Multigenerational Attainment and Mortality:
An Integration of the Long Arm, Personal Attainment, and Social Foreground Perspectives

Joseph D. Wolfe, Shawn Bauldry, Eliza K. Pavalko, and Melissa A. Hardy

Abstract

INTRODUCTION

The association between socioeconomic attainment and health is one of the most robust findings in the social sciences. An enormous body of research suggests that the relationship between SES and health exists at nearly every point in the life course and with nearly every measure of SES (see Adler and Stewart 2010; Pavalko and Caputo 2013). Currently, studies suggest that life expectancy is related, not only to an individual's socioeconomic attainment, but also to the attainment of his or her parents (Hayward and Gorman 2004; Pudrovska 2014) and adult children (Friedman and Mare 2014; Torssander 2013). These studies suggest that the association between SES and mortality reflects attainment processes extending across multiple generations, but research has not empirically tested this possibility.

Prior work provides evidence of a relationship between multigenerational attainment and health, but it has important limitations. First, no single study identifies the degree to which the attainment of individuals, their parents, and their adult children simultaneously shape mortality. Second, the majority of studies rely on samples with low mortality rates, samples in which only 40 to 50% of the respondents have died. This means that much of our knowledge on the association between SES and mortality is based on the mortality rates of less than half the population.

We address the limitations of previous research as follows. First, we make the case for multigenerational health disparities and categorize current research into three perspectives that provide empirical evidence of our argument. We refer to these perspectives as (1) the long arm perspective, which emphasizes early-life socioeconomic conditions as a cause of mortality by way of biological programming and cumulative disadvantage, (2) the personal attainment perspective, which emphasizes one's own attainment as a central determinant of mortality, and (3) the social foreground perspective, which emphasizes the health-related advantages provided by high-SES, adult children. Second, we use the National Longitudinal Survey (NLS) Older Men Cohort, which is a nationally representative sample with nearly complete information on mortality (93 percent of our sample has died).

The combination of socioeconomic measures spanning three generations and the high mortality rate in our data allows us to examine the three perspectives linking SES and mortality with more precision than has been possible in past studies. We find preliminary evidence of multigenerational disparities in mortality. More specifically, we find that parent attainment primarily influences mortality through the attainment of individuals and their adult children. Personal and adult child attainment, on the other hand, appears to have direct effects on mortality risk. Taken together, our results reveal that socioeconomic attainment is capable of proliferating across multiple generations, creating a legacy of health inequalities. Thus, our findings suggest an integration of the long arm, status attainment, and social foreground perspectives into a comprehensive perspective that highlights the multigenerational origins of the SES-mortality gradient.

BACKGROUND

We begin by discussing the importance of multigenerational attainment in shaping individuals' lives. Next, we develop a theoretical model of health that highlights the role of inequalities in attainment in the creation of health disparities. Finally, we discuss research on the long arm, personal attainment, and social foreground perspectives and argue that these distinct

research areas outline the component parts of the relationship between multigenerational attainment and mortality.

Multigenerational Attainment

Sociology has a long history of studying the intergenerational transmission of socioeconomic status, and research often finds that children of more educated parents complete more years of education, obtain higher earning and more prestigious occupations, and accumulate more wealth. Furthermore, scholars increasingly recognize the possibility that the attainment process may even include three or more generations. More specifically, the attainment of both parents and grandparents can have important implications for one's eventual socioeconomic attainment (Mare 2011; Mare 2014). This suggests that in order to understand social inequalities scholarship must consider cumulative advantages or disadvantages across multiple generations – an idea Mare (2011: 4) refers to as "taking a long view of inequality." We refer to this process as multigenerational attainment.

Multigenerational attainment acknowledges cumulative disadvantage across generations and the long-term patterns that can arise out of one generation's attainment, or lack thereof. Cumulative disadvantage [specifically "path dependent" cumulative disadvantage (DiPrete and Eirich 2006)] refers to the process whereby "a prior state influences current state and has both direct and indirect long-term consequences" (Willson, Shuey, and Elder 2007: 1889). For health research, cumulative disadvantage typically refer to the process whereby health inequalities related to SES grow over time. Most discussions on cumulative advantage/disadvantage refer to patterns of increasing inequality over the course of individuals' lives, but the underlying logic is applicable to multigenerational attainment. That is, one generation's attainment can set into motion the successes and failures of multiple future generations (Mare 2011). Thus, attainment processes not only occur within an individual's lifetime, but also across generations as families accumulate advantages or disadvantages and transfer them to their children and grandchildren.

How is this relevant to mortality, though? Although SES provides important material, psychological, and social resources, the origins of these resources are not stagnant across the life course. At both extremes of the life span, for example, child and elderly populations are heavily reliant on the material and psychological resources provided by others and vulnerable to the health-related effects of these resources (Cohen et al. 2010; Friedman and Mare 2014; Torssander 2013). This suggests that the attainment of one's parents and adult children provide additional health-related resources individuals would not have with their SES alone. Three distinct bodies of literature, which we refer to as the long arm, the personal attainment, and the social foreground perspectives, suggest that different generations provide important socioeconomic resources at critical stages in the life course. Combining these perspectives into a unified model of the life course suggests that a cumulative disadvantage process occurring across multiple generations could have devastating effects on life span. Below we discuss empirical evidence of this claim.

The Long Arm, Personal Attainment, and Social Foreground Perspectives

Research within the long arm, personal attainment, and social foreground perspectives provide support for our model of multigenerational health disparities. These three perspectives encompass studies that emphasize different generational sources of attainment, including family of origin's level of attainment, individual's earned attainment, and the attainment of their adult children. These perspectives emphasize a different generation provides a link between SES and

mortality. Below we outline each perspective and selection of related studies.

The Long Arm Perspective. The long arm perspective suggests that the socioeconomic attainment of individuals' parents and the social conditions of early childhood are important predictors of adult health and mortality (Hayward and Gorman 2004; Montez and Hayward 2014; Pudrovska 2014; Pudrovska and Anikputa 2014; Warner and Hayward 2006). Rather than any single experience, scholars increasingly acknowledge that adult mortality likely reflects both the direct effects of biological programming and the indirect, cumulative effects of disadvantaged experiences (e.g., Montez and Hayward 2014). Childhood is a vulnerable period of the life course when poor conditions or events can cause physical and mental damage that continues through their life course. Low parental SES is related to poor home, school, and neighborhood conditions in early life, increasing the chances of exposure to secondhand smoke, poor nutrition, dangerous housing materials (e.g., asbestos, mold, etc.), infectious disease, neighborhoods with high levels of violence and crime, and interpersonal conflict (Cohen et al. 2010; Conger, Conger and Martin 2010; Evans 2004; Haas 2008). Some scholars argue that poor social conditions like these can damage biological functioning to such an extent that, though remaining latent for years, it has a direct and negative effect on health and longevity (Almond and Currie 2011; Blane 2006; Hertzman 1999). Barker et al. (1990), for example, find that the blood pressure of men and women in their late forties and early fifties is significantly different based on birth weight and placenta size, which the authors contribute to poor intrauterine conditions that caused "circulatory adaptation in the fetus, altered arterial structure in the child, and hypertension in the adult" (259).

Research also shows that low-SES childhoods can have a less direct effect on adult health and mortality. Broadly speaking, these studies argue that low-SES conditions in early life impact health in later life by initiating an accumulation of health insults and social disadvantages that reduce health and shorten life span (Montez and Hayward 2014; Pudrovska and Anikputa 2014; Umberson et al. 2014). For example, Hayward and Gorman (2004) find that childhood socioeconomic status, as measured by parents' (typically fathers) education and occupation, impacts men's mortality, but the association is indirect – occurring through adult education, income, wealth, and occupation. Pudrovska (2014) also finds that those who have higher SES at age 18 live longer than their lower SES counterparts, and SES-health disparities seem to grow over time. In Pudrovska's study, however, adult attainment and health behaviors do not explain the association. In sum, research suggests that low-SES in early life, i.e., parents' SES, will have a relationship to mortality, but this association may be conditional on the attainment of future generations.

The Personal Attainment Perspective. Although an individual's SES is undoubtedly linked to the SES of parents and adult children, personal attainment likely provides unique health-related resources (Rogers et al. 2012; Ross and Wu 1995). Research falling within the personal attainment perspective focuses on individuals' socioeconomic attainment as the most immediate determinant of health and mortality. This perspective represents the majority of research on SES and health and has a long history in the social sciences (see Elo 2009). As far back as the observations of 19th century scholars like William Farr, Rudolf Virchow, Emile Durkheim, and Frederick Engels, scholars have known that mental and physical health is vulnerable to economic disadvantage (Adler and Stewart 2010). Since these foundational works, research consistently finds evidence that socioeconomic attainment is a fundamental cause of population-level health disparities (see Phelan, Link and Tehranifar 2010). An individual's economic, educational, and occupational attainment provides them with access to resources like

"money, knowledge, prestige, power, and beneficial social connections" (Phelan et al. 2004: 267).

Beyond the benefits of personal wealth, human capital theories of health argue that education provides cognitive (e.g., skill improvement) and noncognitive (e.g., conscientiousness and a sense of mastery) resources, giving the more educated a measurable advantage in avoiding and treating potentially deadly health problems. Herd (2010), for example, finds that educational attainment and academic performance in high school positively influence reports of overall health in midlife, and academic performance (but not attainment) reduces the number of chronic diseases in midlife. Education is also related to poor health behaviors like poor diet, physical inactivity, and tobacco use that are powerful predictors of preventable diseases (Pampel, Krueger and Denney 2010). SES also affects how well individuals follow medical advice in treating chronic diseases. Luftey and Freese (2005) find that low-SES diabetes patients tend to underestimate the severity of their condition and have trouble following treatment regimens.

An individual's occupation and workplace are also connected to health. More prestigious occupations and higher-paying jobs come with an array of health-related benefits. Among the most prestigious jobs, workers receive much better insurance packages, which are more likely to pay for expensive medications and specialized treatment. Low-prestige occupations, on the other hand, tend to involve repetitive tasks that require little or no thought to accomplish, and workers have very little autonomy (Menaghan 1991; Menaghan and Parcel 1991). Together, occupational benefits and working conditions appear to impact health and mortality regardless of other sources of SES. In sum, personal attainment appears to be especially important to mortality by providing a wide array of social, psychological, and material resources that the attainment of parents and children is unlikely able to capture. However, current research is unable to identify to what degree the effects of personal attainment on mortality are conflated by the attainment of prior and future generations.

Social Foreground Perspective. The social foreground perspective is a more recent development related to the multigenerational effects of SES on mortality. This perspective emphasizes the role of adult children's SES on one's mortality (Torssander 2013). The central argument is that children who achieve higher SES can use the material and educational resources at their disposal to improve the quality and length of their parents' lives. Beyond the financial assistance high-SES children can provide elderly parents (Torssander 2013), the association between offspring's SES and mortality may also exist because of direct care and health spillover (Friedman and Mare 2014). Direct care refers to children providing care for parents, such as running errands, doing dishes, etc. As health and cognition declines and functional limitations increase, their children become an important source of nonpaid care. Higher SES offspring are healthier and have fewer functional limitations (Kawachi, Adler and Dow 2010; Maddox and Clark 1992), both of which affect the level of care they can provide to sick parents (Hogan, Eggebeen and Clogg 1993). More educated individuals are also better able to navigate the healthcare system and locate and implement health-related information (Luftey and Freese 2005; Pampel, Krueger and Denney 2010). Children's education may provide a similar resource for elderly parents. Health spillover refers to the process whereby health, like happiness, obesity, and smoking (Christakis and Fowler 2007; Christakis and Fowler 2008; Fowler and Christakis 2008), proliferate through social networks. We know higher-SES individuals tend to have healthier eating habits, exercise more, follow medical advice, and are less likely to smoke or engage in unhealthy levels of alcohol consumption (see Pampel, Krueger and Denney 2010). Health spillover suggests that adult children's attainment is accompanied by healthier lifestyles,

which they then transfer to parents. For children that provide direct care, he or she may even enforce healthier behaviors by supervising their parents' tobacco use, alcohol use, and diet.

Currently, the majority of research on adult child attainment and health does not use U.S. data (e.g., Torssander 2013; Zimmer, Hermalin and Lin 2002; Zimmer et al. 2007) with one important exception. Friedman and Mare (2014) examined a survey of U.S. adults and found that the association between adult offspring's educational attainment and mortality persists even after controlling for personal attainment. Although these authors find that children's attainment is related to mortality net of personal attainment, they did not consider parent's attainment, which may be an important determinant of future generation's attainment and mortality risk.

The Current Study

The aim of this study is to test our model of multigenerational attainment and mortality and identify the extent to which personal attainment, parents' attainment, and adult children's attainment influences survival. Our analyses extend previous work on the relationship between SES and mortality by examining the transfer of socioeconomic attainment across multiple generations and the association between multigenerational attainment and lifespan. To our knowledge, this association has not been explored in previous research. Using data from the National Longitudinal Surveys of Older Men (NLS-OM), we investigate whether personal, parental, or adult child attainment is associated with survival and whether each generation's attainment has an effect independent of the attainment of other generations.

DATA AND METHODS

Data

Data for this analysis are drawn from the National Longitudinal Survey of Older Men (NLS-OM). The NLS-OM began in 1966 with a nationally representative sample of 5,020 civilian, noninstitutionalized, men between the ages of 45 and 59 and an oversample of blacks. Twelve waves of data collection occurred between 1966 and 1983 and an additional wave of data in 1990. In our sample, the vast majority of participants, 93 percent, are deceased. We use mortality information from the NLS-NDI matched dataset, which includes recently updated mortality information for the NLS-OM cohort. The National Death Index (NDI) is a centralized database of death record information on file in. The National Center for Health Statistics (NCHS), with the help of state vital statistics offices, created the NDI to assist researchers studying mortality. Using information from the OM cohort, including their social securi, first and last names, birth date, father's last name (for female respondents), state of birth, sex, and race, respondents were matched with death records provided by state agencies.

The 1976 wave includes detailed information on the children of the respondents and captures 69.5 percent of the original respondents and 83.4 percent of the original respondents that were still alive. Thus, we limit our sample to 3,451 respondents who participated in the 1976 wave of data with non-missing data for age and age of death. We use multiple imputation using chained equations to construct 20 complete data sets to address missing data in all covariates. Most variables have less than 5 percent missing. The measures of respondent's income and of parent occupational education are missing for 2 and 10 percent of respondents. The most problematic measure is parent education (missing for approximately 42 percent of respondents).

Variables

Age at Entry and Age at Death

We calculated the age of respondents in 1976 based on the interview date and the date of birth (setting the day of the month to 15 for all respondents). In 1976, respondents ranged in age from 54 to 71. We calculated the age of respondents alive as of 2008 using July 2 as the midpoint of the year. The average age of death for the 93 percent of respondents who had died 2008 is approximately 77 years old. Figure 1 illustrates the Kaplan-Meier survival estimates and the hazard estimates. We observe a sharp decline in survival beginning around 60 with the steepest drops occurring around the mean, 77, and 90.

-- Figure 1 about here --

Multigenerational Attainment

Our analyses focus on parent, respondent, and child educational attainment (see Table 1). Education is a key component of socioeconomic status and health disparities. In fact, Montez, Hummer and Hayward (2012) even advocate using education as the sole indicator of SES. However, we also considered several other operationalizations of attainment, including occupational education, occupational earnings, and occupational prestige (Hauser and Warren 1997; Warren, Sheridan and Hauser 1998). When added to models with education, occupational characteristics were in large part not significant and did not improve model fit. Thus, we present the more parsimonious models, which operationalize multigenerational attainment as the educational attainment of parents, respondents, and adult children. Because the role of education changed dramatically in the early half of the twentieth century, we measure parents' attainment different than we do for respondents and adult children. In Table 1, we can see that far fewer parents completed their high school education and went to college than future generations. Thus, we measure parents' attainment as 0 to 6 years, 7-11, and 12 or more, and we measure respondents and adult children's attainment as 0 to 11 years, 12 years, and 13 or more.

-- Table 1 about here --

The construction of parent and respondent educational attainment is straightforward, but due to the nature of the NLS interviews, we had to make several important coding decisions in the construction of adult children's educational attainment. We relied on the rosters of children living outside of the household to determine the number of adult children (ages 25 and older). Respondents in the 1976 sample had between 0 and 12 adult children with 1,022 (30 percent) having no adult children. Among the 2,429 respondents with adult children, 71 percent had at least one child 25 or older and the average age of adult children is 33. There are a number of potential approaches to constructing summary measures of adult children's socioeconomic attainments (Friedman and Mare 2014; Torssander 2013; Torssander 2014; Zimmer et al. 2007). The two most common approaches are calculating the highest level of attainment among the children and calculating the proportion of children at each level of attainment. All of the authors that examine multiple approaches, however, note that the various operationalizations lead to similar model fit and substantive results. We use the highest level of educational attainment among all sons, daughters, and sons-in-law. Following Friedman and Mare (2014) we limited consideration to children aged 25 and older. For all children's SES measures, we entered a code

of 0 for respondents who did not have children or children 25 years old or older. To address this in our models we include a measure for the number of children in all models.

After we consider models of multigenerational attainment that rely only on education, we examine the effects of respondent's average logged family income (in 1980 dollars). This model allows us to establish whether the relationship between multigenerational attainment and mortality is independent of respondents' economic well-being. To create this variable, we took the average of incomes reported for 1965, 1968, 1970, 1975, 1980, and 1989 for respondents 65 and younger at the given year. For these years, NLS-OM calculated household income as the sum of wages and salary, business and farm income, unemployment compensation, rental income, interest and dividends, Social Security, disability payments, public assistance, Food Stamps, and pension benefits. A small number of respondents had negative incomes ($N < 20$ for any given year) that we recoded to 0 before logging.

Other Covariates

In addition to the measures of socioeconomic status we also adjust for a number of additional sociodemgraphic variables (see Table 1). These variables include race (white, black, and other), an indicator for being foreign-born, number of foreign-born parents (0, 1, or 2), family structure at age 15 (biological mother and father; mother or mother and step-father; father or father and step-mother; other), and marital history (the respondent reported never married at every wave; the respondent reported at least one marital disruption including divorce, widowhood, or separation; the respondent reported married at every wave).

Methods

Our analysis relies on Cox proportional hazard models with age at death measured in years. We set entry into the risk set based on respondent's age in 1976 depending on the analysis using Stata's survival-time suite of commands. This approach addresses left-truncation in which some of the members enter at an age older than other members of the sample have already died ($N = 12$). We used Schoenfeld residuals to test the proportion-hazard assumption and found that it held for all of the primary analysis variables. The proportional-hazard assumption did not hold for blacks, therefore we included an interaction between the indicator for blacks and age in all of our models.

RESULTS

As shown in Table 1, a large majority of our sample is white (71 percent) and grew up with their (married) biological parents. Not many in the NLS-OM cohort were born outside the U.S. (5 percent), but 22 percent had one or two foreign-born parents, which reflects an influx of a large immigrant population at the turn of the twentieth century (Hayward and Gorman 2004). Compared to today's standards, the NLS-OM cohort lived in households with extremely low-levels of education. Almost half of the NLS-OM parents never made it past the sixth grade and only 16 percent made it past 11^{th} grade. As for respondents, nearly 40 percent achieved 12 or more years of schooling, more than doubling the percentage of their parents. Although more than their parents, the amount of schooling respondents completed is still low by today's standards with only 15 percent reporting any schooling beyond high school. The adult children of respondents reveal a major upswing in educational attainment in the U.S. Only 5 percent of adult

children failed to complete 12 years of schooling and approximately 40 percent have at least some college experience.

In Table 2, Model 1 provides evidence of significant relationships with several childhood characteristics and mortality. Specifically, we find that parent education, race, nativity, and childhood family structure are significantly related to mortality. Having a parent with a high school education or more is associated with a 13 percent lower hazard of mortality, which offers initial support to the long arm perspective. We also find strong evidence of the healthy immigrant effect as those who are foreign-born or have foreign-born parents have lower mortality risk than their native counterparts. With respect to family structure, we find that men from homes that include at least one biological parent have similar hazard ratios. However, those who were raised in households that did not include a biological parent have 16% higher mortality risk than those who lived with both biological parents.

-- Table 2 about here --

In Model 2, we consider respondents' educational attainment and find a clear gradient, even after controlling for other childhood and adult conditions. Compared to men who attended fewer than 12 years of schooling, those who completed high school and attended at least some college had lower mortality risk by 13 and 25 percent, respectively. The relationship of other covariates to mortality remains basically the same after including respondents' attainment. In Model 3, we examine the effects of adult child attainment. This model reveals that having at least some college is associated with a twenty-five percent reduction in the hazard of mortality or (equivalently) respondents with a child who has more than a high school education are 5 times less likely to die at any given age in our sample.

Taken together, Models 1-3 provide evidence of each perspective. In Model 4, however, we include each generation's attainment simultaneously and find that the effects of parents' attainment are no longer significant. The effects of respondent's and adult child's attainment remain significant and substantially reduce the risk of mortality. In other words, only personal and adult child attainment have significant, and nearly identical, effects on men's hazard of mortality. However, only the most educated adult children reduce men's mortality risk, whereas both high school completion and college attendance both reduce mortality risk.

In our final model, Model 5, we add men's average income to Model 4 to assess whether the effects of men's and adult child educational attainment on mortality are independent of economic status. Although the negative association between completing 12 years of schooling and mortality risk is no longer significant, having at least some college experience is associated with a 16 percent reduction in the hazard ratio. Furthermore, the effects of adult children's attainment is reduced (.79 to .82) remains a significant and negative effect on mortality.

In Figure 2, we consider Model 4 in more detail. We compare the estimated survival function for low and high SES families. Low SES denotes parents attained 0 – 6 years of schooling, respondents attained less than 12 years, and adult children attained less than 12 years. High SES denotes parents 12 or more years of schooling and respondents and adult children attained 13 or more years of schooling. As men age, the gap between low and high SES grows larger until they begin to converge at the age of 90. We also tested the difference between hazard ratios for low and high SES (not shown) and find that they are significantly different from one another at the .001 level.

-- Figure 2 about here --

DISCUSSION

We extend the concept of multigenerational attainment (Mare 2011; Mare 2014) as a means of integrating multiple areas of research that we categorize as the long arm, personal attainment, or social foreground perspectives. Each of these perspectives focuses on the attainment of a different generation as predictors of health and mortality. The long arm perspective emphasizes the attainment of one's parents, the personal attainment perspective emphasizes one's own socioeconomic achievements, and the social foreground perspective emphasizes the attainment of one's adult children. Socioeconomic attainment is generally seen as an indicator of one's access to the ever-changing material, psychological, and social resources that protect and promote health (Link and Phelan 1995), and the origins of these resources can vary across the life course.

In both childhood and old age, people must often rely on the resources provided by the attainment of their parents and adult children, respectively (Cohen et al. 2010; Friedman and Mare 2014; Torssander 2013). This suggests that parent, personal, and adult child attainment could each have an effect on mortality. Although research increasingly supports the view that the cumulative attainment of multiple generations is a central factor for health and mortality (Montez and Hayward 2014; Pudrovska 2014; Torssander 2014), prior research has yet to examine a comprehensive model of multigenerational attainment. Although prior work suggests a relationship between multigenerational attainment and mortality, it has serious limitations that we address. First, we consider parent, personal, and adult child attainment simultaneously in order to identify the effect of each generation's attainment on mortality independent of other generations. Second, we use the NLS-OM data with updated mortality data that provides information on mortality for 93 percent of the sample. The combination of socioeconomic information on three generations and the high mortality rate allows us to examine the association between attainment and mortality with more precision than previous studies.

Our results provide evidence of multigenerational disparities in mortality. Specifically, we find that adult children's educational attainment becomes an important resource net of parent and personal attainment. Parents' attainment, on the other hand, had the smallest effect on mortality. Although it had an initial association with mortality, the association between parent attainment and mortality did not remain significant after personal and adult child attainment were included in the models. Like Pudrovska and Anikputa (2014), our results suggest that, instead of creating a biological links from early-life to adulthood, parents' attainment is acts as a catalyst of multigenerational attainment process. In supplemental analyses (available upon request), we examined the effects of parent attainment on personal and adult child attainment.
We found that the attainment of adult children was related to both parent and personal attainment, which suggests grandparent attainment can have long reaching consequences on intergenerational exchanges. Thus, our results suggest that parent attainment influences mortality through its impact on the attainment of multiple generations (Hayward and Gorman 2004; Pudrovska and Anikputa 2014).

Not surprisingly, personal attainment had a significant effect on mortality risk, even after controlling for parent and adult child attainment and relevant sociodemographics like race and marital history. Adult child attainment also had a robust association with mortality. Even in models controlling for each generation's attainment and average income, higher levels of personal and adult child attainment were significantly related to a reduction in mortality risk.

These findings provide further support to research examining the social foreground perspective (Friedman and Mare 2014; Torssander 2014). Although examining the many mechanisms that link the attainment of adult children to mortality is beyond the scope of this study, our findings suggest that children's attainment is especially important for mortality. In supplemental analyses (available upon request), we found that the differences in the effects of personal and adult child attainment were not significantly different, whereas parent attainment was significantly smaller than the log odds for both personal and child attainment.

In sum, our results provide evidence of multigenerational disparities in mortality. In large part, our findings support our model of multigenerational attainment and mortality. Parent attainment primarily influences mortality through the attainment of individuals and their adult children, which have robust effects on mortality risk. Thus, the attainment of a single generation can impact the attainment of multiple generations and, in turn, shape mortality rates in the population. Taken together, our results reveal that the advantages of attainment are capable of proliferating across multiple generations, creating a legacy of inequalities.

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Figures and Tables

Figure 1: Kaplan-Meier survivor function

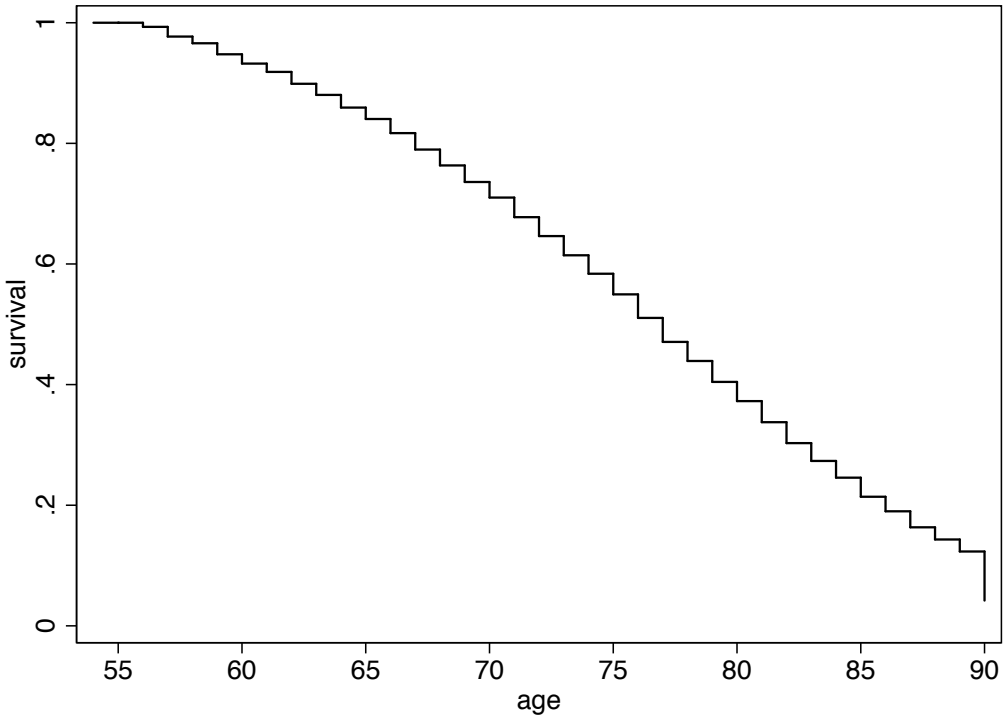
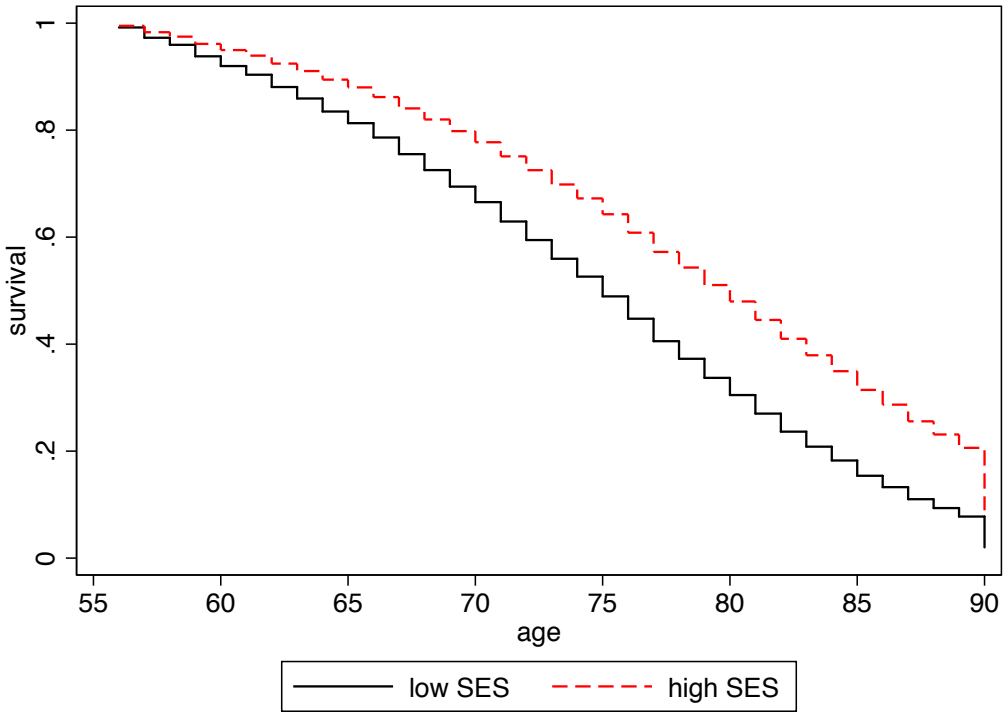


Figure 2: Estimated survival function by multigenerational attainment levels



Notes: Low SES denotes parent attained 0 – 6 years of schooling and respondents and adult children attained less than 12 years. High SES denotes parent attained 12 or more years of schooling and respondents and adult children attained 13 or more years of schooling.

Table 1. Means/proportions for all analysis variables (N= 3,451)

	Means or Proportions	Min	Max
Age in 1976	61.82	54	71
Age of Death	77.28	56	102
Deceased by 2008	0.93	0	1
Multigenerational Attainment			
Parent Education			
0 - 6 years	0.48	0	1
7 - 11 years	0.35	0	1
12+ years	0.16	0	1
Respondent Education			
0 – 11 years	0.63	0	1
12 years	0.22	0	1
13+ years	0.15	0	1
Average Logged Income	9.79	0.75	12.53
Adult Child Education			
0-11 years	0.05	0	1
12 years	0.24	0	1
13+ years	0.41	0	1
All children < 25 years	0.30	0	1
Controls			
Foreign-born	0.05	0	1
Foreign-born Parents			
0 parents foreign-born	0.78	0	1
1 parent foreign-born	0.05	0	1
2 parents foreign-born	0.17	0	1
Family Structure (age 15)			
Biological mother/father	0.72	0	1
Biological mother only	0.12	0	1
Biological father only	0.05	0	1
Other	0.11	0	1
Marital History			
Married	0.71	0	1
Never married	0.03	0	1
Disrupted	0.26	0	1
Number of Adult Children (25+)	1.69	0	12
Race			

White	0.71	0	1
Black	0.27	0	1
Other race	0.01	0	1

Notes: Means/proportions based on average across 20 complete datasets.

Table 2. Selected parameter estimates (hazard ratios) from Cox proportional hazard models (N= 3,451)

	Model 1: Parent Attainment	Model 2: Personal Attainment	Model 3: Child Attainment	Model 4: Multi. Attainment	Model 5: Full
Parent Education					
7 - 11 years	0.96			1.01	1.02
	(0.05)			(0.05)	(0.05)
12+ years	0.87*			0.98	1.01
	(0.05)			(0.07)	(0.07)
Respondent Education					
12 years		0.87**		0.90*	0.93
		(0.04)		(0.04)	(0.05)
13+ years		0.75***		0.79***	0.84**
		(0.04)		(0.05)	(0.05)
Adult Child Education					
12 years			0.95	0.95	0.97
			(0.08)	(0.08)	(0.08)
13+ years			0.75***	0.79**	0.82*
			(0.06)	(0.07)	(0.07)
All children < 25 years old			0.89	0.91	0.93
			(0.08)	(0.08)	(0.08)
Average Logged Income					0.90***
					(0.02)
Foreign-born	0.80*	0.79*	0.78**	0.78**	0.78**
	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
Foreign-born parents					
1 parent foreign-born	0.84*	0.84*	0.84*	0.83*	0.84*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
2 parents foreign-born	0.91	0.93	0.95	0.94	0.96
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Family Structure					
Biological mother only	1.03	1.02	1.03	1.02	1.03
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Biological father only	0.92	0.91	0.90	0.90	0.90
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Other	1.16*	1.13*	1.15*	1.13*	1.12
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Marital History					
Never Married	0.90	0.91	0.88	0.88	0.83
	(0.10)	(0.10)	(0.10)	(0.10)	(0.09)

Disrupted	0.99	0.97	0.97	0.96	0.94
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Number of Adult children (25+)	1.00	1.00	1.02	1.01	1.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Race					
Black	5.91***	5.85***	5.92***	5.83***	5.93***
	(2.27)	(2.24)	(2.27)	(2.24)	(2.27)
Other	1.01	1.04	1.03	1.05	1.05
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)
Black x Time	0.98***	0.98***	0.98***	0.98***	0.98***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$. Hazard ratios with standard errors are in parentheses.