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The undersigned, appointed by the
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"In Search of the Promised Land: Birth and Mental Health Outcomes among African Americans of the Great Migration"

presented by

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and hereby certify that it is worthy of acceptance.

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In Search of The Promised Land: Birth and Mental Health Outcomes among African Americans of The Great Migration

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In Search of The Promised Land: Birth and Mental Health Outcomes among African Americans of The Great Migration

Abstract

The overall aim for this dissertation was to examine the extent that the Great Migration was associated with birth and mental health outcomes. Although Great Migration movers and their children experienced economic gains in education and earnings, literature has suggested that their health may not have followed the same trajectory. Compared to non-migrators, migrators experienced increased risks in adult mortality and infant mortality (Black et al., 2015; Eriksson & Niemesh, 2016). However, there are sizable research gaps remaining. The degree that these findings apply to other health outcomes and the potential mechanisms that might explain the worsened health outcomes documented in literature are unknown. This dissertation, situated towards the latter half of the Great Migration (between 1940 to 1980), aimed to answer a fraction of the many lingering questions that remain about the health of Great Migration migrators.

In the first chapter, I assessed the association between internal migration and low birth weight among Southern African American mothers born between 1950 and 1969. I analyzed 1.64 million birth records from 1975 to 1999 maintained by the US National Center for Health Statistics. To tease out the effect from moving and destination contextual effects, I compared two migration groups to non-migrators: (1) migrators moving out of the South and (2) migrators

moving within the South. Non-migrators were matched to migrators using coarsened exact matching. I estimated the relationship between migration status and low birth weight stratified by birth-year cohorts. I found positive selection in education and marriage among migrators moving out of the South and within the South ($p<0.001$). Results did not show differences in the odds of low birth weight in either migration groups compared to Southern non-migrators. Despite moving to better economic opportunity, migrating out of the South may not have improved low birth weight outcomes of Black mothers during the last decades of the Great Migration.

In the second chapter, I measured the association between county socioeconomic opportunity in the North and West and the odds of low birth weight during the last decade of the Great Migration. I used the US Census from 1970 as well as the birth records of first-time African American mothers who migrated from the South collected through the National Center of Health Statistics from 1973 to 1980 (n=154,346). I examined three measures to operationalize area-based opportunity: racial and economic residential segregation, Black male high school graduation rate, and Black poverty rate. I used multilevel logistic regression where mothers were nested within US counties. After adjusting for individual risk and protective factors for low birth weight, there was no relationship between county socioeconomic opportunity and low birth weight. High socioeconomic opportunity in the North and West may not have ensured better birth outcomes among Great Migration mothers. This is one of the first studies to my knowledge to assess the relationship between the residential environment on the health outcomes of people during the Great Migration.

In the third chapter, I measured the relationship between migration and the odds of mental health disorders among children of migrators and examined the extent that experiences of discrimination explained the relationship between migration status and mental health disorders.

The sample was comprised of 3004 African Americans adults from the National Survey of American Life (2001-2003). I used the birthplaces of participants and their mothers to categorize adults into three migration groups: (1) Southern Stayers, (2) Migrators, and (3) Northern Stayers. The outcomes were lifetime occurrence of any mental health, mood, anxiety, and substance use disorders. I used weighted logistic regressions where I adjusted for demographic, socioeconomic status, and experiences of everyday and major lifetime discrimination. I found that migration status was associated with increased odds of mental health disorders. Migrators had higher odds of any mental health disorder as well as higher odds of any mood, anxiety, and substance use disorder compared to Southern Stayers in the fully adjusted model. Northern Stayers also had higher odd ratios of any mental health, mood, anxiety, and substance use disorders. Migrators and Northern Stayers were more likely to report perceived discrimination. Discrimination partially attenuated the relationship between migration status and mental health disorder outcomes. This study highlights the potential most-migration adversities that families may have experienced.

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Introduction

From 1910 to 1980, approximately eight million African Americans moved from the South to the North and West in what became known as the Great Migration. The Great Migration is an arguably understudied movement in American history. Yet, despite ending around 40 years ago, its ramifications can be seen in the demography of almost every region in the US to this day. In a 70-year period, the South went from having the majority (91%) to just half (53%) of the nation's Black residents from 1910 to 1980 (Gregory, 2005). Additionally, because of the Great Migration, African Americans moved from primarily rural to urban residences. As a result, around 1% lived on farms in 1980 compared to 45% in 1940 (Gregory, 2005). Northern and Western cities experienced drastic increases in their Black population (Boustan, 2016). In Chicago, one of the top destination cities, the proportion of the city's population identifying as Black grew from 8% to 33% between 1940 to 1970 (Gibson et al., 2002).

The Great Migration: A Brief History

The Great Migration has gained more scholarly attention as researchers have documented the profile of migrators, their motivations to move, and their gains. A once commonly held stereotype was that migrators were often poor and illiterate sharecroppers from the rural South. Yet, research in the past few decades has shown that migrators did not necessarily fit this simplistic description (Tolnay, 2003). Compared to Southern non-migrators, migrators were more educated with an average of one to two additional years of schooling (Alexander et al.,

2017; Margo, 1988; Tolnay, 1998). Although many migrators were from the rural countryside, they also commonly came from Southern cities and were potentially more prepared for urban life in the North and West (Alexander, 1998; Tolnay, 2003).

Just as migrators did not fall into a singular description, their motivations also cannot be easily simplified. However, historians have noted certain influential push and pull factors. One important push factor was the declining Southern agricultural economy, one in which there was already little room for African Americans to move up the occupational ladder. A second push factor was the desire to leave stifling racial climates. Racial segregation under Jim Crow touched nearly every aspect of African American lives, including segregated education, work, and transportation (Tolnay, 2003, Fairclough, 2005). Lynching was a powerful motivator to migrate. Southern counties that experienced more lynching of African American individuals had higher out-migration rates to the North (Tolnay & Beck, 1992). One of the important factors attracting migrators to the North was economic opportunity. With the demand in Northern factory labor following World War I and with shifting immigration policies that restricted the number of European migrators, the North was ripe for the employment of African American Southerners. Migrators were enticed with higher Northern salaries. For example, unskilled industrial job wages ranged from around $3.20 to $4.80 a day in Northern cities compared to a maximum of $2.50 a day in Birmingham around 1920 (Boustan, 2016).

Railroad routes and interstate highways helped shape chain migration patterns. There were several major railroad pathways from the South, such as ones travelling from the South Atlantic to the Northeast. For this reason, migrators often sorted by Southern state of origin. Migrators in New York were disproportionately from the Carolinas while those in Chicago were more likely from Louisiana and Mississippi (Derenoncourt, 2022; Tolnay, 2003).

Gains and Losses

Overall, migration out of the South was associated with some economic gains. Moving Northward has been shown to increase wages in 1940, even after adjusting for the higher cost of living (Boustan, 2016). These gains translated to their children as well. By the time they became adults, children of migrators in 2000 achieved higher high school graduation rates, experienced less poverty, and lived in wealthier neighborhoods compared to children of Southern non-migrators (Alexander et al., 2017; Leibbrand et al., 2019).

Yet, in many ways, migrators may have fallen short of achieving the freedom from economic and racial discrimination that they had hoped for in the North and West. As Martin Luther King Jr. remarked in a 1956 address in New York City, "[l]et's not fool ourselves. We are far from the promised land, both North and South. In the South, we still confront segregation in its glaring and conspicuous forms. In the North, we confront its hidden, subtle forms. Segregation is still a fact (King, 1956)." Throughout the Great Migration, racial discrimination was pervasive and was confronted in the workplace, housing, and criminal justice systems (Boustan, 2016; Derenoncourt, 2022; Eriksson, 2019; Gregory, 2005; Sugrue, 2005). African American migrators were relegated to the lowest paid segment of the labor force compared to White and Northern-born African American residents (W. J. Collins, 2021). They moved to increasingly racially segregated areas where the average Black resident in the North lived in a neighborhood were 75% of all residents identified as Black (Boustan, 2016). Through housing discrimination, such as racial steering and discriminatory mortgage lending, migrators were

confined to highly segregated, impoverished, and crowded neighborhoods. Those who moved into majority-White neighborhoods outside city centers were sometimes confronted with intimidation and violent protests (Sugrue, 2005).

Moreover, emerging research is beginning to show that the Great Migration may have deteriorated conditions for Northern and Western urban residents. Destinations cities were more likely to have higher degrees of racial residential segregation, lower municipal revenue, and worse opportunity for Black children (Boustan, 2016; Derenoncourt, 2022; Tabellini, 2019). Black children growing up in Great Migration cities during the 1980s experienced lower earnings and education as adults compared to children growing up in less popular receiving cities. This may not be a mere coincidence, but a policy response to cities' changing racial identities. For instance, destination cities have been shown to have higher rates of Black incarceration, higher police spending, and greater degrees of racial educational segregation (Derenoncourt, 2022). Thus, millions of migrators may have moved into areas that might have slowed down, rather than accelerated, their upward mobility.

Gaps in Public Health

Compared to the socioeconomic outcomes of migrators, there is less known about their health. So far, two studies have indicated that moving out of the South was associated with poorer health outcomes. During the first decades of the Great Migration, African American families who moved Northward experienced higher infant mortality compared to Southern non-migrators. Compared to their Southern counterparts, infants of migrators had a higher mortality

rate by 9 and 5 percentage points in 1920 and 1930, respectively (Eriksson & Niemesh, 2016). There are parallel findings for adult all-cause mortality where African American migrators born in the South from 1916 to 1932 experienced earlier mortality than non-migrators. Observing recorded deaths from 1976 to 2001, authors showed that Southern-born migrators had a 10% lower probability of survival until age 75 compared to Southern stayers, with worse survival rates seen among women compared to men (Black et al., 2015).

Despite this emerging research, there are additional unanswered questions about the health of Great Migration participants. It is unclear the extent that that the relationship between migration and higher adult and infant mortality rates is consistent across additional health outcomes. It is unknown whether the existing research may apply to the other decades of the Great Migration. The potential mechanisms that may have facilitated the worsened health outcomes post-migration have not yet been closely examined. This may include exposure to stress such as discrimination, neighborhood context like racial residential segregation, and hazardous environmental exposures. Finally, migrators were partially driven to move to achieve upward mobility for themselves and their descendants (Gardner, 2020). However, it is unknown the extent that their children experienced health gains associated with migration.

To examine some of these gaps, I rely on the existing concepts and frameworks that already exists within the public health literature on migration. The healthy migrant hypothesis, which is the idea that migrators are healthier than non-migrators, has been documented in US international and internal migration literature (Acevedo-Garcia et al., 2012; Arcaya et al., 2016; Palloni & Morenoff, 2001). It may apply to the Great Migration, especially as movers were positively selected on education and earnings—factors that might be associated with better health outcomes (Black et al., 2015; Tolnay, 1998). The residential context of the destination may also

have an important association to health post-migration. Specifically, race-based segregation determines education and employment opportunities for residents and shapes the available public health resources. Black residents living in highly racially segregated areas were shown to experience higher incidence of heart disease, adult mortality, and infant mortality compared to those living in less segregated areas (LaVeist, 1993; Polednak, 1996; D. R. Williams & Collins, 2001). Because Great Migration movers often settled in highly segregated cities in the North, it is possible that they also experienced its downstream health consequences (Boustan, 2016). Lastly, racial discrimination is one type of stressor that has been linked to poor physical health (e.g. hypertension and asthma) and poor mental health (e.g. depressive and anxiety disorders) among African Americans (Lewis et al., 2015; D. R. Williams & Mohammed, 2009). It is possible that migrators' pervasive encounters of discrimination in the North may be linked to adverse health outcomes.

Dissertation Aims

Therefore, the overall aim for this dissertation is to examine the extent that the Great Migration is associated with birth and mental health outcomes. Although migrators and their children experienced economic gains, studies so far have suggested that their health did not follow the same trajectory. So far, migration out of the South has been adversely linked to adult and infant mortality among African Americans (Black et al., 2015; Eriksson & Niemesh, 2016). However, there are gaps remaining in the literature examining the health differences between Southern-born migrators and non-migrators. We do not know the degree that these findings

apply to other health outcomes or the potential mechanisms that might explain the worsened health documented in literature. This dissertation, situated towards the latter half of the Great Migration (between 1940 to 1980), aimed to answer a fraction of the lingering questions that remain in this area.

In the first chapter, I measured the association between internal migration and low birth weight among Southern African American mothers born between 1950 and 1969. I analyzed 1.64 million birth records from 1975 to 1999 maintained by the US National Center for Health Statistics. I compared three migration groups: migrators moving out of the South, migrators moving within the South, and non-migrators. In the second chapter, I measured the association between county socioeconomic opportunity in the North and West and the odds of low birth weight. I used the US Census from 1970 as well as the birth records of first-time African American mothers who migrated from the South from 1973 to 1980 (n=154,346). In the third chapter, I examined the relationship between migration and the odds of mental health disorders among children of the Great Migration and examined the extent that experiences of discrimination may have explained the association between migration status and mental health disorders. I analyzed a sample of 3,004 African Americans adults from the National Survey of American Life (2001-2003).

In examining these research questions, this dissertation brings together historical, economic, demographic, and medical literature—a marriage that reflects the interdisciplinary nature of public health. It provides valuable findings that contributes to our knowledge of health outcomes of the Great Migration. Most importantly, this dissertation may open further research avenues. Our knowledge of the Great Migration is still unfurling. It is my hope that this dissertation sparks future research questions that has been sparsely asked in public health.

Chapter 1

Moving to Opportunity? Low Birth Weight Outcomes Among Southern-born African American Mothers during the Great Migration

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Abstract

Objective: The Great Migration was a mass movement in the United States during the twentieth century of roughly eight million African Americans from the South to the Northeast, Midwest, and West. Yet, little is known about the health outcomes associated with this internal migration. Therefore, this study assessed the relationship between African American migration and low birth weight among Southern-born mothers born between 1950 and 1969.

Methods: I analyzed 1.64 million birth records from 1975 to 1999 maintained by the US National Center for Health Statistics. To tease out the effects from moving and from destination contexts, I compared two migration groups to Southern non-migrators: (1) migrators moving out

of the South and (2) migrators moving within the South. Non-migrators were matched to migrators using coarsened exact matching. I estimated the relationship between migration status and low birth weight stratified by birth year cohorts.

Results: There was positive selection in education and marriage among migrators moving out of the South and within the South ($p<0.001$). Results did not show differences in the odds of low birth weight in either migration groups compared to Southern non-migrators.

Conclusion: Despite moving to better economic opportunity, migrating out of the South may not have improved infant birth weight outcomes of African American mothers during the last decades of the Great Migration.

Moving to Opportunity? Low Birth Weight Outcomes Among Southern-born African American Mothers during the Great Migration

Introduction

The Great Migration was a sweeping demographic movement in 20th century American history that left indelible prints across the United States as around eight million African Americans left the South between 1910 and 1980. This migration can be studied in two waves: the First Great Migration that spans from around 1915 to 1940 and the Second Great Migration that spans from 1941 to around 1980 (Gregory, 2005). Motivations to move were nuanced and cannot be simplified easily, yet historical research has pointed to a few notable reasons. After World War I, the North was ripe with industrial labor opportunity and in need of workers. Relocating was increasingly enticing as African Americans earned higher wages working Northern jobs (Boustan, 2016). Seeking racial freedom outside the South also spurred migration (Tolnay, 2003). Racial segregation under Jim Crow touched virtually every aspect of African American lives, relegating them to poor quality education and jobs while truncating opportunity for wealth and civil rights (Tolnay, 2003, Fairclough, 2005). Racial violence influenced the exodus from the South where Southern counties experiencing more African American lynching from 1920 to 1930 saw higher out-migration rates (Tolnay & Beck, 1990). Altogether, the population shift created gradual yet seismic changes to the demography of the North and South alike. From 1900 to 1970, the share of the US Black population that lived outside of the South grew from only 8% to 47% (Gregory, 2005).

One relatively unexplored area in the study of the Great Migration is the degree to which migration is linked to health. The improved economic and social conditions in the North might suggest that migration is positively associated with health gains among migrators relative to Southern non-migrators. Settling in areas with higher economic opportunity may be positively linked with better health outcomes, such as lower infant and all-cause mortality (Finkelstein et al., 2019; Venkataramani et al., 2015; Vos et al., 2014). This may also be the case for Great Migration movers. For instance, migrators earned higher wages after moving Northward. Comparing sibling pairs of movers and non-movers, Boustan (2016) showed that African Americans moving Northward in 1940 doubled their wages. Gains remained even after adjusting for the higher cost of living in the North. Migrating families were more likely to move into areas with better educational opportunities compared to the South (Card et al., 2018). Specifically, children of migrators have been shown to gain almost a year of additional schooling in 1940 compared to the children of Southern stayers (Baran et al., 2022). Leaving the Jim Crow system may have also yielded positive health gains, especially as the abolition of Jim Crow has been linked to a drop in infant mortality among Black mothers in the US South (Almond et al., 2006; Krieger et al., 2013).

Additionally, migration may be associated with better health outcomes because of the healthy migrant hypothesis. The healthy migrant hypothesis suggests that movers are healthier than non-movers. Migrators may be more physically fit to endure the potentially treacherous journey, have stronger social and resource support in their destinations, and are more likely to meet selective education and employment criteria (Hamilton, 2015; Palloni & Morenoff, 2001). A body of research has documented the healthy migrant bias among international immigrants to the US (Hamilton, 2015; Palloni & Morenoff, 2001; Riosmena et al., 2017) as well as some

instances of internal US migration (Arcaya et al., 2014, 2016). This may apply to African Americans of the Great Migration. Statistical associations between migration and health might be caused by the healthy migrant bias rather than caused by leaving the social conditions under Jim Crow. Some literature has shown that Great Migration movers were positively selected on education and earnings (Black et al., 2015; Margo, 1988; Tolnay, 1998). Because of the well-known link between socioeconomic status and health, this positive selection might indicate that migrators had a health advantage as well.

On the other hand, despite these gains, migrators still confronted economic and discriminatory hardships. Upon their arrival, they faced racism in hiring and were frequently relegated to the lowest and unskilled occupations (Boustan, 2016; Gregory, 2005). During economic recessions after World War II, African Americans were often the first to be unemployed as factories relocated out of city centers (Sugrue, 2005). Migrators arrived in neighborhoods that were rapidly becoming more racially segregated as the typical African American resident lived in a neighborhood where 75% of residents identified as Black in 1970 (Boustan, 2016). Migrators were further challenged by a higher cost of living as rent in the North was 200% higher than rent in migrant-sending areas (Boustan, 2016). These migrating hardships and continued experiences of racism may outweigh any positive relationship that might be found between place-based opportunity and health.

So far, two studies have examined the health outcomes among African Americans resulting from moving out of the South during the First Great Migration (Black et al., 2015; Eriksson & Niemesh, 2016). Both suggested that moves were disadvantageous for adult survival rates and infant mortality. Using Medicare data among African Americans born in South Carolina, Georgia, Alabama, Mississippi, and Louisiana in 1916–1932, Black et al. (2015) found

that migrators had lower survival rates compared to people who did not move. Migrators lowered their probability of survival until age 70 by 6% and until age 75 by 10%. Eriksson and Niemesh (2016) drew a similar conclusion studying migration and infant mortality. Using linked US Census and death records, they found that the mortality rate of infants of migrators born in 1920 and 1930 were 9 and 5 percentage points higher, respectively, than those of families remaining in the South.

However, several gaps remain in our understanding of the extent that moving out of the South was associated with the health of migrators. First, there is a dearth of research assessing the relationship between out-migration and health outcomes during the Second Great Migration (1940-1980), a period involving five million migrators (W. J. Collins, 2021; Gregory, 2005). Second, to my knowledge, no other study on the health of migrators has attempted to parse out the effects of moving, which may be more positively selected for socioeconomic status and health, from the effects of the destination environments (Boustan, 2016; Tolnay, 2003). Migrators moving within the South could potentially be an ideal comparison group. Although migration within the South was smaller than migration out of the South, it was still sizable. For instance, 47% of Mississippi-born African Americans moved out of the South while 15% moved to another Southern state in 1970 (Gregory, 2005). Compared to migrators to the North and West, movers within the South were more likely to remain in similar socioeconomic environments with similar systems of racial segregation (Fairclough, 2001). This idea is similar to the Moving to Opportunity experiment where researchers compared families who stayed, moved to any neighborhood, and moved to low-poverty neighborhoods (Katz et al., 2001).

To address the research gaps, I examined the association between migrating among African American mothers born between 1950 to 1969 and low birth weight (LBW). I used US

birth certificate records from 1973 to 1999 of African American mothers who migrated from the South. First, I assessed the extent of the healthy migrant hypothesis by comparing the socioeconomic and reproductive health characteristics of migrators and non-migrators. Second, I quantified the differences in the odds of LBW of infants born among migrating mothers moving out of the South and non-migrating mothers. Third, I compared the odds of LBW of babies born to migrators moving within the South to those born to non-migrant mothers. This study had two hypotheses. Results showing reduction in LBW among migrators out of the South may support the idea that contextual environments were beneficial to health. Results showing no reductions in LBW may support the idea that the potentially negative experiences of migrators in receiving areas may have been detrimental to health.

Methods

Sample

The analysis used the US birth certificate data among infants born between 1975 and 1999. These records are part of the United States Department of Health and Human Services' National Center for Health Statistics. I restricted to mothers who reported "Black" as their race, a Southern birth state, and who were born between 1950 to 1969. Because infants born to the same mother might have similar birth weights, I included first-born infants only to reduce clustering (Wang et al., 1995). The total sample size was 1.64 million.

Variables

There are three exposure groups: (1) Out-of-South Migrators, (2) Internal Southern Migrators, and (3) Southern Stayers. Out-of-South Migrators were defined as those born in a Southern state and gave birth in a Northern or Western state. Internal Southern Migrators were those born in a Southern state and gave birth in another Southern state. Southern Stayers, the control group, were those who delivered infants in their same native Southern state. The Southern region included Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Oklahoma, Tennessee, Texas, Virginia, and West Virginia following the US Census criteria (Gregory, 2005). Low birth weight (LBW), the outcome, was defined as infants born below 2500 grams. Other demographic covariates were maternal education; marital status; age; year of birth; and Southern birth state. Health-related covariates were having at least one prenatal care visit during the first trimester; experiencing a past fetal death defined as reporting at least one history of spontaneous fetal death after conception; substance use, defined as ever smoking tobacco or drinking during pregnancy; and reporting at least one medical pregnancy risk factor that includes anemia, cardiac disease, diabetes, hydramnios, hemoglobinopathy, chronic hypertension, pregnancy-associated hypertension, and eclampsia. Maternal education among birth records from Texas as well as all substance use and medical pregnancy risk factors were only included in birth records starting in 1989.

Statistical Analyses

The overall empirical strategy of this study was to test for positive selection on socioeconomic and health characteristics among migrators and to quantify the differences in the odds of LBW of migrators compared to non-migrators. To test for positive selection, I performed

chi-square tests to measure differences among migration groups. To test for the association between migrating and LBW, I used logistic regression while adjusting for maternal age, education, state of origin, report of prenatal care, and history of past fetal deaths. I used matching to reduce the possibility of selection bias. Using guidance from Vable et al. (2019), I also performed propensity score matching and no matching (i.e., adjustment only for covariates) to compare results.

I used logistic regressions to estimate the odds of LBW by migration status, stratifying among four time periods of maternal birth (i.e., 1950-1954, 1955-1959, 1960-1964, 1965-1969) and among two migration groups. I used the following equation:

$$\text{Logit } (\Pr(y_{ij})) = \beta migration_i + \gamma_t + \alpha_j + (\gamma_t * \alpha_j) + X_i\theta$$

where i= mothers, j=state, t=mother's birth year

In this model, y_{ij} was the log odds of LBW. β represented the log odds of LBW compared to Southern Stayers for mothers born in the given time period. X_i were maternal covariates (i.e., education, receiving prenatal care, history of fetal death, age, and marital status). Other variables were γ_t, the fixed effects for the mother's birth year; α_j , the fixed effects for each mothers' state of origin; and the state of origin and mother's birth year interaction.

Coarsened exact matching (CEM) is a method to pair treated and control observations that results in a more balanced covariate distribution. CEM has been shown to have some noteworthy advantages compared to other matching methods. It avoids repeatedly checking the covariate balance and tweaking matching specifications; is more computationally efficient; and can potentially create more substantive matching criteria based on users' subject-matter expertise

(Iacus et al., 2012). In this study, exact matching was implemented on state of birth, birth year, prenatal care, marriage, and past fetal death. Matching was coarsened for age and education so that mothers are paired more flexibly on these covariates. An example stratum in CEM in this analysis were two African American mothers who differed on migration status but who are both born in 1964, from Mississippi, are 24 and 25 years old, married, reported one and two years of post-high school education, and had no histories of a fetal death before their first birth. There was typically more than one Southern stayer for each migrating mother within each matching stratum. For this reason, I weighed the control units. Treated units have a weight of one while untreated units have a weight calculated by the ratio of control to treated units in the stratum multiplied with the ratio of treated to control units in the entire matched dataset (Iacus et al., 2012). In these analyses, CEM retained most migrators and Southern Stayers (Appendix Table 1). CEM resulted in no differences in the percentages of exactly matched variables and negligible differences in coarsened-matched variables between treatment and control groups (Appendix Table 2).

In addition to CEM, I used propensity score matching. The propensity score indicated the likelihood of being a migrator, given their covariates, where values ranged from 0 to 1. Individuals were matched by propensity scores that were within a 0.01 standard deviation from each other (also known as “calipers”). Migrating mothers were paired to their Southern Stayer counterparts by the closest propensity score (i.e., nearest neighbor matching). There was no replacement of the control group. Approximately two control units were matched to one treated unit and unmatched mothers were trimmed from the dataset. I used the R package “MatchIt” to perform both CEM and propensity score matching. I retained all units for the dataset that did not use any matching (Ho et al., 2007).

Lastly, I performed a sensitivity analysis adjusting for medical pregnancy risks and substance use using CEM. These variables were only available starting in 1989 birth records. I did not include them in the main analyses because they were largely absent. For instance, 91% of mothers born between 1950 and 1959 did not have this information recorded.

Results

Table 1.1 displays migration group characteristics and results from tests of group comparisons. Sizable differences in marriage and education rates indicated some evidence for positive selection into migration by socioeconomic characteristics. Southern Stayers had the lowest marriage rates (32%), compared to 53% of Internal Southern Migrators and 38% of Out-of-South Migrators ($p<0.001$). Likewise, Southern Stayers had the lowest proportion of mothers completing high school (22%), compared to 35% Internal Southern Migrators and 29% of Out-of-South Migrators ($p<0.001$).

Table 1.1: Descriptive Statistics by Migration Group from Mothers Born Between 1950 to 1969

	Southern Stayers	Internal Southern Migrators	Out-of-South Migrators	p
N	1200785	165901	269320	
LBW (%)	152052 (12.7)	19409 (11.7)	33735 (12.5)	<0.001
age category				
age <15 (%)	21899 (1.8)	1670 (1.0)	2684 (1.0)	<0.001
age 15-19 (%)	483538 (40.3)	40630 (24.5)	76070 (28.2)	<0.001
age 20-24 (%)	407989 (34.0)	57793 (34.8)	92912 (34.5)	<0.001
age 25-29 (%)	192712 (16.0)	41089 (24.8)	59954 (22.3)	<0.001
age 30-34 (%)	73640 (6.1)	18941 (11.4)	27812 (10.3)	<0.001
age 35-39 (%)	18732 (1.6)	5160 (3.1)	8657 (3.2)	<0.001
age 40+ (%)	2275 (0.2)	618 (0.4)	1231 (0.5)	<0.001
married (%)	369032 (32.1)	83655 (52.7)	89486 (38.2)	<0.001
maternal education				
less than HS (%)	43329 (4.4)	3207 (2.7)	5177 (2.4)	<0.001
HS (%)	70827 (7.3)	11245 (9.5)	18765 (8.9)	<0.001
some college (%)	119549 (12.3)	21713 (18.3)	32271 (15.3)	<0.001
college + (%)	21535 (2.2)	8279 (7.0)	10252 (4.8)	<0.001
missing (%)	225345 (18.8)	47156 (28.4)	57758 (21.4)	<0.001
prenatal care in first trimester (%)	727151 (62.8)	114077 (70.8)	178115 (68.5)	<0.001
mother's state of birth				
AL (%)	103104 (8.6)	17949 (10.8)	31618 (11.7)	<0.001
AR (%)	31880 (2.7)	7414 (4.5)	18727 (7.0)	<0.001
FL (%)	125486 (10.5)	12256 (7.4)	14488 (5.4)	<0.001
GA (%)	98204 (8.2)	21462 (12.9)	18543 (6.9)	<0.001
KY (%)	22435 (1.9)	3057 (1.8)	5627 (2.1)	<0.001
LA (%)	144893 (12.1)	22763 (13.7)	20488 (7.6)	<0.001
MS (%)	85570 (7.1)	22515 (13.6)	45274 (16.8)	<0.001
NC (%)	129751 (10.8)	14312 (8.6)	29057 (10.8)	<0.001
OK (%)	18098 (1.5)	2668 (1.6)	4367 (1.6)	<0.001
SC (%)	99475 (8.3)	15941 (9.6)	23918 (8.9)	<0.001
TN (%)	72630 (6.0)	7699 (4.6)	16493 (6.1)	<0.001
TX (%)	169046 (14.1)	8175 (4.9)	16120 (6.0)	<0.001
VA (%)	95658 (8.0)	8218 (5.0)	20294 (7.5)	<0.001
WV (%)	4555 (0.4)	1472 (0.9)	4306 (1.6)	<0.001
ever had fetal death (%)	150935 (12.7)	26907 (16.3)	54092 (20.3)	<0.001
substance use (%)*	19616 (9.3)	3016 (6.8)	4493 (11.5)	<0.001
at least one pregnancy risk factor (%)*	31785 (15.1)	6503 (14.7)	7479 (13.9)	<0.001

*Variables reported starting from 1989

While Table 1.1 shows positive selection on some socioeconomic characteristics, it is less clear on selection of health. Although migrators had higher rates of seeking prenatal care (71% and 69% for Internal Southern Migrators and Out-of-South Migrators, respectfully) compared to Southern Stayers (63%, $p<0.001$), migrators did not have noticeably lower rates of LBW infants. Migrators reported more history of fetal deaths. Approximately 16% of Internal Southern Migrators and 20% of Out-of-South Migrators had a fetal death before their first live birth compared to only 13% of Southern Stayers ($p<0.001$). Out-of-South Migrators reported the highest alcohol or tobacco use during their pregnancy (12%) compared to Southern Stayers (9%) and Internal Southern Migrators (7%) ($p<0.001$).

The results from logistic regressions after CEM showed no overall differences in LBW in both Internal Southern and Out-of-South Migrators compared to Southern Stayers in all birth year periods (Tables 1.2 and 1.3). The results using the CEM-matched dataset were similar to those using propensity score matching and no matching. Results from the sensitivity analysis where CEM was used among mothers who gave birth after 1989 showed there were still no differences in either migration group compared to Southern Stayers, even after adjusting for pregnancy medical risk factors and substance use (Appendix Table 1.3).

Table 1.2: Odds Ratio of Low Birth Weight Comparing Out-of-South Migrators to Southern Stayers

	Coarsened Exact Matching				Propensity Score Matching				Covariate Adjustment Only			
	N	OR	95% CI		N	OR	95% CI		N	OR	95% CI	
1950-54	76185	1.00	0.99	1.00	60221	0.99	0.99	1.00	85207	0.99	0.99	1.00
1955-59	257094	0.99	0.99	1.00	141665	0.99	0.99	1.00	263626	0.99	0.99	1.00
1960-64	412554	0.99	0.99	1.00	204754	1.00	0.99	1.00	425038	1.00	0.99	1.00
1965-69	400300	0.99	0.99	0.99	163200	1.00	1.00	1.00	410256	0.99	0.99	1.00

Table 1.3: Odds Ratio of Low Birth Weight Comparing Internal Southern Migrators to Southern Stayers

	Coarsened Exact Matching				Propensity Score Matching				Covariate Adjustment			
	N	OR	95% CI		N	OR	95% CI		N	OR	95% CI	
1950-54	58581	0.98	0.98	0.99	34020	0.99	0.98	1.00	72473	0.99	0.98	1.00
1955-59	222613	1.00	0.99	1.00	91558	1.00	0.99	1.00	244323	0.99	0.99	1.00
1960-64	382383	0.99	0.99	1.00	138170	1.00	0.99	1.00	402094	0.99	0.99	1.00
1965-69	386115	0.99	0.99	0.99	130321	0.99	0.99	1.00	399312	0.99	0.99	1.00

Discussion

Observing US births of African American women during the Second Great Migration, I did not find evidence of the healthy migrant hypothesis. The descriptive statistics showed large differences in socioeconomic status so that migrators had higher rates of marriage and educational attainment. However, there was no clear trend in positive health selection on the reproductive health outcomes in this study. Migrators moving out of the South had similar LBW rates, a higher history of past fetal deaths, and higher rates of substance use among migrators moving Northward. After matching with CEM and after adjusting for individual covariates, I found no differences in LBW among both migration groups compared to non-migrants.

This study proposed two hypotheses: one which predicted reduction in LBW associated with moving to better environments and one that predicted no LBW reductions associated with challenges to attaining racial equity. Because migrators did not experience any difference in LBW compared to Southern stayers, these findings may support the latter. Historically-based research has documented that migrators continued facing racism pervasively in the North (Boustan, 2016; Derenoncourt, 2022; Eriksson, 2019; Gregory, 2005). For instance, Southern-born migrators who left the South doubled their rate of incarceration in 1940 compared to Southern stayers, even after matching on pre-migration household characteristics (Eriksson, 2019). The typical Black resident in a Northern urban area during the 1960s and 1970s lived in highly racially isolated neighborhoods (Boustan, 2016). They faced employment discrimination as hiring was only available to certain job sectors, like service workers. Jobs increasingly moved outside cities, remaining more unreachable as most Black residents (80%) in 1970 lived inside city boundaries (Boustan, 2016). Challenges to Black geographic mobility took various forms.

For example, zoning ordinances limited building multifamily dwellings and consequently made suburbs unaffordable to many. Black residents moving outside cities commonly faced intimidation by White neighbors. In 1963, Detroit recorded 63 violent incidents targeted at newly arrived African American residents moving into majority White neighborhoods (Sugrue, 2005).

The pervasive racism that migrators experienced may have contributed to poorer birth outcomes (D. R. Williams & Mohammed, 2013). Racism shapes access to socioeconomic opportunities and wealth building. It may determine the absence of community resources like low housing quality, lack of access to healthcare systems, and exposure to environmental harm—factors potentially associated with adverse infant health (Matoba & Collins, 2017). Racial discrimination is one type of psychosocial stressor. Coping with racial discrimination throughout the life course has been shown to be associated with enhanced inflammatory responses and practices of unhealthy behaviors that can potentially harm fetal development (Matoba & Collins, 2017; Bower et al., 2018; J. W. Collins et al., 2004; Slaughter-Acey et al., 2016). There is little research examining the link between the occurrences of racial discrimination and health outcomes among Great Migration participants. However, further research on this topic may potentially explain why migration to the North was not associated with health protection despite migrators making economic gains.

The findings of positive selection on education and marriage aligns with other demographic research (Black et al., 2015; Boustan, 2016; Margo, 1988; Tolnay, 1997, 1998). I specifically found similar trends in education to Tolnay (1998), who showed up to two additional years of education for migrators from 1940 to 1980. This study, taking place during the Second Great Migration, did not pick up on any relationship between migrating and LBW outcomes among infants. This contrasted with the two studies, taking place in the First Great Migration,

that found a relationship between migrating and adverse health outcomes among adult survival rates and infant mortality (Black et al., 2015; Eriksson & Niemesh, 2016). This study period may be one potential explanation for the different findings. For example, destination cities were more established with migrant networks by the latter half of the Great Migration (Tolnay, 2003), potentially lessening the stress from isolation and navigating new environments. Group resources available during the Second Great Migration may have aided migrators' transition, such as job placement support, community newspapers, and churches (Price-Spratlen, 2008).

This study had some limitations. First, this study was unable to capture more precise location of mothers' places of birth. This would have fine-tuned the pairing of migrating and non-migrating mothers so that they were exposed to similar contexts (e.g., racial terror, racial segregation, and economic disparity). It would have also opened new lines of research allowing me to measure the degree that migrators moved to improved, similar, or worsened conditions from birth to adulthood. Upward economic mobility may have modified the relationship between migration and infant health. Second, this study did not distinguish between pre and post migration variables. It is possible that, for instance, increased substance use may have occurred after migrators moved. Lastly, the study did not include more pre-migration characteristics on childhood socioeconomic position, such as paternal occupation, to further assess and adjust for positive selection. I hypothesize that its inclusion would have moved the estimates towards the null based on the existing positive selection in this study.

Even with these limitations, there were notable strengths of this paper. First, I used CEM to reduce positive selection. The large differences on education, age, and marriage between migrators and non-migrators bolstered the use of CEM. Second, I compared multiple matching and non-matching techniques where their similar results helped to build confidence in these

findings. Finally, I used a geographically representative administrative dataset that recorded the universe of mothers and infants rather than a sample. This allowed me to power the analysis and to represent health trends nationally.

Overall, this study suggests that geographic mobility may not have resulted in LBW reductions among African American migrators during the Second Great Migration. Despite the economic gains, infant LBW rates did not appear to change from migration. This study adds to the growing literature on the Great Migration and is one study in a large potential of future research that could examine the ways that regional moves affect African Americans' health. Thus, I highlight a pivotal, yet understudied US demographic event.

Chapter 2

County-Level Disadvantage and Low Birth Weight Among African Americans of The Great Migration

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Abstract

Background: The Great Migration was one of the most significant mass internal migrations during the 20th century. This involved roughly eight million African Americans moving from the South to the North and West. Little is known about the health outcomes resulting from migration and whether the migrators' destination choices are one potential mechanism.

Objective: This study measured the association between county disadvantage and odds of low birth weight during the last decade of the Great Migration.

Methods: I used the US Census from 1970 as well as the birth records of first-time African American mothers who migrated from the South collected through the National Center of Health Statistics from 1973 to 1980 (n=154,346). I examined three measures to operationalize area-based opportunity: Black male high school graduation rate, Black poverty rate, and racial and economic residential segregation. I used multilevel logistic regression, where mothers were

nested within US counties, to quantify the relationship between county disadvantage and low birth weight.

Results: After adjusting for individual risk and protective factors for low birth weight, there was no relationship between county opportunity measures and low birth weight among migrators.

Conclusion: High socioeconomic opportunity in the North and West may not have ensured better birth outcomes among Great Migration mothers. This is one of the first studies to assess the relationship between residential environment on the health outcomes of people during the Great Migration.

County-Level Disadvantage and Low Birth Weight Among African Americans of The Great Migration

Introduction

From 1910 to 1980, roughly eight million African Americans moved from the South to the North in what became known as the Great Migration. This mass internal migration began with economic demand after World War I when labor shortages in Northern cities created employment opportunities for African American Southerners. The Great Migration was sustained for decades longer as migrators moved for a variety of reasons. These motivations included fleeing from racial segregation and racial violence under the Jim Crow South, leaving a dwindling Southern agriculture economy, and joining established networks of family and friends (Fairclough, 2001; Gregory, 2005; Tolnay, 2003; Wilkerson, 2011). The mass movement shifted the demographic make-up of the US in the 20th century that left the South with a drastically lowered African American population. For example, almost half of Mississippi-born African American adults relocated out of the South by 1970 (Gregory, 2005). Many settled in popular destination cities like New York City, Los Angeles, Chicago, and Detroit, quadrupling the average African American composition from 4% to 16% from 1940 to 1970 in the typical Northern city (Boustan, 2016).

Research is beginning to uncover the ways in which health outcomes were associated with the Great Migration. Using Medicare data of Southerners born between 1916 and 1932, Black et al. (2015) found that migrators had worse mortality outcomes compared to Southern stayers where those who migrated experienced a 10% reduction in their probability of surviving

until age 75. Eriksson and Niemesh (2016) showed a similar conclusion in their study of infant mortality. Linking US Census and death records together, they found that infants born to African American migrators in 1920 and 1930 had increased mortality rates by 9 and 5 percentage points, respectively, compared to infants born to families who remained in the South.

Although studies of economic migrators generally find an immigrant health advantage (the "healthy migrant effect"), this does not appear to have been the case for African American migrators. A potential explanation is that they settled into areas with poorer socioeconomic circumstances, even though their economic opportunity likely improved after moving Northward (Boustan, 2016). One important aspect of the residential environment is racial residential segregation. Racial residential segregation is one vehicle in which systemic racism operates. It facilitates the exodus of residents and employment opportunities which can lead to the reduction in the municipal tax base, the loss of available jobs, and the increase in concentrated neighborhood poverty. Residents in highly racially segregated places may experience poor education quality, poor medical care access, worse physical environments, and less safety. Because health is associated with the socioeconomic opportunities available to communities, race-based segregation may have negative consequences to variety of health outcomes (Schulz et al., 2002; D. R. Williams & Collins, 2001).

The relationship between race-based segregation and health disadvantage can be seen among Black residents. Research with study periods coinciding with the last decades of the Great Migration has indicated that racial residential segregation was adversely associated with adult and infant mortality outcomes (S. A. Jackson et al., 2000; LaVeist, 2003; McCord & Freeman, 1990). Specifically, Black mothers living in highly racially segregated areas in the late 1970s and

1980s had more elevated risks of infant death compared to mothers living in less segregated areas across the US (LaVeist, 1993; Niemesh & Shester, 2020; Polednak, 1996).

Despite the importance of race-based segregation on health, no study to my knowledge has examined the same relationship among Great Migration movers. The health consequences of residing in concentrated disadvantage may be applicable to this group. Migrators moving towards the last decades of the Great Migration settled into increasingly racially segregated neighborhoods. In 1970, the average Black resident in the North lived in neighborhoods where 75% of people were Black residents, a rapid increase from 58% in 1940 (Boustan, 2016). Past studies on race-based segregation and adult and infant mortality have not studied Great Migration movers specifically. As a result, we do not know if the same relationship may be applicable.

To respond to the research gaps, this study aimed to measure the association of destination racial residential segregation and concentrated disadvantage with the odds of low birth weight (LBW) during the last decade of the Great Migration. I used the birth records of infants born to African American mothers who migrated from the South collected through the National Center of Health Statistics from 1973 to 1980. The birth records were then linked to the socioeconomic conditions of destination counties using the US Census Integrated Public Use Microdata from 1970. There were three objectives in this study. First, I observed the extent of between-destination county variation in the odds of LBW among mothers who moved from the South. Second, I quantified the sorting in individual protective and risk factors of LBW. Lastly, I measured the relationship between destination county-level socioeconomic disadvantage and the odds of LBW among African American migrators.

Methods

Sample

This paper used two data sources. The first data set was the US administrative birth records from 1973 to 1980 collected by the National Center of Health Statistics (US Department of Health and Human Services, 1973-1980). These years were specifically selected because 1973 was the earliest year when mothers' state of birth was reported, making it possible to classify migration status, and 1980 was estimated to be the last year of the Great Migration period (Gregory, 2005). The second data set was the 1970 US Census Integrated Public Use Microdata Series (IPUMS) available on Social Explorer (Social Explorer, 1970).

I used several restriction criteria for the US birth records in this study. I limited the sample to women who reported "Black" as their race, who were migrators, and who gave birth outside of the US South. Migrators were classified as those who were born in a US Southern state and gave birth in a non-Southern state. Southern states were defined following the US Census classification of the Southern region and included Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Oklahoma, Tennessee, Texas, Virginia, and West Virginia (Gregory, 2005). I restricted to mothers of first-born infants. This helped minimize clustering since those born to the same mother may have been more likely to have similar birth weights (Wang et al., 1995). Additionally, I limited the data to counties with at least 30 migrating mothers to better ensure statistical power to capture the estimates of interest (Schoeneberger, 2016; Sommet & Morselli, 2017). I included 194 counties that were available in both the 1970 IPUMS and in the US birth records. The final sample was 154,346 mothers.

Variables

I included individual-level characteristics reported in the US births records. Low birth weight (LBW), the outcome, was defined as infants born at 2500 grams or less. Destination county of residence (j) was defined as the county where mothers resided during the time of delivery. Other demographic covariates were maternal education, age, Southern birth state, receiving prenatal care during the first trimester, and experiencing a past fetal death which was defined as reporting at least one history of spontaneous death after conception.

I used three measures to operationalize area-based disadvantages of receiving Northern and Western counties in the 1970 US Census IPUMS. The Index of Concentrated Extremes (ICE) measured racial residential segregation. The ICE is the degree that people in a geographic area lived in the extremes of the social distribution. I calculated the ICE using the following formula:

$$ICE_j = \frac{A_j - P_j}{T_j}$$

A_j is the number of people living in the most privileged category, defined here as the number of non-Hispanic White families living at the highest quartile of household income in county j. P_j is the number of families living in the most deprived category, defined as the number of Black families living in the lowest quartile of household income in county j. T_j is the total number of families reporting income in county j. I used the 1970 income distribution among families in non-US Southern states to categorize into quartiles. ICE values ranged from -1 (all members lived in the most extreme groups for deprivation) to 1 (all members lived in the most extreme groups of privilege) (Krieger et al., 2018). Additionally, I used two variables that

measured concentrated disadvantage among Black residents: high school graduation rates among Black men who are 25 years or older and Black poverty rate defined as the percent of residents living below the poverty level. The poverty level was determined using guidelines from the Federal Interagency Committee in 1969 (US Census Bureau, 1970). To convert these measures to analytical variables, I assigned each county a quartile value for each of the three measures where "1" represented the most advantaged county and "4" represented the most disadvantaged county.

Statistical Analyses

The overall empirical strategy in this study was to estimate the county-level variation in LBW, the extent of individual sorting by socioeconomic status and pregnancy health risk factors, and the association between county-level opportunity and odds of LBW. I used a multilevel logistic regression with two levels so that mothers (*i*, level 1) were nested within US counties (*j*, level 2). Multilevel regression modeling accounts for the fact that mothers' destination choices may depend on their state of origin, their socioeconomic status, and their health. These similarities could underestimate the standard errors (Sommet & Morselli, 2017). I utilized the "lme4" package in R to perform all analyses.

To ascertain the extent to which counties varied in LBW and that sorting occurred in the risk factors for LBW, I calculated the county variance and intraclass correlation (ICC). The ICC measured the proportion of variance of the outcome that was attributed to counties as opposed to individuals. I measured the county-level spread of LBW, education, age, marital status, past fetal deaths, and prenatal care in the first trimester among migrators by running separate logistic

regression multilevel models that contained no other predictors. The ICC was calculated using the following formula (Sommet & Morselli, 2017):

$$ICC = \frac{\sigma^2_{u0j}}{\sigma^2_{u0j} + \frac{\pi^2}{3}}$$

To estimate the association between county-level disadvantage and LBW, I regressed the odds of LBW on each of the measures of disadvantage while adjusting for maternal age, education, state of origin, prenatal care, and history of past fetal deaths. I quantified the odds of LBW associated with each county-level disadvantage measure, comparing to counties in the best-off quartile. I used the following formula:

$$Logit\,(Pr(y_{ij})) = \gamma_{00} + \gamma_{0j} county\ disadvantage + \quad \beta_1 fetal\ death_i + \beta_2 age_i +$$

$$\beta_3 state\ of\ origin_i + \beta_4 education_i + \beta_5 prenatal\ care_i + \ u_{0j}$$

Sensitivity Analyses

I performed two sensitivity analyses for this study. The first sensitivity analysis tested the relationship between county-level disadvantage and preterm birth using the same methods specified above in order to examine multiple birth outcomes. Preterm birth is defined as infants delivered below 37 weeks of gestation. The second sensitivity analysis assessed the impact of dropping the marital status variable. Marital status may have indicated socioeconomic status and family stability among migrators during this period and might have been associated with LBW in this study (Tolnay, 1997). However, marital status was not consistently reported by states until 1989 and was almost completely missing among eight non-Southern states (i.e., California, Nevada, Arizona, New Mexico, Ohio, Maryland, New York, and Connecticut). Because these states were home to popular destination cities during the study period, I performed a sensitivity

analysis to gauge the impact of omitting marital status from this sample. I created a separate sample restricted to only states that reported on marital status, age, education, state of origin, prenatal care during the first trimester, and history of past fetal deaths. I then ran two fully adjusted multilevel logistic regressions to calculate the ICCs, one with and one without marital status. I found similar ICCs comparing both models, suggesting that marital status did not further explain the extent that counties vary in LBW compared to the existing covariates already in the main analysis (Appendix Table 2.2). I interpreted the similar ICCs to justify the decision to drop marital status out of the main analyses. For added assurance, I also performed the analyses among this restricted sample.

Results

Table 2.1 displays the descriptive statistics for migrating mothers from 1973 to 1980. Overall, 12.7% of 154,346 first-born infants had LBW. Table 2.2 shows the county average prevalence of LBW for each quartile of Black high school graduation percentage, poverty percentage, and racial residential segregation. Though most county disadvantage measure showed some differences ($p<0.01$), they were slight and had no consistent direction between deprivation and LBW. For instance, mothers who lived in the highest quartile of Black high school graduation rate in 1970 had a similar LBW prevalence (12.5%) compared to mothers who lived in counties with the lowest Black high school graduation rate (12.4%).

Table 2.3 summarizes the variances, standard deviations, and ICCs for LBW and its risk factors. There was low variability for LBW outcome among the counties in this analysis. Counties explained 0.05% of the total variation in LBW, indicating that counties did not

substantially differ in the proportion of LBW infants. On the other hand, there were sizable county differences in the LBW risk and protective factors. For instance, counties accounted for 11% of the total variation of maternal high school graduation rate and 6% of the total variation in the rates of receiving prenatal care during the first trimester. This might suggest that some county-level sorting occurred by demographic, socioeconomic, and some health characteristics among migrating mothers.

Table 2.4 summarizes the odds ratio of LBW for each 1970 county-level disadvantage indicator. After adjusting for individual risk factors for LBW, results from the multilevel logistic regression uniformly showed that there was no relationship between the county disadvantage measures and LBW. In all county indicators in this analysis, migrating mothers who lived in the worst-off counties were just as likely to have LBW infants as mothers who lived in the best-off counties.

The results from the sensitivity analyses showed similar trends between county-level disadvantage and preterm birth. Overall, there was no consistent direction between deprivation and the preterm birth outcome for each quartile of Black high school graduation percentage, poverty percentage, and racial residential segregation (Appendix Table 2.3). Mothers living in the most deprived counties showed no differences in the odds of delivering a preterm birth compared to mothers living in the most advantaged counties (Appendix Table 2.4). Additionally, the results from the sensitivity analysis restricted to states who reported marital status also showed no relationship between county disadvantage and LBW (Appendix Table 2.5).

Table 2.1: Descriptive Statistics (n=154346)

birth weight	
low birth weight (<2500 grams)	19606 (12.7%)
mean (SD)	3060 (598)
age	
age <18	32036 (20.8%)
age 18-21	55214 (35.8%)
age 22-26	40313 (26.1%)
age 27-30	16751 (10.9%)
age 31+	10032 (6.5%)
maternal education	
less than HS	5765 (3.7%)
some HS	47143 (30.5%)
HS	66744 (43.2%)
some college	22548 (14.6%)
college +	12146 (7.9%)
married	
unmarried	55827 (36.2%)
married	29957 (19.4%)
missing	68562 (44.4%)
prenatal care in first trimester	
	59342 (38.4%)
ever had a fetal death	
	22933 (14.9%)
state of mother's birth	
AL	18340 (11.9%)
AR	9634 (6.2%)
FL	7124 (4.6%)
GA	11758 (7.6%)
KY	2170 (1.4%)
LA	5942 (3.8%)
MS	25695 (16.6%)
NC	22651 (14.7%)
OK	1285 (0.8%)
SC	24938 (16.2%)
TN	7935 (5.1%)
TX	3496 (2.3%)
VA	10969 (7.1%)
WV	2409 (1.6%)

Table 2.2: Descriptive Statistics of Low Birth Weight by County-Level Disadvantage (194 counties)

	LBW %	p
Black high school graduation rate		
Q1 [0.69-1.00] (best-off)	1332 (12.5%)	0.022
Q2 [0.64-0.68]	4550 (13.2%)	
Q3 [0.59-0.63]	11341 (12.6%)	
Q4 [0.15-0.58]	2356 (12.4%)	
Black Poverty		
Q1 [0.00-0.18] (best-off)	1874 (12.5%)	0.018
Q2 [0.18-0.21]	6353 (12.7%)	
Q3 [0.21-0.24]	8720 (12.9%)	
Q4 [0.25-0.78]	2632 (12.1%)	
ICE race and income segregation		
Q1 [0.24-0.54] (best-off)	6083 (12.5%)	0.001
Q2 [0.19-0.23]	6001 (13.2%)	
Q3 [0.15-0.18]	4810 (12.4%)	
Q4 [-0.10-0.14]	2685 (12.6%)	

Table 2.3. County-Level Sorting of Maternal Characteristics (194 counties)

Model	**variance**	**SD**	**SE**	**ICC**
LBW	0.002	0.040	0.0001	0.0005
educational attainment (HS+)	0.422	0.649	0.0017	0.1136
maternal age (age 27+)	0.295	0.543	0.0014	0.0823
past fetal death	0.141	0.376	0.0010	0.0412
prenatal care during first trimester	0.194	0.440	0.0011	0.0556

Table 2.4: Odds Ratio of Low Birth Weight by County-Level Disadvantage (*i*=154346 and *j*= 194 counties)

	OR	95% CI	
Black male HS graduation rate			
Q1	ref		
Q2	0.98	0.93	1.04
Q3	1.01	0.96	1.06
Q4 (worst-off)	0.97	0.92	1.02
Black poverty rate			
Q1	ref		
Q2	1.00	0.95	1.05
Q3	1.02	0.97	1.07
Q4 (worst-off)	0.97	0.92	1.02
ICE			
Q1	ref		
Q2	0.97	0.92	1.03
Q3	1.02	0.97	1.07
Q4 (worst-off)	0.95	0.90	1.00

Models adjusted for education, age, state of origin, past fetal death, and prenatal care

Discussion

In this analysis of 154,346 mothers delivering first-born infants from 1973 to 1980, I did not find evidence that county-level racial residential segregation and concentrated disadvantage were associated with LBW among African American migrators. This analysis showed no substantial variation across county LBW rates, despite variation in the factors that typically predict LBW. I showed that mothers living in the most disadvantaged counties were just as likely to deliver an infant with LBW as those living in the most advantaged counties.

This study builds off existing literature documenting the health outcomes associated with the Great Migration. Prior research by Black et al. (2015) and Eriksson and Niemesh (2016) showed that migrating Northward was associated with poorer adult and infant mortality outcomes compared to remaining in the South. I contribute to this research area by exploring the degree that the socioeconomic environment may be one mechanism linked to these adverse health outcomes. However, I did not find an association between county-level racial residential segregation and concentrated disadvantage to low birth weight. Past literature, also taking place around this study period, has found a relationship between racial residential segregation and birth outcomes among Black mothers (LaVeist, 1993; Niemesh & Shester, 2020; Polednak, 1996). Some used larger geospatial units than counties, which may have resulted in an attenuated relationship (Krieger et al., 2017, 2018), and still found connections between the socioeconomic environment and birth outcomes.

Because of the unexpected results, I discuss two possible explanations for these study findings. First, it is possible that migrators continued facing racial oppression wherever they went. The North and West were perceived by migrators to offer some relief from the oppressive racial climate of the South. However, migrators encountered racism persistently after their moves. Even as migrators gained higher socioeconomic opportunity compared to if they remained in the South (Boustan, 2016), the North and the West may not have been the sanctuaries they may have imagined (Coles, 1967; Wilkerson, 2011). Migrators experienced racism widely in their employment. African American and White workers were rarely integrated because of discrimination in union membership and in promotional opportunities (Boustan, 2016; Gregory, 2005; Sugrue, 2005). They were often relegated to the lowest paid segment of the labor force and were more likely to work service occupations rather than managerial or clerical

roles (W. J. Collins, 2021). African American residents experienced discrimination pervasively in housing, such as in obtaining mortgages, which confined them to highly segregated and impoverished neighborhoods. Those successful in buying a property outside central cities often faced violence and intimidation moving into majority-White areas (Sugrue, 2005). Research situated in more contemporary periods has found that exposure to perceived racial discrimination was associated with infant mortality, low birth weight, and preterm birth among Black women (Bower et al., 2018; J. W. Collins et al., 2004; Slaughter-Acey et al., 2016). If applied to the Great Migration period, it is possible that migrators' experiences of discrimination may be an important contributor to the LBW outcomes in this study. However, more research is needed to examine the ways that racial discrimination encountered during the Great Migration may have been a reproductive health disadvantage for migrators.

Second, the early life course of Southern-born migrators may potentially be more consequential to LBW outcomes than the residential environments during pregnancy. The life course perspective emphasizes that both the pregnancy and the early life course of the mother, starting in utero, influences reproductive health (Lu et al., 2010; Osypuk, 2013). Research has suggested that childhood upbringing in the South—with its legalized segregation, suppressed civil rights, racial violence, and poorer education— was linked with worsened physical health among African Americans as adults. This is applicable even among migrators who moved out of the South. Compared to Northern-born African American residents living in the North at the time of their death from 1980 to 2004, research has found that Southern-born African American residents in the North had higher risks for stroke, pancreatic cancer, and cardiovascular disease (Fang et al., 1996; Glymour et al., 2008, 2009; Glymour M. Maria et al., 2007). A similar outcome was seen in a study of birth outcomes situated a decade after the Great Migration from

1988 to 1994. Comparing the LBW outcomes by maternal nativity in New York City relative to White mothers, authors showed that Southern-born African American women had the highest odds ratio of delivering an LBW infant. Their odds ratio surpassed those of Northeastern-born African American women and Caribbean, South American, and African immigrant women even after adjusting for socioeconomic indicators (Fang et al., 1999). In the context of the Great Migration, even as migrators moved to higher opportunity areas in the North and West, it is possible that mothers' early social conditions may be a more important predictor of LBW outcomes than their destination choices. Future research is necessary to establish migrators' early life contexts as a key mechanism to reproductive health.

There are several limitations worth noting when interpreting the results of this study. First, I was unable to include more pre-migration variables, which would have better controlled for individual sorting (Green et al., 2017). Although the study may have benefitted from adding more variables like childhood socioeconomic position, it is unlikely their addition would have substantially changed the study findings. Second, a smaller spatial unit may have more precisely captured the exposures in this study. Granular geographic units may have produced stronger relationships between the county environment and LBW, just as they did in the relationship between racial residential segregation and childhood mortality, premature mortality, and firearm-related in studies done by Krieger and authors (2017, 2018). Last, I did not measure additional aspects of the social environment that might have been associated with LBW. For instance, social support through immigrant enclaves has been linked to better pregnancy outcomes for U.S. Asian immigrants. It is possible that this may have applied to this study population as well (Chu et al., 2022; A. D. Williams et al., 2020).

Despite these limitations, there are notable strengths. First, this study is one of the first to examine the association between the residential environment and the reproductive health of Great Migration movers. This study fills in an important research gap in the literature on the extent that destination selection of migrators was associated with their health. Second, the inclusion of 194 counties across the US Northeast, Midwest, and West reflected the geographic span of the Great Migration and generalized the findings to multiple regions. Lastly, the use of multilevel regressions adjusted for sorting based on migrators' socioeconomic characteristics, health characteristics, and Southern state of origin which helped overcome the fact that destination choices were not random. Multilevel regression also helped re-weighed counties. As a result, LBW rates in more sparsely populated counties, like Maricopa County in Arizona, were brought closer to the mean rate of the study sample whereas LBW rates from larger counties, like Wayne County in Michigan, were less affected (Schwartz & Jahn, 2020).

This study of Great Migration mothers across the US who delivered infants from 1973 to 1980 showed that county-level racial residential segregation and concentrated disadvantage had no association to LBW. High socioeconomic opportunity, which has been shown to have a protective association for a wide range of health outcomes for African Americans, may not have guaranteed better birth outcomes for mothers who moved during the last decade of the Great Migration. A combination of pervasive racism across socioeconomic contexts in the North and West and early life exposure to racism may have contributed to overriding any protective effect of better county-level socioeconomic conditions for migrators. Overall, this study contributes to our collective understanding of the public health of the Great Migration, an area with a large potential for future research to answer the mounting questions of this understudied historical movement.

Chapter 3

The Mental Health Toll of the Great Migration: A Comparison of Mental Health Outcomes among Descendants of African American Migrators

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Abstract

Background: Emerging research is beginning to examine the health outcomes of migrators of the Great Migration, a movement of up to eight million African Americans from the South to the North and West during the 20th century. However, sparse evidence exists studying the health outcomes of the children of Great Migration movers.

Objectives: The aims for this study were to compare the lifetime occurrences of mental health disorders by migration history and to examine the extent that experiences of discrimination explained the relationship between migration and mental health disorders.

Method: I used a sample of 3,004 African American adults from the National Survey of American Life (2001-2003). Using birthplaces of participants and their mothers, I categorized

adults into three migration groups: (1) Southern Stayers, (2) Migrators, and (3) Northern Stayers. The outcomes were lifetime prevalence of any mental health, mood, anxiety, and substance use disorders. I used weighted logistic regressions where I adjusted for demographic, socioeconomic status, and experiences of everyday and major lifetime discrimination.

Results: Migration status was associated with increased odds of mental health disorders. Migrators had higher odds of any lifetime mental health disorder as well as higher odds of any lifetime mood, anxiety, and substance use disorder compared to Southern Stayers in the fully adjusted model. Northern Stayers also had higher odds ratios of any lifetime mental health, mood, anxiety, and substance use disorders. Migrators and Northern Stayers were more likely to report perceived discrimination. Discrimination partially attenuated the relationship between migration status and mental health disorder outcomes.

Implications: This study is one of the first to examine the mental health outcomes of descendants of the Great Migration, suggesting the potential adversities that migrating families may have experienced.

The Mental Health Toll of the Great Migration: A Comparison of Mental Health Outcomes among Descendants of African American Migrators

Introduction

In recent years, there has been an increasing amount of scholarship spotlighting the significance of the Great Migration. The Great Migration was a demographic movement of roughly eight million African Americans migrating from the rural South to the urban North and West from approximately 1910 to 1980. Motivations to move were nuanced and varied. Frequently mentioned reasons noted by historians included the demand for labor in the North after World War I, the desire to leave racial segregation under Jim Crow, the threat of racial violence, political disenfranchisement, and reuniting with family and friends already settled Northward (Boustan, 2016; Gregory, 2005; Tolnay, 2003; Wilkerson, 2011). One important consequence of the Great Migration was the geographic re-shuffling of the African American population. In 1900, only 8% of African Americans lived outside the South. By the end of the Great Migration in 1980, the proportion jumped to almost half (47%) (Gregory, 2005). African Americans found homes in cities like Chicago, Los Angeles, and Cleveland, causing a quadrupling of the Northern urban Black population from 4% to 16% between 1940 and 1970 (Boustan, 2016; Gregory, 2005).

Growing research has examined the economic benefits related to this internal migration. Migrators increased their earnings by 56% moving Northward, even after taking into account the positive migrant selection and the higher cost of living in the North (Boustan, 2016). Children of migrators benefited economically as well (Alexander et al., 2017; Baran et al., 2022; Leibbrand

et al., 2019). Research linking parental and child US Census data from 1940 to 2000 showed children of migrators achieved higher high school graduation rates, higher median income, and lower poverty rates as adults compared to their Southern peers (Alexander et al., 2017). Using the same dataset, the authors also showed that children of migrators were more likely to live in wealthier and more highly educated neighborhoods compared to children of Southern stayers (Leibbrand et al., 2019).

Although Great Migration migrators made economic gains, their health outcomes may have followed a different trajectory. Evidence has shown that compared to Southern stayers who remained in the South, migrators experienced higher infant and adult mortality (Black et al., 2015; Eriksson & Niemesh, 2016). Among African Americans born in South Carolina, Georgia, Alabama, Mississippi, and Louisiana in 1916–1932, Black et al. (2015) found that migrators had a 10% lower probability of surviving until age 75 compared to Southern non-migrators. Additionally, migrating families from Tennessee, South Carolina, and North Carolina who left for Northern states experienced 9 and 5 higher percentage points of infant mortality in 1920 and 1930, respectively, compared to Southern non-migrating families (Eriksson & Niemesh, 2016).

Despite evidence documenting the health outcomes among Great Migration movers, there is much less evidence exploring the health of their descendants. This may be an omission as one important motivation for African Americans' moves out of the South was to improve the lives of their families and ongoing generations (Gardner, 2020). It is possible that children of migrators had better health outcomes compared to their Southern non-migrating peers for two reasons. First, according to the healthy migrant hypothesis, migrators are more likely to be positively selected on health and socioeconomic status compared to non-migrators (Riosmena et al., 2017). This may apply to their children as well. Like their parents who migrated out of the South a

generation earlier, children of migrators had higher socioeconomic standing compared to children of Southern stayers (Alexander et al., 2017; Black et al., 2015; Tolnay, 1998). The well-known link between socioeconomic status and health suggests the possibility of a health advantage in their descendants. Yet, the degree that the healthy migrant bias is applicable to this population is unknown.

Second, migrating families were more likely to live in higher socioeconomic opportunity areas relative to the South (Baran et al., 2022; Card et al., 2018; Chetty et al., 2018). Research using US federal tax returns has shown that geographic areas with the lowest opportunity for upward mobility among Black children growing up in the 1980s were disproportionally in the US Southeast (Chetty et al., 2018). Residing in upwardly mobile areas has been linked to better health outcomes among adults, such as reduced rates of mortality, diabetes, and hypertension (Venkataramani et al., 2015). For this reason, it is possible that the socioeconomic advantage may have translated to a long-term health advantage.

On the other hand, the barriers confronted in the North may be stressors that could have elevated the risks of adverse health outcomes. Although migrators faced racial discrimination in the South, they also encountered discrimination pervasively in the North. One notable example of racial discrimination was race-based segregation. As the Great Migration unfolded and the African American population among Northern cities grew, racial residential segregation in the North intensified (Boustan, 2016; Leibbrand et al., 2020). Containment strategies to limit the areas where residents could live included restrictive covenants, discriminatory mortgage lending, highway construction separating urban from suburban areas, and violence when African American residents moved into predominantly White-neighborhoods (Rothstein, 2017; Sugrue, 2005). As adults, according to the 2000 US Census, children of migrators lived in slightly more

racially segregated neighborhoods in the North than children of Southern non-migrators living in the South (Leibbrand et al., 2020). Therefore, it is possible that Northern-raised children may have experienced the health ramifications of the chronic exposure to discrimination.

To fill in this research gap, I examine the relationship between migration history and mental health disorders among descendants of the Great Migration in their adulthood. I used the National Survey of American Life (NSAL), a national mental health study of 6,199 participants containing an over-representation of Black American adults interviewed between 2001 to 2003 (J. S. Jackson et al., 2004). This dataset was appropriate for the period of the Great Migration. Since the average birth year of African Americans in the NSAL was around 1959, it was likely that families moved during the peak decades of out-migration from the South, from 1940 to 1970 (W. J. Collins, 2021; Gregory, 2005). The first objective in this study was to compare the lifetime occurrences of mental health disorders among descendants of Southern migrators, Northern stayers, and Southern stayers. The second objective was to examine the extent that experiences of racial discrimination may have explained the relationship between migration status and lifetime prevalence of mental health.

Methods

Sample

The NSAL dataset is a cross-sectional survey conducted in the US from February 2001 to March 2003 and is one of the largest studies on the mental health well-being of Black Americans. The study emerged out of the research need to document the diversity of the US

Black population, particularly from immigration, and to document the social and economic disadvantage, discrimination, and stressors that may contribute to the wide racial health gaps. The NSAL used a multistage, national probability sampling method of non-institutionalized English-speakers aged 18 and over. Its over-sampling of Black Americans resulted in 3,570 African Americans, 1,623 Caribbean Blacks, and 1,006 non-Hispanic Whites. The respondents and the interviewers were race matched. Most interviews were conducted face-to-face using computer-assisted technology, while some (14%) were conducted by telephone (J. S. Jackson et al., 2004). For this study, I restricted the NSAL to only US-born African Americans who had a maternal US birth and who fell into one of the migration groups of interest (n=3,004).

Variables

Migration

The primary independent variable was migration status. I included three migration groups: (1) Southern Stayers, (2) Migrators, and (3) Northern Stayers. I captured migration groups from two generations using survey questions that asked about the participants' state of birth, their mother's state of birth, and the participant's current state of residence. Southern Stayers were defined as children of Southern-born mothers, who were Southern-born themselves, and who resided in the South at the time of the survey. Migrators were individuals who were children of Southern-born mothers, who were either born in the North or the South, and who resided in the North at the time of the survey. Northern Stayers were classified as children of Northern-born mothers, who were born in the North, and who resided in the North at the time of the survey. The "South" was defined using the Census Bureau classification of the Southern region and included Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana,

Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia (Gregory, 2005). The "North" encompassed the Northeast, Midwest, and West US regions.

Mental Health Disorders

The outcome was lifetime occurrence of mental health disorders where I included four measures: any mental health, mood, anxiety, and substance use disorders. Mental health disorders followed the DSM-IV criteria and were diagnosed using the World Mental Health Composite International Diagnostic Interview in a series of structured questions in the NSAL (J. S. Jackson et al., 2004). Lifetime mood disorder was defined as ever having a diagnosis of a major depressive disorder or dysthymia. Lifetime anxiety disorder was defined as ever having a diagnosis of a panic disorder, agoraphobia, social phobia, generalized anxiety disorder, or post-traumatic stress disorder. Lifetime substance use disorder was defined as ever having an alcohol or drug use disorder. If the respondent had at least one of the above disorders, they were classified as having any lifetime mental health disorder.

Racial Discrimination

The everyday and the major lifetime discrimination scales were also included. The everyday discrimination scale captured the daily occurrences of unfair treatment (D. R. Williams et al., 1997). The prompt asked, "In your day-to-day life how often have any of the following things happened to you?" and was followed by 10 scenarios, such as being called names or insults and being followed around in stores. There were six answer options ranging from never (score=0) to almost daily (score=5). The everyday discrimination scale used in the NSAL built on the original nine-item scale with an additional question asking the frequency that participants had been followed around in a store (D. R. Williams et al., 2008). There were six answer options

ranging from never (score=0) to almost daily (score=5). The highest possible score on this scale was 50. The major lifetime discrimination scale captured discrete events of being treated unfairly. The prompt instructed respondents to list the frequency of nine events that occurred in their lives, such as being unfairly denied a bank loan or unfairly fired from a job. Respondents received a "1" for each event they reported. The maximum score for this scale was nine. For both the everyday and major lifetime discrimination scales, the NSAL asked follow-up questions to determine the primary reason for their discrimination experience (e.g., ancestry, ethnicity, race, skin color, gender, sexual orientation, income, age, etc.). I considered only discrimination attributed to race (i.e., ancestry, ethnicity, race, and skin color).

Other Covariates

Demographic and socioeconomic characteristics were captured to better adjust for potential confounders. The demographic variables were age (<30, 30-44, 45-49, 60+), sex (male or female), and marital status (married or partnered; separated, widowed, or divorced; and never married). The socioeconomic variables were income, education, work status, and highest parental education. The five categories of income were < $18,000; $18,000 to $31,999; $32,000 to $54,999; and $55,000 and more. Education was defined as the highest educational attainment at the time of the survey and was divided into less than high school (<12 years), high school graduate (12 years), some college (13-15 years), and college and above (16+ years). Current work status was grouped into employed, unemployed, or not in the labor force. Highest parental education was defined as the highest education attained by either parent. It was similarly divided into less than high school, high school graduate, some college, and college and above.

Analyses

The overall analytical strategy was to assess the differences in mental health status by migration group and to assess the contribution of discrimination in the relationship between migration and poor mental health. I compared the mental health, discrimination, demographic, and socioeconomic status variables by migration group using survey weights to account for the survey sampling design. Next, I regressed the lifetime report of mental health disorders on migration status where Southern Stayers served as the reference group. I ran two weighted logistic regression models. The first model adjusted for the demographic variables: age, sex, and marital status. The second model added socioeconomic variable; namely income, education, work status, and parental education. To evaluate the impact of discrimination, I ran additional logistic regression models where I added everyday and major lifetime discrimination in measuring the relationship between migration status and mental health disorders. All the analyses were performed using R software.

I imputed missing data for everyday discrimination attribution, income, and parental education where 18%, 12%, and 12% of participants had missing values, respectively. I performed multiple imputation by chain equations using the "mice" R package, assuming that the variables were missing at random (Azur et al., 2011). To predict the missing values, I imputed 10 datasets using the variables in this study and additional measures, such as receiving public assistance and financial stress. I reduced the missingness to 8% for everyday discrimination attribution, 6% for income, and 6 % for parental education.

Results

Using African American NSAL participants from 2001- 2003, there were significant differences in the prevalence of lifetime mental health disorders (Table 3.1). Migrators and Northern Stayers had higher rates of any mental disorder as well as any mood, anxiety, and substance use disorders. Approximately 35% and 40% of Migrators and Northern Stayers had any lifetime mental health disorder compared to 27% of Southern Stayers. There were differences in socioeconomic status. Migrators and Northern Stayers had higher education, income, and parental education. There was a noticeable gradient in parental education by lengths of stay in the North where 85% of Northern Stayers had at least one parent graduate high school compared to 62% of Migrators and 52% of Southern Stayers. The descriptive results also showed that Migrators and Northern Stayers reported higher scores on the everyday and major lifetime discrimination scales compared to Southern Stayers.

Table 3.1. Weighted Descriptive Statistics by Migration Status (n=3004)

	Southern Stayers (n=1768)			Migrators (n=770)			Northern Stayers (n=466)		
	sample n	weighted % or mean	SE	sample n	weighted %	SE	sample n	weighted % or mean	SE
lifetime mental health disorder									
any disorder	464	26.7%	1.2%	273	35.2%	2.1%	189	40.3%	2.8%
any mood disorder	169	9.1%	0.8%	107	14.0%	1.5%	91	19.1%	2.2%
any anxiety disorder	299	17.0%	1.0%	174	21.6%	1.7%	116	25.4%	2.5%
substance abuse disorder	139	9.3%	0.8%	116	15.6%	1.6%	57	13.0%	1.9%
sex									
male	605	43.4%	1.4%	297	44.8%	2.1%	154	40.3%	2.8%
female	1163	56.6%	1.4%	473	55.2%	2.1%	312	59.7%	2.8%
age									
<= 29	397	24.5%	1.2%	91	11.9%	1.4%	181	41.4%	2.8%
30-44	621	33.1%	1.3%	265	36.4%	2.1%	175	36.2%	2.7%
45-59	423	24.7%	1.2%	224	28.5%	1.9%	80	16.0%	2.0%
60+	327	17.7%	1.0%	190	23.1%	1.7%	30	6.4%	1.3%
marital status									
married/partnered	638	43.5%	1.4%	256	41.0%	2.1%	154	36.9%	2.8%
separated, divorced, widowed	582	26.5%	1.1%	299	33.7%	2.0%	107	19.1%	2.1%
never married	546	29.9%	1.3%	215	25.3%	1.8%	204	44.1%	2.8%
income									
< 18,000	724	38.2%	1.3%	248	30.0%	1.9%	145	29.6%	2.6%
18,000-31,999	407	24.5%	1.2%	165	21.4%	1.7%	81	18.2%	2.2%
32,000-54,999	318	20.7%	1.2%	164	22.9%	1.8%	109	26.6%	2.6%
55,000+	215	16.6%	1.1%	155	25.7%	2.0%	96	25.5%	2.7%
education									
<=11 years	539	30.5%	1.3%	163	19.8%	1.6%	90	20.5%	2.3%
12 years	706	39.9%	1.3%	275	36.3%	2.0%	159	34.2%	2.6%
13-15 years	341	19.8%	1.1%	206	27.0%	1.9%	133	29.2%	2.6%
16+ years	182	9.8%	0.8%	126	16.9%	1.6%	84	16.2%	2.1%
work status									
employed	1153	66.0%	1.3%	480	63.7%	2.0%	322	69.7%	2.6%
unemployed	173	9.8%	0.8%	69	9.3%	1.2%	64	12.8%	1.8%
not in labor force	442	24.1%	1.2%	221	27.0%	1.8%	80	17.5%	2.1%
highest parental education									
<=11 years	797	48.0%	1.4%	280	38.2%	2.1%	69	15.2%	2.0%
12 years	574	36.0%	1.4%	290	39.1%	2.1%	183	44.5%	2.9%
13-15 years	133	8.4%	0.8%	87	12.2%	1.5%	100	21.7%	2.4%
16+ years	135	7.6%	0.7%	34	10.6%	1.4%	83	18.6%	2.4%
racial discrimination									
everyday racial discrimination sum		9.10	0.28		11.27	0.43		12.03	0.66
major lifetime racial discrimination sum		1.43	0.08		2.82	0.20		2.16	0.21

The results of the weighted logistic regression adjusted for demographic and socioeconomic characteristics in Table 3.2. Migrators had higher odds of having mental health disorders. Compared to Southern Stayers, migrators had an odds ratio of 1.48 (95% CI 1.18-1.85) for any mental health disorder, 1.73 (95% CI 1.27-2.38) for any mood disorder, 1.40 (95% CI 1.09-1.81) for any anxiety disorder, and 1.70 (95% CI 1.23-2.34) for any substance use disorder. Further adjustment for lifetime socioeconomic status in Model 2 elevated the odds ratio upward for any disorder, mood disorder, anxiety disorder, and substance abuse disorder to 1.63 (95% CI 1.28-2.07); 1.62 (95% CI 1.17-2.25); 1.48 (95% CI 1.13-1.94); 2.32 (95% CI 1.60-3.35), respectively. The same pattern was repeated for Northern Stayers. There were increased odds ratios for any mental health disorder compared to Southern Stayers in Model 1. After accounting for lifetime socioeconomic status, there was an uptick in the odds ratios in Model 2 to 1.98 (95% CI 1.47-2.68) for any mental health disorder, 1.94 (95% CI 1.33-2.81) for any mood disorder, 1.65 (95% CI 1.18-2.34) for any anxiety disorder, and 1.98 (95% CI 1.23-3.17) for any substance use disorder.

Additional analyses were conducted to assess the potential role of racial discrimination (Table 3.3). For Migrators and Northern Stayers, adding everyday and major lifetime discrimination together attenuated the association between migration status and mental health disorder for all study outcomes. Though still statistically significant, the odds ratios of having a lifetime prevalence of any mental health disorder were reduced by approximately 8% for Migrators and 12% for Northern Stayers in the comparison to Southern Stayers. This might suggest that discrimination may have acted like a mediator in the relationship between migration status and mental health.

Table 3.2: Odds Ratio of Lifetime Mental Health Disorders by Migration Status (compared to Southern Stayers) using Weighted Logistic Regressions

	any disorder						any mood disorder						any anxiety disorder						substance abuse disorder					
	Model 1			Model 2			Model 1			Model 2			Model 1			Model 2			Model 1			Model 2		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
migration																								
Southern Stayers (ref)																								
Migrators	1.48	1.18	1.85	1.63	1.28	2.07	1.73	1.27	2.38	1.62	1.17	2.25	1.40	1.09	1.81	1.48	1.13	1.94	1.70	1.23	2.34	2.32	1.60	3.35
Northern Stayers	1.80	1.38	2.33	1.98	1.47	2.68	2.15	1.53	3.01	1.94	1.33	2.81	1.55	1.15	2.08	1.65	1.18	2.31	1.58	1.06	2.34	1.98	1.23	3.17
age																								
<= 29 (ref)																								
30-44	1.06	0.81	1.40	1.10	0.82	1.48	0.75	0.51	1.08	0.79	0.52	1.18	0.84	0.61	1.15	0.81	0.58	1.14	1.47	0.94	2.30	1.89	1.18	3.04
45-59	1.16	0.85	1.60	1.09	0.77	1.54	0.83	0.53	1.31	0.85	0.52	1.40	1.05	0.73	1.50	0.92	0.62	1.37	1.64	0.99	2.72	2.13	1.23	3.69
60+	0.51	0.35	0.75	0.44	0.28	0.71	0.26	0.14	0.47	0.24	0.12	0.49	0.43	0.28	0.67	0.34	0.20	0.58	0.89	0.48	1.62	1.02	0.47	2.21
sex																								
female (ref)																								
male	1.00	0.82	1.22	1.13	0.91	1.40	0.65	0.49	0.88	0.70	0.51	0.96	0.53	0.42	0.68	0.62	0.48	0.80	3.68	2.75	4.92	4.71	3.41	6.50
marital status																								
married/partnered (ref)																								
separated, divorced, widowed	1.72	1.34	2.21	1.37	1.04	1.80	1.63	1.14	2.33	1.63	1.11	2.40	1.45	1.10	1.93	1.20	0.87	1.64	1.75	1.21	2.53	1.17	0.78	1.76
never married	1.14	0.88	1.47	0.88	0.67	1.16	1.04	0.72	1.49	1.00	0.67	1.49	1.16	0.86	1.56	0.91	0.66	1.27	1.23	0.83	1.81	0.80	0.52	1.21
income																								
< 18,000 (ref)																								
18,000-31,999				0.92	0.70	1.21				0.86	0.59	1.24				0.99	0.69	1.29				0.77	0.51	1.15
32,000-54,999				0.59	0.43	0.81				0.85	0.56	1.29				0.58	0.39	0.83				0.51	0.32	0.83
55,000+				0.52	0.35	0.76				0.85	0.51	1.41				0.63	0.41	1.01				0.25	0.14	0.45

Table 3.2 (Continued): Odds Ratio of Lifetime Mental Health Disorders by Migration Status (compared to Southern Stayers) using Weighted Logistic Regressions

	any disorder				any mood disorder				any anxiety disorder				substance abuse disorder			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
education																
<=11 years (ref)																
12 years			0.60	0.45 0.78			0.83	0.57 1.22			0.60	0.44 0.82			0.46	0.31 0.68
13-15 years			0.76	0.55 1.05			1.04	0.68 1.61			0.68	0.47 0.97			0.58	0.36 0.94
16+ years			0.83	0.57 1.23			1.25	0.75 2.08			0.79	0.51 1.24			0.25	0.13 0.50
work status																
employed (ref)																
unemployed			1.10	0.78 1.55			1.22	0.78 1.91			1.02	0.69 1.50			0.85	0.51 1.41
not in labor force			0.99	0.73 1.33			1.20	0.82 1.77			1.15	0.82 1.60			0.80	0.50 1.26
highest parental education																
<=11 years (ref)																
12 years			0.91	0.71 1.17			0.97	0.69 1.38			0.93	0.70 1.23			1.30	0.88 1.91
13-15 years			1.28	0.89 1.85			1.41	0.87 2.28			1.07	0.71 1.63			2.00	1.13 3.56
16+ years			0.80	0.54 1.17			0.77	0.44 1.32			0.74	0.47 1.16			1.32	0.73 2.42

Table 3.3: Odds Ratio of Lifetime Mental Health Disorders by Migration Status (compared to Southern Stayers), adjusted for Discrimination

	any disorder						any mood disorder						any anxiety disorder						substance abuse disorder					
	no adjustment for discrimination			adjustment for discrimination			no adjustment for discrimination			adjustment for discrimination			no adjustment for discrimination			adjustment for discrimination			no adjustment for discrimination			adjustment for discrimination		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
migration																								
Southern Stayers (ref)																								
Migrators	1.63	1.28	2.07	1.50	1.16	1.94	1.62	1.17	2.25	1.59	1.12	2.24	1.48	1.13	1.94	1.43	1.08	1.90	2.32	1.60	3.35	2.02	1.36	3.00
Northern Stayers	1.98	1.47	2.68	1.75	1.26	2.43	1.94	1.33	2.81	1.69	1.13	2.52	1.65	1.18	2.31	1.48	1.02	2.14	1.98	1.23	3.17	1.73	1.03	2.90
Racial Discrimination																								
everyday discrimination score				1.04	1.02	1.05				1.03	1.01	1.05				1.03	1.02	1.04				1.04	1.02	1.05
major lifetime discrimination score				1.02	0.99	1.06				1.00	0.95	1.04				1.03	0.99	1.07				1.01	0.97	1.06

All weighted logistic regression models adjusted for demographic (age, sex, marital status) and socioeconomic status (income, education, work status, & parental education) variables

Discussion

This study is one of the first to examine the health outcomes among descendants of Great Migration movers. Using a nationally representative sample of African Americans in 2001-2003, I found that descendants of migrators and Northern stayers had higher odds of any lifetime mental health disorders as well as higher odds of mood, anxiety, and substance use disorders compared to Southern stayers despite having higher lifetime socioeconomic status. I also found that children of migrators and Northern stayers experienced higher degrees of self-reported racial discrimination and that discrimination may have partially explained the relationship between migration status and mental health outcomes.

These findings contribute to the budding research on the health outcomes linked to the Great Migration. Previous research has found that moving out of the South may have been harmful for first-generation African American migrators in all-cause mortality and infant mortality (Black et al., 2015; Eriksson & Niemesh, 2016). This paper extends on these findings. To my knowledge, this is the first study to examine any health outcomes among the descendants of migrators. Like the past studies, I also found harmful associations between migration to the North and health outcomes. Additionally, the results in this study showed some similarities to literature documenting the mental health of US children of international immigrants. There is a consistent pattern among US Black Caribbean, Latinx, and Asian immigrants showing that second generation immigrants have higher risks of mental health disorders compared to recently arrived immigrants (Alegria et al., 2007; Breslau et al., 2009; Takeuchi et al., 2007; D. R. Williams et al., 2007). One of the potential drivers might be the exposure to racial discrimination

in their receiving contexts. Everyday discrimination has been more highly reported in second generation compared to first generation Black Caribbean and Latinx immigrants (Pérez et al., 2008; Taylor et al., 2019), which might heighten their risks of mental health disorders.

There are several possibilities to explain the findings of worsened mental health outcomes among descendants of migrators compared to descendants of Southern stayers. Moving may itself be stressful for families. It may disrupt employment, schooling, routines, and participation in social organizations. Relocating may rupture social support systems (Fussell & Lowe, 2014). African Americans in the NSAL who reported lower social support have been shown to have higher odds of reporting depression in the past year compared to those with high social support (Shim et al., 2012). It is possible that fractured social support systems caused from migration may have elevated the risks of having a lifetime mental health disorder in this study population.

Yet, the higher mental health disorder prevalence among both children of migrators *and* Northern stayers, who have not migrated, may suggest that the risks may have more to do with the places where they resided. Recent research has shown that the Great Migration destination later became places with some of the poorest opportunity (Boustan, 2016; Derenoncourt, 2022; Tabellini, 2019). Derenoncourt (2022) found that destination cities were linked with low upward mobility for Black Americans. Specifically, Black children who grew up in more popular receiving areas during the 1980s had reduced earnings and education as adults compared to children growing up in less popular areas outside the South. The mechanisms for these deteriorating city conditions may be municipal policies and practices that may have represented the reaction to a changing racial identity. For example, Great Migration cities had higher rates of Black incarceration, higher police spending, and greater degrees of racial segregation in schools

(Derenoncourt, 2022). These backlash responses may partially explain my findings. Lifetime socioeconomic status, racial discrimination, and neighborhood disadvantage have been documented risk factors for mental health disorders among African Americans in the NSAL (Chae et al., 2011; Hastings & Snowden, 2019; Hudson et al., 2013). Although I was unable to identify participants' residential cities, it is possible that children of migrators and Northern stayers in this study experienced these chronic stressors that could have harmed their mental health.

Lastly, the higher odds ratios of lifetime mental health disorders among children of migrators and Northern stayers may suggest poor coping to stressors in their receiving environment. Particularly, in response to discrimination, African Americans in the NSAL have been shown to practice high-effort coping defined as a sustained, persistent, and problem-focused strategy to control a stressful situation (Hudson et al., 2016). This is also known as John Henryism based on folklore about an African American steel driver who won a race against a steam-powered machine, but costing his life in the process (James, 1994). John Henyrism can take the form of working longer hours, making personal sacrifices, and forgoing time off to achieve upward social mobility (Hudson, 2016). However, it may have mental and physical health consequences (Angner et al., 2011; Dressler et al., 1998; Hudson et al., 2016; James et al., 2006). A study of 2,137 African Americans in the NSAL Reinterview showed that John Henryism increased the risk of depression (Hudson et al., 2016). In this study, it is possible that children of migrators and Northern stayers experienced John Henryism and that it contributed to their higher odds of mental health disorders. No study to my knowledge has examined this among African American internal migrators, but this research may potentially explain the results from this study.

There are some limitations worth noting while interpreting these study results. The cross-sectional design inhibited me from assessing the temporal order of migration, discrimination, and mental health. This study would benefit from future longitudinal research. A longitudinal design would facilitate causal mediation analyses to measure the indirect impact of migrant discrimination on mental health (Valeri & Vanderweele, 2013). Additionally, I did not consider the role of reverse migration. Reverse migration from the North to the South occurred among migrators and children of migrators beginning in the 1980s. It was spurred partially by the economic growth of Sunbelt cities, like Atlanta, and migrators' disillusionment of upward mobility in the North (Tolnay, 2003). However, reverse migrators were not studied because of their low sample size in the NSAL and possibility of positive social, economic, and health bias in this group. Lastly, I did not calculate prevalence ratios which may have been more appropriate for the common outcomes in this study. Odds ratio produced from the logistic regression models may be slight overestimates compared to prevalence ratios produced in log-binomial regression models (Knol et al., 2012).

Nevertheless, this study has notable strengths. One unique study strength is the national representation of African Americans in the NSAL. Unlike other national health surveys, the oversampling of African Americans allowed me to examine differences among US internal migration groups. The NSAL study period, 2001-2003, is also ideal to study outcomes among children of migrators, Northern stayers, and Southern stayers. With an average participant age of around 43 years, it was probable that familial moves occurred during the latter half of the Great Migration between 1940 to 1980 (W. J. Collins, 2021; Gregory, 2005). Lastly, I showed the potential for using the NSAL to explore the health outcomes of the Great Migration. This is the first study to my knowledge that uses the NSAL in this topic area. The findings encourage

research on other mechanisms that may explain the study results. Some potential avenues include the protective role of social support and religious practices as well as the role of John Henryism as a risk factor for mental health disorders (Cross et al., 2018; Hudson et al., 2016; M. T. Williams et al., 2018).

Overall, this study demonstrated that the Great Migration may have important implications for the mental health of African Americans. I found that migration out of the South was linked to worsened mental health outcomes among this sample. The greater reporting of discrimination among children of migrators and Northern stayers raises the possibility that the receiving environment outside of the South might explain the higher prevalence of lifetime mental health disorders. In general, there is a sizable gap in research on the health outcomes of people of the Great Migration. This is noteworthy given its significance to African American history and the rapid demographic changes to the African American population during the 20th century (W. J. Collins, 2021; Gregory, 2005; Tolnay, 2003). I demonstrate the potential for using the NSAL to further research on this topic. This study may aid in future scholarship that will continue uncovering the health impacts of the Great Migration.

Conclusion

Throughout this dissertation, I showed the multiple ways that the Great Migration was associated with birth and mental health outcomes and the potential stressors in the receiving environment that may have been linked to migrators' health. In Chapter 1, I quantified the relationship between migration and low birth weight. While migrators were positively selected on socioeconomic status, they did not demonstrate a clear health advantage in low birth weight. After using matching to adjust for socioeconomic differences, I used logistic regression to show that migrators' moves out of the South showed no differences in the odds of low birth weight compared to Southern non-migrators born between 1950 and 1969. Despite moving to higher socioeconomic areas, the results suggested that migrators did not experience gains in infant low birth weight. In Chapter 2, I examined aspects of the socioeconomic environment that may have been linked with the low birth weight outcomes of migrators. Using a multilevel logistic regression where mothers were nested within their destination counties, I showed that concentrated disadvantage and race-based segregation were not associated with the odds of low birth weight among migrating mothers delivering between 1973 and 1980. Finally in Chapter 3, I studied the relationship between parental migration history and the odds of mental health disorders among children of migrators. I showed that children of migrators and Northern non-migrators both had higher odds of lifetime mental health disorders relative to descendants of Southern non-migrators. My results also suggested that self-reported racial discrimination might be one explanation for the elevated rates of poor mental health well-being.

When interpreting the results of the three analyses in this dissertation, there are a few limitations to keep in mind. First, the largest limitation was the cross-sectional design among the US birth records and the National Survey of American Life. This limited my ability to compare individual health outcomes before and after moving so that I could better isolate the health effect of migration. The cross-sectional designs also hampered examining any longitudinal relationship, particularly between migration, discrimination, and health. It reduced my capability of performing more rigorous causal mediation to determine the role of post-migration adversity on health outcomes. Second, I was limited by the observed variables captured in the data sets. This was particularly true for the US birth records. While large in sample size, the birth records did not capture pre-migration health status or early socioeconomic status, which are factors that may confound the relationship between migration and health. Lastly, I could not account for the individuals' age of migration. Participants' age of migration may be an important consideration. Those moving earlier may have been more likely to benefit from higher economic environments starting at younger ages. One the other hand, those moving at earlier ages may have had longer exposures to potential adversities that came after migration. Regardless, knowing the age when Southerners migrated would have brought more nuance to our understanding on the health outcomes of Great Migration movers.

Even with these limitations, this research offers several strengths. Our data sets were nationally-representative. Migrators moved across US cities—from Oakland to Boston— and the Great Migration altered the demography of virtually every major city outside the South in the 20th century (Tolnay, 2003). Our data was generalized to reflect this geographic span. The US birth records enumerated the universe of births and recorded mothers' county of residence, while the National Survey of American Life used a national probability sampling of African

Americans. Additionally, I used rigorous methods that controlled for important confounding. Migrators and non-migrators differed in notable ways as migrators have been shown to have higher education and incomes compared to Southern non-migrators (Eriksson & Niemesh, 2016; Tolnay, 2003). Accounting for these important differences enhanced the causal inference among my study findings.

The research produced from this dissertation contribute to literature documenting the health outcomes associated with the Great Migration. I build on prior research by examining low birth weight, the potential post-migration adversity that may be associated with migrators' health, and the health outcomes of the subsequent generation. There are two important implications from my research. First, the economic gains associated with moving out of the US South during the Great Migration may not have been enough for migrators to confer benefits in infant health and mental health. Second, although migrating families may have experienced upward economic mobility compared to Southern non-migrators, they also may have experienced increased stressors like racial discrimination. These post-migration stressors may be important mechanisms to explain why migrators did not have better health outcomes.

While this dissertation sheds some light on this topic, there are large research gaps remaining about the Great Migration and the health outcomes of migrators. The often-unexpected results in this dissertation may yield even more questions than answers. However, throughout this dissertation, I observed that rich potential to perform this historical research. In this dissertation, I used the US birth records and the National Survey of American Life. Both these datasets have been available for at least two decades, yet they were sparsely tapped to study the Great Migration. Other researchers have used data from Medicare, linked US Census and death certificates, and the Health and Retirement Study to examine this topic (Eriksson &

Niemesh, 2016; Glymour et al., 2009; Gregory, 2005; Zhang et al., 2016). Yet, even with this diverse data availability, there is only a handful of past research documenting this topic. The data to examine the Great Migration exists, yet many questions have yet to be asked. It is my ultimate hope that the Great Migration is increasingly recognized both in public health and as an important chapter in our shared American history.

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Appendix

Chapter 1 Moving to Opportunity? Low Birth Weight Outcomes Among Southern-born African American Mothers during the Great Migration

Appendix Table 1.1: Matched and Unmatched Sample Sizes

	matched		unmatched	
	n	%	n	%
1950-1954				
Southern Stayers	54140	89.5%	6351	10.5%
Out-of-South Migrators	22045	89.2%	2671	10.8%
Southern Stayers	48077	79.5%	12414	20.5%
Internal Southern Migrators	10504	87.7%	1478	12.3%
1955-1959				
Southern Stayers	203454	95.2%	10157	4.8%
Out-of-South Migrators	47340	94.7%	2675	5.3%
Southern Stayers	194016	90.8%	19595	9.2%
Internal Southern Migrators	28597	93.1%	2115	6.9%
1960-1964				
Southern Stayers	345179	97.0%	10765	3.0%
Out-of-South Migrators	67375	97.5%	1719	2.5%
Southern Stayers	337850	94.9%	18094	5.1%
Internal Southern Migrators	44533	96.5%	1617	3.5%
1965-1969				
Southern Stayers	346197	97.4%	9204	2.6%
Out-of-South Migrators	54103	98.6%	752	1.4%
Southern Stayers	342936	96.5%	12465	3.5%
Internal Southern Migrators	43179	98.3%	732	1.7%

Appendix Table 1.2: Mean Difference Between Migrators and Southern Stayers After Coarsened Exact Matching

	Out-of-South Migrators				Internal Southern Migrators			
	1950-1954	1955-1959	1960-1964	1965-1969	1950-1954	1955-1959	1960-1964	1965-1969
age (years)	0.03	0.04	0.04	0.03	-0.05	-0.02	0.03	0.04
married (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
maternal education (years)	0.02	0.02	0.02	0.01	0.02	0.02	0.00	0.00
prenatal care in first trimester (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ever had fetal death (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
birth year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
mother's state of birth								
AL (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FL (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GA (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KY (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LA (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OK (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SC (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TN (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TX (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VA (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WV (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix Table 1.3: Odds Ratios of Low Birth Weight after CEM adjusting for Health Risk Factors

	1950-54				
	N	**OR**	**95% CI**		**p**
Out-of-South Migrators	1928	0.98	0.94	1.02	0.318
Internal Southern Migrators	1591	0.97	0.93	1.01	0.091
	1955-59				
	N	**OR**	**95% CI**		**p**
Out-of-South Migrators	14632	1.00	0.99	1.02	0.763
Internal Southern Migrators	13587	1.00	0.99	1.01	0.977
	1960-64				
	N	**OR**	**95% CI**		**p**
Out-of-South Migrators	54928	0.99	0.98	1.00	0.018
Internal Southern Migrators	57222	0.99	0.98	1.00	0.018
	1965-69				
	N	**OR**	**95% CI**		**p**
Out-of-South Migrators	122257	0.99	0.98	1.00	0.003
Internal Southern Migrators	128471	0.99	0.98	0.99	<0.001

All models adjust for mother's state of birth, marital status, age, education, birth year, receiving prenatal care in the first trimester, and having a past fetal death.

* Health risk factors are experiencing at least one medical risk factor during pregnancy and using substances during pregnancy (see methods for definition)

Chapter 2 County-Level Disadvantage and Low Birth Weight Among African Americans of The Great Migration

Appendix Table 2.1: Mean and Distribution of 1970 County-Level Disadvantage Indicators (194 counties)

	mean	min	max	IQR
Black male HS graduation rate	0.64	0.15	1.00	0.09
Black poverty rate	0.22	0.00	0.78	0.07
Black-White HS male graduate rate	0.78	0.27	1.52	0.11
Black- White poverty rate	3.58	0.00	6.11	1.51
ICE	0.20	-0.10	0.54	0.08

Appendix Table 2.2: County Variability in Odds of LBW Among States Reporting on Marital Status (72363 Mothers in 129 Counties)

Model	Variance	SD	ICC
unadjusted for marital status	0.0038	0.0616	0.001
adjusted for marital status	0.0041	0.0639	0.001

All models adjusted for education, age, marriage, state of origin, past fetal death, and prenatal care

Appendix Table 2.3: Descriptive Statistics of Preterm Birth by County-Level Disadvantage (194 counties)

	PTB %	p
Black high school graduation rate		
Q1 [0.69-1.00] (best-off)	1348 (9.0%)	0.01
Q2 [0.64-0.68]	6136 (12.2%)	
Q3 [0.59-0.63]	7965 (11.8%)	
Q4 [0.15-0.58]	2235 (10.3%)	
Black Poverty		
Q1 [0.00-0.18] (best-off)	1882 (9.9%)	0.06
Q2 [0.18-0.21]	10478 (11.7%)	
Q3 [0.21-0.24]	4194 (12.1%)	
Q4 [0.25-0.78]	1130 (10.6%)	
ICE race and income segregation		
Q1 [0.24-0.54] (best-off)	1999 (9.4%)	<0.001
Q2 [0.19-0.23]	4435 (11.5%)	
Q3 [0.15-0.18]	5235 (11.5%)	
Q4 [-0.10-0.14]	6015 (12.3%)	

Appendix Table 2.4: Odds Ratio of Preterm Birth by County-Level Disadvantage (i=115959 and j=194 counties)

	OR	**95% CI**	
Black male HS graduation rate			
Q1	ref		
Q2	1.01	0.94	1.09
Q3	1.02	0.95	1.09
Q4 (worst-off)	1.00	0.92	1.08
Black poverty rate			
Q1	ref		
Q2	1.00	0.95	1.05
Q3	1.02	0.97	1.07
Q4 (worst-off)	0.97	0.92	1.02
ICE			
Q1	ref		
Q2	1.05	0.99	1.12
Q3	1.03	0.97	1.09
Q4 (worst-off)	1.05	0.99	1.12

Appendix Table 2.5: Odds Ratio of Low Birth Weight by County Disadvantage among States with Complete Reporting on Marital Status (i=72363, j=129 counties)

county traits	odds ratio	95%CI	
Black male HS graduation rate			
Q1	ref		
Q2	1.05	0.94	1.17
Q3	1.10	0.97	1.25
Q4 (worst-off)	1.07	0.94	1.23
Black poverty rate			
Q1	ref		
Q2	0.98	0.88	1.10
Q3	1.00	0.92	1.08
Q4 (worst-off)	0.93	0.84	1.03
ICE			
Q1	ref		
Q2	0.99	0.92	1.07
Q3	1.05	0.97	1.14
Q4 (worst-off)	1.01	0.91	1.11

Models adjust for education, age, state of origin, past fetal death, and prenatal care