

Original Study

Does Neighborhood Risk Explain Racial Disparities in Disparities in Low Birth Weight among Infants Born to Adolescent Mothers?

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ABSTRACT

Study Objective: To test associations and interactions between racial identification, neighborhood risk, and low birth weight disparities between infants born to African-American and white adolescent mothers.

Design: Retrospective cross-sectional study. Birth cases were geocoded and linked to census tract information from the 2010 US Census and the 2007–2011 American Community Survey. A “neighborhood risk” index was created using principal component analysis, and mothers were grouped into 3 neighborhood risk levels (low, medium, high). Multilevel models with cross-level interactions were used to identify variation in racial differences in low birth weight outcomes across neighborhood risk levels when controlling for maternal demographic characteristics and pregnancy behaviors (smoking, prenatal care use).

Setting: North Carolina, United States.

Participants: Singleton infants (n = 7923 cases) born to non-Hispanic African American and white adolescent mothers from the North Carolina State Center of Health Statistics for 2011.

Main Outcome Measures: Low birth weight.

Results: African American mothers were significantly more likely to have infants of low birth weight than white mothers in this sample (odds ratio = 1.89; 95% confidence interval, 1.53–2.34). Mothers that resided in areas of high neighborhood risk were significantly more likely to have infants of low birth weight than mothers residing in areas of low neighborhood risk (odds ratio = 1.55; 95% confidence interval, 1.25–1.93). Even when controlling for confounding factors, racial disparities in low birth weight odds did not significantly vary according to neighborhood risk level.

Conclusion: Racial disparities can remain in low birth weight odds among infants born to adolescent mothers when controlling for maternal characteristics, pregnancy behaviors, and neighborhood risk.

Key Words: Adolescent pregnancy, Low birth weight, Racial disparities, Health disparities, Socioeconomic status, Neighborhood, African-American

Introduction

Adolescent mothers experience greater levels of low birth weight (LBW), preterm birth, and neonatal mortality outcomes compared with mothers of older age groups,^{1,2} and racial disparities in adverse birth outcomes persist in all age groups, including adolescent mothers.³ Preterm birth as an independent adverse outcome is the most important factor associated with LBW, but studies have consistently identified other factors, such as individual characteristics and prenatal behaviors, as contributors to LBW. Studies on racial disparities in LBW have examined individual characteristics of mothers with limited consideration of neighborhood and structural factors. Previous findings demonstrated that women who reside in deprived neighborhoods have higher rates of adverse birth outcomes

than women in more affluent neighborhoods^{4–8}; however, this research has focused on adult mothers or general samples of women of childbearing age rather than a focus exclusively on adolescent mothers. Because adolescents could have heightened vulnerability toward neighborhood stress factors,⁹ more studies on neighborhood socioeconomic factors and racial disparities in LBW among infants of adolescent mothers are needed to clarify these associations.

Testing the role of neighborhood factors on birth outcomes among adolescent populations brings additional challenges. For example, neighborhood factors examined in previous studies^{4–8} were focused on income and educational demographic characteristics that have been deemed more problematic for assessment of social class among adolescents compared with adults.¹⁰ Further examinations of new neighborhood variables or more sensitive ways of clarifying existing variables that have greater relevance for adolescent mothers are therefore needed. To address this need, in this study we examined neighborhood risk (defined according to multiple socioeconomic indicators from census tract data) as a potential explanation of racial

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disparities in LBW outcomes among infants born to African American and white adolescent mothers.

This study was designed to answer the following questions: (1) do racial disparities in LBW outcomes persist between African American and white adolescent mothers' infants after controlling for neighborhood risk? (2) Does neighborhood risk moderate the racial disparities in LBW outcomes between African American and white adolescent mothers' infants? With the recognition of intersectional and socioecological frameworks of maternal and infant health outcomes,^{11,12} this examination stemmed from the rationale that individual and neighborhood factors can intersect to influence distribution of resources, household income, access to health resources, employment, and education, and subsequently affect birth weight outcomes and disparities between racial groups of adolescent mothers.

With the exception of 2 studies,^{13,14} previous investigations did not examine the contribution of neighborhood risk factors in explaining racial disparities in birth weight outcomes for infants born to adolescent mothers. This study extends these previous studies by using birth record data from a large statewide sample of almost 8000 adolescent mothers to test the interdependent relationship of multiple neighborhood risk characteristics and the association with racial disparities in LBW. Moreover, this study contributes to the growing literature on neighborhood risk factors and associations with racial disparities in birth outcomes.

Materials and Methods

Data Sources

In this study we used a cross-sectional design to examine birth record data from the North Carolina State Center of Health Statistics for 2011. Neighborhood was defined as census tracts delineated according to 2010 US Census boundaries. Mothers' street addresses were geocoded to census tract identification numbers using ArcGIS 10.0 (Environmental Systems Research Institute, Redlands, CA) and the US Federal Financial Institutions Examination Council geocoder. These adolescent birth cases were subsequently linked to census tract statistics from the 2010 US Census and the 2007–2011 American Community Survey. This study was deemed exempt by the authors' institutional review board because no interactions with human subjects occurred in these secondary data analyses of existing birth record data.

Study Sample

This study focused on 8302 adolescent mothers who matched the following criteria: African American or white racial identification, non-Hispanic ethnic status, born in the United States, age younger than 20 years, North Carolina residency, and delivery of single live births at gestational ages of 20 weeks or more. The study's gestational age cutoff at 20 weeks stemmed from the national use of the 20-week cutoff to compare fetal deaths between states and previous research recommendations for consistency in studies on

birth outcomes across geographic locations.^{15–17} Cases that could not be geocoded at the street address level were excluded from analyses, resulting in a final study sample of 7923 adolescent mothers (95.4% of all eligible cases) who resided in 1803 census tracts across the state.

Study Variables and Measures

LBW (defined as infant birth weight <2500 grams) was used as the dependent variable because of the extensive literature of LBW as an adverse birth outcome. Maternal racial identification was dichotomized (African American or white) and other racial categories were excluded from these analyses. Specifically, adolescent mothers of Hispanic and foreign-born status were excluded to avoid potential confounding of ethnicity in the comparison of racial groups, and mothers of other racial groups (ie, Asian, Native American) were excluded because of the small proportion of adolescent mothers in these groups.

A neighborhood risk index was created from selected census tract variables because multiple socioeconomic factors interact at the community level to affect health outcomes. The potential variables to include in the index were chosen based on previous research^{13,18–24} to assess how interactions of multiple characteristics could explain the effect of socioeconomic status rather than to solely rely on income and educational factors. Principal component analysis²⁵ was used to develop this index. This approach, similar to the creation of neighborhood context indices in previous research,^{13,18,19,26} helps to summarize the pattern of relationships explained by the intersection of census-level socioeconomic factors. The neighborhood risk index was based on one principal component which accounted for 60.1% of the total variance. The final index included the following census tract variables: median household income, poverty proportion, unemployment rate, percentage of people 25 years old and older with a high school diploma or more advanced education, percentage of households headed by single women with children younger than age 18, percentage of households that receive public assistance, the Gini inequality index (a standardized measurement of inequality within census tracts), and percentage of households residing in rental housing. Analyses for the neighborhood risk index indicate that the census tract neighborhood risk for these adolescent mothers' residences ranged between –3.12 (low risk) and 4.54 (high risk).

Next, this index was used to divide adolescents into 3 levels of neighborhood risk following guidelines on research for adolescent samples and assessments on birth outcome disparities among adult mothers involving examination of socioeconomic factors.^{27,28} The “low neighborhood risk” level included adolescents who resided in the neighborhoods in the lowest quartile of neighborhood risk; adolescents in this level represented the referent group with the assumption that these adolescents would have more access to resources for optimal birth outcomes. The “medium neighborhood risk” level included adolescents in the middle 50% quartiles, and the “high neighborhood risk” level included adolescents in the highest quartile of neighborhood risk.

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