HHS Public Access

Author manuscript

Health Place. Author manuscript; available in PMC 2023 August 08.

Published in final edited form as:

Health Place. 2017 July ; 46: 13–20. doi:10.1016/j.healthplace.2017.04.005.

Residential segregation, political representation, and preterm birth among U.S.- and foreign-born Black women in the U.S. 2008–2010

Claire Margerison-Zilko[a,*], **Maria Perez-Patron**[b], **Catherine Cubbin**[c,d]

[a]Department of Epidemiology and Biostatistics, Michigan State University, 909 Fee Hall, Rm 601B, East Lansing, MI 48823, United States

[b]Department of Epidemiology and Biostatistics, School of Public Health, Texas A & M University, 219 University, College Station, TX 77843, United States

[c]School of Social Work, The University of Texas at Austin, 1925 San Jacinto Blvd D3510, Austin, TX 78712, United States

[d]Population Research Center, The University of Texas at Austin, 305 E. 23rd Street Stop G1800, Austin, TX 78712, United States

Abstract

Although racial residential segregation is associated with preterm birth (PTB) among non-Hispanic black (NHB) women in the U.S., prior work suggests that increased black political power arising from segregation may be protective for infant health. We examined associations between residential segregation, black political representation, and preterm birth (PTB) among U.S- and foreign-born NHB women in major U.S. cities using birth certificate data from 2008 to 2010 (n=861,450). Each 10-unit increase in segregation was associated with 3–6% increases in odds of PTB for both U.S.- and foreign-born NHB women. Black political representation was not associated with PTB and did not moderate the association between residential segregation and PTB.

Keywords

Residential segregation; Preterm birth; Political representation; Nativity; Birth certificate

1. Introduction

Preterm birth (PTB) is the leading cause of perinatal mortality in the U.S. and is estimated to cost over $25 billion annually (Behrman and Butler, 2005). Non-Hispanic black (NHB) women are 60% more likely to deliver preterm compared to non-Hispanic white (NHW) women (Martin et al., 2015). This racial disparity has persisted for decades and is not fully explained by individual-level factors, such as access to prenatal care, smoking, alcohol

*Corresponding author. cmargerisonzilko@epi.msu.edu (C. Margerison-Zilko), perez-patron@tamhsc.edu (M. Perez-Patron), ccubbin@austin.utexas.edu (C. Cubbin).

use, age, education, or income (Braveman et al., 2015; Culhane and Goldenberg, 2011; Lhila and Long, 2012), leading researchers to consider the role of broader macrosocial factors contributing to spatial inequalities in residential environments—in particular, racial residential segregation (White and Borrell, 2011).

Residential segregation is defined as the degree to which two or more groups of people (categorized by race, ethnicity, income, or other variables) live separately from one another within an urban environment (Massey and Denton, 1988). In the U.S., blacks have been and remain the most segregated racial/ethnic group. The process of black-white segregation can be traced to the late 19th century freeing of African-American slaves and the subsequent "Great Migration" of blacks from south to north and west (Cutler et al., 1999; Grady, 2006; Wilkerson, 2010), which led to congregation of blacks in particular neighborhoods due to opportunities and social support. From 1940–1970, processes of institutionalized and sanctioned racism—e.g., manipulation of housing markets and concentration of public housing developments—resulted in the consolidation of the urban black "ghetto" (Cutler et al., 1999). Following the Civil Rights Act of 1968, which made discrimination in the sale or rental of housing illegal, segregation in the U.S. has declined slightly but remains high in many cities. In fact, approximately 60% of blacks would need to move to a different census tract in order for whites and blacks to be equally distributed across metropolitan areas in the U.S. (Logan and Stults, 2011).

Historical and current patterns of residential segregation and concentrated poverty shape social and economic conditions for black Americans at the individual, household, and neighborhood levels—conditions which may, in turn, influence health through behavioral, psychosocial, and biological pathways (Kramer and Hogue, 2009; Williams and Collins, 2001). Racial segregation thus represents a spatial manifestation of institutional racism (White and Borrell, 2011) and is considered a fundamental cause of black-white disparities in health in the U.S.

Racial residential segregation may impact pregnancy health—and subsequently, PTB—through several specific pathways. First, segregation limits individuals' opportunities for education and employment and constrains their ability to earn income, accumulate wealth, or gain social mobility (Cutler and Glaeser, 1997; Howell-Moroney, 2005). Women with lower income and education are, in turn, more likely to deliver preterm (Blumenshine et al., 2010) perhaps due to constrained access to medical care, behavior differences, and/or increased psychosocial stress (Adler and Stewart, 2010).

Segregation may also produce neighborhood environments that are unsafe and lack health-promoting resources. Segregated neighborhoods and cities suffer from higher crime levels (O'Flaherty and Sethi, 2007; Peterson and Krivo, 1993) and socioeconomic disadvantage (Massey and Fischer, 2000), both of which are associated with increased risk of PTB (Masi et al., 2007; Messer et al., 2006; O'Campo et al., 2008). Segregated areas offer fewer options for purchasing healthy food (Morland and Filomena, 2007; Zenk et al., 2006), and more options for purchasing alcohol and tobacco (Zenk et al., 2006) compared to less segregated areas, and segregation has been linked with eating fewer fruits and vegetables (Dubowitz et al., 2008), being less physically active (Lopez, 2006), and smoking during pregnancy (Bell

et al., 2007). Segregated areas may face shortages of health care providers, limiting women's ability to access prenatal care or may increase women's exposure to environmental toxins and poor housing quality (Grady and McLafferty, 2007). Segregation may also increase women's perceived levels of discrimination, which has been implicated in risk of PTB for black women (Giurgescu et al., 2011), although some research suggests that higher concentrations of black residents in neighborhoods lowers perceived discrimination (Hunt et al., 2007).

Indeed, research repeatedly shows that living in segregated areas is associated with higher risk of adverse birth outcomes among black women (Anthopolos et al., 2011; Bell et al., 2006; Ellen et al., 2000; Grady, 2006; Walton, 2009), including PTB (Anthopolos et al., 2014; Britton and Shin, 2013; Kramer et al., 2010; Kramer and Hogue, 2008; Osypuk and Acevedo-Garcia, 2008), an association that persists following adjustment for poverty or area measures of socioeconomic status.

Substantial heterogeneity exists in measurement of racial segregation. The proportion of black residents in a census tract has been used as a proxy for segregation, but this measure does not capture important aspects of segregation related to the distribution of individuals within a wider city/region and does not account for the proportion of the overall population that is black (Kramer and Hogue, 2009). Specific measures of segregation often draw on Massey and Denton's seminal work (Massey and Denton, 1988) outlining 5 indices of segregation: evenness/dissimilarity (over- or under-representation of race/ethnic groups in particular areas), exposure (likelihood of encountering members of own or other race/ethnic groups), concentration (physical space occupied by race/ethnic groups), centralization (location of race/ethnic groups relative to an urban core), and clustering (contiguousness of race/ethnic groups). Evidence indicates that an uneven distribution of blacks and whites in an urban area (high dissimilarity) and/or high isolation of blacks from whites are associated with worse birth outcomes (Anthopolos et al., 2011; Bell et al., 2006; Britton and Shin, 2013; Ellen et al., 2000; Kramer et al., 2010; Kramer and Hogue, 2008; Walton, 2009).

Although most research emphasizes the negative impacts of segregation, the "ethnic density hypothesis" argues that living in areas with higher concentrations of one's own race or ethnic group may improve health by enhancing social support, social cohesion, or social capital, by reinforcing healthy behaviors, or by providing material or logistical support (Grady and McLafferty, 2007; Osypuk et al., 2010). Indeed, evidence suggests that higher levels of the clustering dimension of segregation are protective against adverse birth outcomes (Bell et al., 2006; Kramer et al., 2010).

A particularly intriguing hypothesis regarding how black-white segregation may improve health was examined in the early 1990s (LaVeist, 1992, 1993) but has received little empirical attention since then. LaVeist hypothesized—based on the theory that race differences in health status are manifestations of power differentials—that black political power may arise from segregated communities and have a beneficial effect on infant health (LaVeist, 1992). That is, racially segregated communities may be better poised to elect black politicians, organize to effect change, or form partnerships whereby black community

leaders influence public policy. Thus, black political power may reflect or result from black political representation, community organization, and/or social capital.

In LaVeist's empirical work using data from the 1980s, black political power was operationalized by black representation on the city council. Indeed, this measure of political power was greater in more segregated cities and was associated with decreased black infant mortality, net of residential segregation, although political representation did not completely account for racial disparities in infant mortality (LaVeist, 1993). Black political representation may therefore represent an important, but overlooked, factor in the relationship between residential segregation and PTB. Mechanisms by which black political representation may impact perinatal health have not been examined in depth in the literature but may include increased allocation of resources in ways that benefit black constituencies or enhanced accountability of non-discriminatory practices in law enforcement (which may decrease discrimination stress) or city service provision. Thus, we hypothesize that 1) higher black political representation may be associated with lower risk of PTB independent of residential segregation, and 2) black political representation may modify the association between segregation and PTB such that the association between segregation and PTB will be weaker in cities with greater black political representation.

Evidence of the "ethnic density hypothesis" is most frequently noted among immigrant communities. For example, living in areas with a higher proportion of foreign-born residents is associated with reduced probability of low birth weight, especially among women who are themselves foreign-born (Finch et al., 2007)—although other work finds that residential segregation is not strongly associated in either direction with birth outcomes for foreign-born Mexican women (Britton and Shin, 2013; Osypuk et al., 2010). Little empirical work, however, has examined whether associations between racial segregation and birth outcomes differ for foreign-born vs. U.S.-born black women. Researchers hypothesize that foreign-born black women may be less vulnerable to the negative health impacts of living in segregated areas compared to U.S.-born women who have lived their entire lives in these areas, and who may also bear the burden of inter-generational effects of segregation (Geronimus, 1992; Grady and McLafferty, 2007). Discriminatory treatment—one mechanism by which segregation may affect health—has indeed been shown to be less commonly reported by foreign-born, pregnant black women compared to U.S.-born, pregnant black women (Dominguez et al., 2009). Empirically, Grady and McLafferty found that segregation in New York City (NYC) in 2000 was associated with higher rates of low birth weight (LBW) among both U.S.-born and foreign-born NHB women (Grady and McLafferty, 2007). Mason and colleagues also used data from NYC (1995–2003), and found that ethnic concentration was associated with increased PTB for African- and U.S.-born NHB women, but not for Caribbean-born NHB women (Mason et al., 2010). Baker and Hellerstedt report increasing proportions of adverse birth outcomes with increasing racial concentration among both native-and foreign-born black women in the Minneapolis area (Baker and Hellerstedt, 2006). These prior studies were all limited to specific cities, however; no data of which we are aware examines the associations between residential segregation and PTB for both U.S.- and foreign-born NHB women across the entire U.S.

Moreover, no literature examines the relationships between black political representation and birth outcomes among foreign-born NHB women. If segregation does have a protective, or null, association with birth outcomes among foreign-born black women, it stands to reason that black political representation may also be less strongly associated with birth outcomes in this group. That is, the protective aspects of "ethnic density" for immigrants may be less influenced by political representation than by the simple fact of living close to those from the same region of the world.

Major gaps in the literature on the association between black-white residential segregation and PTB include that 1) most analyses are based on data from the early 2000s or before, due to restrictions on obtaining geographically-identified birth data since 2005, 2) no studies have followed up on early evidence that black political representation may improve infant health and 3) no studies have examined differences in the relationships between racial segregation or black political representation and PTB between U.S.- and foreign-born NHB women at the national level. Our study seeks to fill existing gaps with the following objectives.

1. First, we will update prior literature by estimating associations between racial residential segregation and preterm birth (PTB) separately among U.S.- and foreign-born non-Hispanic black (NHB) women using data from all major U.S. cities from 2008 to 2010.

   Hypothesis 1a. *:* Black-white residential segregation will be associated with increased odds of PTB among U.S.-born NHB women.

   Hypothesis 1b. *:* Black-white residential segregation will not be associated with odds of PTB among foreign-born NHB women.

2. Second, we will investigate the role of black political representation as a) a protective factor against PTB and b) a moderator of the association between racial residential segregation and PTB.

   Hypothesis 2a. *:* Higher levels of black political representation will be associated with lower rates of PTB; these associations will be stronger among U.S-born women.

   Hypothesis 2b. *:* The associations between black-white residential segregation and PTB among NHB women will decrease with each increasing unit of black political representation.

2. Data and methods

2.1. Data sources

2.1.1. City level data—Prior studies have measured segregation at levels ranging from the census block group (Anthopolos et al., 2011) to the county (Nyarko and Wehby, 2012). However, cities or metropolitan statistical areas (MSA) better capture information about regional housing and labor markets, which correspond to the conceptualization of racial residential segregation as a process by which individuals and populations are sorted into living environments based on race (Kramer and Hogue, 2009). We chose cities as our unit

of analysis because black political power has been measured in previous research using city council representation of minorities.

Following prior work (LaVeist, 1993), we included only cities with populations of ≥50,000 that were at least 10% NHB based on 2010 U.S. Census data (n=335 cities). We obtained data on residential segregation from the American Communities Project, which uses 2010 US Census data (http://www.s4.brown.edu/us2010/Data/Data.htm). We obtained data on total city population, total NHB population, Census region (Northeast, Southeast, Midwest, or West), total voting age population, total NHB voting age population, % adults > 25 years with a college education, and % households below the federal poverty level from the American Community Survey (ACS) 2007–2011.

Our research team collected data on city-level black political representation between fall 2012 and spring 2013. Based on prior research (LaVeist, 1993), we based this measure on the number of individuals of black race on city councils. (Note: our methods did not allow us to distinguish the Hispanic status of black city councilmembers.) To collect this data, we first inspected city websites, which typically post information of city council members. When the race of a city councilmember could not be determined from the website, we called city clerks to ascertain council members' self-identified race. We obtained complete data on black city council representation for 333 of the 335 cities.

2.1.2. Individual level data—We obtained United States natality data for 2008–2010 from the National Center for Health Statistics (2008– 2010). These include birth certificate data for all live births in the U.S. including mother's self-reported city of residence. Because the city variable is restricted (not publicly available), all analyses were conducted at the Texas Research Data Center. In addition, all sample and cell sizes are rounded to the nearest 10 for reporting purposes to meet the disclosure requirements of NCHS for protected data. The findings and conclusions in this paper are those of the author(s) and do not necessarily represent the views of the Research Data Center, the NCHS, or the Centers for Disease Control and Prevention (CDC).

We were able to link birth data to city data for approximately 280 cities. (The majority of cities that could not be linked were Census Designated Places, which NCHS does not include as cities in their geographic identifiers.) We restricted analyses to singleton births to U.S. residents between the ages of 15 and 44 years old. Our initial sample therefore included 4,868,250 births. Records with missing birth weight or gestational age, with gestational age < 22 or > 44 weeks, or with implausible combinations of birth weight and gestational age (Alexander et al., 1996) were set to missing and excluded from the analysis (n=63,410). We further excluded births missing maternal education (n=66,190), or parity (n=19,300), leaving 4,719,350 total births. Our analyses focus on births to U.S.-born NHB women (n=746,700) and foreign-born NHB women (n=114,750).

2.2. Measures

2.2.1. Racial residential segregation—Most research in this area uses measures of either segregation unevenness or exposure. For this study, we hypothesized that unevenness was the aspect of segregation most likely to affect birth outcomes via pathways related to the

distribution of health-promoting resources—rather than exposure, which would likely reflect pathways related to interpersonal discrimination. We further hypothesized that distribution of resources could be improved by the increased political power that may come as a consequence of unevenness. We used the index of dissimilarity to measure unevenness (Massey and Denton, 1988). A value of 60 on this index means that 60% of NHB individuals in a city would need to move to a different Census tract in order for NHBs and NHWs to be equally distributed.

2.2.2. Black political representation—We calculated black political representation as the ratio of the % black members of the city council to the % black in the total voting age population of the city (LaVeist, 1993). For example, if the voting age population of the city is 25% black and the city council is 25% black, political representation is equal to 1. If the voting age population is 50% black but only 25% of the city council is black, political representation is equal to 0.5.

2.2.3. Preterm birth—We categorized births as preterm (< 37 weeks completed gestation) or term (≥37 weeks completed gestation). We used the NCHS “best estimate” of gestational age, which combines data based on last menstrual period and obstetric/clinical estimate (Centers for Disease Control and Prevention, 2010). We also categorized births as very preterm (< 32 weeks gestation vs. ≥32 weeks) and low birth weight (< 2500 g) to facilitate comparisons with other work.

2.2.4. Covariates—We categorized NHB women as U.S.- or foreign-born. We also obtained mother’s age, marital status (unmarried vs. married), parity (primiparous vs. multiparous), and education (less than high school, some high school, high school/GED, some college, college graduate) from the birth files. In 2003, a revised version of the birth certificate was introduced in the U.S., and uptake of this version has differed by state, resulting in differences in some variables. In order to make use of all available data, we used data from both versions of the birth certificate using common recoded values for education.

2.3. Statistical analyses

All analyses were conducted with outcomes and covariates measured at the individual level. We calculated descriptive statistics separately for births to U.S.- and foreign-born NHB mothers. We calculated bivariate associations between residential segregation (Objective 1), political representation (Objective 2), and each covariate and odds of PTB, using generalized estimating equations (GEE) to account for clustering by city with a logit link to estimate odds ratios. All models of residential segregation and political representation were adjusted for log total population and Census region; models of residential segregation were additionally adjusted for % NHB population. For residential segregation, we estimated the odds ratio for PTB for a 10-unit increase in the dissimilarity index.

For multivariate analysis, we proceeded as follows. Model 1 included both residential segregation and political representation. Model 2 additionally adjusted for city-level variables that could potentially confound the relationship between residential segregation or political representation and PTB (i.e., % below poverty and % adults > 25 years

with a college education). Model 3 adjusted for individual-level social and demographic characteristics of the mother that may influence women's self-selection into cities and thus bias the relationship between residential segregation or political representation and PTB. These variables included maternal age at delivery, marital status, parity, and education. To examine whether the association between residential segregation and PTB differs by level of political representation (Objective 3), we tested for an interaction between residential segregation and political representation in Model 1, using a Wald test with a p-value cut-point of 0.10. All analyses were conducted using SAS 9.3 (14).

We conducted several tests to ensure the robustness of our model specifications. We examined all models using very PTB and low birth weight to reflect other recent work (Britton and Shin, 2013; Grady and McLafferty, 2007; Kramer and Hogue, 2008). We tested models with an indicator variable identifying whether the data came from the 1989 or 2003 version of the birth certificate. We hypothesized that the association between black political representation and PTB might exist only in cities using ward- or district-based election methods, as citywide elections might not enable residents of racially segregated areas to elect black representatives. Thus, we examined models including an interaction between black political representation and a variable for whether the city used a ward or district vs. an at-large election method. We also ran Model 3 (which included both individual- and city-level covariates) using a random effects model with random intercepts at the city-level instead of a GEE model.

3. Results

Table 1 describes key variables among individual births within the U.S.- and foreign-born sub-samples. These data illustrate the high levels of segregation experienced by black mothers in the U.S. For example, the mean (SD) dissimilarity indices experienced by U.S.- and foreign-born NHB mothers were 57.4 (15.7) and 60.3 (19.5), respectively, indicating that these women live in cities where, on average, about three-fifths of the NHB population would need to move to a different census tract in order for the city to have an even geographic distribution of NHB and NHW residents. Furthermore, 44% and 54% of U.S.- and foreign-born NHB mothers live in cities with high dissimilarity (> 60), respectively (data not shown).

U.S.-born NHB women had higher rates of PTB (15.6%) compared to foreign-born NHB women (10%) (Table 1). Other key maternal characteristics also differed by nativity. U.S.-born mothers were younger, less likely to be married, and more likely to report smoking during pregnancy, compared to foreign-born mothers. Foreign-born mothers exhibited a wider distribution of educational attainment: almost 7% of foreign-born mothers had less than a high school education, compared to only 1% of U.S.-born NHB mothers; however, about 21% of foreign-born women had a college education compared to only 10% of U.S-born women.

Table 2 shows the unadjusted and adjusted (Models 1–3) odds ratios (95% confidence intervals [CI]) for PTB for residential segregation (NHB-NHW dissimilarity index), political representation, and all other control variables for U.S.-born NHB women. Each ten-unit

increase in residential segregation was associated with a 4% increase in odds of PTB (unadjusted and Models 1 and 2), an association which was slightly attenuated with the inclusion of maternal characteristics (Model 3). Black political representation was not independently associated with PTB (unadjusted and Models 1–3). Political representation also did not significantly moderate the association between residential segregation and PTB (p=0.64), and the inclusion of political representation in the model did not alter the coefficient for residential segregation (Models 1–3).

Similarly, each ten-unit increase in residential segregation was associated with a 5–6% increase in odds of PTB among foreign-born NHB women (Table 3, unadjusted, Models 1–3). Again, black political representation was not associated with PTB, nor did it moderate the relationship between residential segregation and PTB (p=0.49), and inclusion of political representation in the model did not alter the coefficient for residential segregation (Models 1–3).

Maternal characteristics were associated with PTB in the expected directions (Tables 2, 3). Findings from models using very PTB and low birth weight outcomes, and including an indicator variable for the 1989 vs. 2003 birth certificate were similar in direction, magnitude, and significance to original findings, with the exception that the association between segregation and low birth weight for foreign-born women was smaller than the association for PTB (Table 4). We found no significant interactions between method of election (ward/district vs. at-large) and political power. We also ran all models again excluding political representation to ensure that it was not impacting estimates of the association between residential segregation and PTB; findings were similar (Table 4). Estimates from random effect models of PTB were similar in magnitude and significance to estimates from the GEE models (Table 4), and the city-level variation in PTB was < 1% ($p < 0.01$) for U.S.-born and 1.3% ($p < 0.01$) for foreign-born mothers.

4. Discussion

The current study examines associations between racial residential segregation, political representation, and PTB among singleton live births to U.S.- and foreign-born NHB women in the U.S., 2008–2010. Our findings indicate that each 10-unit increase in the unevenness dimension of residential segregation was associated with a 3–6% increase in the odds of PTB for both U.S.- and foreign-born NHB women. Contrary to our hypotheses, black political representation was not associated with PTB and did not moderate the associations between residential segregation and PTB.

We find support for Hypothesis 1a that residential segregation would be associated with increased odds of PTB among U.S.-born NHB women. Indeed, each 10-unit increase in the unevenness dimension of residential segregation was associated with a 3–5% increase in the odds of PTB. These findings are consistent with those of previous studies indicating that racial residential segregation is associated with increases in odds of PTB of between 3% and 10% for NHB women (Britton and Shin, 2013; Kramer et al., 2010; Osypuk and Acevedo-Garcia, 2008).

Our findings did not support our Hypothesis 1b that residential segregation would not be associated with PTB among foreign-born women. To the contrary, our findings indicated that residential segregation was associated with higher odds of PTB for foreign-born NHB women. Prior work in New York City also found that segregation was associated with low birth weight among foreign-born NHB women (Grady and McLafferty, 2007), although this association was attenuated and no longer significant after accounting for women's country of origin. Although it is outside the scope of this study, future analyses using national data should examine whether the association between segregation and PTB is explained by or moderated by country of origin.

Our data did not support our Hypotheses 2a or 2b regarding the role of black political representation. That is, black political representation was not associated with PTB and did not moderate the associations between residential segregation on PTB. Thus, our findings for PTB did not replicate those of prior work showing that political representation decreased rates of black infant mortality (LaVeist, 1993). In LaVeist's study, which used data from the 1980s, the correlation between residential segregation and black political representation was 0.26, slightly higher than the correlation in our data (ρ=0.17); thus, the link between segregation and political representation may have declined in the past 3 decades. Indeed, evidence from the 1980s and 1990s showed that segregation in the Southern U.S. was inversely correlated with black political representation in the U.S. Congress (Ananat and Washington, 2009). It is also notable that LaVeist's work utilized an ecological/aggregate study design, whereas our analysis controlled for individual covariates such as maternal age, parity, education, and marital status. City-level variation in PTB was low (although significant), at around 1% of total variation, indicating a limited role for city-level factors compared to individual-level factors in general.

Modeling of associations between residential segregation and health is complicated by the fact that many variables may represent either potential mediators of the relationship or bias variables that need to be controlled. In our analysis, for example, maternal age, education, marital status, and parity may be impacted by residential segregation and in turn causally affect PTB (i.e., act as mediators) or influence women's self-selection into cities and thus need to be controlled in the analysis. Similarly, city-level poverty and education could act as mediators or confounders. We thus chose to present findings from models both with (Models 2 and 3) and without (Model 1) such variables. Notably, as in prior work (Britton and Shin, 2013; Kramer et al., 2010), only a small portion of the association between residential segregation and PTB for NHB women was explained by individual-level factors (i.e., maternal age, education, marital status, and parity); city-level poverty and education also did not substantially alter the relations between segregation and PTB. However, identification of true mediators and moderators of the impacts of residential segregation on perinatal health among NHB women in the U.S. remains an important area of research, especially with respect to development of interventions or policies. Mechanisms that should be examined in future research include exposure to poor housing conditions, environmental toxins, quality of medical care, diet, physical activity, psychosocial stress, and discrimination across women's life course. Different data sets coupled with mediation analytic methods (Valeri and Vanderweele, 2013) should be employed in such work.

We note several limitations to the current analyses. First, in order to analyze data from all births in the U.S., we were limited to birth certificate data. In these data, length of gestation is notoriously imprecise (Pearl et al., 2007; Wier et al., 2007), and measurement error may be correlated with quality of medical care and therefore with segregation. The birth certificate data also do not enable us to account for other potentially important maternal characteristics such as household income and wealth, occupational status, or employment status, and we are unable to examine potential mechanisms such as psychosocial stress, discrimination, or quality of medical care. We only examined one dimension of segregation —unevenness—based on our hypothesis that this dimension would be most strongly related to political representation and allocation of resources. Prior work, however, suggests that other dimensions of segregation, such as clustering (the extent to which minorities live in contiguous census tracts), may have protective associations with infant health (Bell et al., 2006). Finally, we utilized a proxy measure of black political representation, in absence of any validated measure of this construct that is available at the national level. We relied in many cases on photos of city council members to assign race/ethnicity which may not accurately reflect self-identification, and due to the start date of our study, we collected the data on city council members in 2012–2013, whereas birth outcomes occurred in 2008–2010. Theoretically, political representation may also include election of officials at other levels such as the county or state; thus our finding of no association may reflect measurement error in the construct of political representation. Moreover, political *power* may include power held or wielded by non-elected leaders, which we did not measure. Finally, use of metropolitan areas as the unit of analysis is typically preferred for research on segregation, as metropolitan areas provide a more complete picture of the housing and unemployment market, and because the proportion of blacks living in the central city compared to suburban areas may differ substantially across metropolitan areas (Acevedo-Garcia and Osypuk, 2008). We chose the city as the area of analysis based on the prior work on political power, but future studies should consider ways of measuring political representation at the metropolitan area level.

These analyses reflect the most recent and comprehensive examination of the association between black-white residential segregation and PTB in the U.S. of which we are aware; we are also the first to examine differences in this association by nativity at the national level. Our data include all singleton births in all major cities in the U.S. from 2008 to 2010. Moreover, we include a unique measure of black political representation that has not been included in prior studies examining contextual determinants of PTB.

Our work adds to a substantial body of literature demonstrating that black women in the U.S. living in more segregated areas face higher risks of adverse birth outcomes compared to black women living in less segregated areas, net of area socioeconomic factors and traditional, individual-level risk factors for adverse birth outcomes. Given evidence that adverse birth outcomes are associated with long-term health as well as social outcomes such as educational attainment (Conley and Bennett, 2000), racial residential segregation may have lasting adverse impacts on the health and wellbeing of children born in segregated communities. Researchers should now focus on identifying whether any specific mechanism or set of mechanisms (e.g., environmental exposures, discrimination) is particularly salient in explaining the segregation-infant health association and on identifying factors that may

buffer the impacts of segregation on health. This mechanistic work is key to the development of policies or interventions that could one day mitigate the detrimental impacts of racial residential segregation on black infant health in the U.S.

Acknowledgements

This work was funded by the American Cancer Society (RSGT-11-010-01-CPPB), the Office of the Vice President of Research at University of Texas at Austin, and the Texas Research Data Center pilot grant program and supported by the Population Research Center at University of Texas at Austin (5 R24 HD042849, NICHD). The authors would like to thank Derek Falk for help collecting data.

References

Acevedo-Garcia D, Osypuk T, 2008. Invited commentary: residential segregation and health-the complexity of modeling separate social contexts. Am. J. Epidemiol 168 (11), 1255–1258. [PubMed: 18974060]

Adler NE, Stewart J, 2010. Health disparities across the lifespan: meaning, methods, and mechanisms. Ann. N. Y. Acad. Sci 1186, 5–23. [PubMed: 20201865]

Alexander GR, Himes JH, Kaufman RB, Mor J, Kogan M, 1996. A United States national reference for fetal growth. Obstet. Gynecol 87, 163–168. [PubMed: 8559516]

Ananat EO, Washington E, 2009. Segregation and Black political efficacy. J. Public Econ 93, 807–822.

Anthopolos R, James SA, Gelfand AE, Miranda ML, 2011. A spatial measure of neighborhood level racial isolation applied to low birthweight, preterm birth, and birthweight in North Carolina. Spat. Spatio-Tempo. Epidemiol 2, 235–246.

Anthopolos R, Kaufman JS, Messer LC, Miranda ML, 2014. Racial residential segregation and preterm birth: built environment as a mediator. Epidemiology 25, 397–405. [PubMed: 24681575]

Baker AN, Hellerstedt WL, 2006. Residential racial concentration and birth outcomes by nativity: do neighbors matter? J. Natl. Med. Assoc 98, 172–180. [PubMed: 16708503]

Behrman R, Butler A, 2005. In: Medicine, Bo.H.S.P.Io (Ed.), Preterm Birth: Causes, Consequences, and Preventioned.. National Academies Press, Washington, DC.

Bell JF, Zimmerman FJ, Almgren GR, Mayer JD, Huebner CE, 2006. Birth outcomes among urban African-American women: a multilevel analysis of the role of racial residential segregation. Soc. Sci. Med 63, 3030–3045. [PubMed: 16997438]

Bell JF, Zimmerman FJ, Mayer JD, Almgren GR, Huebner CE, 2007. Associations between residential segregation and smoking during pregnancy among urban African-American women. J. Urban Health-Bull. N. Y. Acad. Med 84, 372–388.

Blumenshine P, Egerter S, Barclay CJ, Cubbin C, Braveman PA, 2010. Socioeconomic disparities in adverse birth outcomes: a systematic review. Am. J. Prev. Med 39, 263–272. [PubMed: 20709259]

Braveman PA, Heck K, Egerter S, Marchi KS, Dominguez TP, Cubbin C, Fingar K, Pearson JA, Curtis M, 2015. The role of socioeconomic factors in Black-White disparities in preterm birth. Am. J. Public Health 105, 694–702. [PubMed: 25211759]

Britton ML, Shin H, 2013. Metropolitan residential segregation and very preterm birth among African American and Mexican-origin women. Soc. Sci. Med 98, 37–45. [PubMed: 24331880]

Centers for Disease Control and Prevention, 2010. User Guide to the 2010 Natality Public Use File.

Conley D, Bennett NG, 2000. Is biology destiny? Birth weight and life chances. Am. Sociol. Rev 65, 458–467.

Culhane JF, Goldenberg RL, 2011. Racial disparities in preterm birth. Semin. Perinatol 35, 234–239. [PubMed: 21798403]

Cutler D, Glaeser EL, 1997. Are ghettos good or bad? Q. J. Econ 112, 827–872.

Cutler DM, Glaeser EL, Vigdor JL, 1999. The rise and decline of the american ghetto. J. Polit. Econ 107, (455–455).

Dominguez TP, Strong EF, Krieger N, Gillman MW, Rich-Edwards JW, 2009. Differences in the self-reported racism experiences of US-born and foreign-born Black pregnant women. Soc. Sci. Med 29, 258–265.

Dubowitz T, Subramanian SV, Acevedo-Garcia D, Osypuk TL, Peterson KE, 2008. Individual and neighborhood differences in diet among low-income foreign and US-born women. Women's. Health Issues 18, 181–190. [PubMed: 18222706]

Ellen IG, Cutler DM, Dickens W, 2000. Is segregation bad for your health? The case of low birth weight [with Comments]. Brook.-Whart. Pap. Urban Aff, 203–238.

Finch BK, Lim N, Perez W, Phuong Do D, 2007. Sociol. Perspect 50, 445–468.

Geronimus AT, 1992. The weathering hypothesis and the health of African-American women and infants: evidence and speculations. Ethn. Dis 2, 207–221. [PubMed: 1467758]

Giurgescu C, McFarlin BL, Lomax J, Craddock C, Albrecht A, 2011. Racial discrimination and the black-white gap in adverse birth outcomes: a review. J. Midwifery Women's Health 56, 362–370. [PubMed: 21733107]

Grady S, McLafferty S, 2007. Segregation, nativity, and health: reproductive health inequalities for immigrant and native-born black women in New York City. Urban Geogr. 28, 377–397.

Grady SC, 2006. Racial disparities in low birthweight and the contribution of residential segregation: a multilevel analysis. Soc. Sci. Med 63, 3013–3029. [PubMed: 16996670]

Howell-Moroney M, 2005. The geography of opportunity and unemployment: an integrated model of residential segregation and spatial mismatch. J. Urban Aff 27, 353–377.

Hunt MO, Wise LR, Jipguep MC, Cozier YC, Rosenberg L, 2007. Neighborhood racial composition and perceptions of racial discrimination: evidence from the black women's health study. Social. Psychol. Q 70, 272–289.

Kramer MR, Hogue CR, 2008. Place matters: variation in the black/white very preterm birth rate across U.S. metropolitan areas, 2002–2004. Public Health Rep. 123, 576–585. [PubMed: 18828412]

Kramer MR, Hogue CR, 2009. Is segregation bad for your health? Epidemiol. Rev 31, 178–194. [PubMed: 19465747]

Kramer MR, Cooper HL, Drews-Botsch CD, Waller LA, Hogue CR, 2010. Metropolitan isolation segregation and black-white disparities in very preterm birth: a test of mediating pathways and variance explained. Soc. Sci. Med 71, 2108–2116. [PubMed: 20947234]

LaVeist T, 1992. The Political Empowerment and Health Status of African-Americans: mapping a New Territory. Am. J. Sociol 97, 1080–1095.

LaVeist T, 1993. Segregation, poverty, and empowerment: health consequences for African Americans. Milbank Q 71, 41–64. [PubMed: 8450822]

Lhila A, Long S, 2012. What is driving the black-white difference in low birthweight in the US? Health Econ. 21, 301–315. [PubMed: 21294220]

Logan J, Stults B, 2011. The Persistence of Segregation in the Metropolis: New Findings from the 2010 Census, Census Brief prepared for Project US2010.

Lopez R, 2006. Black-White residential segregation and physical activity. Ethn. Dis 16, 495–502. [PubMed: 17682254]

Martin JA, Hamilton BE, Osterman MJ, Curtin SC, Matthews TJ, 2015. Births: final data for 2013. Natl. Vital. Stat. Rep 64, 1–65.

Masi CM, Hawkley LC, Piotrowski ZH, Pickett KE, 2007. Neighborhood economic disadvantage, violent crime, group density, and pregnancy outcomes in a diverse, urban population. Soc. Sci. Med 65, 2440–2457. [PubMed: 17765371]

Mason SM, Kaufman JS, Emch ME, Hogan VK, Savitz DA, 2010. Ethnic density and preterm birth in African-, Caribbean-, and US-born non-Hispanic black populations in New York City. Am. J. Epidemiol 172, 800–808. [PubMed: 20801865]

Massey DS, Denton NA, 1988. The Dimensions of Residential Segregation. Social. Forces 67, 281–315.

Massey DS, Fischer MJ, 2000. How segregation concentrates poverty. Ethn. Racial Stud 23, 670–691.

Messer LC, Kaufman JS, Dole N, Savitz DA, Laraia BA, 2006. Neighborhood crime, deprivation, and preterm birth. Ann. Epidemiol 16, 455–462. [PubMed: 16290179]

Morland K, Filomena S, 2007. Disparities in the availability of fruits and vegetables between racially segregated urban neighbourhoods. Public Health Nutr. 10, 1481–1489. [PubMed: 17582241]

National Center for Health Statistics, 2008–2010. Natality Files, Accessed through the Research Data Center.

Nyarko KA, Wehby GL, 2012. Residential segregation and the health of African-American infants: does the effect vary by prevalence? Matern Child Health J. 16, 1491–1499. [PubMed: 22105739]

O'Flaherty B, Sethi R, 2007. Crime and segregation. J. Econ. Behav. Organ 64, 391–405.

O'Campo P, Burke JG, Culhane J, Elo IT, Eyster J, Holzman C, Messer LC, Kaufman JS, Laraia BA, 2008. Neighborhood deprivation and preterm birth among non-Hispanic black and white women in eight geographic areas in the United States. Am. J. Epidemiol 167, 155–163. [PubMed: 17989062]

Osypuk TL, Acevedo-Garcia D, 2008. Are racial disparities in preterm birth larger in hypersegregated areas? Am. J. Epidemiol 167, 1295–1304. [PubMed: 18367470]

Osypuk TL, Bates LM, Acevedo-Garcia D, 2010. Another Mexican birthweight paradox? The role of residential enclaves and neighborhood poverty in the birthweight of Mexican-origin infants. Social. Sci. Med 70, 550–560.

Pearl M, Wier ML, Kharrazi M, 2007. Assessing the quality of last menstrual period date on California birth records. Paediatr. Perinat. Epidemiol 21 (Suppl 2), 50–61. [PubMed: 17803618]

Peterson RD, Krivo LJ, 1993. Racial segregation and black urban homicide. Soc. Forces 71, 1001–1026.

Valeri L, Vanderweele TJ, 2013. Mediation analysis allowing for exposure-mediator interactions and causal interpretation: theoretical assumptions and implementation with SAS and SPSS macros. Psychol. Methods 18, 137–150. [PubMed: 23379553]

Walton E, 2009. Residential segregation and birth weight among racial and ethnic minorities in the United States. J. Health Soc. Behav 50, 427–442. [PubMed: 20099449]

White K, Borrell LN, 2011. Racial/ethnic residential segregation: framing the context of health risk and health disparities. Health Place 17, 438–448. [PubMed: 21236721]

Wier ML, Pearl M, Kharrazi M, 2007. Gestational age estimation on United States livebirth certificates: a historical overview. Paediatr. Perinat. Epidemiol 21 (Suppl 2), 4–12.

Wilkerson I, 2010. The Warmth of Other Suns. Vintage Books, New York, NY.

Williams D, Collins C, 2001. Racial residential segregation: a fundamental cause of racial disparities in health.

Zenk SN, Schulz AJ, Israel BA, James SA, Bao S, Wilson ML, 2006. Fruit and vegetable access differs by community racial composition and socioeconomic position in Detroit, Michigan. Ethn. Dis 16, 275–280. [PubMed: 16599383]

Table 1

Descriptive statistics on city- and individual-level variables among singleton live births to U.S.-born and foreign-born non-Hispanic black women in the U.S. 2008–2010[a].

	U.S.-born	Foreign-born
Number of births	746,700	114,750
City-level variables	**Mean (SD)**	
Residential segregation		
NHB-NHW dissimilarity	57.4 (15.7)	60.3 (19.5)
Political power		
Black political power	1.1 (0.4)	1.0 (0.5)
Sociodemographics		
Total population	1,008,120 (1,866,890)	2,659,580 (3,500,240)
Poverty rate	21.9 (6.0)	19.4 (4.9)
% college education	17.0 (5.0)	18.8 (4.6)
Individual-level variables	**n (%)**	
Preterm delivery		
Term	630240 (84.4)	818190 (90.0)
Preterm (< 37 weeks)	116460 (15.6)	90580 (10.0)
Very preterm (< 32 weeks)	21385 (2.9)	2416 (2.1)
Birth weight		
Low (< 2500 g)	90460 (12.1)	9504 (8.3)
Normal (≥2500 g)	656234 (87.9)	105240 (91.7)
Maternal age		
< 20	141200 (18.9)	4110 (3.6)
20–35	549320 (73.6)	83840 (73.1)
> 35	56180 (7.5)	26800 (23.4)
Maternal education		
Less than high school	8690 (1.2)	7770 (6.8)
Some high school	176040 (23.6)	13340 (11.6)
High school/GED	270700 (36.3)	37360 (32.6)
Some college	216440 (29.0)	32690 (28.5)
College graduate	74830(10.0)	23580 (20.6)
Marital status		
Unmarried	605880 (81.1)	51080 (44.5)
Married	140820 (18.9)	63670 (55.5)
Parity		
Primiparous	304910 (40.8)	44220 (38.5)
Multiparous	441780 (59.2)	70520 (61.5)

[a]Singleton NHB births to US residents living in a city with population of > 50,000 at least 10% NHB.

Table 2

Unadjusted and adjusted odds ratios (95% confidence interval) for preterm delivery among U.S.-born non-Hispanic black mothers (n=746,700).

	Unadjusted[a]	Model 1[a]: residential segregation and political power	Model 2[a]: adjustment for city-level variables	Model 3[a]: adjustment for maternal characteristics
City-level variables				
NHB-NHW dissimilarity index	1.04 (1.03, 1.06)	1.04 (1.02, 1.06)	1.04 (1.02, 1.06)	1.03 (1.01, 1.05)
Black political power	1.04 (1.00, 1.07)	1.01 (0.98, 1.05)	1.01 (0.98, 1.04)	1.01 (0.98, 1.04)
Poverty rate[b]	1.01 (1.00, 1.01)		1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
% population > 25 college grad[b]	1.00 (1.00, 1.00)		1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Individual-level variables				
Maternal age	1.01(1.01, 1.02)			1.03 (1.03, 1.03)
Maternal education				
Less than high school	1.57 (1.47, 1.68)			1.84 (1.72, 1.96)
Some high school	1.18 (1.15, 1.22)			1.25 (1.22, 1.29)
High school/GED	1.30 (1.26, 1.35)			1.43 (1.38, 1.48)
Some college	1.48 (1.43, 1.53)			1.70 (1.64, 1.77)
College graduate	(ref)			(ref)
Marital status				
Unmarried	1.13 (1.11, 1.15)			1.14 (1.12, 1.16)
Married	(ref)			(ref)
Parity				
Primiparous	0.86 (0.85, 0.87)			0.97 (0.95, 0.98)
Multiparous	(ref)			(ref)

[a]Unadjusted models for residential segregation and political representation include controls for Census region and log total population size; unadjusted models for residential segregation as well as Models 1–3 include percent NHB population.

[b]Odds ratio per 1-unit increase in %poverty and %population > 25 college graduate.

Health Place. Author manuscript; available in PMC 2023 August 08.

Table 3

Unadjusted and adjusted odds ratios (95% confidence interval) for preterm delivery among foreign-born non-Hispanic black mothers (n=114,750).

	Unadjusted[a]	Model 1[a]: residential segregation and political power	Model 2[a]: adjustment for city-level variables	Model 3[a]: adjustment for maternal characteristics
City-level variables				
NHB-NHW dissimilarity index	1.05 (1.01, 1.09)	1.05 (1.01, 1.08)	1.06 (1.02, 1.09)	1.05 (1.01, 1.08)
Black political power	1.05 (0.99, 1.12)	1.03 (0.97, 1.09)	1.03 (0.97, 1.09)	1.03 (0.97, 1.08)
Poverty rate[b]	1.00 (1.00, 1.01)		1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
% population > 25 college grad[b]	0.99 (0.98, 1.00)		0.98 (0.98, 0.99)	1.00 (0.98, 0.99)
Individual-level variables				
Maternal age	1.02 (1.01, 1.02)			1.03 (1.02, 1.03)
Maternal education				
Less than high school	1.40 (1.29, 1.52)			1.45 (1.33, 1.58)
Some high school	1.17 (1.11, 1.22)			1.19 (1.13, 1.25)
High school/GED	1.19 (1.12, 1.25)			1.21 (1.13, 1.29)
Some college	1.37 (1.28, 1.47)			1.42 (1.33, 1.51)
College graduate	(ref)			(ref)
Marital status				
Unmarried	1.19 (1.14, 1.24)			1.23 (1.18, 1.28)
Married	(ref)			(ref)
Parity				
Primiparous	0.98 (0.95, 1.02)			1.10 (1.04, 1.15)
Multiparous	(ref)			(ref)

[a]Unadjusted models for residential segregation and political representation include controls for Census region and log total population size; unadjusted models for residential segregation as well as Models 1–3 include percent NHB population.

[b]Odds ratio per 1-unit increase in %poverty and %population > 25 college graduate.

Table 4

Adjusted[a] odds ratio (95% confidence interval) for preterm delivery associated with a 1-unit change in dissimilarity index in alternate models.

Alternate models	U.S.-born NHB	Foreign-born NHB
Very preterm delivery outcome	1.03 (1.00, 1.05)	1.07 (1.02, 1.13)
Low birth weight outcome	1.03 (1.01, 1.04)	1.02 (0.99, 1.05)
Indicator variable for 1989 vs. 2003 birth certificate	1.03 (1.01, 1.05)	1.04 (1.01, 1.08)
Residential segregation only (no political representation variable)	1.03 (1.01, 1.05)	1.05 (1.02, 1.08)
Random effects models (preterm delivery outcome)		
NHB-NHW dissimilarity index	1.03 (1.01, 1.05)	1.05 (1.01, 108)
Black political power	1.01 (0.98, 1.04)	1.04 (0.98, 1.10)

[a]Models adjusted for political representation, % below poverty and % adults > 25 years with a college education, maternal age at delivery, marital status, parity, and education.