The Impact of the Great Migration on Mortality of African Americans: Evidence from the Deep South

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July 18, 2011

We are grateful for support from the University of Kentucky Poverty Research Center and from the National Institute of Child Health and Human Development. We have benefited from excellent research assistance from Ryan Brown, and from comments by seminar participants at UC-Berkeley, Stanford, University of Chicago, University of Kentucky, Chicago Federal Reserve, and IZA. All errors are our own.

Abstract

The Great Migration—the early twentieth-century migration of millions of African Americans out of the South to locations with better social and economic opportunities—is understood to be a key element in the progress of African Americans in the U.S. This paper evaluates the role of the Great Migration on an essential dimension of lifetime wellbeing—longevity. Using data on precise place of birth, place of death, and age at death for individuals born in the Deep South in the early twentieth century, we seek to identify the impact of migration on mortality among older African Americans. To sort out causal effects we rely on the fact that proximity of birthplace to early twentieth century railroad lines had a powerful effect on migration, and thus serves as a viable instrument for migration. We find that there was positive selection into migration, in terms of human capital and physical health. Estimates indicate that migration *reduced* longevity, perhaps because of relatively poor health conditions in the urban areas to which this population migrated.

1. Introduction

Two inextricably linked phenomena lie at the heart of African American social history in the twentieth century: The first is the Great Migration—the movement of millions of African Americans from the South to the North, Midwest, and West. The second is a painstakingly slow, but extremely important, reduction in disparity between blacks and whites along many measures of personal well-being, e.g., in political enfranchisement, human capital accumulation, labor market success, and health.

A tremendous flow of intellectual energy has been devoted to the task of understanding economic forces surrounding the Great Migration—including efforts to ascertain the forces that led to the Great Migration in the first place, to evaluate the impact of migration on labor markets in places to which African Americans moved, and to assess how migration out of the South affected migrants' economic outcomes.[1] On this latter issue, prominent accounts—from Lemann's (1991) influential *The Promised Land: The Great Black Migration and How It Changed America* through Wilkerson's (2010) recent award-winning monograph, *The Warmth of Other Suns: The Epic Story of America's Great Migration*—emphasize that the Great Migration was indeed a flight from poverty and oppression toward the promise of opportunity and freedom, but one whose promise was unmet for many migrating African Americans. Still, while there are extensive debates about many details, our reading suggests a general consensus, expressed in Smith and Welch (1989), that the Great Migration from low-wage to generally higher-wage labor

[1] Forces that caused out-migration of blacks from the South include poor economic conditions and oppressive social conditions in the South, as well an increased demand for black workers in the North, due, it has been suggested, to a sharp decline in the flow of immigrants from Europe that occurred after the implementation of restrictive post-World War I immigration policies (Collins, 1997). Bouton (2009) provides a recent account of the impact of the migration of blacks from the South on wages in Northern labor markets.

markets contributed substantially to the significant black-white economic convergence in the mid twentieth century.[2]

To our knowledge, though, no previous research evaluates the causal impact of the Great Migration on health outcomes of migrating individuals. Our paper tackles that important question, focusing on mortality. Essentially we compare mortality rates, at older ages, for two groups of African Americans born in the "Deep South"—South Carolina, Georgia, Alabama, Mississippi, and Louisiana—during the early twentieth century: those who remained in the South and those who migrated to States outside of the South.[3] To make sense of our exercise we draw on observations from four strands of literature:

A first literature focuses on health outcomes of African Americans in the twentieth century, especially the disparity in outcomes compared to whites. Measured in terms of life expectancy, racial disparity has decreased over the century, but remains high. According to recent life tables produced at the Division of Vital Statistics (Arias, 2010), the gap in life expectancy at birth between whites and blacks born in the U.S. declined from 10.4 years for

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[2] There is also general agreement about the importance of improved schooling opportunities for black children, and that civil rights legislation contributed to decreased black-white economic disparity, though there is less agreement about the magnitude of effects and precise causal paths involved. To mention just a few contributions: Smith and Welch (1989) give empirical evidence about declining black-white gaps in schooling and wages, and provide a definitive overview of the broad issues, Butler and Heckman (1977) and Donohue and Heckman (1991) provide important analyses of the role of civil rights legislation, Card and Krueger (1992) analyze the role of school quality, Neal and Johnson (1996) and Neal (2006) focus attention on the black-white gap in human capital as measured by objective cognitive skills measures, and Altonji and Blank (1999) discuss challenges in the empirical evaluation of market disparities. The large empirical literature is complemented by an important theoretical literature on discrimination, e.g., as discussed by Loury (2002) or reviewed recently by Lang and Lehmann (2010).

As for the impact of migration on labor market outcomes of the migrants themselves, evidence below shows that among black individuals born in Mississippi, those who migrated accumulated more education and had substantially higher incomes than those who remained behind. Still, recent work by Eichenlaub, Tolnay, and Alexander (2010) argues against making too much of statistics such as these in inferring the impact of migration on economic well-being. They amass evidence to indicate that black migrants often did not fare substantially better than comparable non-migrating individuals. Similarly, Black, *et al.* (2010) caution that by using nominal wages to evaluate welfare, one can easily overstate the improvement in welfare for an individual moving from a low-wage to high-wage location, because high-wage areas often are also high-cost areas. We return to this issue at the conclusion of our paper.

[3] These five States have larger birth cohorts of African Americans in the years under study (1916 through 1932) than any other States in the U.S. None are States that border the North and have large urban areas (e.g., Virginia or Missouri)—important destination locations for some migrants during the Great Migration.

cohorts born 1919-1921 (with life expectancies of 57.4 for whites and 47.0 for blacks) to 5.0 for the cohort born in 2006 (78.2 for whites and 73.2 for blacks)—a disparity that is at a historic low, but that, obviously, is still large.[4]

There are many proximate medical causes for the mortality gap, including black-white disadvantages in mortality due diseases of the heart, cancer, cerebrovascular disease, diabetes mellitus, and pneumonia and influenza (e.g., Levine, *et al*., 2001). Importantly, for our purposes, the incidence of life-threating disease (and other threats, such as violence) varies substantially across local areas in the U.S. For example, in a seminal paper, McCord and Feeman (1990) estimated the rate of survival beyond the age of 40 for black men in Harlem, circa 1960-1980, to be lower than for men in Bangladesh. Geronimus, Bound, and Colen (2011) provide more recent location-specific statistics, by race, for a geographically diverse set of locations, and similarly demonstrate high variation in mortality rates, and in black-white differences in mortality rates, across locations.

A second important literature examines the links between income, education, and mortality. As Preston (1975, 1980) famously demonstrated, mortality is much higher in the world's poorest countries than in wealthier countries.[5] Also, income and health are correlated within counties. For instance, Sorlie, *et. al* (1992) show that the life expectancy in 1980 of Americans in the bottom 5 percent of the income distribution was 25 percent lower than for those in the top 5 percent of the income distribution. Elo and Preston (1996), as another example, document an inverse relationship between income and mortality, and also between education and mortality. As for causality, Lleras-Muney's (2005) work shows that increases in the education of

[4] These estimates are from "period life tables," which calculate life expectancy for a hypothetical cohort that experiences current rates of age-specific mortality throughout its lifetime.
[5] See an updated presentation of the "Preston curve" in Deaton (2003), who provides also an extended discussion of the relationship between mortality and development, and extensive overview of the literature.

whites in the U.S. due to expanded compulsory schooling laws in the early twentieth century resulted lower mortality. There is a possibility that post-school labor market success also directly improves health.[6] In general, though, causal relationships between income, education, and mortality are very complex and difficult to sort out.[7]

The black-white gap in human capital and income is doubtless a major contributor to racial differences in health outcomes. This issue has been studied in many papers. For example, Sorlie, *et al.* (1992) find that increased income is associated with lower mortality rates generally, but blacks have higher mortality than whites at every level of income.[8] Again, causal relationships are tough to unravel; we hope that our work on the Great Migration—one potential mechanism through which economic success and mortality might be linked—will shed some light on the matter.

The third literature focuses on the "long reach" of health threats in early childhood and *in utero* (Barker, 1990 and 1995), particularly conditions of nutritional deficiency during these crucial periods of human physical development. This idea plays an important role, for example, in Fogel's (2004) analysis of the long-run decline in mortality. Importantly, for our study, even using a relatively small sample of 582 older African Americans, Preston, Mill, and Drevenstedt (1998) were able to show that "children who were exposed to the most unhealthy childhood environments were far less likely to reach age 85 than those living in more favorable environments." In their study, mortality risks at young ages and mortality risks at older ages are

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[6] A particularly famous study by Marmot, *et al.* (1991) of Whitehall public employees in the U.K. demonstrates an inverse relationship between job success and mortality. Recent analysis by Andersen and Marmot (2011) shows that promotions among Whitehall employees, generated by plausibly exogenous sources, are associated with reductions in the onset of heart disease.

[7] For example, higher income may lead to improved health via a variety of mechanisms, but, conversely, good health is an important contributor to labor force participation and productivity. Cutler, Deaton, and Lleras-Muney (2006) provide a good discussion and references to further literature.

[8] See also Guralnik, *et al.* (1993) and Warner and Hayward (2006). Relevant research on the origins of black-white disparities comes also from detailed historical work such as that done by Costa and her colleague, e.g., Costa (2004) and Costa, Helmchen, and Wilson (2007).

shown to be positively correlated for this population, suggesting that assaults on health early in life adversely affect mortality at all subsequent ages for the population.[9]

The fourth, and final, strand of literature upon which we draw focuses on the migration decision itself. Migration is a form of investment; a possibly very high cost is paid by the migrant—direct migration costs, but also often a loss of present-day economic security and diminished contact with community and family—in the hope that life will be better elsewhere. Those who migrate plausibly have disproportionately high aspirations and motivation, and thus tend to invest more heavily in human capital generally (both schooling and investments in health). As Norman, Boyle, and Rees (2005) point out, for more than a century (at least since Farr, 1864), analysts have understood that migrants are a select group, and many papers examine this selection process. Halliday and Kimmitt (2008), for instance, show that among men younger than age 60 there is far lower geographic mobility at the bottom of the health distribution than among healthy men.[10] Clearly, any effort to estimate the causal impact of the Great Migration on mortality must include careful consideration of issues related to selective migration.

Against this rather complex background, we focus on our narrow, but important, question: How did migration out of the Deep South affect older-age mortality of black men and women born in the early twentieth century?

As noted above, to our knowledge there has been no scholarly work on this topic. A key reason for this dearth of research, no doubt, is the lack of data. The key problem is that the primary sources of data for the study of mortality—Census records, vital statistics, and historic panel survey data—either provide far too little detail on place of birth (at best, typically, State of

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[9] Hayward and Gorman (2004), Lundberg (1993), Elo and Preston (1996), Leon, *et al.* (1998), Preston, *et al.* (1998), and Vaupel, *et al.* (1998) provide additional evidence. Almond's (2006) study of the fetal-origins impact of the 1918 influenza pandemic is another prominent contribution.

[10] This paper also provides extensive reference to the relevant literature on selective migration.

birth, and often only region or country of birth) or have sample sizes that are far too small to be definitive.

An innovative feature of our work is the use of administrative data from the Medicare Part B program, which accurately records date of birth (used for eligibility determination) and date of death (for the purpose of terminating benefits). While these data do not include place of birth, as a federal administrative dataset they contain Social Security numbers, and these in turn can be used to match to the Numerical Identification Files of the Social Security Administration, which have "town or county of birth." With permission from the Center for Medicare and Medicaid Studies and the Social Security Administration (and with extensive confidentiality protection), these two files were matched. The resulting data cover almost the entire older population of the U.S.; our dataset includes more than 70 million observations. Because our data include place of birth and place of residence or death at old age, the data allow us to investigate the relationship between lifetime migration and mortality. However, the data are largely limited to individuals aged 65 and older, because 65 is the typical age of eligibility for Medicare, so for the most part our analysis is limited to mortality for men and women living to age 65. We study mortality also using coarser data from the vital statistics and the U.S. Census, which is useful for evaluating mortality at younger ages and for examining robustness more generally.

The remainder of our paper proceeds as follows:

In Section 2 we give a simple model in which young individuals treat both schooling and migration choices as investment decisions. The model presents the logic behind a pattern of selective migration—the possibility that those who migrate disproportionately have high levels of human capital, along observed dimensions such as years of schooling and unobserved dimensions such as initiative or ability. Our model shows that to identify the causal impact of

migration out of the South on mortality, it is necessary to have an instrument that affects the likelihood of migration but is otherwise statistically independent of mortality. We suggest that proximity to early twentieth-century railway lines is helpful in this regard.

Sections 3 through 5 report the empirical exercise. In Section 3 we describe our data sources. In Section 4 we present our basic findings about migration patterns of African Americans born between 1916 and 1932 in the Deep South, with a focus on the ages at which migration occurs, and the labor market outcomes of migrants and non-migrants. We document that most migration out of South (which we generally call "migrating North") occurs when individuals are in the early part of their prime earnings years (ages 18-40). Men who migrate North earn substantially more than those who remain in the South. Section 5 proceeds with our analysis of mortality. Our central finding is survival rates declined among older African Americans as a consequence of migrating North.

In the concluding section we discuss implications of our findings.

2. A Model of Human Capital Investment and Migration

To fix basic ideas and set the stage for empirical analysis to come, in this section we provide a simple model. At the core of our model is the assumption that an individual's lifetime indirect utility, U, depends on human capital, H, which in turn is a function of an endowed latent ability, α, and the level of schooling, E, chosen by the individual (or by parents), typically when the individual is young. We thus write $H = f(\alpha, E)$, assuming $H = f(\alpha, E)$ to be strictly concave, with $H = f_{\alpha}(\alpha, E) > 0$ and $H = f_{E}(\alpha, E) > 0$. We also expect that $H = f_{\alpha E}(\alpha, E) > 0$.

Let κ be the marginal cost of education, and w be the market return to human capital. Individuals then maximize indirect utility, which is simply

$$U(E) = wf(\alpha, E) - \kappa E. \tag{1}$$

The necessary condition for optimization is

$$U'(E^*) = wf_E(\alpha, E^*) - \kappa = 0, \tag{2}$$

and the second order condition is

$$U''(E^*) = wf_{EE}(\alpha, E^*) < 0. \tag{3}$$

Our model predicts that individuals respond to market incentives in an intuitively sensible way; an increase in the anticipated wage induces higher investment in education,

$$\frac{\partial E^*}{\partial w} = \frac{f_E(\alpha, E^*)}{-U''(E^*)} > 0. \tag{4}$$

In our model, individuals with relatively high levels of innate ability acquire more schooling than those with lower levels of ability,

$$\frac{\partial E^*}{\partial \alpha} = \frac{wf_{E\alpha}(\alpha, E^*)}{-U''(E^*)} > 0. \tag{5}$$

With this basic model of human capital accumulation in mind, consider a decision to migrate, which, like schooling, constitutes a form of investment.[11] In particular, consider an individual living in a Southern State who anticipates earning a higher return on human capital in the North: $w_N > w_S$. To obtain the higher return, he incurs a migration cost, M. Lifetime welfare maximization then requires that the individual compare the optimal outcome given a move North to the optimal outcome in the absence of migration, i.e., to compare

$$U_N^* = w_N f(\alpha, E_N^*) - \kappa E_N^* - M \tag{6}$$

and

$$U_S^* = w_S f(\alpha, E_S^*) - \kappa E_S^*, \tag{7}$$

[11] In our conception, it is helpful to think of both schooling and migration as decisions that occur early in life, prior to labor market participation. Of course, some migration (and schooling, for that matter) occurs at older ages. However, as we document below, most migration by African Americans out of the Deep South was indeed by younger individuals.

where educational attainment is chosen optimally in each case (which for any α gives $E_N^* > E_S^*$, since the return to human capital found in the North is higher than in the South).

Given this set up, it is easy to see the emergence of a pattern of "selective migration" for individuals born in the South. As the model is set up, the cost of migration is the same for all individuals, but the lifetime return to migration is higher for those who are endowed with relatively higher levels of innate ability.[12] Let $\hat{\alpha}$ be the level of ability such that an individual is indifferent between migrating North and remaining in the South $(U_N^* - U_S^* = 0)$, i.e., the level that solves

$$w_N f(\hat{\alpha}, E_N^*) - w_S f(\hat{\alpha}, E_S^*) - M - \kappa(E_N^* - E_S^*) = 0. \tag{8}$$

Individuals with ability lower than $\hat{\alpha}$ remain in the South, while those with higher ability migrate to the North.

The selection pattern we describe potentially bedevils attempts to empirically evaluate the effect of migration on individual outcomes. Any observed differences in outcomes between migrants and those who remain in the South—increased education, higher income, better health, etc.—can be the consequence of improved conditions in the North relative to the South, but can also be due to systematic unobserved differences in traits of migrants and non-migrants.

We argue below that the key to making headway in the identification of causal effects depends on observing Southern-born individuals who face differing costs to migration. So, for future reference, we give an intuitively sensible comparative static here:

$$\frac{\partial \hat{\alpha}}{\partial M} = \frac{-1}{w_N f_\alpha(\hat{\alpha}, E_N^*) - w_S f_\alpha(\hat{\alpha}, E_S^*)} > 0. \tag{9}$$

[12] This observation follows immediately from the result that optimal schooling is increasing in initial ability, i.e., equation (4).

An increase in migration costs shifts upward the threshold the level of α necessary to induce migration.

Within this framework, we are interested in estimating an effect that might reasonably be thought of as "the causal impact on longevity of migrating North" for African Americans. Toward that end, let $D=1$ indicate that the individual migrates North and $D=0$ indicate non-migration. Let Y be the outcome of interest; our focus in this paper is longevity, but one might be interested in other outcomes like income, education, or literacy. We designate Y_1 to be the outcome if an individual migrates and Y_0 to be the outcome if the individual does not migrate; of course we actually observe only $Y = Y_0 + D(Y_1 - Y_0)$.

Now let $Z \in \{0,1\}$ be an indicator for birthplace in a town on a railroad line (1) or not on a railroad (0). We assume, crucially, that $Z \perp\!\!\!\perp (Y_1, Y_0)$ where, following Dawid (1979), the symbol $\perp\!\!\!\perp$ indicates statistical independence. Proximity of birthplace to a railroad line is thereby assumed to have no impact on longevity, but it does affect the cost of migration, M. Letting X be relevant covariates, we assume that $p(X,Z)$, the probability of migration, is increasing in Z,

$$p(X^0,1) \geq p(X^0,0), \tag{10}$$

for all X^0, with strict inequality holding for some X^0.[13] To conserve notation, we ignore the covariate notation for the remainder of the discussion.

Arguments presented in the literature surveyed in the Introduction give us reason to believe that longevity (Y) is increasing in human capital (which is, of course, unobservable here).[14] If so, our theory has crisp predictions:

[13] As we show below, the proximity of one's birthplace to the railway has a substantial influence on migration North for African Americans born in early twentieth-century Deep South. We discuss the independence assumption in more detail when we turn to empirical work.

Let α_0 be the threshold level of innate ability necessary to induce migration North for individuals whose birthplace in on a railway line, and let α_1 be the comparable threshold for those whose birthplace is *not* on a railway line. Notice that $\alpha_1 > \alpha_0$; there are some individuals who will migrate if they are born in a railway town, but not if they are born in a non-railway town. Now we can divide individuals into three groups:

First, designate all individuals whose latent ability level is below α_0 to be in *Set N,* the set of "never movers." Second, let those whose latent ability is greater than α_1 be assigned to *Set A,* the set of "always movers," i.e., individuals who move North regardless of where they are born. Finally, we have *Set C*, the set of "compliers," so named because conceptually they are people who "comply" with the instrument—moving North if born in a railway town and remaining in the South if born in a non-railway town. These, obviously, are individuals for whom $\alpha_0 < \alpha < \alpha_1$.

Our predictions, then, are

$$\begin{aligned} &\mathrm{E}(Y_0 \mid N) < \mathrm{E}(Y_0 \mid C) < \mathrm{E}(Y_0 \mid A), \text{ and} \\ &\mathrm{E}(Y_1 \mid N) < \mathrm{E}(Y_1 \mid C) < \mathrm{E}(Y_1 \mid A). \end{aligned} \tag{11}$$

These predictions follows from the fact that longevity is monotonically increasing in α for a given location.

We cannot observe these relationships in (11) directly in either location. We can, however, estimate some of the objects in the two sets of inequalities. The mean longevity for the non-migrating individuals belonging to *Set N* (the "never movers") is found by evaluating non-migrants $(M = 0)$ who were born in a railway town $(Z = 1)$:

[14] In our context we have no instrument for schooling, so we have no hope of identifying a causal effect of schooling separate from migration. Notice that human capital more broadly is unobservable because it depends on innate ability α which is not observed.

$$E(Y_0 \mid N) = E(\overline{Y}_{D=0,Z=1}). \tag{12}$$

Since no one in *Set N* migrates to the North we cannot estimate the counterfactual $E(Y_1 \mid N)$. Conversely, the mean longevity of migrating individuals in *Set A* (the "always movers") is found by evaluating migrants to the North who were born in towns *not* on the railway line:

$$E(Y_1 \mid A) = E(\overline{Y}_{D=1,Z=0}). \tag{13}$$

And since no one in *Set A* remains in the South we never observe the counterfactual $E(Y_0 \mid A)$.

For our purposes—finding the causal impact of migration on mortality—*Set C* is key. For these people we can estimate both $E(Y_0 \mid C)$ and $E(Y_1 \mid C)$. To see how, notice first that expected longevity among non-migrants collectively is simply

$$\mathrm{E}(Y_0 \mid N \cup C) = \frac{\Pr(N)}{\Pr(N)+\Pr(C)}\mathrm{E}(Y_0 \mid N) + \frac{\Pr(C)}{\Pr(N)+\Pr(C)}\mathrm{E}(Y_0 \mid C), \tag{14}$$

so

$$\mathrm{E}(Y_0 \mid C) = \frac{\Pr(N)+\Pr(C)}{\Pr(C)}\mathrm{E}(Y_0 \mid N \cup C) - \frac{\Pr(N)}{\Pr(C)}\mathrm{E}(Y_0 \mid N). \tag{15}$$

We can easily estimate each element of the right-hand side. $\mathrm{E}(Y_0 \mid N \cup C)$ is estimated by $\overline{Y}_{M=0,Z=0}$ and $\mathrm{E}(Y_0 \mid N)$ is estimated by $\overline{Y}_{M=0,Z=1}$. The term $\Pr(N)+\Pr(C)$ is estimated by $\left(1-\overline{D}_{Z=0}\right)$, i.e., by the proportion not migrating among individuals born in non-railway towns. Similarly, $\Pr(N)$ is estimated by $\left(1-\overline{D}_{Z=1}\right)$, i.e., by the proportion not migrating among those born in railway towns. Finally, $\Pr(C)$ is simply $\Pr(N)+\Pr(C)$ minus $\Pr(N)$.

Similarly, longevity among migrants is

$$\mathrm{E}(Y_1 \mid C \cup A) = \frac{\Pr(A)}{\Pr(A)+\Pr(C)}\mathrm{E}(Y_1 \mid A) + \frac{\Pr(C)}{\Pr(A)+\Pr(C)}\mathrm{E}(Y_1 \mid C), \tag{16}$$

and we can rearrange to get the desired expression

$$\mathrm{E}(Y_1 \mid C) = \frac{\Pr(A)+\Pr(C)}{\Pr(C)}\mathrm{E}(Y_1 \mid C \cup A) - \frac{\Pr(A)}{\Pr(C)}\mathrm{E}(Y_1 \mid A), \tag{17}$$

where the term $\mathrm{E}(Y_1 \mid C \cup A)$ is estimated directly by $\overline{Y}_{D=1,Z=1}$, and the term $\mathrm{E}(Y_1 \mid A)$ is estimated by $\overline{Y}_{D=1,Z=0}$.

In sum, we can directly test the following subset from our predicted inequalities (11):

$$\begin{aligned}&\mathrm{E}(Y_0 \mid N) < \mathrm{E}(Y_0 \mid C) \text{ and}\\ &\mathrm{E}(Y_1 \mid C) < \mathrm{E}(Y_1 \mid A).\end{aligned} \tag{18}$$

These latter inequalities should prevail if (a) migration is positively selected and (b) higher levels of human capital lead to improved longevity.

As for the causal impact of migration, our set-up leads in a natural way to a standard Wald estimator,

$$\hat{\Delta}^W = \frac{\overline{Y}_{Z=1} - \overline{Y}_{Z=0}}{\overline{D}_{Z=1} - \overline{D}_{Z=0}}. \tag{19}$$

Using the relationships given above, asymptotically this estimator is equivalent to

$$\begin{aligned}\mathrm{plim}\left(\hat{\Delta}^W\right) &= \frac{\{\Pr(N)\mathrm{E}(Y_0 \mid N) + \Pr(C)\mathrm{E}(Y_1 \mid C) + \Pr(A)\mathrm{E}(Y_1 \mid A)\}}{\Pr(C \cup A) - \Pr(A)}\\ &\quad - \frac{\{\Pr(N)E(Y_0 \mid N) + \Pr(C)\mathrm{E}(Y_0 \mid C) + \Pr(A)\mathrm{E}(Y_1 \mid A)\}}{\Pr(C \cup A) - \Pr(A)}\\ &= \mathrm{E}(Y_1 - Y_0 \mid C).\end{aligned} \tag{20}$$

This estimator identifies the impact of moving North for individuals in *Set C,* the "compliers." These are individuals in the middle of the ability distribution—people whose characteristics lead them to migrate North if they are born on a railway line, but to remain in the South if they are born in a non-railway town.

In setting up our estimation, we have closely followed Imbens and Angrist (1994) and Angrist, Imbens, and Rubin (1996)—proposing to estimate a "local average treatment effect" (to

use their expression), where the term “local” emphasizes the fact that the estimate pertains for a particular subset of the population, and term “treatment effect” refers to the impact of migration.

Three useful points are clarified by our discussion. First, the estimated effect applies for the middle-ability group only; the impact of migration on longevity might differ for higher- or lower-ability individuals. Second, the estimated effect includes the impact of behavioral responses made in anticipation of migration. Thus, for example, individuals who plan to move North might acquire more education in anticipation of higher returns in the North, and if so, the “treatment effect” of migration includes this behavioral change as part of the causal pathway whereby health might improve due to migration. Third, if individuals are positively selected into migration the LATE estimate will of course be smaller than the corresponding OLS coefficient. In addition, we can evaluate the selection process directly using (18): For those who remain in the South, those who stay regardless of birthplace (Set N) will have lower longevity than those born in non-railway towns who would have migrated had they been born in railway towns (Set C). And among migrants North, those who migrate regardless of birthplace (Set A) will have greater longevity than those who migrate only because of birthplace was in railway towns (Set C, the “compliers”).

3. Data

As we have noted, our ability to study the impact of the Great Migration on mortality hinges on access to a unique data source, the Duke SSA/Medicare Dataset. We also use additional data sources, described below.

3.1. The Duke SSA/Medicare Dataset

Our primary data source is the Duke SSA/Medicare Dataset. These data consist of the Master Beneficiary Records from the Supplementary Medical Insurance Program (Medicare Part

B) merged by Social Security Number to records from the Numerical Identification Files (NUMIDENT) of the Social Security Administration (SSA). The data are complete for the period 1976-2001. There are over 70 million records in the data, covering a very high proportion of the population aged 65 years and older. Because enrollment requires proof of age, the age validity of the records is high compared with other data sources for the U.S. elderly population. In addition to race, sex and age, information includes entitlement status (primary versus auxiliary beneficiary), zip code of the place of residence, exact date of death, and, importantly, detailed place of birth information. Specifically, the data include either town and State of birth or town, county and State of birth for all U.S.-born respondents.

To our knowledge, this is the only data source that provides detailed place of birth and detailed place of current residence in a very large sample. The data are therefore ideal for answering these questions: Which "sending communities" in the South sent people to which "receiving communities" in the North. A further advantage of these data is that death and population counts are based on the same data source.[15]

Before the SSA/Medicare data could be used for our purposes, there was a technical hurdle to overcome concerning location of birth. The SSA provides a 12-character text field for the place of birth as well as a two-character abbreviation for the State of birth. The State of birth abbreviations follow the Postal Service abbreviations and pose only minor issues to convert to Census State FIPS codes. However, the research strategy outlined above requires that we establish birthplace at a detailed level, so that we can determine precise longitude and latitude coordinates, and then determine proximity to railway lines using appropriate historical records.

[15] An alternative way of estimating age-specific mortality entails combined use of mortality data from Vital Statistics and the U.S. Census. Below we also use such methods.

In order to establish the birthplace from the 12-character text field, we developed an algorithm that matches this object to place names recorded in the U.S. Geological Service's Geographic Names Information System (GNIS). The GNIS is the master list of all place names in the U.S. both current and historic, and includes geographic features including the longitude and latitude of each place. Our algorithm essentially classifies places according to the strength of their match between the write-in place of birth on the SSA NUMIDENT file and the GNIS list. We were able to match places at very high rates, and, we believe, with modest error.

An Appendix Table shows that our data seem to have quite high coverage rates (typically 0.80 or above) for the 1916-1932 cohorts, but coverage rates are much lower for earlier cohorts. Thus we restrict attention to only the 1916-1932 cohorts. Additional details about the process and match quality are in an unpublished appendix available from the authors.

3.2. Vital Statistics and Census Data

In our analysis below we also use the Detailed Mortality Files (DMF) of the U.S. Vital Statistics registry. These files contain all deaths in the U.S. and includes State of death and State of birth. Using these data we can calculate the number of deaths at each age by State of birth for African-Americans. In order to estimate age-specific death rates by State of birth, we need to form estimates of the number of African Americans alive in specific years by State and birth cohort. Data to form these estimates come by combining data from the DMF and data from the 5 percent Integrated Public Use Samples (IPUMS) of the Decennial U.S. Censuses. In addition, we make use the of IPUMS Decennial Census files for 1920-1990 to trace out the age of migration for the early twentieth-century cohorts.

4. Patterns of Migration and Labor Market Outcomes of Migrants

As a first step in our empirical analysis, we present evidence about migration concerning the magnitude of lifetime migration North among blacks born in the Deep South, and locations to which these individuals moved. We also compare characteristics of migrants and non-migrants.

4.1. Patterns of Migration

Table 1 uses data from the 1970 U.S. Census to show location of residence for black individuals in birth cohorts 1916-1932 for each of the five States under study. In this Table, "South" is defined to be the Deep South plus the other six Confederate States, and those living outside the Confederacy are said to be in the "North".[16] A striking feature of these statistics is that a substantial proportion of black Americans born in each of these States reside in the North when they are middle aged—ages 38 to 54 in 1970. The proportion migrating North ranges from 0.32 (migrating out of Louisiana) to 0.49 (migrating out of Mississippi).

Many social scientists have noted that an important aspect of the Great Migration was a "vertical" pattern of migration from the South to the North. For example, African American migrants to Washington DC, Philadelphia and New York were often came from North or South Carolina, while African Americans in Chicago disproportionately were born in the Mississippi Delta region. The prevailing historical theory is that during the Great Migration black individuals from the South tended to begin travels North from the nearest train stop, and then often settled at the terminus of rail lines. Thus there were migratory streams from the Carolinas to cities on the eastern seaboard along the *Pennsylvania Railroad* line, and from Mississippi to

[16] The 11 former Confederate States are Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Tennessee, Texas, and Arkansas. (Kentucky and Missouri were officially neutral, though they were represented by stars in the Confederate flag when secessionist parts of these States joined the Confederacy in 1861.)

Chicago along the *Illinois Central Railroad*. The formation of African American neighborhoods around the terminus of railroads has been documented in several cities.

Table 1 provides statistics based on Census data. These statistics document "vertical" migratory patterns. Conditional on residing in the North, individuals born in South Carolina and Georgia tended to settle in New York, New Jersey, and Pennsylvania (with a substantial proportion of Georgians moving also to Michigan and Ohio). Migrants from Alabama and Mississippi tended to migrate to such Midwestern States as Ohio, Illinois, and Michigan. Finally, while there was significant migration from Louisiana to Illinois, a strikingly high faction of these migrants moved west to California. In each of the States we are studying, most blacks who remained in the South remained in their home State.

Table 2 provides an analysis that parallels Table 1 using our Duke SSA/Medicare Dataset. This analysis now looks at these same cohorts but at older ages—age 65 and older. Also, because these data provide the city or town in which individuals reside, here we list the large *cities* to which individuals migrate (rather than *States*, as in Table 1). We notice that migrants from South Carolina and Georgia often moved to New York City and Philadelphia; those born in Alabama and Mississippi often moved to Chicago and Detroit; Louisianans tended to migrate to Los Angeles and San Francisco. Nearly all migration North was to urban areas.[17]

The key role of the railways themselves can be easily illustrated with the GIS maps that we developed in the process of building the data used in our regressions below. Consider, for example, the famous migration of African Americans born in Mississippi to Chicago via the *Illinois Central Railroad*. Figure 1 reproduces a map of this line from the turn of the century. Then Figure 2 shows the fraction of black individuals within each of Mississippi's counties who

[17] By way of comparison, individuals in our sample who remain in their home States often reside in non-metro areas: 0.45 in South Carolina, 0.42 in Georgia, 0.33 in Alabama, 0.77 in Mississippi, and 0.28 in Louisiana.

resided in Chicago at age 65 or older toward the end of the 20th century. There is a striking concentration of migration to Chicago from counties along the *Illinois Central*. Figure 2 gives another example: migration by African Americans from Louisiana to California occurred largely from counties along the *Vicksburg, Shreveport and Pacific* line that traverses Northern Louisiana, connecting with the *Texas and Pacific* in Shreveport.

Because of similarities in migratory patterns, in some of our analyses below we divide our data into three groupings: South Carolina and Georgia, which tended to have migration up the East coast; Alabama and Mississippi, which tended to have migration to the Midwest, and Louisiana, which had migration to cities in the West.

As for the ages at which migration occurs, for African Americans born 1916-1932 in the Deep South, we calculate at each age the proportion of individuals were living their birth State, in the South (i.e., other States for the former Confederacy) but outside of their birth State, and in the North. Figure 4 uses Census data from the years 1920 through 1990 to plot the fraction of African Americans who migrated to the North and to other areas of the South by the indicated age. Like Table 1, Figure 4 shows that total lifetime migration out of the Deep South was extremely high. Approximately 45 percent of these individuals had by age 60 migrated to the North. The figure also shows clear trends in the age of migration: Nearly all of the migration within the South occurred by age 20, most likely indicating movements of individuals as children with their parents. Migration to the North is quite low prior to age 18—about the same as migration to other Southern States—but there is a steep escalation in migration to the North between ages 18 and 37. Thereafter we observe only little increase in the fraction of African Americans living in the North—an indication of lower rates of migration at older ages.

Migration to the North therefore occurs primarily in the early prime years of labor market participation. Because most African American migrants to the North spent their childhood and adolescent years in the South, they presumably are generally similar to non-migrants with respect to the quality of available schooling and exposure to early-life health conditions.

4.2. Income and Education Among Migrants

As we discuss above, the existing literature suggests that movement from the South to the North was an important component in improving the income of African Americans by the mid-twentieth century. In Table 3 we provide evidence consistent with this idea. Specifically, using the 1970 Decennial Census, we estimate regressions in which men's earnings are specified to be a function of birth cohort (entered as indicator variables), and an indicator variable for moving North. We use two measures of earnings: wage and salary income and total personal income, both reported in 2010 dollars.

For both earnings measure used, and for each of the three groups of States we analyze, black men who migrant North have much higher income than those who remain in the South. Estimates suggest that income was 65 to 79 percent higher in the North.

What accounts for the large increase in earnings for Southern-born men moving North? Wages were doubtless higher in the North, but an important additional possibility is selection into migration of the sort we outline in our theoretical section above; migrating individuals probably had higher productivity than those not migrating (both unconditional and conditional on educational attainment). Consistent with the selection story, evidence in Table 4 shows that African American men migrating had approximately 2 years more schooling—roughly 25 percent more years of completed education—than those who remained in the South. Similarly large gaps appear for women as well. It is interesting to note, still, that if we condition on

education in our regressions in Table 3, the earnings gap is reduced only moderately; some of the difference in productivity is likely due to unobservable characteristics.

In sum, then, available evidence establishes three important facts about migration relevant to the analysis of mortality that follows: First, patterns of migration differed quite markedly across States, with much of the migration following "vertical" paths for South Carolina, Georgia, Alabama, and Mississippi. Much of the migration from Louisiana was to the West. Railroads played a major role in determining the flow of migrants from specific areas in the South to specific cities in the North. Second, most migration North occurred among the relatively young, though typically after childhood and adolescence. Third, migrating individuals had more education and earned substantially more than those who remained behind—facts broadly consistent with the idea that migrants were positively selected on the basis of such characteristics as ability.

5. Migration and Mortality

We turn now to our key empirical results, in which we attempt to establish the causal relationship between the migration we have documented, and old-age mortality recorded in our Duke SSA/Medicare dataset. We use these data to construct survival measures among those aged 65 and older, which we compare for migrants and non-migrating African Americans born in the Deep South.

As we discuss in Section 3, a simple comparison of survival rates for migrants and non-migrants confounds the "treatment effect" of migration and the selection of individuals into migration (which, given evidence in Tables 3 and 4, is likely positive). To make headway, we use proximity of birthplace to a railway as an instrument for migration. Our argument is that if an individual is born near a town with a train stop on a line heading North, he may be more

likely to migrate than the individual born far from the train line, and certainly is not less likely. Thus distance to the train line of the town of birth is an instrument that affects the probability of migration, but otherwise has no direct effect on late-life mortality.

As for the location of the railways themselves, a brief history of the expansion of railways in the U.S. is helpful. In general, eminent domain was used to allow railroad companies to minimize the cost of connecting large cities. Land was generally acquired in as straight a path as possible, given geographic restrictions, to connect major cities. For example, small towns in Mississippi were likely to be located on a rail line if it was located on a straight line, roughly speaking, between Memphis and Jackson, between Jackson and New Orleans, and so forth (as was illustrated above in Figure 1).

Using the detailed birthplace information, we classify whether the town of birth was on a railroad line. We do this by overlaying maps of all rail lines at the turn of the twentieth century on a modern GIS map of the U.S. We consider a town to have a rail stop if the longitude and latitude of a town is within three miles of the train lines; we allow for a three mile radius as the longitude and latitude reflects the city center and the train stop could be away from the city center. In addition, there is some measurement error for the exact path of the rail line that we trace from our map.

If our strategy is to be successful, of course, historians' observations about the importance of railroads to migration must be empirically correct: being located near transportation lines must be a statistically meaningful determinant of out-migration from the South. Fortunately, this turns out to be the case.

Table 5 provides our primary findings. Our regressions are estimated for black men and women born in the Deep South, 1916-1932. Recall that individuals enter our sample at age 65

(with the exception of a small number who enter because of disability, and whom we also include in our sample if they survived to 65). A simple and sensible measure of mortality is survival to age 70 or to age 75. We specify these survival variables be a function of where individuals reside at age 65—North or South. We also include an indicator variable for each of the 34 gender-cohort cells in the data, and indicator variables for State of birth.

Regression (1) presents initial baseline OLS results. In this regression survival is taken to be a function of gender and birth cohor; (we enter a full set of gender by birth cohort indicator variables) and birth State, and migration North. We find that migration North has no effect on survival to age 70 or to age 75 conditional on survival to age 65.[18] Our estimates suggest that migration is associated with no impact on longevity. This is unexpected, given theoretical expectations that migrants are positively selected and the empirical evidence above about positive selection on the basis of labor market skills, and given the expectation that this same selection process would show up in meaningfully higher survival probabilities.

For a fairly substantial proportion of our sample we are able to match on State and county of birth, but not on the town of birth (usually because the respondent only supplied the county). To implement our IV strategy we need proximity of birthplace to the railway. So we estimate a second OLS regression, reported in column (2), in which we include only those cases in which we are able to match on the town of birth. The estimated coefficients are extremely close in the two regressions. In the second regression, and in the IV exercise that follows, we use clustered standard errors—clustering on birthplace.

We turn next to our IV estimates. We notice, to begin, that in the first stage of estimation, reported in column (3), close proximity of one's birthplace to a railroad line has a

[18] We have access to data through 2002. For the regression in which dependent variable is survival to age 70, we use birth cohorts, 1916-1932. For survival to age 75, we can only use birth cohorts, 1916-1927. Hence the smaller sample size in the second regression.

large impact on migration North; the estimated impact of birth in a railway town is estimated to be approximately 0.06, which amounts to an increase in migration of more than 13 percent relative to those born in non-railway towns. *t* statistics on the railroad coefficients exceed 40 in our regressions (so marginal *F* statistics exceed 1600); trains are powerful instruments.

Turning to the second stage, reported in column (4), our theory tells us that the estimated coefficient on "Living in the North" gives a local average treatment effect (LATE) of migration. Given positive selection into migration, we expect this estimated effect to be lower than the effect estimated by OLS, i.e., to be negative here. We find this to be the case in both regressions. The estimated LATE on survival to age 70 is approximately -0.04, and the estimated LATE on survival to age 75 is -0.09. Given baseline survival probabilities of 0.88 and 0.72, respectively, these estimated coefficients are quite large. Both estimates are significantly less than zero by standard statistical criteria. There is surely little to suggest that for our study population the Great Migration improved mortality; to the contrary, the best evidence is that moving to the North substantially reduced longevity.

In Tables 6 through 8 we repeat our key analyses for, respectively, South Carolina and Georgia, Alabama and Mississippi, and Louisiana. The basic message is the same in each case. The estimated causal impact of migration is to reduce longevity at older ages. We note, though, that standard errors are fairly large for some of the estimates coefficients in our regressions.[19]

In general, survival rates for women are higher than for men. This is true, we find, for survival at older ages among African Americans born in the Deep South. Still, we find that the causal effect of migration on those survival rates is similar for men and women, as shown in Tables 9 and 10.

[19] As noted above, in all cases we report standard errors clustered by town of birth. Standard errors are somewhat smaller if we use other schemes. Standard errors on the key estimate "Living in the North" in the 2SLS regressions are approximately 20 percent smaller if we cluster by sex-cohort-town or if we use robust standard errors.

We mention two additional analyses not reported in our tables:

First, we conducted our analysis for survival to age 70 using two divisions of the data—cohorts 1916-1923 and 1924-1932. Not surprisingly, proximity to railroad lines has a larger effect on migration in the earlier period than in the later period, when use of bus and automobile transportation was becoming more widespread. But the first stage is highly significant in both cases, and the estimated impact of moving North on survival was virtually identical over the two periods.

Second, we conducted the analysis omitting large cities. Specifically, we notice that for all cities that are *off* the railway lines we have 12,500 or fewer observations per city in our sample. In contrast, there are many such cities on railway lines. So we conduct our analysis for a subsample that includes the smaller cities only.[20] Standard errors increase when we conduct this analysis, but there is virtually no change in the magnitude of the coefficients.

Finally, recall the predictions implied by equation (18) in our theoretical section under the condition of positive selection into migration. With positive selection we expect: First, among individuals who remain in the South, those who stay regardless of birthplace (Set N, the "never movers") should have lower longevity than individuals born in non-railway towns who would have migrated had they been born in railway towns (Set C, the "compliers"). Second, among individuals who migrate to the North, those who migrate regardless of birthplace (Set A, the "always movers") should have greater longevity than those who migrate only because of

[20] We thereby eliminate from our sample individuals born in New Orleans, LA; Atlanta, GA; Birmingham, AL; Savannah, GA; Shreveport, LA; Charleston, SC; Montgomery, AL; Mobile, AL; Spartanburg, SC; Macon, GA; Columbia, SC; Greenville, SC; Augusta, GA; Jackson, MS; Sumter, SC; Columbus, GA; Baton Rouge, LA; Meridian, MS; Tuscaloosa, AL; and Selma, AL.

birthplace was in railway towns (Set C, the "compliers"). Table 11 shows that both inequalities hold for both men and women.[21]

5.2. Mortality Patterns Drawn from Other Data Sources

To our knowledge, the Duke SSA/Medicare data are the only data available to conduct the analyses reported in the previous section. We can, however, conduct an important consistency check as follows: Recall that a key result from the OLS regressions is Table 5 is among blacks born in the Deep South, those who migrate North have slightly higher survival rates at older ages than those who remain in the South (not significantly different from zero). Another way of comparing mortality for Southern-born blacks residing in the North and those residing in the South is to construct base population estimates using Census records (which have age, State of current residence, and birth State), and then use death counts from the Detailed Mortality File of the Vital Statistics (which also have age of death, State of current residence, and birth State).[22]

Figure 5 illustrates mortality rates for 1916-1932 cohorts of black men and women born in the Deep South—in this case for the year 1980. In that year individuals in the 1932 cohort were approximately aged 48 and those in the 1916 cohort were approximately aged 64, i.e., these individuals were considerably younger than when death rates are evaluated in our analysis in the previous sections (ages 65 to 75). The important observation in Figure 1 is that at these younger ages mortality rates are very close for those residing in the North and those residing in the South—typically slightly lower in the North. Table 12 provides regression analysis, showing that for these individuals the 1980 mortality rates were on average 0.003 lower per year for those

[21] The Wald estimator (19) can be calculated directly from this Table; it is $0.700 - 0.637 = -0.063$ for men, and $0.831 - 0.727 = -0.104$. These differ slightly from the estimates presented in Tables 9 and 10 because those estimates are from a regression that also includes cohort and State indicator variables.

[22] Black, *et al.* (2011) provide a simple GMM method for optimally combining the data sources for this purpose. Notice that for our purposes here we can only calculate these rates for years in which there is a Decennial Census.

residing in the North. The same general observation holds true ten years later, in 1990 (at ages approximately 58 to 75), and again in 2000 (at ages approximately 68 to 85).

As a guide for comparing results in Table 5 and Table 12, notice that if mortality rates were 0.003 lower per year for Northern residents than for Southern residents from ages 65 to 70, five-year *survival* rate were roughly 0.015 higher for Northern residents than Southern residents. While that is larger than the OLS result reported in Table 5 (which almost exactly 0), it is not substantially different. Differences in the two estimates could be due to sampling variation, though we cannot rule out some bias in estimates based on the Census and Vital Statistics data and/or estimates from the Duke SSA/Medicare.[23]

In any event, there is little in these data to suggest that mortality rates on average differed substantially for Southern-born residents living in the North from those living in the South. Importantly, these data tell us that this latter observation holds true not only for the older individuals we can study with the Duke SSA/Medicare data, but also at younger ages.

6. Conclusion

Our analysis suggests that migration of African Americans out of the South to urban areas in the North, Midwest and South was detrimental to longevity. We find this inference surprising given the voluminous evidence that migration North increased the economic opportunities of African Americans, and given the understanding that increased income and education are associated with reduced mortality.

One possibility, of course, is that the traditional view overstates the welfare gains from migration. Eichenbaum, Tolney and Alexander (2010) recently revisited the question of the

[23] A nice advantage of the Duke SSA/Medicare data is that the denominator and numerator of mortality rates are being constructed from the same source. The same is not true for the analysis in this Section. Thus, for example, if the Census undercounts African Americans, we will be overestimating mortality rates here. This would be problematic if undercounts are a bigger problem in the South than in the North, or *vice versa*.

economic benefit of migration and conclude that the economic benefits may have been smaller than previous estimated. In particular, they emphasize evidence that housing prices African Americans paid upon arriving in the South were substantially higher than in the South (and indeed increased as a consequence of the Great Migration). In short, mortality may have failed to decline because real economic outcomes were not markedly improved by migration.

Even so, the evidence is compelling that migrants were positively selected into migration, and our empirical work indicates that selection alone should have resulted in lower mortality among migrants than among non-migrants. It appears that expected improvements to longevity in the North, due to positive selection into migration or any beneficial effects of better economic opportunities in the North, were swamped by other factors, e.g., health conditions that were worse in destination locations—primarily large cities like New York, Detroit, Chicago, and Los Angeles—than in the predominantly rural areas in South where non-migrants remained.[24]

Our work may have some bearing on the extent to which early-life poverty casts a long shadow on lifetime health outcomes—an issue that is possibly quite important for cohorts of African Americans born in the Deep South in the early twentieth century. The key idea is laid out in Fogel's important book, *The Escape from Hunger and Pre-mature Death: 1700-2100*. In that work, Fogel emphasizes the role of nutrition for giving the body the constitution to withstand insults from pathogens; an individual's "biological capital" is profoundly affected by early life nutrition. While poverty and poor nutrition among African Americans children growing up in the Jim Crow South surely harmed lifetime health in ways that could not be

[24] To sort out the mechanisms that lead to this higher mortality, it would be helpful to have additional health records and information on cause of death for the SSA/Medicare data. At present we do not have access to such data. We have, though, done some preliminary investigation of publically available cause-of-death information from the Vital Statistics. Black men and women migrating from Mississippi to Illinois have disproportionately high death rates, in comparison to non-migrants, from the following causes: chronic liver disease and cirrhosis, pneumonia and influenza, and chronic obstructive pulmonary diseases (bronchitis and emphysema).

reversed at older ages, our work suggests that some choices made in later life—in particular, migration North—had important systematic effects on mortality.

In any event, our empirical work suggests a new layer of complexity for the relationships between education, income, and health among African Americans born in the U.S. in the early twentieth century. The vast majority of these individuals were born into poverty in the South, and a high fraction moved North in search of improved social and economic conditions. We believe it is important to continue to study how early childhood conditions, migration, and economic success as adults affected health for these individuals.

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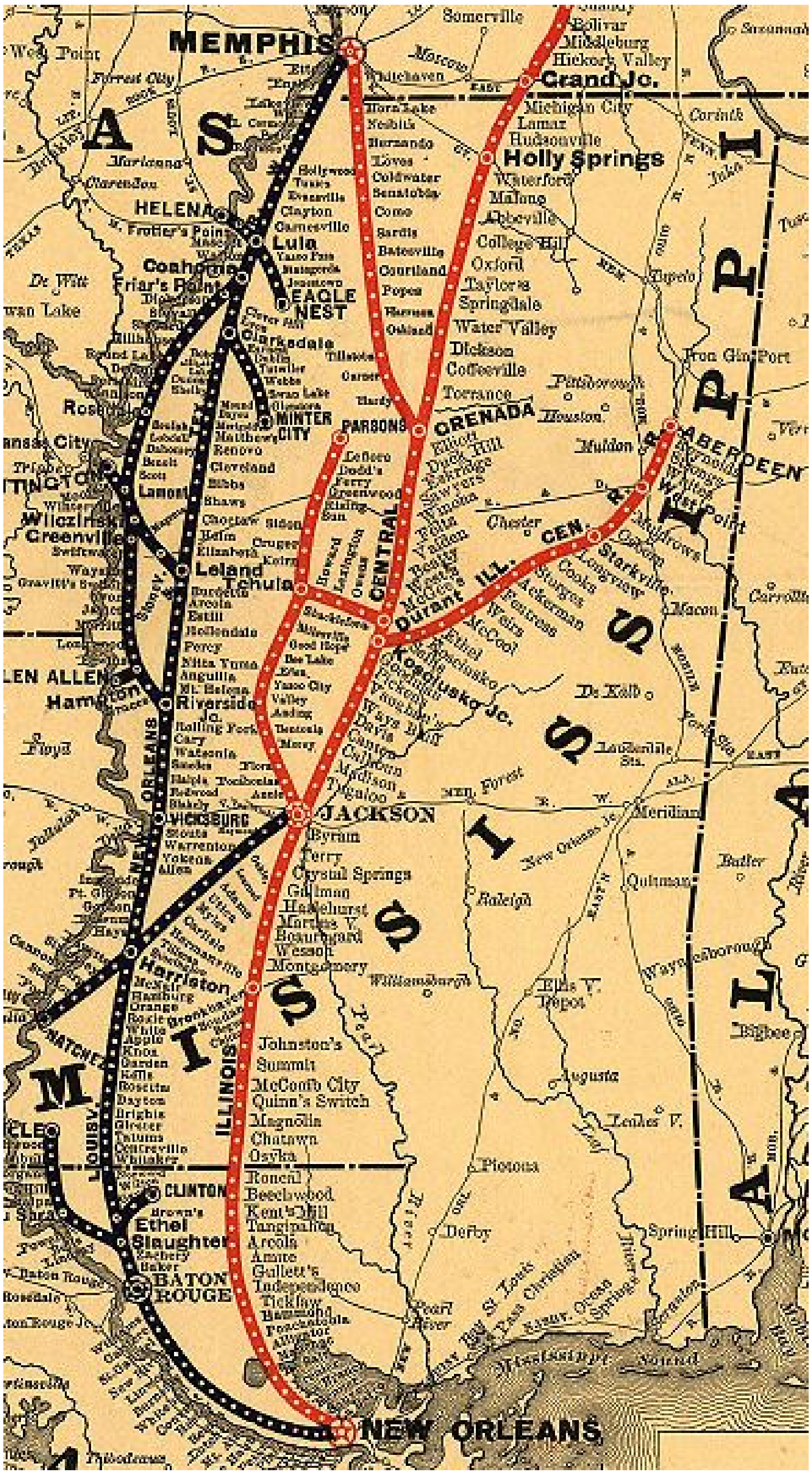
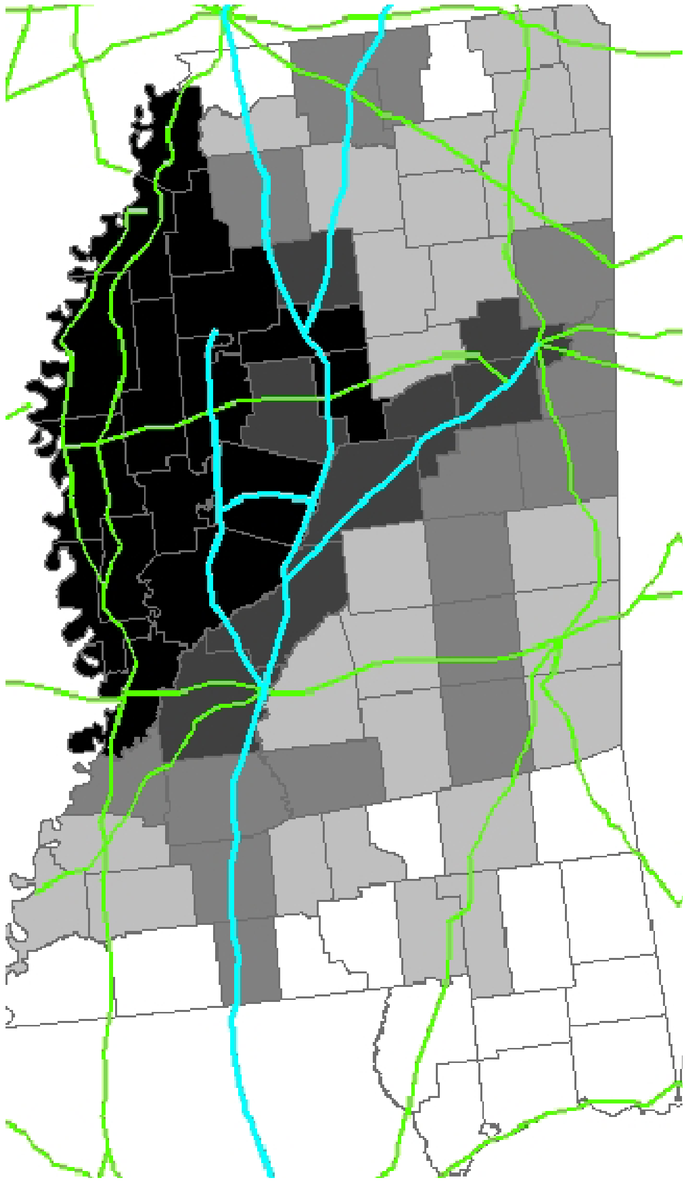
Figure 1. Illinois Central Railroad Stops in Mississippi, 1892



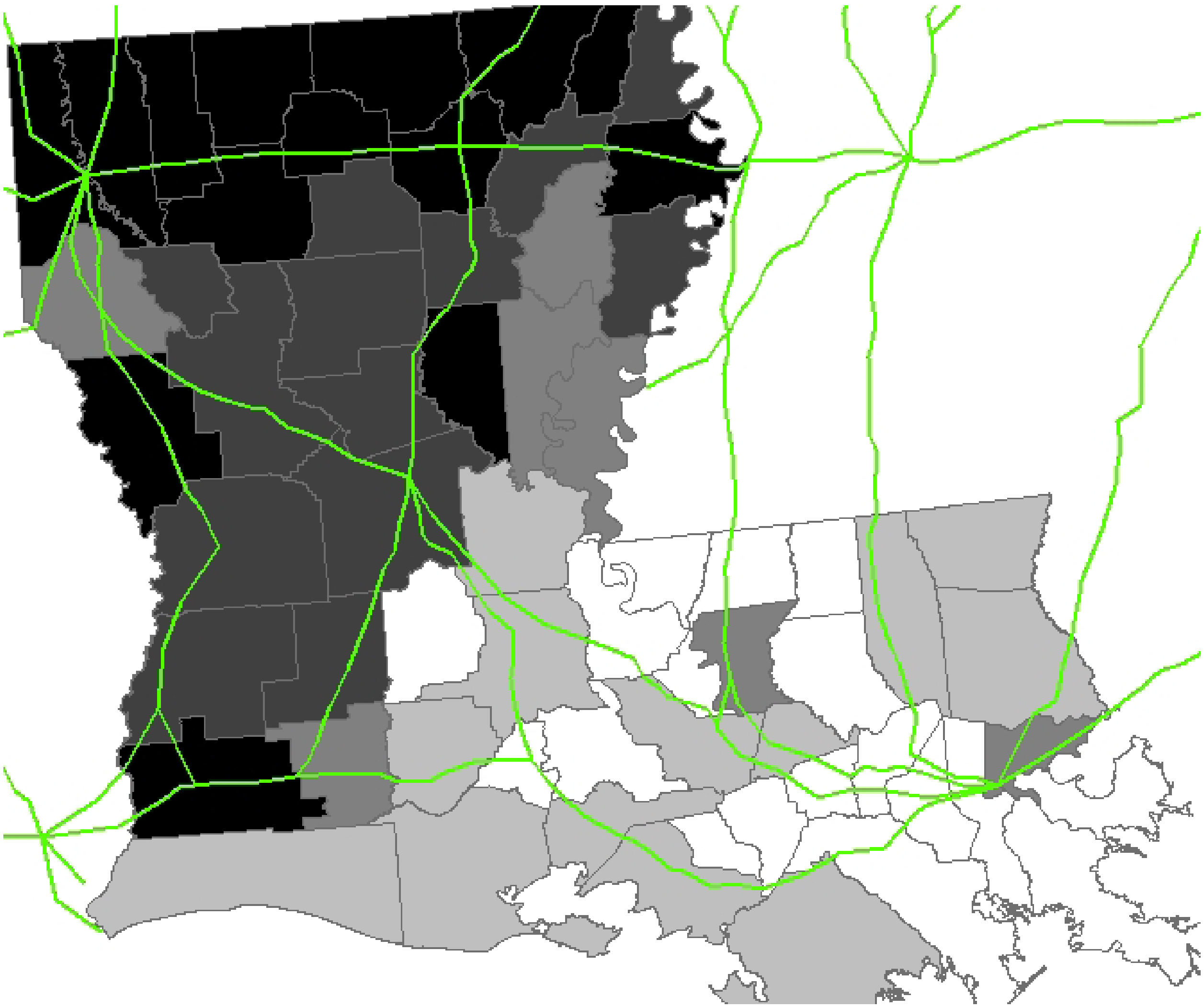
Source: Rand McNally & Co., Engravers, Chicago. Library of Congress Call Number G4041.P3 1892 .R3 RR431.

Figure 2. Percent of Black Population Migrating to Chicago from Mississippi, Birth Cohorts 1916-1932



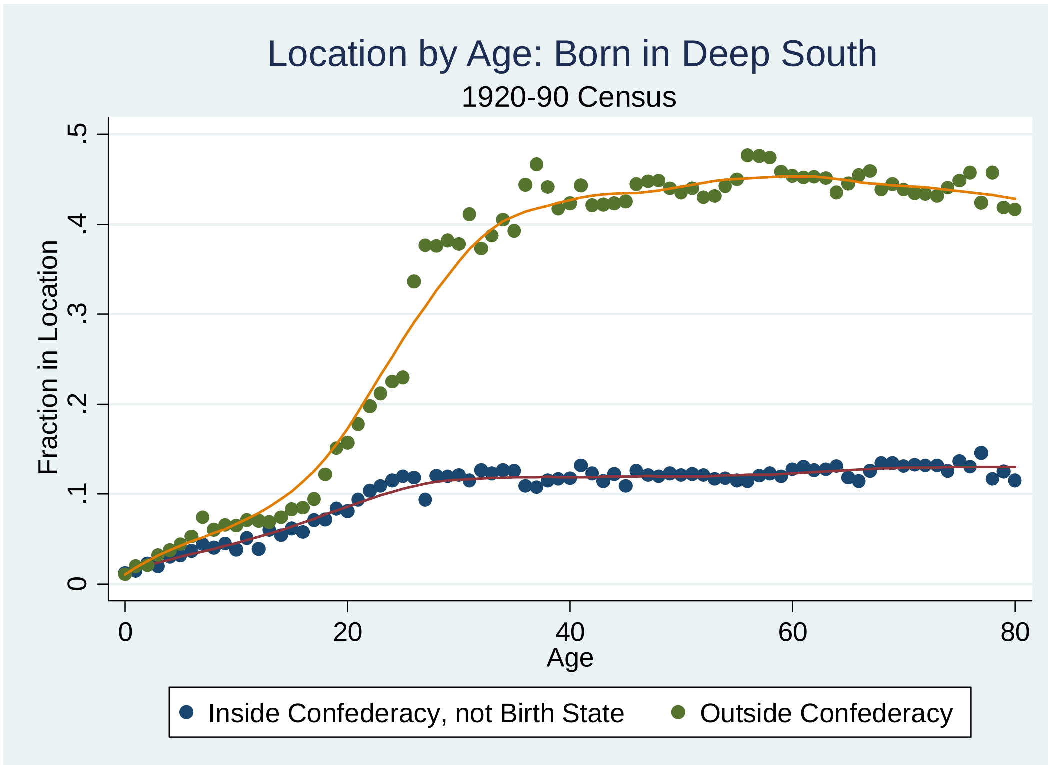
Source: Authors' calculations from the Duke-SSA data, birth cohorts 1916 to 1932. Proportion of black population in a county migrating to Chicago is indicated by shading, from light to dark: <0.10, 10-0.14, 0.14-0.18, 0.18-0.22, and >0.22. The *Illinois Central* line is highlighted.

Figure 3. Percent of Black Population Migrating to California from Louisiana, Birth Cohorts 1916-1932



Source: Authors' calculations from the Duke-SSA data, birth cohorts 1916 to 1932. Proportion of black population in a county migrating to Chicago is indicated by shading, from light to dark: <0.10, 10-0.14, 0.14-0.18, 0.18-0.22, and >0.22. The railway line running across the northern part of the State is the *Vicksburg, Shreveport and Pacific,* connecting to the *Texas and Pacific* in Shreveport in the upper northwestern corner of Louisiana.

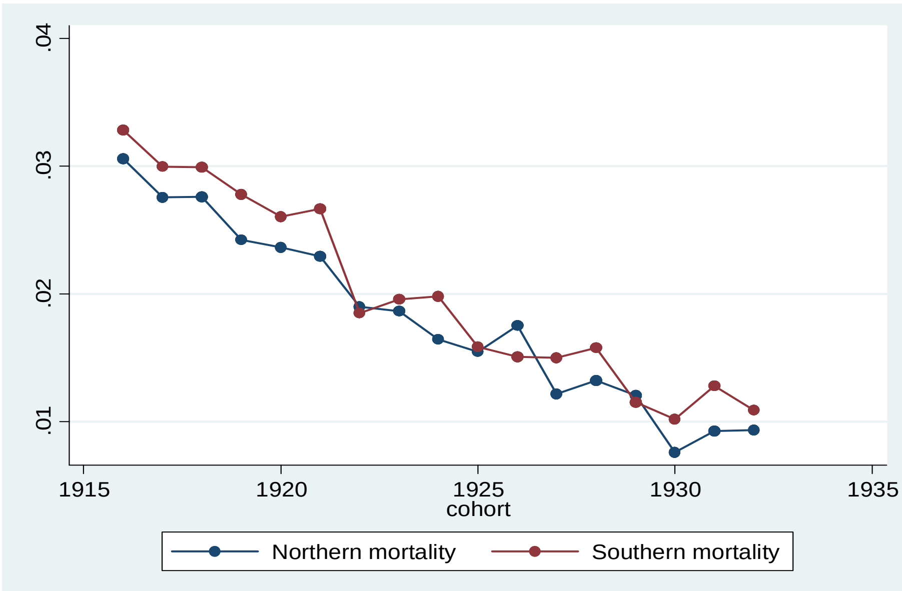
Figure 4. Migration within the South and to the North for African Americans Born 1916-1932



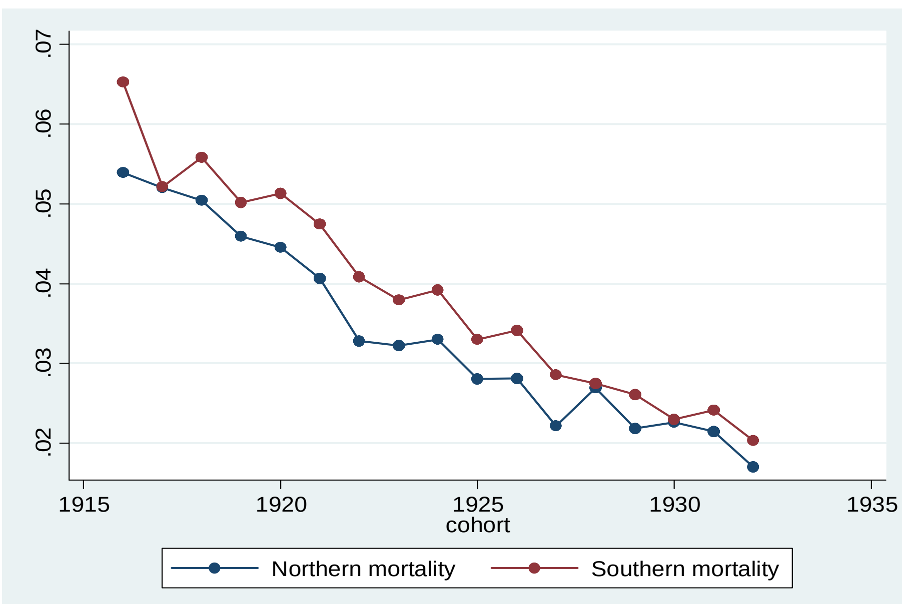
Source: Authors' calculations for blacks in the 1920-1990 Decennial Census born in the Deep South, 1916-1932.

Figure 5. Mortality Rates in 1980 by Region of Residence,
Black Women and Men Born in the Deep South, 1916-1932

Women



Men



Source: Authors' calculations, Detailed Files from the Vital Statistics and PUMS of the 1980 Decennial Census. See Table 5 for details.

Table 1. State of Residence in 1970, African Americans Born in the Deep South, 1916-1932

Born in South Carolina	Proportion
Reside in South Carolina	0.43
Reside in rest of South	0.11
Reside in North	0.47
Conditional on residing in North, proportion residing in:	
New York	0.34
Pennsylvania	0.17
District of Columbia	0.10
New Jersey	0.10
Maryland	0.10

Born in Georgia	Proportion
Reside in Georgia	0.49
Reside in rest of South	0.16
Reside in North	0.35
Conditional on residing in North, proportion residing in:	
New York	0.21
Michigan	0.15
Ohio	0.15
Pennsylvania	0.11
New Jersey	0.11

Born in Alabama	Proportion
Reside in Alabama	0.44
Reside in rest of South	0.10
Reside in North	0.47
Conditional on residing in North, proportion residing in:	
Ohio	0.23
Michigan	0.21
Illinois	0.12
New York	0.12

Born in Mississippi	Proportion
Reside in Mississippi	0.38
Reside in rest of South	0.14
Reside in North	0.49
Conditional on residing in North, proportion residing in:	
Illinois	0.39
Michigan	0.13
California	0.11

Born in Louisiana	Proportion
Reside in Louisiana	0.57
Reside in rest of South	0.12
Reside in North	0.32
Conditional on residing in North, proportion residing in:	
California	0.53
Illinois	0.10

Source: Authors' calculations, 1970 PUMS, state sample, black individuals aged 37 to 53 inclusive. We list destination States that have a proportion 0.10 or higher.

Table 2. Place of Residence in Old Age, African Americans Born in the Deep South, 1916-1932

Born in South Carolina	Proportion
Reside in South Carolina	0.42
Reside in rest of South	0.15
Reside in North	0.43
Conditional on residing in North, proportion residing in:	
New York City	0.41
Washington	0.19
Philadelphia	0.17
Non-metro area	0.0095

Born in Georgia	Proportion
Reside in Georgia	0.46
Reside in rest of South	0.19
Reside in North	0.35
Conditional on residing in North, proportion residing in:	
New York City	0.23
Detroit	0.15
Philadelphia	0.11
Non-metro area	0.014

Born in Alabama	Proportion
Reside in Alabama	0.42
Reside in rest of South	0.13
Reside in North	0.45
Conditional on residing in North, proportion residing in:	
Detroit	0.19
Chicago	0.14
Cleveland	0.12
Non-metro area	0.018

Born in Mississippi	Proportion
Reside in Mississippi	0.32
Reside in rest of South	0.15
Reside in North	0.53
Conditional on residing in North, proportion residing in:	
Chicago	0.36
Detroit	0.11
St. Louis	0.10
Non-metro area	0.025

Born in Louisiana	Proportion
Reside in Louisiana	0.53
Reside in rest of South	0.15
Reside in North	0.32
Conditional residing in North, proportion residing in:	
Los Angeles	0.30
San Francisco	0.19
Chicago	0.11
Non-metro area	0.016

Source: Authors' calculations, Duke-SSA data, birth cohorts, 1916 to 1932. We list destination cities that have a proportion of 0.10 or more.

Table 3. Earnings (in 2010 Dollars) by Residence in 1970, African American Men Born in the Deep South, 1916-1932,

Born in South Carolina or Georgia	(1) Wage and Salary Earnings	(2) Total Personal Income
Mean for Men Residing in the South	27,222	30,341
Coefficient on "Residing in the North"	17,997	20,101
	(1,063)	(1,136)
N	2,569	2,569

Born in Alabama or Mississippi	(1) Wage and Salary Earnings	(2) Total Personal Income
Mean for Men Residing in the South	25,808	29,466
Coefficient on "Residing in the North"	20,376	22,034
	(1,052)	(1,243)
N	2,516	2,516

Born in Louisiana	(1) Wage and Salary Earnings	(2) Total Personal Income
Mean for Men Residing in the South	27,910	31,296
Coefficient on "Residing in the North"	18,840	20,270
	(1,859)	(1,796)
N	1,070	1,070

Source: Authors' calculations, 1970 PUMS, state sample, black men aged 37-53 inclusive. Earnings are for 1969. Regressions include cohort indicator variables. Standard errors are in parentheses.

Table 4. Education by Residence in 1970, African Americans Born in the Deep South, 1916-1932

Born in South Carolina and Georgia	Years of Education	
	Men	Women
Living in South	7.0	8.0
Living in North	8.9	9.5
t-statistic on difference	12.5	12.0
N	2,569	3,112
Born in Alabama and Mississippi	Years of Education	
	Men	Women
Living in South	7.3	8.3
Living in North	9.0	9.6
t-statistic on difference	11.6	11.0
N	2,516	3,117
Born in Louisiana	Years of Education	
	Men	Women
Living in South	7.2	8.1
Living in North	9.3	9.9
t-statistic on difference	8.6	8.5
N	1,070	1,285

Source: Authors' calculations, 1970 PUMS, state sample, people aged 37 to 53 inclusive.

Table 5. Impact of Living in the North on Survival to Age 70 or Age 75 Conditional on Survival to Age 65, African Americans Born in the Deep South, 1916-1932

A. Survival to Age 70	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.88	0.88	0.43	0.88
Living in the North	0.0001 (0.0006)	0.0010 (0.0010)	--	-0.052 (0.017)
Born on Railroad Line	--	--	0.056 (0.0013)	--
N	1,077,335	826,846	826,846	826,846
B. Survival to Age 75	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.72	0.72	0.43	0.72
Living in the North	0.0003 (0.0010)	0.0010 (0.0017)	--	-0.097 (0.025)
Born on Railroad Line	--	--	0.062 (0.0015)	--
N	757,815	574,341	574,341	574,341

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African Americans born in South Carolina, Georgia, Alabama, Mississippi, and Louisiana, 1916-1932. The regressions also include gender × cohort indicator variables and State of birth indicator variables. Standard errors, given in parentheses, are clustered by birthplace for regressions (2), (3) and (4).

Table 6. Impact of Living in the North on Survival to Age 70 or Age 75 Conditional on Survival to Age 65, African Americans Born in South Carolina and Georgia, 1916-1932

A. Survival to Age 70	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.88	0.88	0.39	0.88
Living in the North	-0.0034 (0.0010)	-0.0018 (0.0012)	--	-0.033 (0.032)
Born on Railroad Line	--	--	0.052 (0.0020)	--
N	459,127	323,998	323,998	323,998
B. Survival to Age 75	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.72	0.72	0.40	0.72
Living in the North	-0.0072 (0.0016)	-0.0063 (0.0022)	--	-0.040 (0.044)
Born on Railroad Line	--	--	0.060 (0.0024)	--
N	329,904	229,195	229,195	229,195

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African Americans born in South Carolina and Georgia, 1916-1932. The regressions also include gender × cohort indicator variables and State of birth indicator variables. Standard errors, given in parentheses, are clustered by birthplace for regressions (2), (3) and (4).

Table 7. Impact of Living in the North on Survival to Age 70 or Age 75 Conditional on Survival to Age 65, African Americans Born in Alabama and Mississippi, 1916-1932

A. Survival to Age 70	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.88	0.88	0.51	0.88
Living in the North	-0.0001 (0.0010)	-0.0003 (0.0012)	--	-0.052 (0.019)
Born on Railroad Line	--	--	0.070 (0.0020)	--
N	447,332	353,907	353,907	353,907
B. Survival to Age 75	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.72	0.72	0.50	0.72
Living in the North	0.0002 (0.0016)	-0.0002 (0.0020)	--	-0.102 (0.033)
Born on Railroad Line	--	--	0.076 (0.0024)	--
N	308,805	242,393	242,393	242,393

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African Americans born in Alabama and Mississippi, 1916-1932. The regressions also include gender × cohort indicator variables and State of birth indicator variables. Standard errors, given in parentheses, are clustered by birthplace for regressions (2), (3) and (4).

Table 8. Impact of Living in the North on Survival to Age 70 or Age 75 Conditional on Survival to Age 65, African Americans Born in Louisiana, 1916-1932

A. Survival to Age 70	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.88	0.88	0.32	0.88
Living in the North	0.011 (0.0017)	0.012 (0.0018)	--	-0.090 (0.066)
Born on Railroad Line	--	--	0.041 (0.0028)	--
N	170,876	148,941	148,941	148,941

B. Survival to Age 75	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.72	0.72	0.32	0.72
Living in the North	0.025 (0.0028)	0.023 (0.0031)	--	-0.211 (0.136)
Born on Railroad Line	--	--	0.045 (0.0034)	--
N	119,106	102,753	102,753	102,753

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African Americans born in Louisiana, 1916-1932. The regressions also include gender × cohort indicator variables and State of birth indicator variables. Standard errors, given in parentheses, are clustered by birthplace for regressions (2), (3) and (4).

Table 9. Impact of Living in the North on Survival to Age 70 or Age 75 Conditional on Survival to Age 65, African American Men Born in the Deep South, 1916-1932

A. Survival to Age 70	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.84	0.84	0.44	0.84
Living in the North	0.0007 (0.0011)	0.0024 (0.0016)	--	-0.055 (0.029)
Born on Railroad Line	--	--	0.050 (0.0019)	--
N	480,281	364,316	364,316	364,316
B. Survival to Age 75	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.64	0.65	0.44	0.65
Living in the North	0.0037 (0.0017)	0.0043 (0.0020)	--	-0.065 (0.038)
Born on Railroad Line	--	--	0.057 (0.0023)	--
N	337,763	252,732	252,732	252,732

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African Americans born in South Carolina, Georgia, Alabama, Mississippi, and Louisiana, 1916-1932. The regressions also include cohort indicator variables and State of birth indicator variables. Standard errors, given in parentheses, are clustered by birthplace for regressions (2), (3) and (4).

Table 10. Impact of Living in the North on Survival to Age 70 or Age 75 Conditional on Survival to Age 65, African American Women Born in the Deep South, 1916-1932

A. Survival to Age 70	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.91	0.91	0.42	0.91
Living in the North	-0.0004 (0.0008)	-0.0000 (0.0010)	--	-0.049 (0.018)
Born on Railroad Line	--	--	0.060 (0.0017)	--
N	597,054	462,530	462,530	462,530
B. Survival to Age 75	(1) OLS (Full Sample)	(2) OLS (Town-Matched)	(3) First-Stage	(4) 2SLS
Mean of the Dependent Variable	0.78	0.78	0.42	0.78
Living in the North	-0.0025 (0.0013)	-0.0017 (0.0021)	--	-0.117 (0.029)
Born on Railroad Line	--	--	0.067 (0.0020)	--
N	420,052	321,609	321,609	321,609

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African Americans born in South Carolina, Georgia, Alabama, Mississippi, and Louisiana, 1916-1932. The regressions also include cohort indicator variables and State of birth indicator variables. Standard errors, given in parentheses, are clustered by birthplace for regressions (2), (3) and (4).

Table 11. Probability of Survival to Age 75 Conditional on Survival to Age 65, Moment Orderings Implied by Theory

Expected longevity is lower for "never movers" than for "compliers":

$\boxed{E(Y_0 \mid N) < E(Y_0 \mid C)}$	**Males**	**Females**
$E(Y_0 \mid N)$	0.643	0.778
$E(Y_0 \mid C)$	0.700	0.831

Expected longevity is lower for "compliers" than for "always movers":

$\boxed{E(Y_1 \mid C) < E(Y_1 \mid A)}$	**Males**	**Females**
$E(Y_1 \mid C)$	0.637	0.727
$E(Y_1 \mid A)$	0.651	0.786

Source: Authors' calculations using Duke SSA/Medicare data. The sample is African American men and women born in the Deep South, 1916-1927. See text for discussion of the estimates.

Table 12. Impact of Living in the North on the Annual Mortality Rate, African Americans Born in the Deep South, 1916-1932

Mortality Rate	1980	1990	2000
Mean Mortality Rate	0.026	0.030	0.052
Resident of North, 1980	-0.003	-0.003	-0.004
	(0.0005)	(0.0005)	(0.0008)
N	340	340	340

Source: Authors' calculations, Detailed Files of the Vital Statistics and Public Use Micro Samples of the Decennial Censuses from 1980, 1990, and 200. Dependent variable is the one-year death rate. The numerator is obtained from Vital Statistics records (April to the following March), and the denominator is constructed from Census records. Regressions also contain birth cohort-sex interactions. Huber-Eicker-White standard errors are given in the parentheses. Observations are the mortality rate for birth cohort by sex by birth State by residency status.

Appendix Table. Coverage Rates of Medicare Part B for African Americans Born in the Deep South, 1906 to 1932

Birth Cohort	Coverage Rate	Birth Cohort	Coverage Rate
1906	0.24	1920	0.83
1907	0.26	1921	0.83
1908	0.25	1922	0.82
1909	0.28	1923	0.90
1910	0.27	1924	0.77
1911	0.35	1925	0.85
1912	0.44	1926	0.84
1913	0.50	1927	0.86
1914	0.57	1928	0.85
1915	0.69	1929	0.79
1916	0.84	1930	0.87
1917	0.78	1931	0.86
1918	0.79	1932	0.90
1919	0.76		

Sources: Authors' calculations from the Duke SSA/Medicare data, and the 1980, 1990, and 2000 Public Use Micro Samples of the Decennial Censuses.