Race Differences in the Health and Mortality Consequences of Intergenerational Educational Mobility

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Abstract:

There is no theoretical consensus regarding how changes in socioeconomic position across generations, either upward or downward social mobility, influences health. Further, little research explores how the health consequences of social mobility may vary by race. Integrating theories from social mobility and medical sociology, this research uses data from the General Social Survey and the National Death Index (N=32613) and diagonal reference models to isolate the health consequences of intergenerational educational mobility on self-rated health and mortality risk. Results demonstrate detrimental health consequences of downward mobility, and that downward mobility is more consequential to the subjective health of whites relative to African Americans. Results also show that upward educational mobility is less beneficial to the health of African Americans relative to whites. These findings suggest interventions to increase upward educational mobility may improve overall population health, but have limited effect on reducing racial disparities in health and mortality.

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Can social mobility change our health, or is the fate of one's health destined by their socioeconomic origins? There is no theoretical consensus regarding the health consequences of changes in socioeconomic status across the life-course and across generations (Ben-Shlomo and Kuh 2002; Hallqvist et al. 2004; Pudrovska and Anikputa 2014). Some theories suggest that early life socioeconomic conditions directly influence health, while other theories suggest that early life socioeconomic conditions only shape health through their influence on adult socioeconomic attainment (Lynch and Smith 2005). Other theories suggest that changes in socioeconomic position, either climbing the economic ladder upward or downward may be consequential to our health (Lynch and Smith 2005). A firm understanding of how early life and adult socioeconomic conditions shape our health is critical to the design and implementation of economic interventions aimed at improving health, signaling how/when scarce resources should be targeted in order to maximize returns and reduce social disparities in health (Bartley and Plewis 2007).

Do the health benefits/consequences of social mobility vary by race? Research regarding the relationship between race, socioeconomic position, and health is complicated. Most research shows that racial disparities in health are driven by socioeconomic inequalities between races (Hayward et al. 2000). However, a growing body of work challenges these findings and argues that racial disparities in health are driven by both socioeconomic inequalities and racial differences in the returns to socioeconomic resources (Colen et al. 2017; Do, Frank, and Finch 2012; Farmer and Ferraro 2005). In order to reduce racial disparities in health, it is critical that we understand the complicated relationship between socioeconomic position, race, and health. If on one hand,

racial inequalities in health result from socioeconomic inequalities, economic based interventions would be effective in reducing racial health inequalities. If on the other hand, racial inequalities in health result from both material inequalities and differences in the benefits of socioeconomic resources, purely economic based interventions may be rather ineffective in reducing racial disparities in health.

This study synthesizes literature from social mobility, medical sociology, and life-course epidemiology research to generate and test several competing hypotheses about the health consequences of intergenerational educational mobility. Using health and mortality data from the General Social Survey and the National Death Index, this study employs diagonal reference/mobility models to isolate the contribution of socioeconomic origins (parental education), adult socioeconomic position (respondent education), and changes in socioeconomic positon (upward or downward educational mobility) on health. This study aims to answer the following questions: (1) Are there health benefits/consequences associated with downward intergenerational educational mobility?; and (2) Are there health benefits/consequences associated with upward intergenerational educational mobility? In addition to investigating the main effects of intergenerational education mobility on health and mortality, this study also examines how the health consequences of downward and upward intergenerational educational mobility may depend on the race of the respondent. The results of this study demonstrate differential returns/consequences of socioeconomic mobility on health and mortality and contributes towards our understanding of the persistence of racial disparities in health and mortality.

Life-course Socioeconomic Status and Health

The relationship between socioeconomic conditions and health has a long and rich history in sociology and other social sciences (Krieger 2011). Early social scientists credited with the development of sociological thinking, including Durkheim, Marx, Engels, and DuBois, all contributed to our understanding as to how socioeconomic change, working conditions, income, occupations, living conditions, and nutrition shape health, mortality, and well-being. Durkheim highlighted the ways in which broader socioeconomic changes generated feelings of distress and disengagement, which helped to explain patterns of suicide (Durkheim 1897). Marx and Engels shed light on the ways in which physical and psychosocial working conditions, including noise pollution, hazards of working with industrial machinery, long hours, and workplace autonomy, shaped the health of the English working class through alienation and stress (Engels and Kelley 1892; Marx and Engels 1984). DuBois, in his study of the health and physique of African Americans living in Philadelphia highlighted the ways in which inequalities in living conditions, occupations, poverty, and nutrition contributed to racial disparities in health (Du Bois 1899). More recent approaches to the study of socioeconomic conditions and health consider the importance of understanding how socioeconomic conditions *across the life-course* influence health and well-being (Elder Jr 1998).

The life-course approach to the study of health and well-being elucidates the complex ways in which exposures, both social and physical, during different periods of the life-course, including gestation/utero, childhood/adolescence, and adulthood shape health and well-being (Elder, Johnson, and Crosnoe 2003). This approach to the study of health and well-being builds on inter- and intra-generational perspectives of development driven in part by contemporary sociologists. The life-course approach to the study of socioeconomic conditions and health has been quite

fruitful, and has generated several compelling yet competing theories of how early life and adult socioeconomic conditions shape health, mortality, and well-being (Pudrovska and Anikputa 2014).

There is considerable variation in life-course approaches to the study of socioeconomic status disparities in health and mortality. Conceptual models differ based on the period in the life-course they privilege, the processes through which early life socioeconomic conditions shape adult health, and the extent to which changes in socioeconomic position across the life course influence health. The four main conceptual models include the *critical period* model, the *accumulation* model, the *pathways* model, and the *social mobility* model. The following section briefly reviews the logic behind each of these conceptual models.

Critical period

The critical period model of life-course socioeconomic conditions and health privileges the importance of early life conditions, specifically in-utero/gestational exposures in shaping adult health and well-being (Hallqvist et al. 2004). The fetal programming/origins hypothesis, also known as the Barker hypothesis, is among the best examples of the critical period model (Barker 2004). The logic of the Barker hypothesis lies in the importance of how maternal nutrition, stress, and adversity impact fetal development and growth. The Barker hypothesis argues that this adversity biologically programs/imprints on the fetus, which leads to increased risk of circulatory and metabolic disease, including heart disease and diabetes (Barker 2004).

A well-known and often cited example application of the Barker hypothesis is the Dutch Hunger Winter study, which traces the long-term impacts of a famine that occurred during world war two in the then Nazi-occupied Netherlands. Nazi forces placed fuel and food blockades during the winter of 1944-1945, which resulted in high levels of starvation and death among the affected populations. Researchers interested in identifying the long term consequences of in-utero caloric

and nutritional restriction on health have since identified and followed those individuals whose mothers were pregnant during the Dutch Hunger Winter and who were exposed to adverse gestational conditions (Schulz 2010). Findings from the Dutch Hunger Winter study show that those affected individuals are at increased risk of metabolic and cardiovascular disease, in addition to a more rapid cognitive decline in adulthood, providing clear support for the Barker Hypothesis (Schulz 2010).

Accumulation

The accumulation model of life-course socioeconomic conditions and health privileges exposure to advantage and adversity across the life-course in explaining adult health and well-being. The cumulative advantage/dis-advantage hypothesis is a good example of the accumulation model (Dannefer 2003). The key logic behind the CA/CD hypothesis is that differential health status in adulthood is the result of long accumulated exposures to advantage or dis- advantage that began in early in the life-course (and in previous generations). Here, persistent advantage or disadvantage is important for health, rather than simply early life socioeconomic conditions.

Major strengths of the CA/CD hypothesis and accumulation model is that is privileges exposures across the entire life-course in shaping health. For example, continuing with the idea of nutritional deficiency in-utero, the accumulation model would suggest this early life disadvantage would directly and negatively influence adult health. However, the accumulation model would also suggest that our health remains responsive to socioeconomic position across the life-course, including early childhood, adolescence, young adulthood, and adulthood. From this view, single experiences of adversity or advantage are less important to our health compared to our cumulative exposures (Hallqvist et al. 2004).

Pathways

The pathways conceptual model challenges the critical period argument and privileges the impact of adult socioeconomic conditions in shaping health, arguing that the importance of early life socioeconomic conditions in shaping adult health operates through determining our socioeconomic position in adulthood. A well-known example hypothesis derived from the pathways model is the "long arm of childhood" hypothesis (Haas 2007; Hayward and Gorman 2004). The fundamental assumption behind this hypothesis is that our adult socioeconomic position in adulthood reflects our socioeconomic position in childhood, and that early life socioeconomic disadvantages drives health disadvantage through reducing socioeconomic attainment/achievement in adulthood.

The power of the pathways model and the "long arm of childhood" hypothesis is the direct identification that early life socioeconomic disadvantage contributes to the production of socioeconomic disadvantage in adulthood. For example, growing up in worse socioeconomic conditions may hinder cognitive decline and educational attainment, socialize individual's attitudes towards and engagement in damaging health behaviors (smoking and substance abuse), and hinder their mental health and emotional well-being. This approach highlights the importance of adult socioeconomic position in shaping our health, and the importance of improving child socioeconomic position in shaping our adult socioeconomic position.

Social Mobility

The social mobility conceptual model privileges the moderating effect of adult socioeconomic conditions can have one the effect of early life socioeconomic conditions on adult health and well-being. This perspective pays special attention to how changes in socioeconomic position both across the life-course and across generations contribute to the health and well-being

(Pudrovska and Anikputa 2014). The social mobility model of life-course socioeconomic position and health contends that our health reflects both early life and adult socioeconomic conditions, in addition to the changes we experience in socioeconomic position (either upward mobility or downward mobility).

Health Consequences of Downward Mobility

The main advantages of the social mobility perspective are that it highlights the complicated effects that changes in socioeconomic position might have on health. For example, take the case of those who come from more advantaged socioeconomic early life conditions who experience downward mobility and end up is more disadvantaged socioeconomic conditions. A social mobility perspective would suggest that this person's early life advantage may moderate the effect of their adult socioeconomic disadvantage in complicated ways. The experience of downward mobility may generate distress isolation for those mobile individuals.

Several theories about the health consequences of downward mobility have emerged in recent years, including the falling from grace hypothesis (Newman 1988, 1999). The falling from grace highlights the psychosocial consequences of status loss. The falling from grace thesis rests on the premise that higher socioeconomic status embodies resources and social connections, including money, power, knowledge, and privilege that allow individuals to maintain good health (Link and Phelan 1995). The loss of power, prestige, and privilege that comes with moving into a lower socioeconomic status increases feelings of distress, anger, and powerlessness when individuals lose socioeconomic advantage, which erodes health status (Newman 1988, 1999).

Health Consequences of Upward Mobility

In the case of upward mobility, a social mobility perspective might consider that the benefits of adult life socioeconomic conditions interact with the level of socioeconomic disadvantage experienced in early life, or that the process of upward mobility in itself is stressful and challenging. Theories have emerged that detail the ways in which upward social mobility may actually harm health, including the John Henryism thesis.

The John Henryism thesis starts with the premise that individuals raised in lower socioeconomic households are more likely to face social, economic, and familial stressors, including poverty, economic insecurity, and family dissolution (Almeida et al. 2005; Pearlin et al. 2005). Individuals may respond to these stressors in several ways. One potential way to respond to social and economic stressors is through active coping in attempt to gain mastery over stressors (Lazarus and Folkman 1984). Active coping and mastery entails individuals attempting to gain control and overcome the experiences that generate stress (Lazarus and Folkman 1984). Psychologists refer to the active coping process that some lower socioeconomic individuals engage in when faced with environmentally induced stressors as "John Henryism," as a tribute to the fable of John Henry (Bonham, Sellers, and Neighbors 2004; James 1994).

The legend of John Henry details the conflict of John Henry, a blue-collar rail worker, who faced off against a steam-powered drill in a competition to drive railroad ties into the ground. According to the fable, through sheer determination and hard work, John Henry overcame the odds and beat the machine in driving the rail ties. However, due to the effort it took to beat the machine, John Henry, overcome from mental and physical exhaustion, collapsed and died. For those individuals from lower socioeconomic backgrounds, the work and stress associated with overcoming disadvantage and achieving upward mobility may come at a cost to their health.

Achieving upward mobility requires individuals to cope with material, and likely social and cultural capital, deficits through hard work and determination.

Disentangling Theories of Life-Course Socioeconomic and Health

This review highlights the complex and seemingly competing theories regarding the relationship between life-course socioeconomic status and health. Figure one offers a graphical representation of each of these conceptual models. Theories vary to the extent to which they believe that changes in socioeconomic position across the life-course can change our health destiny, highlighting the long-term consequences of early life disadvantage (critical period). Other theories argue that the impact of early life socioeconomic disadvantage on health works through adult socioeconomic position (pathways model). Further, other theories highlight the ways in which our health in adulthood reflects our cumulative exposure to socioeconomic advantage/disadvantage (accumulation model), while other models argue that health reflect the effects of both socioeconomic origins, adult socioeconomic attainment, and the change in socioeconomic position (social mobility model).

[Figure 1 about here]

The premises of each of these theories make different predictions about life-course socioeconomic position and health. In the case of someone who is downwardly mobile, who comes from socioeconomic advantage and ends up in a lower socioeconomic position in adulthood, a critical period model would suggest that this person's health will resemble those who shared similar socioeconomic origins. However, the pathways model would suggest that this individual would share similar health status to those individuals in their adult socioeconomic position.

Further, the accumulation model would suggest the health of this downwardly mobile individual would decline to the extent to which they accumulate disadvantage associated with being in this lower position. However, the social mobility model would suggest the loss of their early life advantage might interact with adulthood disadvantage and actually increases the consequences associated with being in a disadvantaged position. With these competing theories, it remains unclear as to how life-course socioeconomic positions shapes our health and well-being.

Race, Life-course Socioeconomic Status, and Health

The relationship between race, socioeconomic status, and health remains unclear. On one hand, considerable research highlights the ways in which socioeconomic inequities between Whites and African-Americans, including income, wealth, neighborhood conditions, occupations, and school quality, drives racial disparities in health (Hayward et al. 2000). Research highlights the importance of socioeconomic position in shaping health, with many theorizing that socioeconomic status embodies resources and social connections, including money, power, knowledge, and privilege that allow individuals to maintain good health (Link and Phelan 1995).

Other research has challenged the assumption that racial disparities in health reflect resource inequalities, but instead argue that racial disparities in health reflect both differences in resources *and* differences in the effectiveness of resources to maintain good health. This body of work highlights the extent to which racial disparities in health are evident across the socioeconomic position, and in some cases are highest at the more advantaged levels. This body of work has developed around the minority "diminishing returns" hypothesis, and has shown that racial minorities, particularly African Americans appear to benefit less from educational attainment, income, wealth, and occupational prestige (Farmer and Ferraro 2005; Turner, Brown, and Hale 2017). What remains uncertain is how race might shape the consequences of social

mobility. Do racial groups experience equal benefits/consequences to social mobility, or does race moderate the effects of social mobility on health?

Upward Mobility, Race, and Health

There are several pathways through which African-Americans may see reduced benefits of upward educational mobility (Colen 2011). First, upwardly mobile African Americans may see differential socioeconomic returns to their increased educational position, including differences in neighborhood quality and wealth accumulation (Colen 2011). African Americans at every level of educational attainment show more material and social disadvantages than whites, including disparities in income, occupational prestige, neighborhood quality, and school quality (Williams et al. 2010). Second, the process of upward mobility itself may be more taxing for African Americans. If African Americans face greater material and social disadvantage at every level of attainment, this suggests that upwardly mobile African Americans need to overcome more disadvantage to achieve upward educational mobility relative to upwardly mobile whites (Colen 2011). This difficulty may increase the risk that African Americans engage in active coping to achieve upward mobility, reducing the health benefits of mobility (Bonham et al. 2004; James 1994).

Downward Mobility, Race, and Health

According to the falling from grace thesis, downward mobility is related to worse health due to the negative emotions and distress associated with the loss of power, privilege, and prestige (Newman 1999). The uniformity of this effect across racial groups is dependent on two assumptions: the proposition that the amount of power, privilege, and prestige are equivalent

across racial groups, and that racial groups react equally to the actual loss of power, privilege, and prestige.

As previously mentioned, African Americans at every level of educational attainment are worse off than whites in terms of income, wealth, prestige, neighborhood, and school quality (Williams et al. 2010). These racial differences in power, privilege, and prestige might result in racial differences in the effect of downward social mobility on health, as African Americans are losing less power, privilege, and prestige relative to their downwardly mobile white counterparts.

Downward mobility may be also be more consequential to white individuals relative to African Americans due to racial differences in the stress associated with the pressure to be economically successful (Malat, Mayorga-Gallo, and Williams 2017). Recent research exploring the health consequences of housing foreclosure during the great recession suggest that white individuals may be more likely to stress over the risk of economic failure and may be more likely to blame themselves for failure (Houle and Light 2017). White individuals are hypothesized to experience role conflict when they experience economic loss, as it runs counter to their perceived status of being economically successful (Malat et al. 2017). This experience of role conflict generates significant distress, which is harmful to health (Houle and Light 2017; Malat et al. 2017). If downward mobility is in fact linked to worse health outcomes due to the distress and negative emotions associated with the interpretation of and the loss of prestige, power, and privilege, it is plausible that racial differences in prestige, power, and privilege, combined with racial differences in the interpretation of experiencing downward mobility may cause the health consequences of downward mobility to vary by race.

Current Study

This study contributes to our understanding of life-course socioeconomic status, race, and health in several ways. First, this study will simultaneously test multiple theories that attempt to explain the relationship between life-course socioeconomic position and health. Clarifying the relationship between life-course socioeconomic position and health is crucial to the development of targeted economic interventions to improve population health in addition to advancing our knowledge about socioeconomic position and health. Second, this study is among the first to test the extent to which racial groups experience diminishing returns/differential consequences to social mobility. While previous research has focused on identifying and explaining racial disparities in health *among* the upwardly mobile (Colen et al. 2017), our understanding of racial differences in the *effects* of mobility, both upward and downward remains limited.

One shortcoming of previous research is the choice of reference group when attempting to isolate mobility effects. For example, Colen et al. (2017) identifies racial differences in self-rated health among those who experienced upward income mobility across the life-course, comparing upwardly mobile whites to upwardly mobile non-Hispanic African Americans. While this shows racial differences in health status *among* the upwardly mobile, it does not tell us whether there are racial differences in the *effect* of upward mobility. In order to isolate and identify such an effect, it is necessary to identify the appropriate reference group(s). Previous research has argued that in order to understand the effect of social mobility, we must compare those mobile individuals to the immobile individuals with who they shared socioeconomic origins as well as those immobile individuals with who they shared socioeconomic destinations. Therefore, in order to estimate racial differences in mobility effects, we should be comparing how similar/dissimilar mobile individuals are to their immobile counterparts of their same race. The purpose of this paper is to address this

gap in the literature and determine the extent to which racial minorities receive differential returns/consequences to the effects of intergenerational educational mobility.

Data and Methods

The data used in this study come from the General Social Survey (GSS) 1972-2016 cumulative file, and the General Social Survey – National Death Index (GSS-NDI) 1978-2014 file. The General Social Survey is a nationally representative survey of US households conducted annually and biannually since 1972. The General Social Survey contains questions regarding demographic information (e.g., age, income, race, gender), social/opinion questions (e.g., political views, confidence in institutions, support for abortion), and health. The cumulative file contains approximately 62,426 observations. This study makes specific use of measures of parental education, respondent education, respondent age, respondent gender, survey year, and self-reported health. The GSS-NDI file links GSS respondents from the years 1978-2010 to mortality records up to 2014 (Muennig et al. 2011).

In order to account for potential misclassification issues, respondents were only included in this study if they reported their age as 25 or older in the study. This is under the assumption that most individuals will have completed their education by this point in the life course (Cutler and Lleras-Muney 2010).

Missing Data – Self Rated Health Analysis

I begin with approximately 46,021 cases with valid responses to the self-rated health item. In dropping the "other race" sample, I lose approximately 2,389 cases (down to 43632 cases). In selecting the ages 25-74 subsample, I lose approximately 149 cases who were completely missing on age, 3236 cases who were 75 or older, and 4423 cases who were younger than 25 (down to 35824 cases). I dropped approximately 77 cases due to missing data on self-reported education

(down to 35747 cases). Approximately 8795 individuals were missing data on father's education, while 4468 individuals were missing data on mother's education. I used information from mother's education to recover some information on parental education, allowing approximately 5661 cases to be recovered. This leads to a final sample of approximately 32613 individuals.

Missing Data – Mortality Analysis

I begin with approximately 44174 cases with valid data on the mortality follow up. In dropping the "other race" sample, I lose approximately 2,437 cases. In selecting the ages 25-74 subsample, I lose approximately 67 cases who were completely missing on age, 3239 cases who were 75 or older, and 3996 cases who were younger than 25. Approximately 53 cases were dropped due to missing data on self-reported education. Approximately 8319 individuals were missing data on father's education, while 4241 individuals were missing data on mother's education. Information from mother's education was used to recover some information on parental education, allowing approximately 5457 cases to be recovered. This leads to a final sample of approximately 31520 individuals.

Intergenerational Educational Mobility

Participants reported the levels of educational attainment of their father and of their mother, as well as their own level of educational attainment. Response categories includes less than high school, high school degree, junior college, college degree, and graduate degree. In the case when individuals did not report father's education, the mother's education (if observed) replaced this missing value, and when mother's education was missing, father's education (if observed) replaced this value. For those who reported both mothers and father's education, I selected the highest degree. Those missing on both parent's educations were dropped from the analysis. From these categories, I created two educational mobility measures. The first indicator, upwards educational

mobility, represents those respondents who reported a higher level of educational attainment than their parent did. The second indicator, downwards educational mobility, represents those respondents who reported a lower level of educational attainment than their most educated parent did. In the case of these categories, those who experienced stable educational levels are the reference category.

Self-rated Health and Mortality

This study makes use of two health measures: self-rated health and mortality. Self-rated health has been validated as a measure that does well in capturing differences in health, and is highly correlated with more objective measures of health (Wu et al. 2013). In the case of self-rated health, participants were asked to rate their health as either excellent, good, fair, or poor. For the purpose of this study, I create a binary self-rated health measure, where excellent/good health is coded as a '1', with fair/poor serving as the reference category.

The GSS – NDI provides information for respondent's mortality status up to 2014. In the case that an individual died during the observation period following their response to the GSS, the NDI linked file provides researchers with the year of death, the age at death, and in most cases, the leading cause of death. For the purpose of this study, I used survival analysis techniques to model mortality hazard during the study period (1978 to 2014). In this case, those individuals who remained alive following the end of the study period were right censored, as well as any deaths that occurred beyond age 95. In addition, respondents contributed durations were left truncated, in that their observed risk of mortality began at the age of their initial response of the GSS. Alternative constructions included adding a constant just to those individuals who died in the year they were surveyed, adding a constant for everyone, and estimating the effects when dropping those with a

zero duration. In addition, the findings of the mortality effects were robust to the specification of the link function as either logistic transformation or a complementary log-log transformation.

Race, Gender, and Age

Due to small sample sizes of non-white and non-black individuals, only whites and blacks were included in this study, with whites serving as the reference category. Due to changes in racial classification over the years the GSS has been active, there are challenges to identifying racial identity from the survey items. However, more recent documentation on the GSS suggests that the "other" race category, which is not included in this analysis, includes non-European and non-African individuals, which suggests that the "White" and "Black" classifications used in this study largely reflect non-Hispanic white and non-Hispanic black individuals (Harnois 2017). In terms of respondent gender, females served as the reference category. Finally, age remained as a continuous measure of years for the models, with those under 25 and those 75 or older becoming excluded from the sample. This was done to reduce potential health and mortality selection bias, under the assumption that those who survive to older observed ages may be more genetically robust than those who die earlier in the life course.

Methods

I make use of non-linear regression models to jointly test the effects of parental education, respondent education, and social mobility on health (Sobel 1981, 1985). This class of models, known as diagonal mobility models/diagonal reference models, emerged in the sociological literature early in the 1980's as a response to the issue of linear dependency in the relationship between social origins, social destination, and social mobility. The rationale behind this model is that in order to isolate the effects of mobility on health, we must understand how mobile

individuals compare to the non-mobile individuals from their origins and the non-mobile individuals in their new social position. For example, if we wanted to understand the health effects of going from a household with a high school educated parent to a respondent having a graduate degree, we should compare the individual to the non-mobile individuals in both their origins (those who come from a high school educated household and achieve a high school education) and their destination (those who come from a graduate degree household and achieve a graduate degree). These non-mobile individuals reflect the "diagonal references."

The relative contribution of these diagonal references is determined by the generation of a weighting parameter that reflects on average, how similar mobile individuals to the non-mobile individuals in their new destinations. This weighting parameter *w*, is constrained to lie in the interval [0, 1]. This weight determines the relative contribution of the diagonal reference in determining the off diagonal cell mean. For instance, in reference to the above example, a .70 weight would suggest that the mean of the off-diagonal cell, ($\mu_{HS,GD}$), would be .70 of the non-mobile destination ($\mu_{GD,GD}$) cell mean and .30 of the ($\mu_{HS,HS}$). The use of the *w* weighting parameter allows for mobility effects to be estimated that are no longer confounded with origin effects and destination effects. In order to estimate overall mobility effects, an indicator of mobility, along with other covariates can be included.

For the purpose of this paper, I estimate a series of distinct diagonal mobility models. Here

$$\log\left(\frac{P_{ijk}}{1-P_{ijk}}\right) = w\,\mu_{jj} + (1-w)\mu_{kk} + \sum_{a=1}^{a}\beta_a X_a + \gamma_1 downward + \gamma_2 upward + \varphi_i \qquad \textbf{(1)}$$

$$\mathrm{w} + (1 - \mathrm{w}) = 1$$

P_{ijk} represent the probability of respondent *i* in social destination *j* from social origin *k* to report being in excellent/good health, with *w* reflecting the destination weight, μ_{jj} reflecting the mean probability of being in excellent/good health of the immobile destination reference group (j=1 (less than high school degree), 2 (high school degree), 3 (junior college degree), 4 (college degree), and 5 (graduate degree)), 1-w reflecting the origin weight, and μ_{kk} (*k*=1 (less than high school degree), 2 (high school degree), 3 (junior college degree), 4 (college degree), and 5 (graduate degree))) reflecting the mean probability of being in excellent/good health of the immobile social origins reference group, with X_a representing a vector of covariates (age, sex, race) and β_a representing a vector of coefficients for these covariates. Let γ_1 represent the coefficient associated with an indicator of downward mobility, and let γ_2 represent the coefficient associated with an indicator with upward mobility. Also, let φ_i (*i=1978, 1979…2016)* represent the vector of coefficients associated with year to year differences in the mean probability of reporting excellent/good health (year fixed effects). Note, the results of this study were robust to alternative specification of parental education, including only using father's education or using mother's education for those missing on father's education. Results were also robust to the use of cohort fixed effects instead of period fixed effects.

The diagonal reference model offers a clear and parsimonious to test the several competing models of life-course socioeconomic position and health. The weighting parameters allow us to disentangle the relative importance of early life socioeconomic position vs later life socioeconomic position for the health of mobile individuals, helping to assess the value of the critical period model versus the pathways model. The critical period model would place the most weight to the early life whereas the pathways model would place the most weight on adult conditions. The mobility indicators allow me to test the social mobility model assumptions. A significant effect would

suggest that early life socioeconomic conditions interact with adult socioeconomic conditions to shape adult health, whereas a null effect would suggest that the health of socially mobile individuals reflects equal contributions of parental attainment and adult attainment. Finally, the diagonal references, those individuals who remain in socioeconomic position across generations, allow us to test the assumptions of the accumulation model, by comparing the health of those cumulatively exposed to socioeconomic advantage to those most exposed to socioeconomic dis-advantage.

Results

Whole Sample and Race Stratified Descriptive Statistics for Self-Rated Health Analysis

The descriptive statistics for the entire sample of the self-rated health analysis are shown in Table 1. The sample consisted of 32,613 individuals; 77% of them reported excellent/good health. Approximately 19% of this sample had less than a high school education, whereas 51%, 6%, 16%, and 8% had a high school education, a junior college education, a college education, and a graduate level education, respectively. In terms of respondent's parental education, approximately 38% of this sample parents had less than a high school education, whereas 43%, 3%, 6%, and 14% had a high school education, junior college education, college education, and a graduate level education, respectively. Approximately 14% of the sample experienced downward educational mobility, while about 39% experienced upwards educational mobility.

[Table 1 about here]

Whole Sample and Race Stratified Descriptive Statistics for Mortality Analysis

The descriptive statistics for the entire sample used for survival analysis are shown in Table 2. The sample consisted of 31,520 individuals. Overall, approximately 27% of the sample

experienced mortality during the study period. The mean observed duration for this sample was about 17.5 years, with a standard deviation of about 9 years. Approximately 16% of this sample had less than a high school education, whereas 52%, 7%, 17%, and 8% had a high school education, a junior college education, a college education, and a graduate level education, respectively. In terms of respondent's parental education, approximately 35% of this sample parents had less than a high school education, whereas 46%, 3%, 10%, and 7% had a high school education, junior college education, college education, and a graduate level education, respectively. Approximately 14% of the sample experienced downward educational mobility, while about 40% experienced upwards educational mobility.

[Table 2 about here]

Social Mobility and Self-Rated Health

The results of model 1 suggest that after adjusting for origin and destination educational position, the log odds of someone who experiences downward educational mobility reporting excellent/good health are .19 lower than their stable counterpart, consistent with the social mobility model and the falling from grace hypothesis. The results of model 1 suggest no independent effect of upward mobility on health, consistent with the accumulation model and the cumulative advantage/dis-advantage hypothesis. The *w* parameter in model 1 shows that after adjusting for the main effects of downward and upward mobility, the health of mobile individuals is still shaped more by their own education than their parents (.66 to .34), which challenges both the pathways and critical period model, and shows that both early life and adult life conditions are important. The results of this model suggest that compared to white individuals, the log odds of a black individuals reporting being in excellent health are .36 lower. This model suggests that men are more likely to report better health than women and the log odds of reporting better health decline

with age. In looking at the diagonal references across all of these models, we can see that when compared to those most cumulatively disadvantaged (those non-mobile individuals in the less than high school position), the cumulatively advantaged individuals are consistently more likely to report being in excellent/good health.

[Table 3 about here]

Model 2 includes the race/mobility interactions. The results of this model suggest that the log odds of downwardly mobile black individuals reporting better health are about 0.02 (0.25-0.23) higher than those stable black individuals, while log odds of downwardly mobile white reporting better health are 0.23 lower than those stable white. This is consistent with the race specific falling from grace thesis. The results of model 2 suggest no racial differences in the effect of upwardly mobility on health.

Social Mobility and Mortality

Table 4 includes the results of two general non-linear diagonal mobility model predicting mortality hazard conditional on mobility status, race, age, and gender. The results of model 3 show that after adjusting for origin and destination effects, downward educational mobility is associated .15 higher mortality risk, consistent with the falling from grace thesis. The results of model 3 show no independent effect of upward mobility on mortality risk, consistent with the cumulative advantage/dis-advantage thesis. This model shows that after adjusting for the main effects of downward and upward mobility on mortality hazard, the relative importance of individual's parent's education is higher than the importance of the individual's education (.53 vs .47), and shows that both early life and adult life conditions are important. The results of this model suggest that compared to white individuals, the log odds of a black individuals experiencing mortality during the study period are .33 higher. This model suggests that men have an increased risk of

mortality relative to women. The results of these models suggest that the log odds of experiencing mortality were higher for older respondents. The diagonal references suggest that those who are in stable high education positions (Graduate Degree) have a .46 lower mortality hazard than those in a stable low education position (less than high school).

[Table 4 about here]

Model 4 includes the race/mobility interactions. The results of this model suggest no racial differences in the mortality consequences of downward mobility. Model 4 shows that the log odds of upwardly mobile black individuals to experience mortality during the study period are about 0.09 (0.14-0.05) higher than the log odds of stable black individuals (which is consistent with the race-specific John Henryism thesis). However, there is no statistically significant difference in the log mortality hazard between upwardly mobile whites and stable whites ($p<.10$). In order to describe this effect, I generate cumulative hazard rates for stable whites, stable blacks, upwardly mobile whites, and upwardly mobile blacks. I then take the difference in cumulative mortality hazard rates at each time point and plot these differences in Figure 2. Under the assumption of equal affects, we would expect to see no differences in the cumulative hazard between upwardly mobile and stable individuals across races. However, figure 2 shows that upwardly mobile blacks experience a higher cumulative hazard compared to stable blacks, whereas upwardly mobile whites experience a lower (although not statistically significant ($P<.10$) cumulative hazard.

[Figure 2 about here]

Discussion

Our early life socioeconomic conditions do not determine our health destiny. Our health is responsive to our socioeconomic position across the life course. This study tested competing

models about the relationship between life-course socioeconomic position and health. These models include the critical period model, the accumulation model, the pathways model, and the social mobility model (Hallqvist et al. 2004; Pudrovska and Anikputa 2014). These models differ in the relative importance they give to certain periods of life, with the critical period model arguing the health in adulthood is primarily determined by early life conditions, while the pathways model argues that health reflects our adult socioeconomic conditions, and that early life socioeconomic conditions affect health indirectly through shaping socioeconomic attainment.

The results of this study show that both our early life socioeconomic conditions and our adult socioeconomic conditions play a direct role in shaping our health, which is more consistent with the accumulation model. However, I find a significant effect of mobility, specifically downward mobility. This shows that while the accumulation model of health is more fruitful that either the critical period or pathways model, it does not fully capture the complicated ways in which *changes* in socioeconomic position shape health.

The effect of socioeconomic disadvantage in adulthood was stronger for those individuals who came from more advantaged early life conditions. Whereas one might expect adult socioeconomic disadvantage in adulthood to have similar health repercussions, if not lessened repercussions, adult disadvantage was more consequential to the health of the downwardly mobile. This is consistent with the social mobility model of health and the falling from grace thesis, which argues that our early life conditions interact with our adult conditions to shape our health in unique ways.

Our health is responsive to socioeconomic position across the life course, rather than being solely determined in early life (Hallqvist et al. 2004). Evidence that downward mobility can negatively influence our health highlights the importance of adopting a life course and generational

perspective when identifying the impacts of socioeconomic forces on health. If downward mobility can erode early life health advantage, it is important that we focus on reducing downward mobility and increasing economic stability across the life course and across generations in order to protect population health.

The upwardly mobile individuals in this study were able to reap the full benefits of being in a more advantaged socioeconomic position. While I hypothesized that early life disadvantage might reduce the effectiveness of adult socioeconomic advantage, this was not the case. Interventions to increase upward mobility can have a positive impact on overall population health (Bartley and Plewis 2007).

The second goal of this study was to explore how the health consequences of social mobility varied by race. Resolving the theoretical tensions regarding the relationship between race, socioeconomic position, and health is important for advancing theory and the design of interventions. If socioeconomic position mediates the relationship between race and health (i.e., racial disparities in health are driven by racial differences in socioeconomic position), policy interventions to reduce socioeconomic disparities through upward mobility may reduce racial disparities in health. However, if socioeconomic position moderates the relationship between race and health (i.e., the effect of socioeconomic status on health varies by race), policy interventions to reduce socioeconomic disparities through upward mobility may have little impact on racial disparities in health. Establishing how the health consequences of social mobility vary across race can aid in resolving this theoretical tension and generating insight for policy makers.

This study tested two hypotheses on how the health consequences of social mobility might vary by race. The first hypothesis, that upward mobility will be less beneficial for African American individuals, proposes that the process of upward mobility is less beneficial for African

Americans relative to whites (Colen 2011). This is due to differential socioeconomic returns to education, including income, wealth, and neighborhood quality, as well as racial differences in the amount of disadvantage necessary to overcome to be upwardly mobile (Colen 2011; Williams et al. 2010). This study finds no racial differences in the effect of upward mobility on self-rated health. In this case, upwardly mobile whites and upwardly mobile African Americans reaped the full benefits of adult socioeconomic advantage. However, this study finds racial differences in the effect of upward mobility on risk of mortality. Upwardly mobile African Americans mortality risk was elevated relative to their immobile counterparts, suggesting that the process of upward mobility is less beneficial to the mortality risk of African Americans, while upward mobility was more beneficial to the mortality risk of whites.

Multiple factors may explain race differentials in the health returns of upward educational mobility. First, African Americans may have a more difficult time with the challenges associated with both achieving and adapting to their new socioeconomic position. Part of the diminishing returns thesis suggests that high socioeconomic status African Americans experience increased rates of racism and discrimination in the predominantly high socioeconomic white spaces they occupy (Colen et al. 2017; Farmer and Ferraro 2005; Turner et al. 2017). In turn, this increased exposure to racism and discrimination results in mental and physical distress that erodes the health of high status African Americans (Colen et al. 2017). It is plausible that upwardly mobile African Americans experience differential health benefits of upward mobility due to the physical health and mental health consequences associated with the discrimination they face during and after the upward mobility process. This, in combination with differential socioeconomic returns to education, may help to explain this gap.

Second, racial differences in early life health, including low birthweight and worse childhood health, might explain the differential return. It is plausible to assume there may be a ceiling effect in terms of the benefits of upward social mobility, whereby the possible benefits are dependent on early life health. Future research should explore how the health consequences of social mobility may be conditional on early life health. It is plausible that a threshold may exist, where enough early life health disadvantage reduces the possible gains associated with upward mobility.

African Americans self-rated health benefits from the process of upward mobility, but the upward mobility process is less beneficial to their mortality risk. However, the upward mobility process is beneficial to both the self-rated health and the mortality risk of whites. These findings show that black individuals experience diminishing returns to the reduced mortality risk than upwardly mobile whites' experience. Upwardly mobile whites are able to overcome early life disadvantage to reduce their mortality risk, whereas upwardly mobile blacks' health was less responsive to socioeconomic gains. This is consistent with the growing body of work exploring diminishing returns that SES has for the health of African Americans (Assari 2018; Boen 2016; Farmer and Ferraro 2005; Turner et al. 2017). Future research should explore if diminishing returns are the results of challenges of adapting to this new higher socioeconomic position, or if upwardly mobile African Americans are unable to overcome early life health disadvantages.

The second hypothesis, that downward mobility will be more consequential to white individuals, proposes that the racial differences in power, prestige, and privilege at higher levels of education, coupled with white cultural norms related to achieving/maintaining high economic status, will make the experience of downward mobility more distressing to white individuals (Houle and Light 2017; Malat et al. 2017; Williams et al. 2010). This study finds racial differences

in the effect of downward mobility on self-rated health. Downward mobility was more consequential to the self-rated health of white individuals. However, there are no racial differences in the effect of downward mobility on mortality risk. In this case, downwardly mobile whites and downwardly mobile African Americans had the same higher risk of mortality than their immobile-racial counterparts did.

Downward mobility has a greater impact on the subjective health of whites than it does on blacks. This is consistent with research that suggests white individuals may experience increased health consequences associated with the loss of power and prestige (Houle and Light 2017; Malat et al. 2017). African-American individuals who were downwardly mobile actually reported better health than their non-mobile counterparts, suggesting that downwardly mobile African Americans maintained more of their early life health advantage than downwardly mobile whites. However, the results on mortality are different. Downward mobility was equally detrimental to the mortality risk of both whites and African Americans. This may be due to the race difference in subjective response to downward mobility. Blacks may be subjectively less affected by the loss of power and prestige which however still takes a big toll on their survival (Keyes 2009). In contrast, while whites may be more subjectively affected by downward mobility, their survival may be buttressed by their parental socioeconomic background and bigger safety net compared to blacks (Jayakody 1998).

Limitations/Future Research

This study is not without limitations. The survey data used in this study comes from a single observation (with mortality follow-up). This research would benefit from the use of longitudinal data in which observations of socioeconomic position occurred at several points in time. While this study purposefully chose a largely time-invariant measure social position (educational

attainment), future research should consider how social class or income mobility might produce different findings.

Further, it might be of interest to explore *relative* educational or income mobility, rather than *absolute* mobility. While educational attainment is the most stable measure of socioeconomic position across the life-course, the rapid expansion of higher education and growth in educational attainment has changed the meaning of education. While this does generate potential bias, the robustness of these findings to both cohort and period fixed effects suggests that even when comparing within periods and within cohorts, downward mobility was consequential to health. Future research should explore how changes in *relative* position across generations shapes health. For example, using better data on parental age and educational attainment, one could compute better measures of relative position for both parents and respondents. While this is currently not possible given that parental age is not included in this dataset, other longitudinal sources of data may make this type of analysis feasible.

Finally, future research should further examine differential health consequences of social mobility within the African American community. The findings of this study gloss over the considerable heterogeneity within the African American by key factors, including skin-tone and religiosity. Recent research on skin ton and health among the African American population suggest that the effects of social mobility on health could be shaped by skin tone. For example, different shades of skin tone might make it more or less difficult for African Americans to become upwardly mobile, which could reduce the health consequences of the upward mobility process for those with the lightest skin tones and increase the health consequences of the upward mobility for those with the darkest skin tones.

Conclusion

Our health is responsive to socioeconomic change across the life-course and across generations. Increased socioeconomic position can improve our health, just as socioeconomic disadvantage can erode our health. Upward intergenerational educational mobility leads to improvements in self-rated health and a decreased mortality risk, and downward mobility leads to a decline in self-rated health and an increased mortality risk. Efforts to increase upward mobility and decrease downward mobility will improve overall population health.

Race, life-course socioeconomic position, and health interact in complicated ways. The health of white individuals was more responsive to socioeconomic change across the life-course. Whites benefited more from upward mobility, but experienced more negative health consequences from downward mobility. Efforts to reduce racial disparities in health must consider how both racial differences in material resources and differential returns to material resources shape health.

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Table 1.
Descriptive Statistics For Self-Rated Health Analysis by Full Sample and by Race

	Full Sample (N= 32613)	White Sample (N= 27889)	Black Sample (N= 4724)
Variable Name	Mean (SD)	Mean (SD)	Mean (SD)
Excellent/Good Health	77%	78%	69%
Respondent Education			
Less than High School	19%	17%	28%
High School	51%	51%	51%
Junior College	6%	6%	7%
College	16%	17%	10%
Graduate Degree	8%	9%	4%
Parent Education			
Less than High School	38%	36%	52%
High School	43%	44%	36%
Junior College	3%	3%	4%
College	6%	10%	6%
Graduate Degree	10%	7%	3%
Any Mobility	53%	53%	52%
Downwardly Mobile	14%	14%	13%
Upwardly Mobile	39%	39%	39%
Male	45%	46%	38%
Black	14%	0%	100%
Age	45.9 (13.77)	46.15 (13.82)	44.42 (13.37)

Table 2. Descriptive Statistics For Discrete Time Mortality Analysis by Full Sample and by Race						
	Full Sample (N= 31520)		White Sample (N= 26964)		Black Sample (N= 4556)	
Variable Name	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Experienced Mortality	27%		26%		32%	
Age at Death	66.40 (14.60)	25 - 95	67.27 (14.53)	25 - 95	62.28 (14.26)	26 - 95
Contributed Duration	17.51 (8.85)	1 - 37	17.66 (8.84)	1 - 37	16.60 (8.85)	1 - 37
Respondent Education						
Less than High School	16%		14%		25%	
High School	52%		52%		53%	
Junior College	7%		7%		8%	
College	17%		18%		10%	
Graduate Degree	8%		9%		4%	
Parent Education						
Less than High School	35%		32%		50%	
High School	46%		47%		38%	
Junior College	3%		3%		4%	
College	10%		11%		6%	
Graduate Degree	7%		7%		3%	
Any Mobility	54%		54%		53%	
Downwardly Mobile	14%		14%		12%	
Upwardly Mobile	40%		39%		41%	
Male	44%		45%		38%	
Black	14%		0%		100%	
Age	45.57 (13.72)	25 -74	45.86 (13.79)	25 -74	43.86 (13.16)	25 -74

Table 3.
Results of Diagonal Mobility Models Predicting Excellent/Good Health (N=32613)

	Model 1			Model 2		
Variable Name	**Log-odds**		**SE**	**Log-odds**		**SE**
Educational Mobility						
Stable Individuals	REF			REF		
Downward Mobility	-0.19	**	0.07	-0.23	***	0.07
Upward Mobility	0.13		0.07	0.13		0.07
Black	-0.36	***	0.04	-0.37	***	0.05
Male	0.09	**	0.03	0.09	**	0.03
Age	-0.04	***	0.01	-0.04	***	0.00
Age*Age	0.00	*	0.00	0.00	*	0.00
Downward*Black				0.25	*	0.12
Upward*Black				-0.08		0.08
Destination Weight	66%			67%		
Origin Weight	34%			33%		
Year Fixed Effects	*Yes*			*Yes*		
Diagonal References						
Less than High School	0.00			0.00		
High School	1.08	***	0.04	1.08	***	0.04
Junior College	1.44	***	0.09	1.44	***	0.09
College	1.94	***	0.07	1.94	***	0.07
Graduate	2.15	***	0.09	2.15	***	0.09

Standard errors reported for two-tailed tests. * z < .05; **z < .01; ***z < .001.

Table 4. Results of Diagonal Mobility Models Predicting Mortality Hazard (N=551769)

	Model 3			Model 4		
Variable Name	**Log-odds**		**SE**	**Log-odds**		**SE**
Educational Mobility						
Stable Individuals	REF			REF		
Downward Mobility	0.15	**	0.05	0.12	*	0.05
Upward Mobility	-0.03		0.04	-0.05		0.04
Black	0.33	***	0.03	0.26	***	0.04
Male	0.32	***	0.02	0.32	***	0.02
Age	0.05	***	0.00	0.05	***	0.00
Downward*Black				0.18		0.10
Upward*Black				0.14	*	0.06
Destination Weight	46%			47%		
Origin Weight	54%			53%		
Year Fixed Effects	*Yes*			*Yes*		
Piecewise Constant Hazard	*Yes*			*Yes*		
Diagonal References						
Less than High School	0.00			0.00		
High School	-0.20	***	0.03	-0.20	***	0.03
Junior College	-0.25	***	0.07	-0.25	***	0.07

College	-0.41	***	0.05	-0.41	***	0.05
Graduate	-0.46	***	0.06	-0.46	***	0.06
Standard errors reported for two-tailed tests. * z < .05; **z < .01; ***z < .001.						

Figure One. Conceptual Models Regarding the Relationships Between Life-course Socioeconomic Status and Health

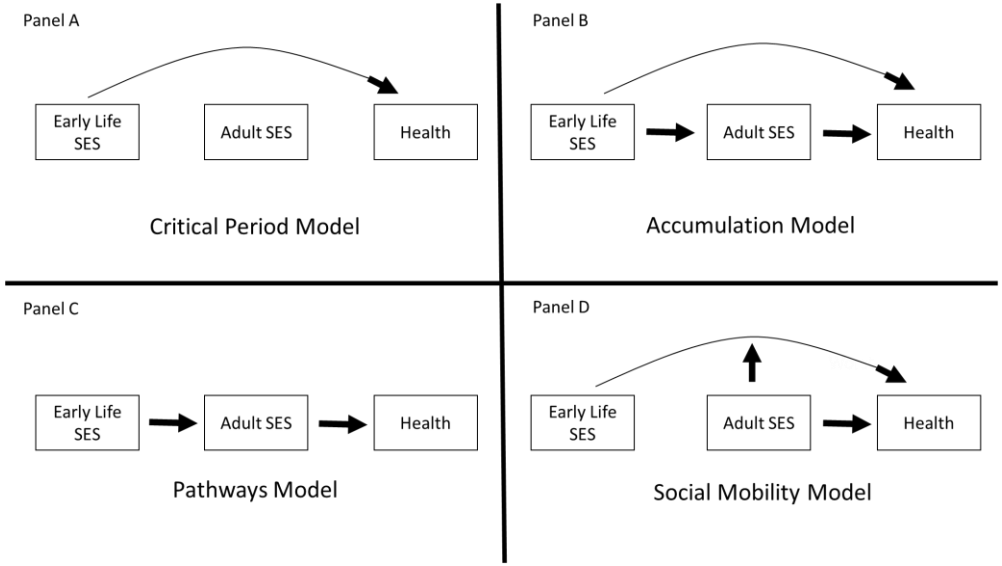

Figure 2. Difference in Predicted Cumulative Mortality Hazard between Upwardly Mobile and Stable Individuals by Race