 2017). “Employed” includes self-employed individuals and those who are either working or on temporary leave such as sick leave or holiday. The classification follows this procedure: first, if individuals report themselves as employed, they are classified as “employed”. Second, for individuals who report themselves as not employed, they are classified as “retired” only if they report themselves as retired. Third, those who are left from the first two procedures are classified to the last state. For ages above cohort-specific Social Security full retirement ages, people are either “retired” or “employed”. Those who report themselves as not employed and not retired are automatically classified as retired.

Predictors

We measure education by the highest degree obtained; it has three levels: below high school diploma; a high school diploma or a GED; and a college or university degree.[1] Other key predictors include gender, the state in the preceding year, period dummy variables for 1996–1999, 2000–2003, 2004–2007, 2008–2011, and 2012–2015. Age is included using a smoothing spline (Debón et al., 2006; Yee & Wild, 1996), together with three dummy variables for *Age 62–64*, *Age 65*, and *Age 66* capturing institutional retirement entry, and one dummy variable *Age 67+* to capture older-age retirement entry.

Statistical analyses

Ideally, we would be interested to observe complete later-life work-retirement histories. However, complete cohort data is rarely available—it takes long to collect and is expensive. A

[1] We did not further divide the last category as some other studies may have done due to the small group sizes of the earlier birth cohorts we study.

solution to the lack of complete cohort data is to use the synthetic cohort approach—a method that is commonly used by demographers. With longitudinal data where individuals' transitions over a certain period can be observed, we create a hypothetical cohort assuming that the conditions of the observed period stay constant throughout the lives of the members of the hypothetical cohort. One of the advantages of this approach is that it reflects temporal changes in mortality and retirement behavior, and provides provisional answers to timely important questions. This synthetic cohort approach has been used by many previous studies on old-age labor market activities and health transitions (Leinonen et al., 2018; Skoog & Cieka, 2010; Warner et al., 2010; West & Lynch, 2020). Our synthetic cohorts each correspond to one of the five periods mentioned earlier.

First, we use multinomial logistic regression models to estimate probabilities of transitions between states. Besides the predictors mentioned above, the interaction terms between education and period and between education and age dummies are also included. Survey weights are used. All models are estimated separately for men and women. The survival probabilities resulting from these models are adjusted such that they match survival probabilities provided by the Human Mortality Database (for details see Dudel & Myrskylä, 2017).

Subsequently, for each period-gender-education combination, we use the predicted year-to-year transition probabilities to analytically derive (1) probabilities of dying without retiring and (2) distributions of state occupation time (Dudel, 2018). This assumes that transitions between states follow the Markovian processes, i.e., transition probability from time (age) t to time $t + 1$ only depends on the state at time t, not prior transition histories.

Retirement expectancy (RE) is calculated as the average of the distribution of time spent in the state "retired". We use both absolute and relative inequality measures for RLV. Absolute inequality is translation-invariant (i.e., inequality remains invariant when all individuals gain the same number of years of life in retirement), whereas relative inequality is scale-invariant (i.e., inequality remains invariant when all individuals gain the same proportional change in years of life in retirement). Absolute and relative measures provide complementary perspectives on inequality and may sometimes lead to different results. We use the Average Inter-individual Difference (AID) to measure absolute RLV. The AID can be interpreted as the average difference in retirement lifespan between any two random individuals. It is calculated as:

$$AID = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \left| x_i - x_j \right|}{2n^2}$$

where x_i and x_i are the retirement lifespans for individuals i and j, and n is the total number of individuals. We use the Gini coefficient (G), a commonly used inequality measure in the literature, for relative inequality. It is calculated as:

$$G = \frac{AID}{RE}$$

We use the bootstrap method to calculate 95% confidence intervals.

Results

Not all adults reach retirement. Figure 1 shows the percentages of people who die without retiring conditional upon survival to and not being retired at age 50. Men were more likely to die before retirement than women in all periods for all education subgroups. On average, the probability of dying without ever retiring was around 15% for men and below 10% for women. This is partly explained by men's higher mortality and higher employment rates. Indeed, men were more likely to be employed at age 50 than women[2], and these gender differences in employment rates persist to older ages.

Higher education was associated with a lower percentage of dying before retirement for both men and women, despite higher labor force participation rates among the higher-educated. In 1996–2015, the average difference in the percentage of not surviving to retirement between the lowest and highest education groups was 5.7% for women and 8.1% for men. Educational percentage-point differences in pre-retirement mortality were stable for men but decreased from 7.6% in 2000–2003 to 3.2% in 2012–2015 for women.

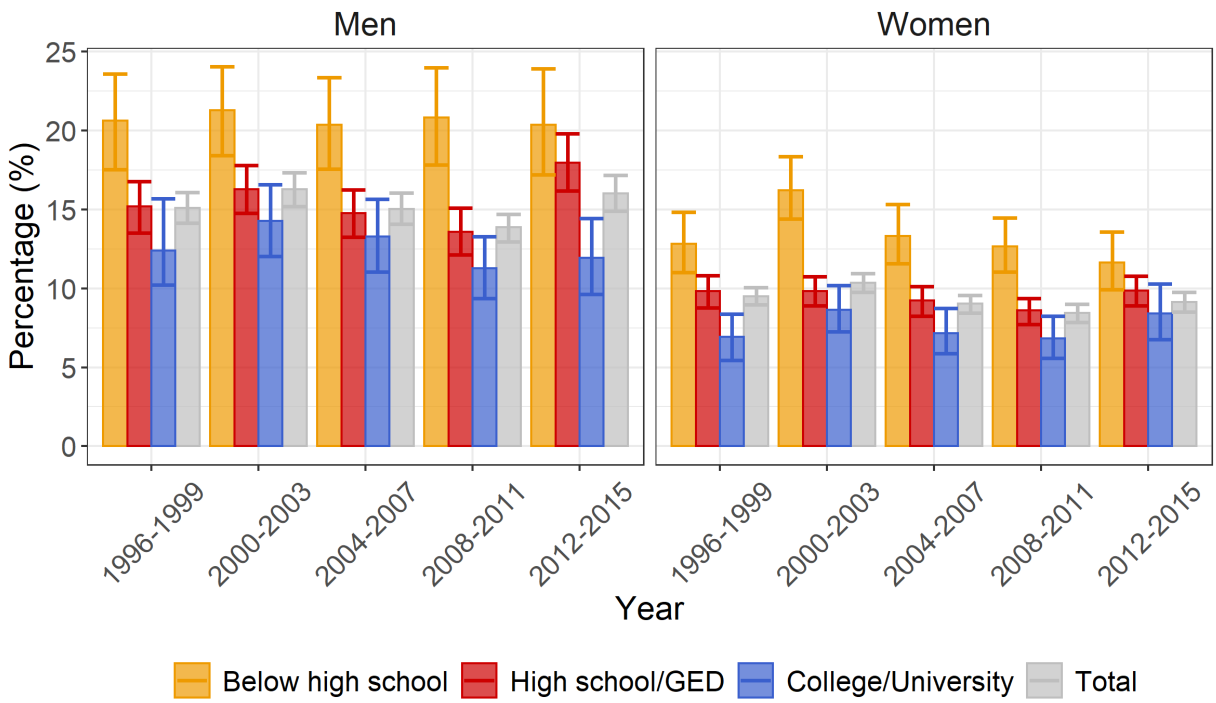

Figure 1. Percentage of individuals not surviving to retirement. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Error bars show 95% bootstrap confidence intervals.

[2] In 1996–2015, the average percentage of employed individuals at age 50 for men was 80.1% and 70.8% for women.

For those *who were not retired at age 50 and survived to retirement*, Table 1 shows their mean initial retirement age, LE, RE, expected years in labor force re-entry at the initial retirement age, and the percentage of LE in re-employment.[3] Among the lowest educated, women retired later than men; whereas the gender difference is reversed in the two higher education groups. Overall, for both genders, the initial retirement age was positively associated with education. For women, there were no educational differences in re-employment expressed either as expected years or a proportion of LE at initial retirement; whereas for men, a positive educational gradient was found on both.

Table 1. Initial retirement age, life expectancy (LE), retirement expectancy (RE), expected years in re-employment at initial retirement, and percentage of LE in re-employment.

	Men					**Women**				
	1996–1999	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**	**1996–1999**	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**
Initial retirement age										
Total	63.5	64.5	64.5	64.2	65.9	63.8	64.9	64.5	64.4	65.4
Below high school	63.5	63.6	63.7	63.2	64.5	63.9	64.6	64.4	64.3	65.0
High school/GED	62.7	64.0	63.9	63.8	65.4	64.0	64.8	64.4	64.1	65.0
College/university	64.6	65.9	66.2	66.1	67.9	63.3	66.1	65.2	65.4	67.0
LE at initial retirement										
Total	16.2	15.9	16.7	17.7	16.2	19.7	18.9	19.7	20.4	19.8
Below high school	14.3	14.4	14.9	15.0	15.2	18.4	16.4	17.9	18.3	19.2
High school/GED	16.3	15.8	16.8	17.7	15.2	19.5	19.4	20.1	20.9	20.0
College/university	17.1	16.4	16.9	18.4	17.7	21.3	18.9	20.8	21.4	19.9
RE at initial retirement										
Total	14.4	13.9	14.6	15.6	14.0	17.7	16.8	17.7	18.4	17.7
Below high school	12.7	12.8	13.3	13.5	13.4	16.6	14.6	15.9	16.3	17.2
High school/GED	14.5	13.8	14.8	15.5	12.9	17.4	17.2	17.9	18.8	17.8
College/university	15.0	14.1	14.5	15.8	15.1	19.5	16.7	18.7	19.2	17.6
Expected years in re-employment										
Total	1.8	2.0	2.1	2.1	2.2	2.0	2.1	2.0	2.0	2.1
Below high school	1.6	1.6	1.7	1.6	1.8	1.8	1.8	1.9	2.0	2.0
High school/GED	1.8	2.0	2.0	2.2	2.2	2.1	2.2	2.2	2.2	2.2
College/university	2.1	2.3	2.4	2.6	2.6	1.8	2.1	2.1	2.2	2.3
LE% in re-employment										
Total	11.2	12.6	12.3	12.1	13.7	9.9	11.0	10.2	9.9	10.6
Below high school	11.1	11.1	11.1	10.4	11.9	9.7	11.0	10.8	10.7	10.4
High school/GED	10.9	12.7	12.1	12.3	14.8	10.8	11.3	10.8	10.4	11.1
College/university	12.4	14.2	14.2	13.9	14.9	8.4	11.4	10.2	10.2	11.8

Source: Authors' calculation based on the Health and Retirement Study, 1996–2016.

[3] See Tables A1–A5 in the Online Appendix for results with 95% bootstrap confidence intervals.

While Table 1 described only those individuals who survived to retirement, below we focus on *all individuals* (i.e. including those who died without retiring). Figure 2 shows a clear educational gradient in LE at age 50 for both genders. Higher education is associated with more time both employed and retired. Those with below high school education spent more years not employed and not retired, especially for women.

We also find that women had a higher RE than men. Across education, the absolute difference in RE between women and men was larger among the college/university group; on the other hand, the gender difference in LE was smaller among the college/university group. On average, women with college/university education had 2.6 years more in LE than their male counterparts, whereas they had 4.0 years more in RE. This demonstrates that our multistate approach captures additional inequalities due to different work-retirement patterns in addition to LE differences.

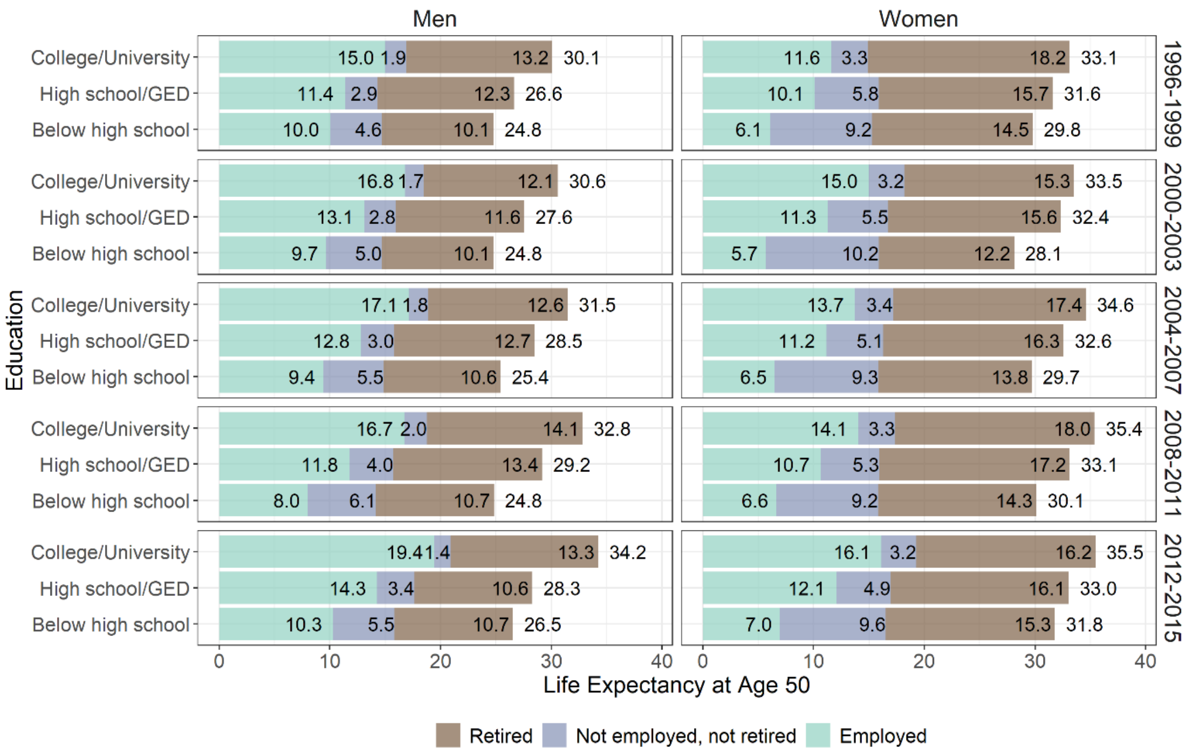

Figure 2. Life expectancy (LE) at 50 and the composition by state. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016.

Education is positively associated with both RE and LE. Figure 3 shows differences in RE and LE between people with the highest and lowest education. Differences in RE between educational groups were smaller than differences in LE, particularly for men. This suggests that work dynamics in old ages compensate for the disadvantage in mortality of the lower educated people. Among men, although differences in LE increased over time, differences in RE were relatively stable. Again, this indicates that rising inequalities in LE were driven by rising inequalities in time spent working, not in retirement, once their actual work-retirement transitions were considered. For women, the trends of the two measures were both stable.

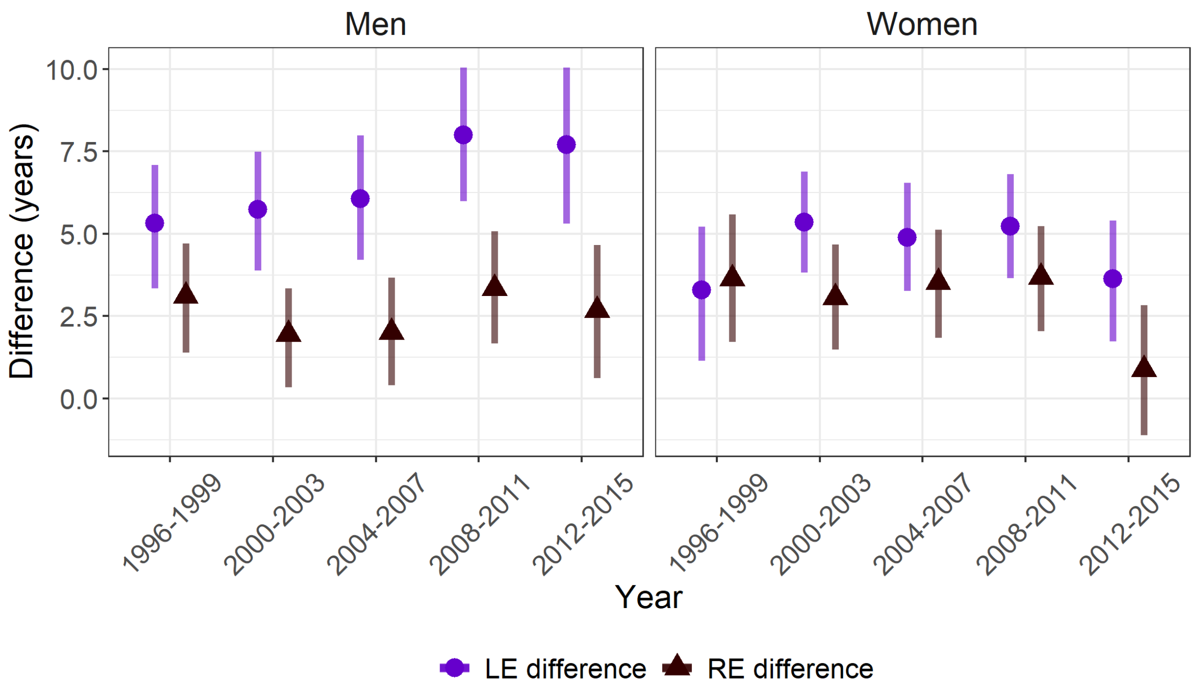

Figure 3. Differences in life expectancy (LE) and retirement expectancy (RE) at age 50 between the lowest and highest education groups. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Error bars show 95% bootstrap confidence intervals.

Figure 4 shows AID and G of retirement lifespan by gender and education. Overall, we find that the variation in retirement lifespan was relatively stable in 1996–2015. The lower educated had less absolute variation, but given their lower RE, this translates to more relative variation. Similarly, men had lower AID than women, but men had higher G because of their lower RE.

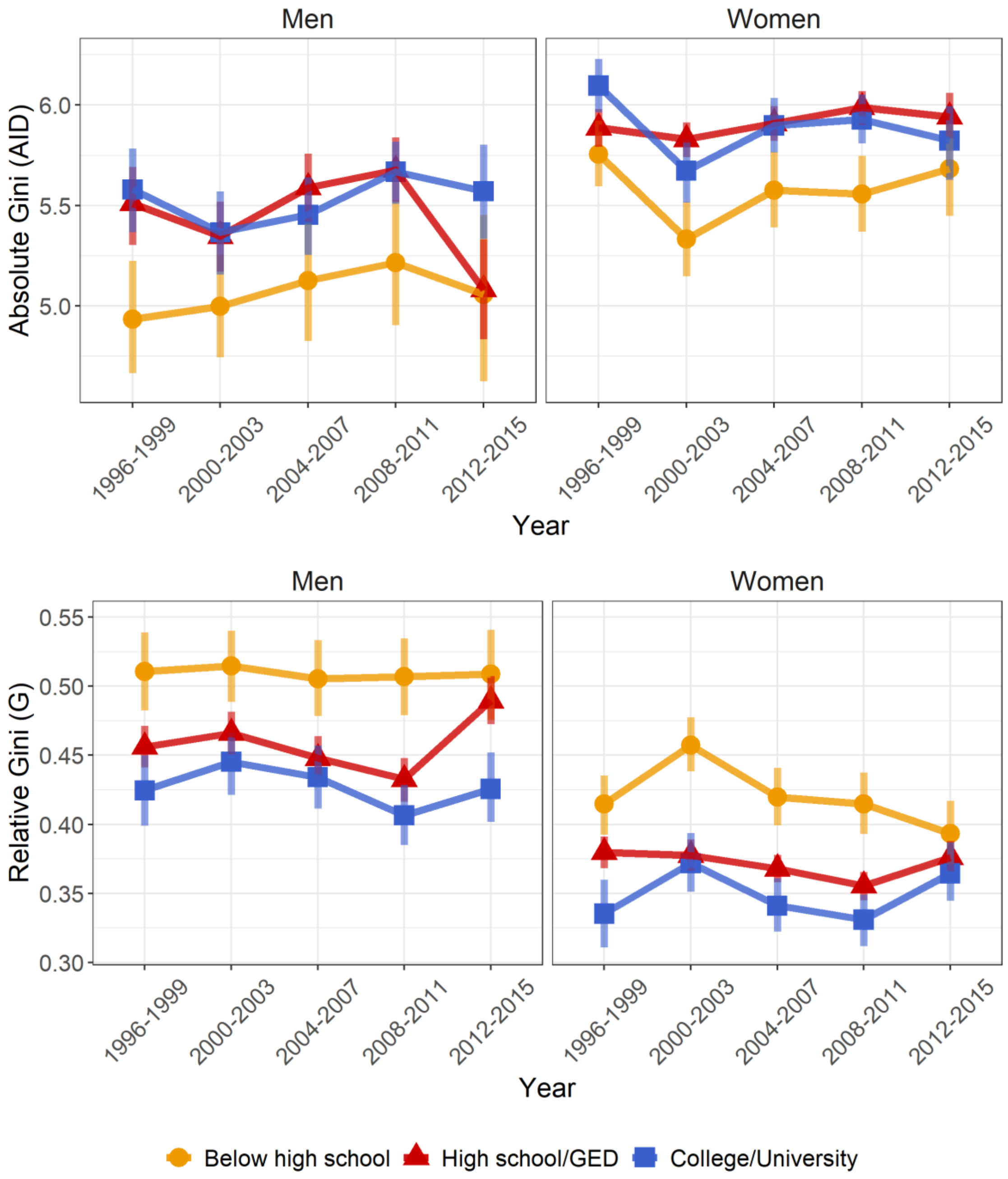

Figure 4. Trends of retirement lifespan variation. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Calculations are conditional upon surviving to 50, and individuals in all transient states at 50 are included.

Discussion

This paper examined gender and educational differences in retirement expectancy (RE) and retirement lifespan variation (RLV) in the U.S. over 1996–2015. RLV is a novel concept that captures the within-group heterogeneity in the length of retirement and is measured by AID and G. Despite the longevity improvement at the population level over the study period, we find substantial and consistent inequalities in RE by gender and education. Over the study period, women spent 3.8 years longer in retirement than men, on average. Higher educated men lived 2.6 years longer in retirement than lower educated men; the gap for women was 3.0 years. Time spent in retirement varies less within the lower-educated group than it does within the other two groups. However, given their lower RE, this translates into higher relative RLV.

Retirement Expectancy

As pension reforms are taking place in the aging world, there is increasing interest in documenting trends and disparities in lifespans at older ages to understand the implications of mortality on pension systems (Shi and Kolk 2021). As a good starting point, researching lifespans at pensionable ages (e.g., age 65)—an approach used by most prior studies—facilitates comparisons between income, education, and countries (Chomik & Whitehouse 2010; Kalwij et al. 2013; Zarulli et al., 2012). Assuming everyone retires at the full retirement age is a useful approach when studying the pension system as a whole on topics such as intergenerational equity and pension sustainability.

Murtin et al. (2021) showed that in 2011 LE at age 65 (LE_{65}) was 18.3 years for men and 20.5 years for women. We found that for those who survived to retirement, RE was 15.6 years for men and 18.5 for women in 2008–2011 (Table 1). The discrepancies in LE_{65} and our estimates of RE for retirees were around 2 years, roughly equivalent to the time spent in labor-force re-entry. Further, as men with higher education spent more time in labor-force re-entry, the gap in RE between retirees with the lowest and highest education for men (2.5 years) was smaller than the gap in LE_{65} (4.2 years). For women, as time spent in re-entry was rather similar across education groups, the gap in RE between retirees with the lowest and highest education (3.4 years) was similar to the gap in LE_{65} (2.8 years). Hence, the conventional approach of using LE_{65} to approximate RE overestimates the actual time in retirement, and may also overestimate the educational gap in RE as individuals with higher education tend to spend more time in re-entry.

Additionally, the conventional approach of using LE at age 65 ignores individuals who died without retiring, whereas our analyses were restricted to individuals aged above 50. This makes our study conceptually different from the aforementioned studies. Deaths before retirement are arguably an important reason why there are discrepancies between LE at pensionable age and our estimates of RE at age 50. Such differences were smaller for women and the higher educated, which could be mostly explained by higher mortality before retirement among men and the lower educated. Besides, differences in initial retirement age and labor force re-entry could both contribute to gaps in the results from the two approaches. Our multistate approach does well to capture differential mortality before pensionable age as well as work-retirement transitions. Therefore, we show a more accurate picture of inequalities in retirement lifespan.

A few studies have examined RE considering dynamic transitions. For example, Leinonen et al. (2018) used the Sullivan method to compare RE across occupational classes in Finland, and Ghilarducci & Webb (2018) used the non-parametric approach of hot-deck imputation and the HRS data to study RE across gender, education, race, etc. They both find that longer RE is associated with higher SES, consistent with our findings. Our patterns of gender and educational differences in the probability of dying without retiring are consistent with Ghilarducci and Webb (2018), though we used a period and parametric approach while they used a cohort and non-parametric approach. Our findings are also consistent with the literature on post-retirement employment which highlights the importance of labor force re-entry (Cahill et al. 2015). Although men are more likely to re-enter the labor force than women (Cahill et al. 2011), interestingly, there are no gender differences in the duration of re-employment, nor by education (Table 1).

Gender differences in RE were up to five years within education groups. This could mainly be explained by women's lower mortality. One caveat is that we used self-reported information on retirement. Prior research suggests that women's earlier exits from the labor force due to family caretaking responsibilities make them less likely to identify themselves as retirees (Allmendinger et al., 1992). If this is taken into account, in reality, gender differences in RE would be even larger.

Lower education is associated with higher chances of death without retirement, lower RE. However, the magnitudes of educational differences are volatile across time, suggesting the important role of external social and economic circumstances, consistent with previous literature on the business cycle and late working life (e.g., Dudel & Myrskylä, 2017). For both men and women, more educated individuals not only have a longer working life expectancy but also a longer RE. This implies that it might be a high-SES privilege to work longer due to better health.

Retirement Lifespan Variation

An important contribution of our study is that we introduce RLV, the within-group variation of retirement lifespan. Within-group RLV is substantial. An AID between 4.8 and 6.1 years when RE is between 10.0 and 18.8 years is big. Between-group differences in RLV are also large in magnitude. To put our results into perspective, the AID and G of lifespan conditional on surviving to age 65 ranged between 4.5–5.0 and between 0.23–0.35, respectively, for men in 2015 across all countries in the Human Mortality Database (with the U.S. having the highest AID). Hence, the gaps in AID and G of retirement lifespan between the lowest and highest education groups in the U.S. are at similar (sometimes larger) levels of cross-country differences in AID and G of total lifespan at age 65. Although retirement lifespan and lifespan after age 65 are not the same, the comparison suggests that the observed gender and educational differences in RLV are substantial.

The two measures, AID and G, show different ranks of gender and educational groups. Declines in relative measures can be partly explained by the fact that the average is increasing (Permanyer & Scholl, 2019). Also, if a certain number of people have increasingly longer retirement lifespans and push the maximum possible retirement lifespan up while others from the same group improve little, it creates more room for absolute variation. We do not have a preference over either measure, as AID and G give complementary perspectives.

Methodological Considerations

The assumptions on which the models are based need to be considered in interpretation. First, the Markovian assumption, that a transition probability at age x only depends on the state at x (besides age, period, and education), not prior transition histories, can over-simplify the reality. Among retirees at older ages, people who had unstable employment histories are more likely to die due to possible precarious economic conditions. Taking transition history into account when estimating transition probabilities is rather impractical, as we would need a sufficiently long window of observation and a large sample size, yet such data are usually unavailable. Second, the multistate life table technique is based on hypothetical cohorts who are assumed to experience stationary transition probabilities. Period changes such as the Covid-19 pandemic that have an impact on the labor market or mortality will affect the experience of actual retirement life of people. However, these potential challenges do not limit our analysis. Particularly, our findings highlight the usefulness of the concept of retirement lifespan variation.

To test the robustness of the findings, we used an alternative threshold age of 70 (Figures A2–A4) above which respondents who were in NENR were re-classified as “retired”. The general patterns of results remain, but the less educated are more affected by the choice of a higher threshold. Consequently, choosing a higher threshold yields larger educational differences, but the changes in magnitude are small.

One important extension of our work would be to include race/ethnicity in the analysis. If we further break down our analysis of the HRS data by race/ethnicity, some groups will have very small sample sizes. Nevertheless, racial/ethnic disparities in mortality and labor participation are important to understand inequalities in the U.S., and future work should explore these aspects.

Policy Implications

Understanding the distribution of retirement lifespan is important for welfare policies. Providing resources to protect individuals against contingencies including old age and inability to work is on the global policy agenda. Individuals with poorer health are more likely to quit jobs earlier and less likely to return to work, and they also depend more heavily on welfare programs such as Social Security and Medicare. Thus, shortfalls in health and economic resources are reflected in retirement, particularly for less-educated individuals and women. Policymakers who aim at equity in social provision for older adults can be better informed by differences in the amount of needs by gender and education, not only the average needs but their uncertainty.

As the population ages, policymakers are concerned about sustainable healthcare and social security policies. Many countries are encouraging individuals to postpone their retirement (OECD, 2019). These policies overlook the substantial gender and SES differences in LE, not to mention differences in RE and RLV. The differences in LE between gender and SES groups have recently gained attention among researchers who study the fairness and sustainability of healthcare and pension systems (Auerbach et al., 2017; Goldman & Orszag, 2014). We argue that differences in actual retirement length should also be considered when designing these welfare programs. Our findings suggest that uniform retirement policies will particularly lower RE for men and low-education groups.

References

Allmendinger, J., Brückner, H., & Brückner, E. (1992). Ehebande und Altersrente. oder: Vom Nutzen der Individualanalyse. *Soziale Welt*, 90-116.

Auerbach, A. J., Charles, K. K., Coile, C. C., Gale, W., Goldman, D., Lee, R., ... & Wong, R. (2017). How the growing gap in life expectancy may affect retirement benefits and reforms. *The Geneva Papers on Risk and Insurance-Issues and Practice, 42*(3), 475-499.

Beach, B., & Bedell, G. (2019). The EXTEND project: Exploring pension reforms, work, and inequalities. International Longevity Centre UK. https://ilcuk.org.uk/wp-content/uploads/2019/04/The-EXTEND-Report-Exploring-pension-reforms-work-and-inequalities.pdf

Behagel, L., & Blau, D. M. (2012). Framing social security reform: Behavioral responses to changes in the full retirement age. *American Economic Journal: Economic Policy, 4*(4), 41–67.

Bernheim, B. D. (1989). The timing of retirement: A comparison of expectations and realizations. In *The Economics of Aging* (pp. 335-358). University of Chicago Press.

Brown, D. C., Hayward, M. D., Montez, J. K., Hummer, R. A., Chiu, C. T., & Hidajat, M. M. (2012). The significance of education for mortality compression in the United States. *Demography, 49*(3), 819-840.

Cahill, K. E., Giandrea, M. D., & Quinn, J. F. (2011). Reentering the labor force after retirement. *Monthly Labor Review, 134*, 34.

Cahill, K. E., Giandrea, M. D., & Quinn, J. F. (2015). Retirement patterns and the macroeconomy, 1992–2010: The prevalence and determinants of bridge jobs, phased retirement, and reentry among three recent cohorts of older Americans. *The Gerontologist*, *55*(3), 384-403.

Chetty, R., M. Stepner, S. Abraham, S. Lin, B. Scuderi, N. Turner, A. Bergeron, and D. Cutler. (2016). The association between income and life expectancy in the United States, 2001-2014. *Journal of the American Medical Association, 315*(16):1750–1766.

Choi, N. G. (1994). Racial differences in timing and factors associated with retirement. *Journal of Sociology and Social Welfare*, *21*, 31.

Chomik, R., & E. Whitehouse (2010), Trends in Pension Eligibility Ages and Life Expectancy, 1950-2050, *OECD Social, Employment and Migration Working Papers*, No. 105, OECD Publishing, Paris, https://doi.org/10.1787/5km68fzhs2q4-en.

Courgeau, D. (2012). The dispersion of measures in population sciences. In *Probability and social science: Methodological relationships between the two approaches* (pp. 155–190). New York, NY: Springer.

Crimmins, E. M., Saito, Y., Kim, J. K., Zhang, Y. S., Sasson, I., & Hayward, M. D. (2018). Educational Differences in the Prevalence of Dementia and Life Expectancy with Dementia: Changes from 2000 to 2010. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *73*(Suppl 1), S20.

Damman, M., Henkens, K., & Kalmijn, M. (2011). The impact of midlife educational, work, health, and family experiences on men's early retirement. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 66*(5), 617-627.

Debón, A., Montes, F., & Sala, R. (2006). A comparison of nonparametric methods in the graduation of mortality: Application to data from the Valencia region (Spain). *International Statistical Review*, *74*(2), 215-233.

Dudel, C. (2018). Expanding the Markov chain tool box: distributions of occupation times and waiting times. *Sociological Methods & Research*, 1-28.

Dudel, C., & Myrskylä, M. (2017). Working life expectancy at age 50 in the United States and the impact of the Great Recession. *Demography*, *54*(6), 2101-2123.

Dyer, O. (2018). US life expectancy falls for third year in a row. *BMJ: British Medical Journal (Online)*, 363.

Engelman, M., Caswell, H., & Agree, E. M. (2014). Why do lifespan variability trends for the young and old diverge? A perturbation analysis. *Demographic Research*, *30*, 1367.

Fisher, G. G., Chaffee, D. S., & Sonnega, A. (2016). Retirement timing: A review and recommendations for future research. *Work, Aging and Retirement*, *2*(2), 230-261.

Ghilarducci, T., & Webb, A. (2018). The distribution of time in retirement: Evidence from the health and retirement survey. *Work, Aging and Retirement*, *4*(3), 251-261.

Goldman, D. P., & Orszag, P. R. (2014). The growing gap in life expectancy: using the Future Elderly Model to estimate implications for Social Security and Medicare. *American Economic Review*, *104*(5), 230-33.

Hale, J. M., Dudel, C., & Lorenti, A. (2021). Cumulative Disparities in the Dynamics of Working Poverty for Later Career US Workers (2002–2012). *Socius*, 7, 1-9.

Hanson, K., & Wapner, S. (1994). Transition to retirement: Gender differences. *The International Journal of Aging and Human Development*, *39*(3), 189-208.

Hayward, M. D., Grady, W. R., Hardy, M. A., & Sommers, D. (1989). Occupational influences on retirement, disability, and death. *Demography*, 26(3), 393. https://doi.org/10.2307/2061600

Hayward, M. D., Hardy, M. A., & Liu, M. C. (1994). Work after retirement: The experiences of older men in the United States. *Social Science Research*, *23*(1), 82-107.

Jung, J., Choi, J., Myong, J. P., Kim, H. R., & Kang, M. Y. (2020). Is Educational Level Linked to Unable to Work Due to Ill-health?. *Safety and Health at Work*, *11*(2), 159-164.

Kalwij, A. S., Alessie, R. J., & Knoef, M. G. (2013). The association between individual income and remaining life expectancy at the age of 65 in the Netherlands. *Demography*, *50*(1), 181-206.

Kibele, E. U., Jasilionis, D., & Shkolnikov, V. M. (2013). Widening socioeconomic differences in mortality among men aged 65 years and older in Germany. *Journal of Epidemiology & Community Health*, *67*(5), 453-457.

Lawless, M., Buggy, C. J., & Codd, M. B. (2015). Educational influences on early retirement through disability in Ireland. *Occupational Medicine*, *65*(4), 303-308.

Lee, C. (2001). The expected length of male retirement in the United States, 1850–1990. *Journal of Population Economics*, *14*(4), 641-650.

Leinonen, T., Martikainen, P., & Myrskylä, M. (2018). Working life and retirement expectancies at age 50 by social class: Period and cohort trends and projections for Finland. *The Journals of Gerontology: Series B*, *73*(2), 302-313.

Majer, I. M., Nusselder, W. J., Mackenbach, J. P., & Kunst, A. E. (2011). Socioeconomic inequalities in life and health expectancies around official retirement age in 10 Western-European countries. *J Epidemiol Community Health*, *65*(11), 972-979.

Maestas, N. (2010). Back to work expectations and realizations of work after retirement. *Journal of Human Resources*, *45*(3), 718-748.

Meara, E. R., Richards, S., & Cutler, D. M. (2008). The gap gets bigger: changes in mortality and life expectancy, by education, 1981–2000. *Health Affairs*, *27*(2), 350-360.

Mermin, G. B. T., Johnson, R. W., & Murphy, D. P. (2007). Why do boomers plan to work longer? *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *62*, S286–S294.

Murray, E. T., Carr, E., Zaninotto, P., Head, J., Xue, B., Stansfeld, S., Beach B., & Shelton, N. (2019). Inequalities in time from stopping paid work to death: findings from the ONS

Longitudinal Study, 2001–2011. *Journal of Epidemiology & Community Health*, *73*(12), 1101-1107.
Myers, G. C., & Manton, K. G. (1984). Compression of mortality: myth or reality?. *The Gerontologist*, 24(4), 346-353.
OECD. (2019). *Working Better with Age*, Ageing and Employment Policies, OECD Publishing, Paris, https://doi.org/10.1787/c4d4f66a-en.
Pleau, R. L. (2010). Gender differences in postretirement employment. *Research on Aging*, *32*(3), 267-303.
Potočnik, K., Tordera, N., & Peiró, J. M. (2009). The role of human resource practices and group norms in the retirement process. *European Psychologist*, *14*(3), 193-206.
Quinn, J. F., Cahill, K. E., & Giandrea, M. (2011). *Early retirement: The dawn of a new era?*. (Policy Brief No. July 2011). New York, NY: TIAA-CREF Institute.
Rau, R., Bohk-Ewald, C., Muszyńska, M. M., & Vaupel, J. W. (2018). Surface Plots of Age-Specific Contributions to the Increase in Life Expectancy. In *Visualizing Mortality Dynamics in the Lexis Diagram* (pp. 81-97). Springer, Cham.
Permanyer, I., & Scholl, N. (2019). Global trends in lifespan inequality: 1950-2015. *PloS One*, *14*(5). https://doi.org/10.1371/journal.pone.0215742
Sasson, I. (2016). Trends in life expectancy and lifespan variation by educational attainment: United States, 1990–2010. *Demography*, *53*(2), 269-293.
Sasson, I., & Hayward, M. D. (2019). Association between educational attainment and causes of death among white and black US adults, 2010-2017. *Journal of the American Medical Association*, 322(8), 756–763. https://doi.org/10.1001/jama.2019.11330
Shi, J., & Kolk, M. (2021). How does mortality contribute to lifetime pension inequality? Evidence from five decades of Swedish taxation data. *Stockholm Research Reports in Demography*.
Skoog, G. R., & Ciecka, J. E. (2010). Measuring years of inactivity, years in retirement, time to retirement, and age at retirement within the Markov model. *Demography*, *47*(3), 609-628.
Smits, J., & Monden, C. (2009). Length of life inequality around the globe. *Social Science & Medicine*, *68*(6), 1114-1123.
Stenberg, A., & Westerlund, O. (2013). Education and retirement: does University education at mid-age extend working life?. *IZA Journal of European Labor Studies*, *2*(1), 16.
Szinovacz, M. E., Martin, L., & Davey, A. (2014). Recession and expected retirement age: Another look at the evidence. *The Gerontologist*, *54*(2), 245-257.
van Raalte, A. A., Kunst, A. E., Deboosere, P., Leinsalu, M., Lundberg, O., Martikainen, P., Strand, B. H., Artnik, B., Wojtyniak, B., & Mackenbach, J. P. (2011). More variation in lifespan in lower educated groups: evidence from 10 European countries. *International Journal of Epidemiology*, 40(6), 1703–1714. https://doi.org/10.1093/ije/dyr146
van Raalte, A. A., Martikainen, P., & Myrskylä, M. (2014). Lifespan variation by occupational class: Compression or stagnation over time?. *Demography*, *51*(1), 73-95.
van Raalte, A. A., Sasson, I., & Martikainen, P. (2018). The case for monitoring life-span inequality. *Science*, *362*(6418), 1002-1004.
Venti, S., & Wise, D. A. (2015). The long reach of education: early retirement. *The Journal of the Economics of Ageing*, *6*, 133-148.
Warner, D. F., Hayward, M. D., & Hardy, M. A. (2010). The retirement life course in America at the dawn of the twenty-first century. *Population Research and Policy Review*, *29*(6), 893-919.
West, J. S., & Lynch, S. M. (2020). Demographic and Socioeconomic Disparities in Life Expectancy With Hearing Impairment in the United States. *The Journals of Gerontology: Series B*. Vol. XX, No. XX, 1–12 doi:10.1093/geronb/gbaa166
Yee, T. W., & Wild, C. J. (1996). Vector generalized additive models. *Journal of the Royal Statistical Society: Series B (Methodological)*, *58*(3), 481-493.

Zarulli, V., Jasilionis, D., & Jdanov, D. A. (2012). Changes in educational differentials in old-age mortality in Finland and Sweden between 1971-1975 and 1996-2000. *Demographic Research*, *26*, 489-510.

Zickar, M. J. (2013). The evolving history of retirement within the United States. In M. Wang (Ed.), *The Oxford Handbook of Retirement* (pp. 10–21). New York, NY: Oxford University Press.

Supplementary Materials

Table A1. Initial retirement age, with 95% bootstrap confidence intervals.

	Men					**Women**				
	1996–1999	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**	**1996–1999**	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**
Total	**63.5**	**64.5**	**64.5**	**64.2**	**65.9**	**63.8**	**64.9**	**64.5**	**64.4**	**65.4**
95% CI lower bound	63.2	64.1	64.1	63.8	65.4	63.5	64.5	64.2	64.0	64.9
95% CI upper bound	63.9	64.8	64.9	64.6	66.3	64.2	65.2	64.8	64.7	65.8
Below high school	**63.5**	**63.6**	**63.7**	**63.2**	**64.5**	**63.9**	**64.6**	**64.4**	**64.3**	**65.0**
95% CI lower bound	62.9	62.9	63.0	62.5	63.6	63.4	64.0	63.8	63.8	64.2
95% CI upper bound	64.1	64.2	64.4	64.0	65.5	64.4	65.1	65.0	64.9	65.8
High school /GED	**62.7**	**64.0**	**63.9**	**63.8**	**65.4**	**64.0**	**64.8**	**64.4**	**64.1**	**65.0**
95% CI lower bound	62.3	63.6	63.4	63.3	64.8	63.6	64.3	64.0	63.6	64.5
95% CI upper bound	63.2	64.5	64.5	64.3	66.0	64.4	65.2	64.8	64.5	65.6
College/university	**64.6**	**65.9**	**66.2**	**66.1**	**67.9**	**63.3**	**66.1**	**65.2**	**65.4**	**67.0**
95% CI lower bound	64.0	65.3	65.5	65.4	67.0	62.6	65.2	64.5	64.7	66.1
95% CI upper bound	65.4	66.6	67.0	66.8	68.7	64.1	66.9	65.9	66.0	67.9

Source: Authors' calculation based on the Health and Retirement Study, 1996–2016.

Table A2. Life expectancy at initial retirement, with 95% bootstrap confidence intervals.

	Men					Women				
	1996–1999	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**	**1996–1999**	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**
Total	**16.2**	**15.9**	**16.7**	**17.7**	**16.2**	**19.7**	**18.9**	**19.7**	**20.4**	**19.8**
95% CI lower bound	15.9	15.5	16.3	17.3	15.7	19.4	18.5	19.4	20.1	19.4
95% CI upper bound	16.5	16.3	17.1	18.1	16.7	20.0	19.2	20.1	20.8	20.2
Below high school	**14.3**	**14.4**	**14.9**	**15.0**	**15.2**	**18.4**	**16.4**	**17.9**	**18.3**	**19.2**
95% CI lower bound	13.4	13.6	14.0	13.9	13.8	17.5	15.5	16.9	17.4	18.0
95% CI upper bound	15.5	15.4	15.9	16.1	16.8	19.3	17.2	18.8	19.2	20.5
High school & GED	**16.3**	**15.8**	**16.8**	**17.7**	**15.2**	**19.5**	**19.4**	**20.1**	**20.9**	**20.0**
95% CI lower bound	15.5	15.2	16.1	16.9	14.3	18.8	18.9	19.5	20.3	19.3
95% CI upper bound	17.1	16.4	17.6	18.4	16.0	20.1	20.0	20.7	21.6	20.7
University & college	**17.1**	**16.4**	**16.9**	**18.4**	**17.7**	**21.3**	**18.9**	**20.8**	**21.4**	**19.9**
95% CI lower bound	16.1	15.4	15.9	17.5	16.6	20.0	17.8	19.7	20.3	18.6
95% CI upper bound	18.2	17.3	17.9	19.3	18.9	22.7	20.0	21.9	22.5	21.2

Source: Authors' calculation based on the Health and Retirement Study, 1996–2016.

Table A3. Retirement expectancy at initial retirement, with 95% bootstrap confidence intervals.

	Men					Women				
	1996–1999	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**	**1996–1999**	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**
Total	**14.4**	**13.9**	**14.6**	**15.6**	**14.0**	**17.7**	**16.8**	**17.7**	**18.4**	**17.7**
95% CI lower bound	14.1	13.6	14.3	15.2	13.5	17.5	16.5	17.4	18.1	17.3
95% CI upper bound	14.7	14.2	15.0	15.9	14.5	18.0	17.1	18.0	18.7	18.1
Below high school	**12.7**	**12.8**	**13.3**	**13.5**	**13.4**	**16.6**	**14.6**	**15.9**	**16.3**	**17.2**
95% CI lower bound	11.9	12.1	12.4	12.5	12.0	15.8	13.8	15.1	15.4	16.0
95% CI upper bound	13.6	13.7	14.2	14.4	15.0	17.5	15.3	16.8	17.2	18.5
High school & GED	**14.5**	**13.8**	**14.8**	**15.5**	**12.9**	**17.4**	**17.2**	**17.9**	**18.8**	**17.8**
95% CI lower bound	13.8	13.2	14.1	14.8	12.1	16.7	16.7	17.3	18.2	17.1
95% CI upper bound	15.2	14.4	15.5	16.2	13.7	18.0	17.8	18.5	19.4	18.5
University & college	**15.0**	**14.1**	**14.5**	**15.8**	**15.1**	**19.5**	**16.7**	**18.7**	**19.2**	**17.6**
95% CI lower bound	13.9	13.1	13.5	15.0	14.0	18.2	15.6	17.6	18.2	16.3
95% CI upper bound	16.0	15.0	15.5	16.7	16.2	20.9	17.9	19.8	20.4	18.8

Source: Authors' calculation based on the Health and Retirement Study, 1996–2016.

Table A4. Expected years in re-employment at initial retirement, with 95% bootstrap confidence intervals.

	Men					Women				
	1996–1999	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**	**1996–1999**	**2000–2003**	**2004–2007**	**2008–2011**	**2012–2015**
Total	**1.8**	**2.0**	**2.1**	**2.1**	**2.2**	**2.0**	**2.1**	**2.0**	**2.0**	**2.1**
95% CI lower bound	1.7	1.9	1.9	2.0	2.1	1.8	1.9	1.9	1.9	1.9
95% CI upper bound	2.0	2.2	2.2	2.3	2.4	2.1	2.2	2.2	2.2	2.3
Below high school	**1.6**	**1.6**	**1.7**	**1.6**	**1.8**	**1.8**	**1.8**	**1.9**	**2.0**	**2.0**
95% CI lower bound	1.3	1.4	1.4	1.3	1.5	1.6	1.6	1.6	1.7	1.7
95% CI upper bound	2.1	1.8	1.9	1.8	2.1	2.0	2.0	2.2	2.2	2.3
High school & GED	**1.8**	**2.0**	**2.0**	**2.2**	**2.2**	**2.1**	**2.2**	**2.2**	**2.2**	**2.2**
95% CI lower bound	1.6	1.8	1.8	2.0	2.0	1.9	2.0	2.0	2.0	2.0
95% CI upper bound	2.1	2.2	2.3	2.4	2.5	2.3	2.4	2.4	2.4	2.4
University & college	**2.1**	**2.3**	**2.4**	**2.6**	**2.6**	**1.8**	**2.1**	**2.1**	**2.2**	**2.3**
95% CI lower bound	1.9	2.1	2.1	2.3	2.4	1.6	1.9	1.9	2.0	2.1
95% CI upper bound	2.4	2.6	2.7	2.8	3.0	2.0	2.4	2.4	2.4	2.6

Source: Authors' calculation based on the Health and Retirement Study, 1996–2016.

Table A5. Life expectancy% in re-employment at initial retirement, with 95% bootstrap confidence intervals.

	Men					Women				
	1996–1999	2000–2003	2004–2007	2008–2011	2012–2015	1996–1999	2000–2003	2004–2007	2008–2011	2012–2015
Total	**11.2**	**12.6**	**12.3**	**12.1**	**13.7**	**9.9**	**11.0**	**10.2**	**9.9**	**10.6**
95% CI lower bound	10.3	11.8	11.4	11.2	12.8	9.3	10.4	9.6	9.3	9.9
95% CI upper bound	12.1	13.5	13.3	13.0	14.9	10.6	11.7	11.0	10.6	11.4
Below high school	**11.1**	**11.1**	**11.1**	**10.4**	**11.9**	**9.7**	**11.0**	**10.8**	**10.7**	**10.4**
95% CI lower bound	9.5	9.7	9.5	8.8	10.1	8.5	9.7	9.4	9.4	9.0
95% CI upper bound	13.7	12.4	12.6	11.9	13.9	11.0	12.3	12.2	12.0	11.8
High school & GED	**10.9**	**12.7**	**12.1**	**12.3**	**14.8**	**10.8**	**11.3**	**10.8**	**10.4**	**11.1**
95% CI lower bound	9.9	11.6	11.1	11.3	13.5	9.9	10.5	10.0	9.6	10.2
95% CI upper bound	12.3	13.8	13.4	13.5	16.1	11.7	12.1	11.8	11.2	12.0
University & college	**12.4**	**14.2**	**14.2**	**13.9**	**14.9**	**8.4**	**11.4**	**10.2**	**10.2**	**11.8**
95% CI lower bound	10.9	12.8	12.7	12.6	13.3	7.5	10.1	9.1	9.1	10.4
95% CI upper bound	14.0	15.7	16.0	15.5	16.8	9.5	12.8	11.4	11.3	13.2

Source: Authors' calculation based on the Health and Retirement Study, 1996–2016.

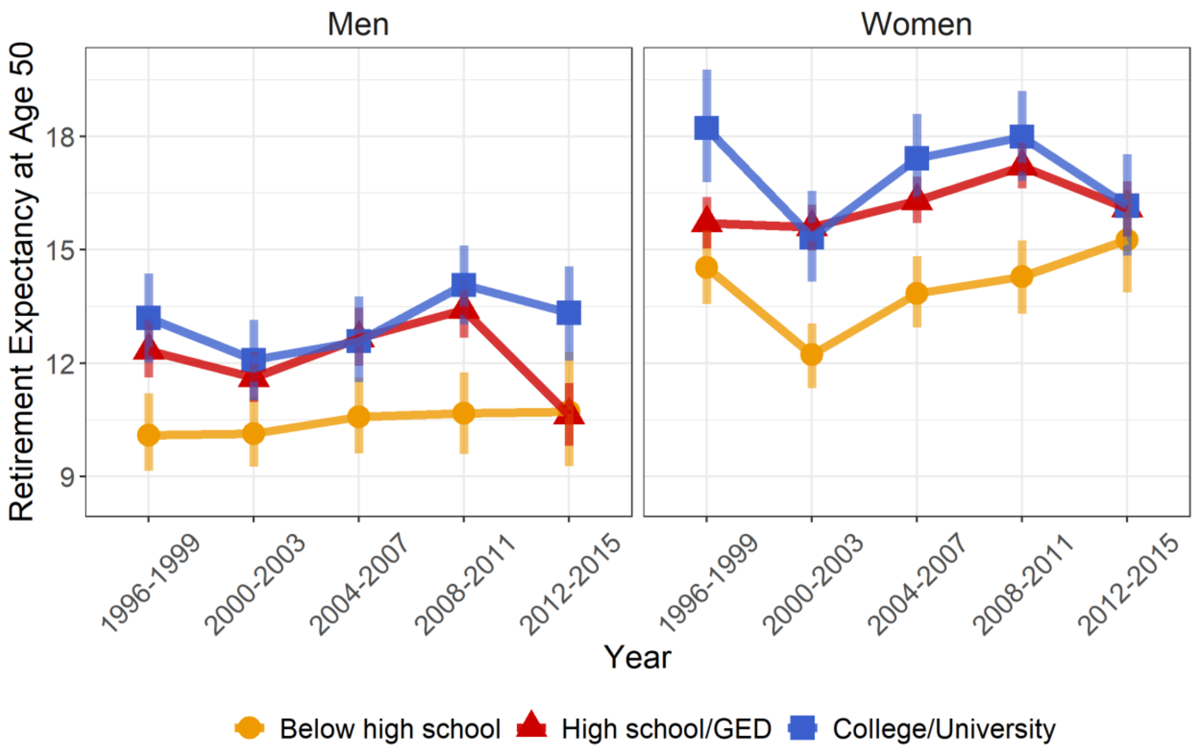

Figure A1. Trends of retirement expectancy, with 95% bootstrap confidence intervals. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Calculations are conditional upon surviving to 50, and individuals in all transient states at 50 are included.

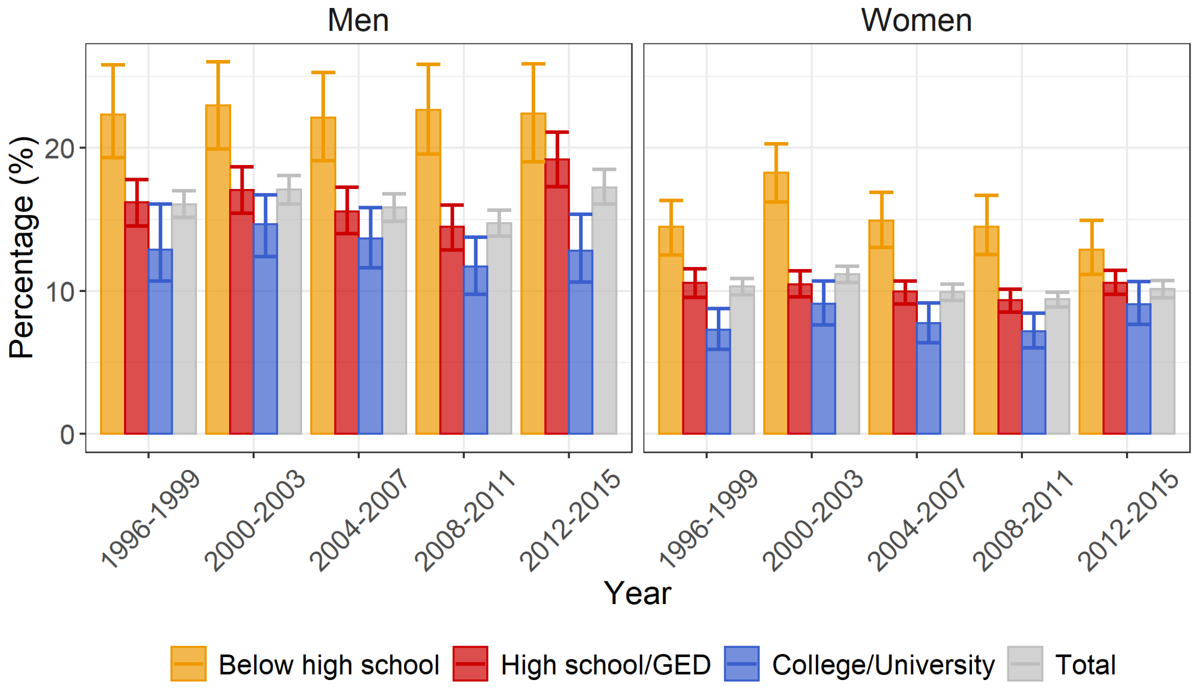

Figure A2. Percentage of individuals not surviving to retirement, with retirement threshold age 70. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Error bars show 95% bootstrap confidence intervals.

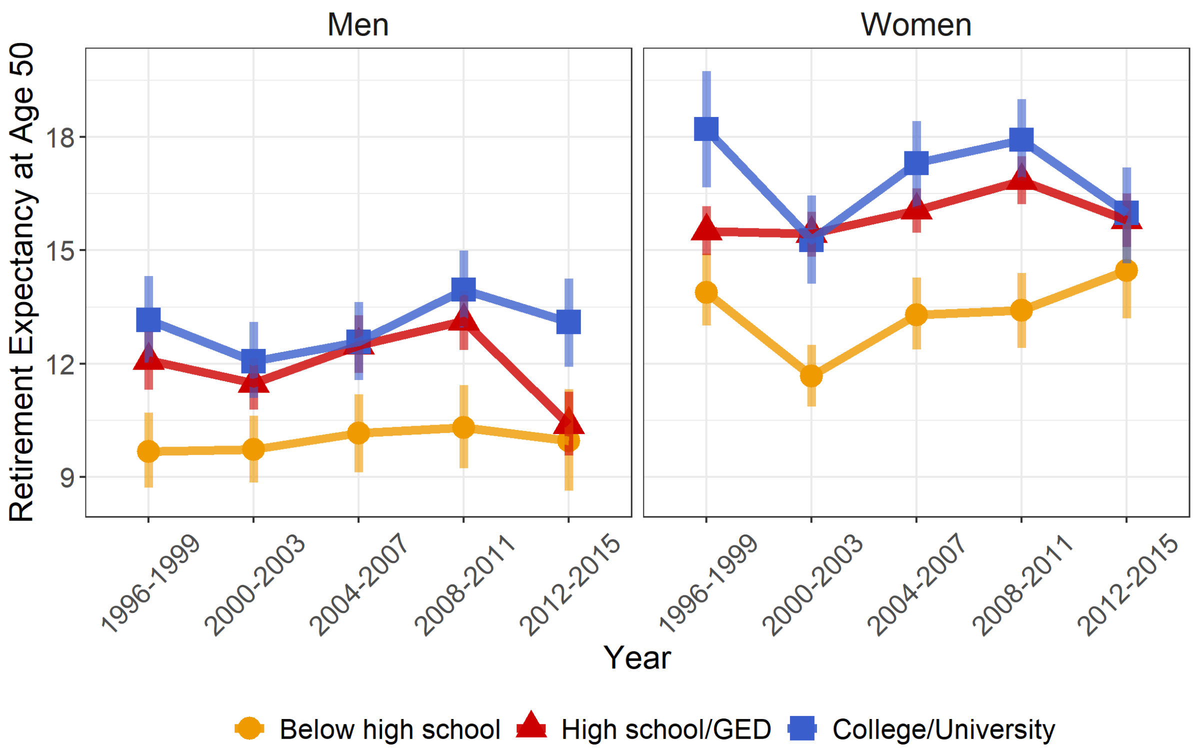

Figure A3. Trends of retirement expectancy, with retirement threshold age 70. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Calculations are conditional upon surviving to 50, and individuals in all transient states at 50 are included.

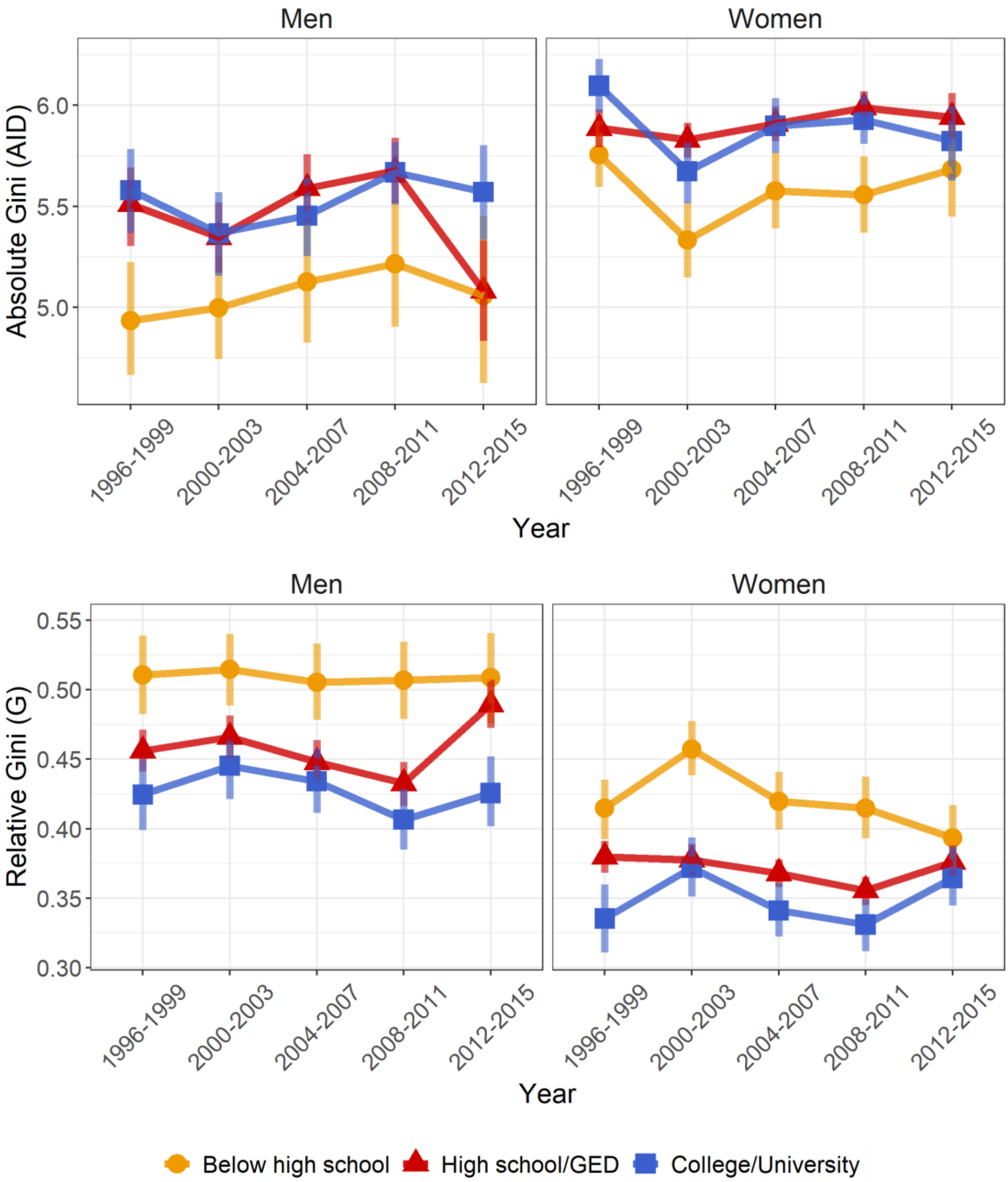

Figure A4. Trends of retirement lifespan variation, with retirement threshold age 70. *Source:* Authors' calculation based on the Health and Retirement Study, 1996–2016. *Note:* Calculations are conditional upon surviving to 50, and individuals in all transient states at 50 are included.