Race, Age, and Neighborhood Socioeconomic Status in Low Birth Weight Disparities Among Adolescent Mothers: An Intersectional Inquiry

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Abstract

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Methods: Using data from the North Carolina State Center of Health Statistics for 2010-2011, birth cases for 16,472 adolescents were geocoded by street address and linked to census-tract information from the 2010 United States Census. Multilevel models with interaction terms were used to identify significant associations between maternal racial status, age, and neighborhood socioeconomic status (as defined by census-tract median household income) and low birth weight outcomes across census tracts.

Results: Significant racial differences were identified in which African-American adolescents had greater odds of low birth weight outcomes than Caucasian adolescents (OR=1.88, 95% CI 1.64, 2.15). Although racial disparities in low birth weight outcomes remained significant in context of maternal age and neighborhood socioeconomic status, the greatest disparities were found between African-American and Caucasian adolescents that lived in areas of higher socioeconomic status (p

Conclusion: These findings indicate that racial disparities in low birth weight outcomes among adolescent mothers can vary by neighborhood socioeconomic status. Further investigations using intersectional frameworks are needed for examining the relationships between neighborhood socioeconomic status and birth outcome disparities among infants born to adolescent mothers.

Keywords

adolescent mother; African-American; health disparities; low birth weight; socioeconomic status; neighborhood; birth outcomes

Cover Page Footnote

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ABSTRACT

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Methods: Using data from the North Carolina State Center of Health Statistics for 2010-2011, birth cases for 16,472 adolescents were geocoded by street address and linked to census-tract information from the 2010 United States Census. Multilevel models with interaction terms were used to identify significant associations between maternal racial status, age, and neighborhood socioeconomic status (as defined by census-tract median household income) and low birth weight outcomes across census tracts.

Results: Significant racial differences were identified in which African-American adolescents had greater odds of low birth weight outcomes than Caucasian adolescents (OR=1.88, 95% CI 1.64, 2.15). Although racial disparities in low birth weight outcomes remained significant in context of maternal age and neighborhood socioeconomic status, the greatest disparities were found between African-American and Caucasian adolescents that lived in areas of higher socioeconomic status ($p<.001$). Maternal age was not significantly associated with racial differences in low birth weight outcomes.

Conclusion: These findings indicate that racial disparities in low birth weight outcomes among adolescent mothers can vary by neighborhood socioeconomic status. Further investigations using intersectional frameworks are needed for examining the relationships between neighborhood socioeconomic status and birth outcome disparities among infants born to adolescent mothers.

Keywords: adolescent mother; African-American; health disparities; low birth weight; socioeconomic status; neighborhood; birth outcomes

INTRODUCTION

Although disparities in low birth weight (LBW) outcomes have remained a consistent public health concern in the United States, few studies have addressed how the intersections of background characteristics, such as maternal racial status, age, and socioeconomic status, may contribute to widening these disparities. Instead, most studies have examined these characteristics individually, showing greater prevalence of LBW among African American mothers than Caucasian mothers (Mathews & MacDorman, 2013) and higher LBW rates among adolescent mothers when compared to adult mothers (Black, Fleming, & Rome, 2012; Chen et al., 2007). Likewise, socioeconomic factors have been found to contribute greater proportions of adverse birth outcomes and associated disparities among mothers in lower socioeconomic environments (Collins, Wambach, David, & Rankin, 2009; Lhila & Long, 2012). This study therefore examined the intersections of maternal racial status, age, and neighborhood socioeconomic status (SES) and associations with LBW disparities within a statewide sample of adolescent mothers.

Previous studies on adverse birth outcomes and racial disparities have primarily focused on adult mothers with lesser focus on adolescent mothers despite the greater prevalence of LBW, preterm birth, congenital abnormalities, fetal and infant mortality among infants born to adolescent mothers (Black, Fleming, & Rome, 2012). Adolescent mothers are also more likely to have poor educational attainment, experience with trauma, and less social support during and after pregnancy (Black, Fleming, & Rome, 2012), therefore childbearing that results in adverse outcomes could complicate these mothers' ability to cope with motherhood. Given these additional complications of adolescent childbearing, it is important to continue investigations of these adverse outcomes and associated disparities among adolescent mothers.

The recognition of younger maternal age as a risk factor of adverse birth outcomes drives the assumption that younger maternal age sufficiently explains birth outcome disparities among infants born to populations of adolescent mothers (Gilbert, Jandial, Field, Bigelow, & Danielsen, 2004). This assumption subsequently limits investigation of other factors. This combined body of literature suggests that African-American adolescent mothers experience greater risk of adverse birth outcomes than Caucasian adolescent mothers and mothers of older age groups due to their younger age, racial status, and socioeconomic factors, but few studies specifically examined the interplay of race and socioeconomic factors in associations with birth outcomes among adolescent populations (Madkour, Harville, & Xie, 2014; Partington, Steber, Blair, & Cisler, 2009).

Implementing research grounded in intersectional conceptual frameworks can allow researchers to look at the contributions of race and class to the social operation of gender, relationships of how social relationships of power transpire, resulting in improved conceptualization of the intertwining dynamics that affect women's health (Berger & Guidroz, 2009; Hankivsky & Christoffersen, 2008; Shields, 2008). Advocacy for the use of intersectional frameworks in examinations of health disparities had increased in recent years (Bauer, 2014; Bengiamin, Capitman, & Ruwe, 2010; Cummings & Jackson, 2008; Jackson & Williams, 2006; Notaro, 2012). Despite the potential contributions that the use of intersectional frameworks can provide, these frameworks remained sparsely incorporated in quantitative research for health research (Bauer, 2014; Williams et al., 2012). Although some may view intersectional approaches as unfeasible to implement in quantitative research, recent quantitative studies utilized intersectional approaches to explore health disparities among adolescents (Kennedy,

Bybee, Kulkarni, & Archer, 2012; LeVasseur, Kelvin, & Grosskopf, 2013; Marshal et al., 2013; Rogers, Scott, & Way, 2015; Seaton, Caldwell, Sellers, & Jackson, 2010). These studies give justification for more examinations of health disparities among adolescents using intersectional approaches.

Taking these research limitations into account, the research team examined LBW disparities between African-American and Caucasian adolescent mothers through the lens of an intersectional socio-ecological framework. Intersectionality theory was combined with previous social-ecological perspectives (Bronfenbrenner, 1994; Glanz & Bishop, 2010; McLeroy, Bibeau, Steckler, & Glanz, 1988) to comprise the study's framework. This combination of perspectives can enhance insight in associations between factors that contribute to health outcomes at different ecological levels (Agénor, Krieger, Austin, Haneuse, & Gottlieb, 2014; Seng, Lopez, Sperlich, Hamama, & Reed Meldrum, 2012). The authors proposed that African-American adolescent mothers' social identities based on race and age (within gender roles as mothers) uniquely intersect with socioeconomic factors at the community level. Subsequently, these intersectional effects were expected to contribute to greater proportions of LBW outcomes among infants born to African-American mothers in comparison to Caucasian adolescent mothers.

Two central research questions were examined in this study through the use of interaction analyses and multilevel modeling: 1) Does neighborhood SES moderate racial differences in LBW outcomes of infants born to adolescent mothers? 2) Does neighborhood SES moderate racial differences in LBW outcomes differently between younger and older adolescent mothers? In examining intersections between race, neighborhood socioeconomic status (SES), and age, this study contributes to the incorporation of intersectional approaches to quantitative analyses of maternal and infant health outcomes and associated health disparities. Implications from this study can also inform prenatal support programming to increase pregnancy care to adolescent mothers at greater risk for adverse birth outcomes.

METHODS

Data sources and study sample

This cross-sectional study was completed as part of a larger examination of birth outcome disparities among adolescent mothers in North Carolina. With approval from the North Carolina State Center of Health Statistics (NCSCHS) and the research team's institutional review boards, anonymous birth record data from the NCSCHS for the years 2010 and 2011 were examined in these secondary analyses. This sample included cases for adolescent mothers with the following characteristics: self-identified racial status as African-American or Caucasian, non-Hispanic ethnic status, birthplace in the United States, age 19 and under at their infants' birthdate, residency within North Carolina, and singleton live birth delivery at 20+ weeks gestation. In order to add socioeconomic information to these birth cases, the mothers' street addresses were geocoded to census tract identification numbers using ArcGIS 10.0 (Redlands, CA: Environmental Systems Research Institute) and a public geocoder maintained by the Federal Financial Institutions Examination Council (http://www.ffiec.gov). Cases that could not be geocoded through these two systems were excluded from analyses; this exclusion resulted in the final study sample of 16,472 cases for adolescent mothers (~93% of all eligible cases) that resided in 1,991 census tracts across the state. As a next step, geocoded cases were linked to census-tract median household income statistics from the 2010 United States Census.

The incorporation of data from a state vital records database and the US Census has two main benefits. First, using this combined dataset brought the benefit of an ample sample size for examining these birth outcome disparities and testing hypotheses involving multiple variables (Griffith, Neighbors, & Johnson, 2009; Nkansah-Amankra, Luchok, Hussey, Watkins, & Liu, 2010). This study sample also had the advantage of near-equal sample sizes of African-American and Caucasian adolescents (47% vs. 53% respectively) to effectively measure racial differences.

Study measures

Individual-level variables for these analyses included LBW, racial status, and age. LBW (birth weight less than 2500 grams) was the outcome variable of interest with racial status (non-Hispanic African-American / non-Hispanic Caucasian) and age (16 years old and under / 17-19 years old) as independent variables. The maternal age variable was dichotomized rather than examined as a continuous variable in order to assess if younger adolescent mothers in this sample had greater prevalence of adverse birth outcomes than older adolescent mothers as identified in prior research (Eure, Lindsay, & Graves, 2002).

Because income still remains as the most commonly used variable to define individual and neighborhood SES in research (Culhane & Elo, 2005; Cummings & Jackson, 2008; Jackson & Williams, 2006), census-tract median household income was used to operationalize neighborhood SES. Census-tract median household income represented community level and interpersonal level socioeconomic circumstances for this study's framework based on the premise that most adolescent mothers live with their parents during pregnancy. The census-tract median household income information obtained from the US Census was used to separate the adolescents into three SES groups as recommended in prior research guidelines for adolescent populations (Leventhal & Brooks-Gunn, 2000). The "low SES" group consisted of adolescents in the low 25th quartile of the SES distribution, and the "middle SES" group consisted of the two middle quartiles. The "high SES" group included adolescents in the upper 25th quartile. This separation of the census-tract median household income variable by quartiles patterned methodological procedures in previous research on birth outcome disparities (ex. Collins, David, Simon, and Prachand, 2007). The high SES group was designated as the referent group for all analyses because of the expectation that adolescents in the high SES group would have more access to pregnancy health resources (ex. prenatal care) and subsequently have better health throughout pregnancy and optimal birth outcomes.

Analyses

The first stage of the analysis plan included the computation of descriptive and bivariate analyses (chi-square tests and independent sample t-tests) to identify racial differences in infant birth weight outcomes, age, and SES levels. Chi-square tests were also computed for identifying differences in LBW outcomes across racial status, age, and SES groups. SPSS v.21 (IBM Corp, 2012) was used for these analyses.

Applying intersectional theoretical approaches to quantitative analyses have previously been completed through examining interactions and moderating relationships between variables (Cummings & Jackson, 2008; McCall, 2005). Therefore, the analysis plan patterned recent intersectional research (Hinze, Lin, & Andersson, 2012; LeVasseur et al., 2013; Marshal et al., 2013; Seaton et al., 2010) with the use of two-way and three-way interaction terms to assess whether neighborhood SES acts as a moderator variable that changes the direction or strength of relationships between racial status, age, and LBW. In contrast to previous intersectional examinations, multilevel modeling was completed to identify cross-level interactions between

variables at the individual level (racial status, age) and neighborhood level (SES) in impacting birth outcomes. The main benefit of multilevel modeling is the ability to capture variations between groups (neighborhood census-tracts in this case) in addition to differences in outcomes between individuals. Thus, the use of multilevel modeling is encouraged by advocates of ecological approaches and makes this type of modeling appropriate for the study's framework. HLM 7.01 (Scientific Software International, 2013) was used for all multilevel analyses.

All multilevel models were completed according to the guidelines described by Raudenbush & Bryk (2002). Binomial hierarchical generalized linear modeling was used to determine associations between racial status, neighborhood SES, maternal age, and LBW in three models. Model 1 included racial status alone for identifying the independent relationship between racial status and birth outcomes. Model 2 included two-way interaction terms (racial status x SES) for assessing whether the relationship between racial status and LBW changed based on the mothers' SES group. The final Model 3 included three-way interactions (racial status x SES x age) to determine if moderating relationships of SES differed based on the mothers' age group. Significant interactions were tested through omnibus interaction tests and examination of 95% confidence intervals (Dawson, 2013; Jaccard, 2001). Two-sided p-values $< .05$ determined significance for all analyses.

RESULTS

Descriptive and bivariate analyses

Table 1 describes the maternal and birth outcome characteristics for this sample. As expected from previous studies, infants born to African-American adolescents had a lower birth weight average and a greater proportion of LBW outcomes than Caucasian adolescents ($p<.001$). Significantly more African-American adolescents were 16 years old and younger at the time of their infants' birth ($p<.001$). In addition, more African-American adolescents resided in low SES environments than Caucasian adolescents ($p<.001$).

Table 1. Maternal age and socioeconomic characteristics of study sample stratified by racial status [n (%)]

	African-American (n=7,781)	Caucasian (n=8,691)
Birth weight (grams)	3035.60 ± 585.25	3257.82 ± 554.47
Birth weight status		
Normal	87.4%	92.7%
LBW	12.6%	7.3%
Mothers' age groups		
16 and under	14.7%	9.8%
17 – 19	85.3%	90.2%
SES groups		
Low SES (USD $31,388 or less)	38.4%	13.1%
Middle SES (USD $31,389 - $48,466)	42.2%	56.9%
High SES (USD $48,467 or more)	19.4%	30.0%

Note: LBW = low birth weight, SES = socioeconomic status, USD = United States dollars
All racial differences were statistically significant at p<.001.

The chi-square tests highlighted in Table 2 revealed significant racial differences in LBW within each age and SES group. (Table 2 includes the chi-square statistics differences between maternal race groups only; chi-square statistics from separate analyses for within-group comparisons are explained in the text.) Racial disparities were found within each age group for younger mothers (χ^2 = 19.23, p<.001) and older mothers (χ^2 = 108.56, p<.001). However, for the overall sample, no significant differences in LBW by age were found between younger and older adolescents (10.7% vs. 9.7%, χ^2 = 1.78, p>.05) . In addition, no significant differences in LBW were found between younger and older African-American adolescents (13.3% vs. 12.5%, χ^2 = 1.78, p>.05), nor between younger and older Caucasian adolescents (7.2% vs. 7.4%, χ^2 = 1.78, p>.05).

Racial differences in LBW were found between African-American and Caucasian adolescents in each level of neighborhood SES. Furthermore, the widest disparity was found between African-American and Caucasian adolescents in the high SES group (13.1% vs. 6.1% respectively, χ^2 = 59.79, p<.001). African-American adolescents in the high SES group also had the highest proportion of LBW among all African-American mothers and Caucasian mothers in all SES groups. In separate analyses, significant differences by SES group were found in the overall sample (χ^2 = 26.52, p<.001) and within Caucasian adolescents (χ^2 = 11.84, p<.01); no significant differences were found within African-American adolescents across the three SES groups (χ^2 = 1.10, p>.05).

Table 2. Chi-square results in LBW proportions stratified by racial status and SES

	Total Sample	African-American	Caucasian	Chi-square
LBW rate	9.8%	12.6%	7.3%	129.18***
Age 16 and under	10.7%	13.3%	7.2%	19.23***
Age 17 - 19	9.7%	12.5%	7.4%	108.56***
Low SES	11.8%	12.9%	9.1%	10.96**
Middle SES	9.4%	12.2%	7.6%	48.69***
High SES	8.7%	13.1%	6.1%	59.79***

Note: Table reflects differences between maternal race groups only, *p<.05, **p<.01, ***p<.001.

Table 3 (see next page) provides the interaction chi-square tests between race, neighborhood SES and age. Tests within each age and SES group indicated that the smallest disparities were present between African-American and Caucasian adolescents in the low SES group, and only the disparity between low SES adolescents age 17-19 was statistically significant (χ^2 = 9.47, p<.01). In contrast, racial disparities for middle and high SES mothers were identified for younger and older adolescent mothers, and the highest racial disparity in LBW rates was found between African-American and Caucasian mothers age 16 and younger (12.1% vs. 4.3%, χ^2 = 9.82, p<.01).

Multilevel models

Table 4 provides the multilevel analyses for each model. Model 1 identified significant differences in LBW odds relative to racial status across all census tracts. Similar to previous

study samples, significant racial differences in LBW odds were identified in Model 1 in which African-American adolescents had greater odds of LBW than Caucasian adolescents (OR = 1.88, 95% CI 1.64, 2.15). Model 2 with the inclusion of racial status x SES interaction terms revealed significant moderating relationships which further confirm the findings in the chi-square analyses. In contrast to Caucasian adolescents, African-American adolescents of low SES and middle SES neighborhoods had significantly lower odds of LBW births than high SES African-American adolescents. As indicated by the significant interaction terms, disparities in low birth weight odds between African-American and Caucasian adolescents were greater at the high SES level than the low and middle SES levels.

Table 3. Chi-square results in LBW proportions stratified by racial status, neighborhood SES and age

	Total Sample	African-American	Caucasian	Chi-square
Low SES, age 16 years and younger	11.3%	12.2%	8.1%	1.69
Low SES, age 17 – 19	11.9%	13.0%	9.3%	9.47**
Middle SES, age 16 years and younger	11.8%	15.0%	8.5%	9.37**
Middle SES, age 17 – 19	9.1%	11.7%	7.5%	37.24***
High SES, age 16 years and younger	7.7%	12.1%	4.3%	9.82**
High SES, age 17 – 19	8.8%	13.3%	6.3%	51.28***

Note: Table reflects differences between maternal race groups only, *p<.05, **p<.01, ***p<.001.

For the final Model 3, African-American racial status was still significantly associated with greater odds of low birth weight. The two-way interactions between African-American racial status x low SES and African-American racial status x middle SES were significant similar to the results for Model 2, which means that the association between racial status and LBW can still vary depending on SES level when controlling for age. The two-way interaction between age 16 and younger x middle SES was also significant. Thus, middle SES adolescents age 16 and younger have a higher likelihood of LBW births than younger adolescents in higher SES environments and older adolescents. Separate chi-square analyses identified significant differences between younger and older mothers only within the middle SES group (11.8% vs. 9.1% respectively, $\chi^2 = 6.59$, $p<.05$). No significant differences were found between younger and older mothers within the low SES group (11.3% vs. 11.9%, $\chi^2 = .22$, $p>.05$) nor the high SES group (7.7% vs. 8.8%, $\chi^2 = .57$, $p>.05$). The other two-way interactions and the three-way interactions with African-American racial status, age and SES were not significant in this model.

Table 4. Intersectional multilevel models, fixed effects only [OR (95% CI)]

Independent Variables	Model 1	Model 2	Model 3
Intercept	0.11 (0.10, 0.11)***	0.10 (0.10, 0.11)***	0.10 (0.10, 0.11)***
African-American (AA)[a]	1.88 (1.64, 2.15)***	2.03 (1.77, 2.34)***	1.93 (1.69, 2.21)***
Low SES [b]		1.49 (1.29, 1.72)***	1.49 (1.31, 1.70)***
Middle SES		1.13 (1.00, 1.29)	1.13 (1.01, 1.27)*
AA x low SES		0.50 (0.34, 0.74)**	0.51 (0.36, 0.74)**
AA x middle SES		0.70 (0.51, 0.97)*	0.70 (0.51, 0.95)*
Under 17yrs [c]			0.92 (0.73, 1.16)
AA x Under 17yrs			1.18 (0.87, 1.61)
Under 17yrs x low SES			1.35 (0.73, 2.52)
Under 17yrs x middle SES			1.76 (1.02, 3.03)*
AA x Under 17yrs x low SES			0.80 (0.36, 1.75)
AA x Under 17yrs x middle SES			0.84 (0.41, 1.75)

*p<.05, **p<.01, ***p<.001. Referent groups: [a] Caucasian for racial status, [b] High SES for socioeconomic status, [c] Age 17-19 for mothers' age

Overall, racial differences in LBW odds persisted when accounting for age and SES for this sample, and significant relationships between SES levels and LBW outcomes differed by race. Neighborhood SES did moderate racial differences in LBW outcomes between African-American and Caucasian mothers with the highest disparities identified within mothers that lived in high SES neighborhoods. Although African-American adolescents in this study sample were significantly younger than Caucasian adolescents, these results indicate that 1) age did not function as a significant moderator in the relationship between African-American racial status and higher odds of LBW outcomes, and 2) modifying relationships between race and neighborhood SES did not significantly vary by the age group of the mother in relationships with LBW outcomes.

DISCUSSION

In all models for LBW outcomes, significant racial differences were found when controlling for age and neighborhood SES levels. These results resemble findings for adult mothers (Collins et al., 2007) in showing that African-American adolescents experience unique health burdens based on racial status that consequentially contribute to health disparities across all SES levels. All analyses showed the continued association between African-American racial status and higher likelihood of LBW outcomes. These results show that 1) racial differences in adverse outcomes for African-American adolescents can persist when controlling for age and neighborhood SES as defined by income and 2) the relationships between racial status and birth outcomes can potentially vary by neighborhood SES level. These findings contribute to the

scarce literature that found the persistence of racial disparities among adolescent mothers when controlling for demographic and socioeconomic factors (Madkour et al., 2014; Partington et al., 2009).

However, these analyses also show that racial disparities could persist between African-American and Caucasian adolescents regardless of neighborhood SES level. Contrary to other recent examinations of birth outcome disparities with adult mothers (Lhila & Long, 2012; Schempf, Kaufman, Messer, & Mendola, 2011), these results do not indicate the reduction of racial disparities when accounting for SES. Therefore, these results indicate that neighborhood SES as defined by income does not explain away racial disparities in adverse outcomes for adolescent mothers. These results parallel previous findings in a Midwestern sample where African-American mothers had higher odds of LBW in context of income (Partington et al, 2009). Furthermore, these findings revealed the highest disparities in LBW between African-American and Caucasian adolescents among the highest SES groups for both younger and older adolescents. These findings therefore pattern prior study results in which African-American adult mothers of higher education and income experienced greater levels of adverse outcomes than lower SES Caucasian adult mothers (Collins et al., 2007; Cummings & Jackson, 2008; Jackson & Williams, 2006).

With respect to greater risk of LBW outcomes, these findings also indicate that the impact of living in low SES environments for African-American adolescents is minimal compared to the impact for Caucasian adolescents. These findings differ from previous research with a national sample of adolescent mothers in which neighborhood disadvantage did not significantly impact LBW outcomes for Caucasian adolescents, although neighborhood disadvantage was negatively associated with continuous birth weight among African-American adolescents (Madkour et al., 2014). However, these findings compliment prior research in another Midwestern sample in which increased economic mobility does not translate into better birth outcomes for African-American adolescent mothers when compared with impoverished African-American mothers (Collins, Rankin, & David, 2011). Comparing results from these studies highlights the importance of investigating adverse birth outcomes in context of geographic region for identifying potential differences in socioeconomic relationships that could remain hidden in national datasets.

These findings also indicate a weaker relationship between younger age and disparities in LBW than suggested by prior literature (Chen et al., 2007; Gilbert et al., 2004). Younger middle SES adolescents had a higher likelihood for LBW outcomes in the overall sample as illustrated with the significant age x middle SES interaction. These results indicate that younger age could explain significant differences in LBW outcomes, but only in context of SES. Despite this finding, younger age did not explain the higher proportion of LBW outcomes among the African-American adolescents as indicated by the non-significant interaction terms that included both racial status and age. Therefore, these results show that maternal age 16 and under is insufficient to explain racial disparities between adolescent mothers. Future research could explore these differences more between age groups of adolescent mothers.

When interpreting these LBW results, readers should recognize that the LBW births in this sample included all preterm and full-term LBW births. In a previous study (Coley et al., 2015), African-American adolescent mothers in higher socioeconomic neighborhoods had significantly higher odds of preterm birth than Caucasian mothers and African-American mothers across all socioeconomic levels. When comparing these findings with the previous

study, African-American adolescent mothers from areas of higher socioeconomic status may have a greater risk for LBW outcomes because of stressors that would contribute to preterm birth. Examples of such stressors include potential limits in social support stemming from small populations of African-American residents in neighborhoods of higher socioeconomic status (Pickett, Collins, Masi, & Wilkinson, 2005). Future research on other samples of adolescent mothers would help to clarify these findings. Nevertheless, the benefits of looking at neighborhood SES associations for all LBW births among adolescent mother samples should outweigh potential confounding effects of preterm birth status.

Directions for future research

These findings have implications for future research on adolescent mothers, particularly mothers in middle and high SES environments. In interpreting the results, the higher 25th percentile might represent adolescents living in families living well above poverty levels but may lack the financial and social means to obtain the necessary resources during their pregnancies. Because most studies that examined socioeconomic factors of birth outcomes focused on the dichotomy between low and high SES groups, more research is warranted for studying the effects of middle class environments on birth outcome disparities as advocated by previous literature (Jackson & Williams, 2006).

Several factors in social context should also be explored to investigate further into these identified intersectional effects on birth outcomes. Maternal stress has been shown to influence birth outcomes (Rosenthal & Lobel, 2011), and prior research had also identified racial differences in types of maternal stress that mothers experience during pregnancy (Nkansah-Amankra, Luchok, et al., 2010). Moreover, pregnancies for African-American adolescent mothers could have stemmed from coercive circumstances and resulted in high biological stress from conception. Higher prevalence rates of sexual coercion and intimate partner violence had been identified among African-American adolescent females in comparison to the United States national average for adolescents (Howard, Debnam, & Wang, 2013; Kennedy et al., 2012).

Investigations of maternal stress in relation to the intersecting effects of neighborhood SES are warranted for further exploration of birth outcome disparities among adolescent mothers. In previous studies, cumulative neighborhood risk was positively associated with higher allostatic load as a stress indicator among adolescents (Theall et al., 2012), and African-American women were also more likely to live in neighborhoods of higher neighborhood poverty and higher allostatic load (Wallace et al., 2013). However, the resulting associations between linking neighborhood SES, maternal stress, and adverse outcomes have been underexplored, and current research did not find significant associations between allostatic load and adverse birth outcomes (Wallace et al., 2013). These interpersonal and environmental factors could lead to increased maternal stress for adolescent mothers and subsequently poorer outcomes; future studies could investigate if these factors contribute to differences in maternal stress and subsequent birth outcomes between African-American and Caucasian adolescent mothers.

More exploration on the influence of social support during pregnancy is also warranted, particularly from infants' fathers. Previous studies identified the lack of paternal support as a risk factor for adolescent mothers experiencing adverse birth outcomes, and this risk was more pervasive among African-American adolescent mothers (Alio, Mbah, Grunsten, & Salihu, 2011). Given the current recommendation for examining social context future research in health inequities (Aïach & Baumann, 2011), investigating social context and disparities could identify

points of intervention in providing tailored support for African-American adolescent mothers during pregnancy.

Finally, future exploration is needed to better understand how health care and insurance impacts birth outcome disparities. Previous research on adolescent births occurring before the Affordable Care Act revealed the presence of racial disparities in birth outcomes between African-American and Caucasian adolescent mothers when controlling for adequacy of prenatal care utilization (Coley & Aronson, 2013). However, research is sparse in insurance coverage and investigations of prenatal care quality in services that adolescent mothers receive. Future research could include further examination on the association of insurance coverage as well as racial differences in prenatal care quality to enhance our understanding of how healthcare inequities might factor into racial disparities in birth outcomes.

Limitations

This study was completed with the recognition of several limitations. One main limitation was the inability to sufficiently capture the concept of racial status in one demographic self-reported variable. Warner (2008) cautions against the use of "master categories" (i.e. race) that might lead to stereotypical viewpoints of results. To avoid stereotyping in quantitative health disparities research, future studies could explore related maternal stressors related to racial status such as racial discrimination and inequity. Current research on adolescents found associations for African-American adolescents that experience multiple forms of racial discrimination and poor health outcomes that exceed the contribution of a singular type (Grollman, 2012). This prior research justifies further investigation of these experiences for African-American adolescents.

Other limitations stem from the cross-sectional nature of the study and operationalization of variables. First, this study used only census-tract median household income to operationalize neighborhood SES. To delve further into SES relationships with birth outcomes, future studies could explore other measures of SES (i.e. poverty, public assistance, housing, crime) with relationships to birth outcomes. Given the cross-sectional nature of this study, a second limitation stems from the lack of available information about the length of time that the mothers spent at their residencies at the time of their infants' births. Varied lengths in mothers' residential tenure might have contributed to differences in neighborhood influence on these mothers' preconception and prenatal health and subsequently influence birth weight outcomes. If adolescents moved between neighborhoods of different SES levels, the neighborhoods of their current residencies would not capture the full socioeconomic nature of these mothers' experiences. Moreover, upward mobility to higher SES neighborhoods might not compensate for adverse effects from prior years of residence in disparate neighborhoods. Previous research noted detrimental effects of long-term poverty on birth outcomes for African-American women that grew up in deprived neighborhoods (Collins, Wambach, David, & Rankin, 2009; Love, David, Rankin, & Collins, 2010), and future research can explore similar longitudinal effects of deprived neighborhood environments and upward mobility in higher SES neighborhoods for adolescent mothers. Finally, interactions can only capture limited understanding of intersections at the descriptive level (Cole, 2009). Future studies are therefore needed to improve efforts to quantitatively operationalize intersectionality in health research as previously noted (Bauer, 2014).

The strengths of this study outweigh the limitations. To date, no other studies have been found that takes an intersectional multilevel approach to investigating LBW disparities between African-American and Caucasian adolescent mothers. This study also exemplifies an

intersectional approach for examining health outcomes among a statewide sample of adolescent mothers using vital records data. Thus, future research for local, county, and state populations can employ this same approach in order to identify subgroups of adolescent mothers at higher risk for adverse birth outcomes. Another strength stems from the study's use of US Census household income data for operationalizing SES of neighborhoods; this technique allows these study's findings to build on previous research that found significant associations between characteristics of neighborhood context and health outcomes (Messer, Vinikoor-Imler, & Laraia, 2012; Nkansah-Amankra, Dhawain, Hussey, & Luchok, 2010; Nkansah-Amankra, Luchok, et al., 2010). Finally, this study examined a large sample of adolescent mothers that provided the statistical power necessary for examining subgroups of adolescent cases for interactions in accordance with other prior quantitative examinations (Nkansah-Amankra, Luchok, et al., 2010).

CONCLUSION

Overall, this study contributes to limited research that explored neighborhood socioeconomic factors related to LBW disparities among adolescent mothers using an intersectional approach. In order to develop and improve interventions that support adolescent mothers, greater efforts to identify at-risk groups and disparities are needed (Meyer et al., 2013; Shaw & Lawlor, 2007). These LBW disparities therefore justify further exploration for the benefits of improvement of perinatal services, improving birth outcomes, and reducing disparities among infants born to adolescent mothers.

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