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Characteristics Associated with Downward Residential Mobility Among Birthing Persons in California.

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Short communication

Characteristics associated with downward residential mobility among birthing persons in California

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ABSTRACT

Background: Substantial research documents health consequences of neighborhood disadvantage. Patterns of residential mobility that differ by race/ethnicity and socioeconomic status (SES) may sort non-Hispanic (NH) Black and low-SES families into disadvantaged neighborhoods. In this study, we leverage a sibling-linked dataset to track residential mobility among birthing persons between pregnancies and investigate baseline characteristics associated with downward mobility, including race/ethnicity, SES, and pre-existing health conditions.
Methods: We used a probabilistic linkage strategy to identify births to the same person between 2007 and 2015 (n = 624,222) and categorized downward residential mobility by quartile-level increases in neighborhood disadvantage. We defined strong downward mobility as a move from a neighborhood with very low (quartile 1) to very high (quartile 4) disadvantage and estimated the logit (i.e., log-odds) of strong downward mobility as a function of racial/ethnic, sociodemographic, and health characteristics of the birthing person and their first birth. We further explored the role of neighborhood housing affordability by examining changes in affordability from first to second birth by race/ethnicity.
Results: NH Black birthing persons show an over three-fold increased odds of strong downward mobility relative to NH white birthing persons (OR = 3.34, CI: 2.91, 3.84). To a lesser extent, Hispanic race/ethnicity, WIC receipt, low educational attainment, obesity, and infant preterm birth (PTB) also predict strong downward mobility. Examination of changes in neighborhood affordability indicate that over half of NH Black birthing persons move to a more affordable neighborhood, compared to less than a quarter of NH white birthing persons, before the birth of their second child. Results remain consistent across outcomes, measures of neighborhood SES, and modified log-Poisson models.
Conclusion: We find an elevated risk of strong downward mobility among NH Black and low-SES birthing persons. Future research may identify other factors (e.g., housing affordability) that generate downward residential mobility to identify interventions that promote neighborhood equity.

Disadvantaged neighborhoods exhibit relatively high levels of poverty, unemployment, and dilapidated housing, as well as reduced access to advanced educational opportunities (Kane et al., 2017). Extensive literature reports an association between residence in a disadvantaged neighborhood and adverse health (Metcalfe et al., 2011). The literature also finds that residential mobility varies substantially by race/ethnicity. A key study from the 1990s finds that Black families in particular move from 'low' to 'high' disadvantage neighborhoods (South and Crowder, 1997). Taken together, these circumstances indicate that downward residential mobility, especially among Black persons, may contribute to the persistence of well-documented racial/ethnic disparities in health (Darlington-Pollock et al., 2016; Mehra et al., 2017; Pearl et al., 2018; Williams and Mohammed, 2013).

Childbearing represents a dynamic period of residential mobility. Nearly half (44.8%) of birthing persons in California move between pregnancies (Bruckner et al., 2019). The birth of a child may stimulate a desire to find a larger residence or move closer to family and other social support structures (McDonald and Richards, 2008). Alternatively, financial challenges associated with providing for a new infant may compel families to move into more affordable residences and

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neighborhoods. The public health literature also reports 'health selection' such that elevated morbidity of a birthing person and/or their newborn precedes a downward 'drift' into disadvantaged neighborhoods (Goldman, 1994). These factors represent only a subset of the many individual, community, and structural influences on residential mobility.

We take advantage of a unique longitudinal dataset on over 600,000 birthing persons in California to evaluate whether individual-level racial/ethnic, socioeconomic, and health factors play a role in downward residential mobility. We focus on birthing persons for two reasons. First, as described above, the childbearing years correspond with considerable residential mobility. Second, on a practical note, the California birth file collects residential information on birthing persons at the time of each birth. This file permits identification of *changes in residence* for persons who had at least two children in California. Our analysis also provides an important update to previous work that examines whether Black families in particular show downward residential mobility (Pearl et al., 2018; Sampson, 2012; South and Crowder, 1997).

1. Methods

1.1. Variables and data

We retrieved birth data from the California Department of Public Health (CDPH) birth files for years 2007–2015. Importantly, the birth file contains the birthing person's home address at the time of birth, which permits linkage of neighborhood socioeconomic variables (described below). CDPH records the race and ethnicity of the birthing person, which we used to classify into the following categories, consistent with the literature: non-Hispanic (NH) Black, NH white, Hispanic, Asian, and other. The State of California and the University of California, Irvine approved the study (IRB protocol approval #13-06-1251 and 2013–9716, respectively).

1.2. Sibling linkage strategy

We used a probabilistic linkage strategy to identify consecutive singleton live births to the same person from January 2007 through December 2015. These births include only those that occurred during the study period, and do not necessarily correspond with the birthing person's first birth. We, consistent with prior literature (Bruckner et al., 2019; Gailey et al., 2021; Putnam-Hornstein et al., 2013), performed record linkages using Link Plus (version 3.0), an open-source probabilistic record linkage program developed at the Division of Cancer Prevention within the Centers for Disease Control and Prevention. We used Link Plus to pair birthing persons with the same date of birth and assigned a match score to comparison-pairs based on the similarity of maternal first and last names and paternal date of birth (see details in Appendix). Pairs with sufficiently high match scores were classified as 'matches.' We then geocoded residential addresses of sibling pairs using ArcGIS software version 10.4 (Redlands, California).

1.3. Neighborhood socioeconomic context

We used neighborhood disadvantage, measured at the census tract level, to derive our key dependent variable of residential mobility (King et al., 2011). Census tracts, a proxy for neighborhoods, represent relatively permanent geographical subdivisions of a county. In the US, census tracts generally correspond to a buffer with approximately a 0.8-mile radius and contain 4000 residents. Census tracts in California are, on average, slightly smaller (0.5-mile radius) and more populous (4500 residents) than census tracts in the entire US (US Census Bureau, 2010). The disadvantage index consists of six variables retrieved from the 2010 US Decennial Census: the proportion of households with income <$15,000, the proportion of households with income ≥$50,000 (reverse coded), the proportion of families in poverty (e.g., <$22,314 for a family of four in 2010), the proportion of households receiving public assistance (e.g., Supplemental Nutrition Program [SNAP]), the total unemployment rate, and the proportion of vacant housing units (Cronbach's alpha = 0.92). We standardized each variable and performed exploratory factor analysis to arrive at a composite indicator of the neighborhood disadvantage index. We then categorized neighborhood disadvantage into quartiles, where quartile 4 (Q4) represents the most disadvantaged quartile while Q1 represents the least disadvantaged quartile. Additionally, we constructed a neighborhood deprivation index (NDI; Messer et al., 2006), categorized into quartiles, using similar methods for use in sensitivity analyses. We describe NDI in further detail in the Appendix.

1.4. Residential mobility

Based on the sibling linkage and geocoding of residential addresses for each of the consecutive live births, we categorized birthing persons by the level of mobility away from, or into, disadvantage (or deprivation). For this short communication, downward mobility serves as the key dependent variable. We coded downward mobility such that moving from a very low to a very high disadvantage neighborhood (i.e., from Q1 to Q4) constitutes strong downward mobility, a move from Q2 to Q4 moderate downward mobility, and a move of one quartile (e.g., Q2 to Q3) low downward mobility.

1.5. Analysis

We estimated the logit (i.e., log-odds) of strong downward mobility (where '1' = strong downward mobility, '0' = no mobility or other level of downward mobility) among birthing persons who originated in very low (Q1) disadvantage neighborhoods (n = 123,156) as a function of race/ethnicity, sociodemographic variables, and health aspects of the birthing person and their first birth. The health variables available in the California birth file include pre-pregnancy body mass index (BMI), which we used to classify obesity (i.e., '1' if BMI ≥ 30; '0' otherwise). In addition, infant health characteristics include PTB (i.e., delivery <37 weeks of gestational age) and small-for-gestational age (SGA, i.e., <10^{th} percentile in weight for that gestational week of birth). We included these infant health variables because (1) they may capture unmeasured (but correlated) aspects of the birthing person's health that precede downward 'health selection,' and (2) these adverse birth outcomes may induce additional financial demands that strain families' resources. We also included Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) status – a federally funded program that provides supplemental nutritious foods and nutrition education to low-income pregnant and new birthing persons – as an indicator of SES, as well as education level (categorized as less than a high school diploma, high school diploma, some college, 4-year college degree or higher, other/not reported) and birthing person's age (categorized as <20, 20–24, 25–29, 30–34, 35–39, 40 years) given that life stage could affect the likelihood of residential mobility.

Since persons who exhibit *strong* downward mobility must, by definition, live in very low disadvantage neighborhoods (Q1) at the time of first birth, we also used ordered logistic regression methods to assess relations of race/ethnicity, sociodemographic, and health variables to a four-category measure of downward mobility, where values of '1', '2', and '3' represent low, moderate, and strong downward mobility, respectively, and all other levels of mobility (i.e., no mobility or any level of upward mobility) are categorized as non-downwardly mobile ('0'). This analysis provides a larger eligible sample of birthing persons (n = 441,625) as it excludes only those who live in very high disadvantage (Q4) neighborhoods at first birth (and therefore cannot exhibit subsequent quartile moves of downward mobility).

We conducted additional sensitivity tests to assess the robustness of our results. First, we repeated analyses but categorized birthing persons by the level of residential mobility away from, or into, deprivation

Table 1
Odds ratios (OR)[a] and 95% confidence intervals (CI) predicting the probability of (Model 1) strong downward mobility, and (Model 2) any downward mobility, measured by changes in neighborhood disadvantage, as a function of race/ethnicity, sociodemographic, and health characteristics of the birthing person and their first birth.

Characteristic	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Race/ethnicity				
NH white (ref)	–	–	–	–
NH Black	3.34	2.91, 3.84	1.88	1.81, 1.96
Asian	0.95	0.84, 1.07	1.01	0.98, 1.04
Hispanic	1.41	1.29, 1.55	1.03	1.01, 1.06
Other, unknown, or not stated race/ethnicity	1.16	0.89, 1.51	1.08	1.00, 1.16
Insurance				
Private (ref)	–	–	–	–
Public	1.72	1.57, 1.89	1.34	1.30, 1.37
Self-pay or other	1.69	1.46, 1.94	1.35	1.30, 1.40
Parity				
1 birth (ref)	–	–	–	–
2 births	1.20	1.08, 1.33	1.10	1.07, 1.13
3 + births	1.45	1.29, 1.63	1.19	1.16, 1.23
WIC receipt - yes	1.78	1.62, 1.96	1.24	1.21, 1.27
Age at birth				
<20	1.24	1.12, 1.38	1.12	1.09, 1.16
20–24 (ref)	–	–	–	–
25-29	0.62	0.56, 0.68	0.71	0.70, 0.73
30-34	0.35	0.31, 0.40	0.51	0.49, 0.52
35-39	0.31	0.26, 0.37	0.40	0.39, 0.42
≥ 40	0.32	0.19, 0.52	0.37	0.33, 0.42
Education				
Less than HS	1.23	1.11, 1.36	1.07	1.04, 1.10
HS degree (ref)	–	–	–	–
Some college	0.89	0.81, 0.98	0.95	0.92, 0.97
4-year college degree or more	0.36	0.32, 0.41	0.64	0.62, 0.66
Unknown or not stated education	0.73	0.58, 0.90	0.83	0.79, 0.88
Obesity at time 1	1.17	1.06, 1.28	1.07	1.04, 1.09
PTB at time 1	1.26	1.12, 1.43	1.08	1.05, 1.11
SGA at time 1	0.98	0.89, 1.09	1.00	0.98, 1.03

Abbreviations: CI, confidence interval; HS, high school; NH, non-Hispanic; OR, odds ratio; PTB, preterm birth; SGA, small-for-gestational age; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

[a] All odds ratios in the table are adjusted for all other variables in the model.

(rather than disadvantage). Next, given that odds ratios (OR) may overestimate the true effect of an exposure on a common outcome, we repeated analyses but used a modified log-Poisson model and robust standard errors to estimate risk ratios (RR) of associations between downward mobility and the birthing person's race/ethnicity, sociodemographic, and health characteristics (Gallis and Turner, 2020). Additionally, we repeated primary analyses but specified as outcomes (a) measures of residential mobility (i.e., strong downward mobility, any downward mobility) constructed from quintiles, rather than quartiles, of neighborhood disadvantage, and (b) change in neighborhood disadvantage as a continuous metric.

Lastly, we retrieved census tract-level data on neighborhood housing affordability from The Center for Neighborhood Technology (available at https://htaindex.cnt.org/download/) to explore what role, if any, housing affordability may play in the racial-ethnic patterning of residential mobility. We used the standard housing policy threshold of 30% to define neighborhoods as 'affordable' (i.e., if the cost of housing is 30% or less of household income based on regional averages) and examined whether the proportion of persons who move out of unaffordable neighborhoods and into affordable neighborhoods varies by race/ethnicity (Acevedo-Garcia et al., 2016). We conducted all analyses in SAS 9.4 (Cary, North Carolina).

2. Results

The linkage process produced an analytic sample of 624,222 birthing persons in California whose residences were tracked across two births. These persons include a broad socioeconomic spectrum and a racially/ethnically diverse population (see Appendix Table S1). Between the first and second birth (on average, 1.5 years), 46.2% of birthing persons in our analytic sample moved. Among persons initially living in a neighborhood characterized as very low disadvantage (n = 123,156), 56.2% (n = 25,475) of movers show some level of downward mobility, and 9.1% (n = 4126) show strong downward mobility (i.e., from lowest to highest quartile of neighborhood disadvantage).

As shown in Table 1 (Model 1), NH Black birthing persons exhibit an over three-fold increased odds of strong downward mobility relative to NH whites (OR = 3.34, CI: 2.91, 3.84). Hispanics also show an increased odds of strong downward mobility (OR = 1.41, CI: 1.29, 1.55), but the magnitude of this result is much smaller than that for NH Black persons. Individual-level variables at first birth which capture low SES also precede an increased odds of strong downward mobility. These SES variables include receipt of public health insurance, WIC federal benefits, and education less than a high school diploma. In addition, obesity and PTB precede strong downward mobility (Model 1).

Results of the ordered logit model estimating the probability of downward mobility using a four-category response variable, also presented in Table 1 (Model 2), indicate that NH Black race/ethnicity varies with an elevated risk of *any* downward mobility (OR = 1.88, CI: 1.81, 1.96) relative to NH white race/ethnicity. As with strong downward mobility, Hispanic race/ethnicity, public health insurance, WIC federal benefits, less than a high school education, obesity, and PTB also predict downward moves, but to a lesser extent than does NH Black race/ethnicity.

Sensitivity analyses in which downward residential mobility captures an increase in neighborhood deprivation yield consistent results

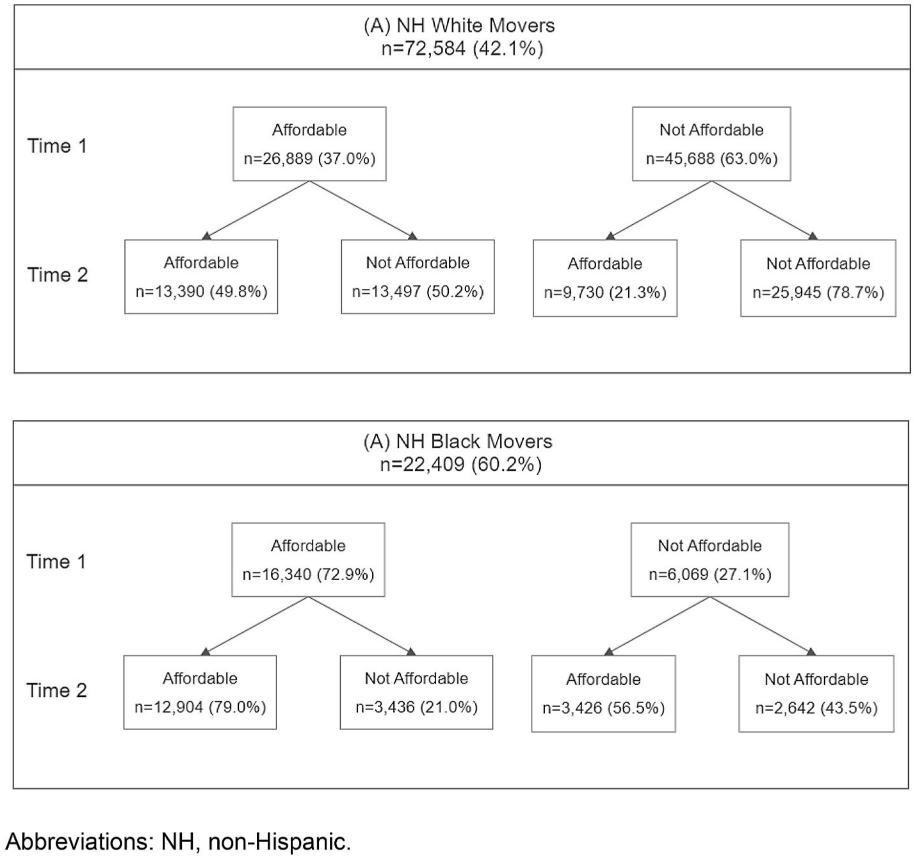

Fig. 1. Change in neighborhood affordability from time 1 (first birth) to time 2 (second birth) among (A) NH white movers (42.1% of all NH white birthing persons) and (B) NH Black movers (60.2% of all NH Black birthing persons) in California, 2007–2015.

(Table S2). Results of the robustness check using a modified log-Poisson approach cohere with analyses estimating the log-odds of downward mobility, although the strength of associations is somewhat attenuated (Table S3). Sensitivity tests that specify outcomes of strong downward mobility (Table S4, Model 6) and any level of downward mobility (Table S4, Model 7) constructed from quintiles of neighborhood disadvantage, as well as continuous change in neighborhood disadvantage (Table S5, Model 8), also appear consistent with our original results.

Based on results demonstrating a particularly high risk of downward mobility for NH Black birthing persons, we focused our exploration of neighborhood housing affordability on Black-white differences. Neighborhood housing affordability shows a strong inverse correlation with neighborhood disadvantage ($r = -0.68$) and deprivation ($r = -0.71$). Examination of changes in neighborhood housing affordability from first to second birth shows substantial heterogeneity in patterns of residential mobility for NH white and NH Black birthing persons (Fig. 1). A relatively small percentage of NH Black persons (27.1%) live in neighborhoods classified as 'unaffordable' at first birth, compared to a majority of NH white persons (63.0%). Among NH Black birthing persons living in unaffordable neighborhoods, over half (56.5%) moved to affordable neighborhoods between births, whereas less than a quarter (21.3%) of NH white birthing persons made such moves.

3. Discussion

Our longitudinal analysis of downward residential mobility among more than 600,000 birthing persons in California reveals several findings. First, NH Black persons in particular show an alarmingly elevated risk of strong downward residential mobility relative to NH white persons. This finding extends previous work on the uniquely downwardly mobile circumstance of NH Black families living in Baltimore in the late 20th century (McDonald and Richards, 2008) to NH Black birthing persons of childbearing age in California between 2007 and 2015. Second, less healthy persons (as measured by pre-pregnancy obesity) and those with previous adverse birth outcomes show an increased likelihood of strong downward mobility. Third, consistent with earlier work, individual socioeconomic disadvantage increases the risk of strong downward mobility (South and Crowder, 1997).

Possible explanations for downward residential mobility among NH Black birthing persons include structural constraints, which refer to imbalances between the costs of living in a neighborhood and the economic resources available to families (Sharkey, 2012). Our findings suggest that constraints related to housing affordability (measured at the neighborhood level) may differ for Black compared to white persons. Among NH Black residents living in neighborhoods characterized as unaffordable at the time of their first birth, over half moved into affordable neighborhoods before the birth of a second child. By contrast, less than a quarter of NH whites moved from unaffordable to affordable neighborhoods between births. The birth of a child may force families with limited economic resources to make tradeoffs between housing costs and costs associated with providing for a new infant. As a result, growing NH Black families may land in more affordable neighborhoods but with poorer access to high-quality schooling and health-promoting resources (Acevedo-Garcia et al., 2016).

Historical and contemporary housing discrimination and cycles of racial residential segregation may further constrain residential options. These processes influence the 'mental perceptions' people have about which neighborhoods are available to them (Sharkey, 2012). Black and white residents have different neighborhood 'blind spots', such that Black persons are more familiar with predominantly Black neighborhoods that have been systematically disinvested in, while white persons have more familiarity with neighborhoods that tend to provide more resources (Krysan and Bader, 2009). This socially constructed gap – the result of racialized social systems – may partially explain our results on the uniquely downwardly mobile circumstance of NH Black birthing persons.

Our study design fills an important methodological gap in that it reduces confounding due to unmeasured characteristics of birthing persons that may bias cross-sectional work on neighborhood disadvantage. The sibling comparison design 'absorbs' time-invariant socio-demographic characteristics that may influence a birthing person's place of residence across births. However, given that our study design relies on birthing persons with at least two children, limitations of our study include that results may not generalize to the broader population of birthing persons. As indicated by the parity results (Table 1), greater parity corresponds with an increased risk of strong downward mobility. To the extent that birthing persons with only one child appear relatively less likely to move to poor-resourced neighborhoods, our reported associations may overestimate the prevalence of downward mobility. In addition, given previous longitudinal research (South and Crowder, 1997), our study sample likely overestimates the prevalence of low SES (as approximated by WIC status, public health insurance coverage, and low educational attainment) compared to that of all birthing persons in California.

To advance knowledge on this topic, we encourage additional studies, particularly on factors generating residential mobility among NH Black families, that can overcome some of the limitations of our analysis. Information on marriage/cohabitation and the extent of financial support provided by fathers may further enrich our understanding of mobility patterns among NH Black birthing persons. In addition, employment and extended family network information like that collected in the Moving to Opportunity study in Chicago (Chetty et al., 2016), as well as data on predatory lending practices and housing instability, may illuminate potential causes of downward mobility (Matoba et al., 2019).

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available to guarantee the anonymity of individuals.

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Credit author statement

Samantha Gailey: Conceptualization, Methodology, Formal analysis, Writing – original draft; Rebekah Israel Cross: Conceptualization, Writing – original draft; Lynne C. Messer: Conceptualization, Writing – review & editing; Tim A. Bruckner: Conceptualization, Methodology, Writing – original draft, Supervision.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2021.113962.

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