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Young maternal age and low birth weight risk: An exploration of racial/ethnic disparities in the birth outcomes of mothers in the United States¹

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Abstract

This study considers how low birth weight (LBW) prevalence varies by race/ethnicity and maternal age and explores mechanisms that explain disparities. Results show that maternal age patterns in LBW risk for African Americans differ from whites and foreign- and U.S.-born Hispanics. Background socioeconomic disadvantage, together with current socioeconomic status and smoking during pregnancy, explain almost all of the LBW disparity between white teenage mothers and their older counterparts. These findings suggest that social disadvantage is a primary driver in unfavorable birth outcomes among white teenage mothers compared to older white mothers. Alternatively, background disadvantage and other social characteristics explain very little of the LBW disparities among African Americans and U.S.- and foreign-born Hispanics. Overall, these results indicate LBW disparities by maternal age are a complex product of socioeconomic disadvantage and current social and behavioral factors, such that LBW risk does not operate uniformly by race/ethnicity or maternal age.

Keywords

low birth weight; maternal age; race/ethnicity; weathering hypothesis

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²All N's are rounded to nearest 50 to accommodate data security restrictions.

³Odds obtained by exponentiating logistic regression coefficients, e.g., in Model 2: $=e^{(0.48)}=1.62^4=e^{(0.48-0.12)}=1.43$

1. Introduction

Early life exposure to social disadvantage or unfavorable health conditions may have a lasting impact on later life health, although the pathways that these factors take are varied and in many cases indirect (Ferraro & Kelley-Moore, 2003; Haas, 2007; Hayward & Gorman, 2004; Willson, Shuey, & Elder, 2007). In particular, unfavorable birth outcomes have been associated with adverse health and developmental outcomes throughout the life course (Barker, 1995; Barker, et al., 1989; Boardman, et al., 2002; Conley & Bennett, 2000). Through birth outcomes, a mother's health, as a product of the social and behavioral circumstances of her life during and before pregnancy, has the potential to have far reaching health implications for her child (Lu & Halfon, 2003). This study investigates racial/ethnic differences in prevalence of low birth weight (LBW) among teenage mothers compared to older mothers and considers the factors that contribute to these disparities.

The assumption that teenage mothers are inherently at risk for compromised birth outcomes because of biological factors is considered. Large-sample U.S. studies indicate that unfavorable birth outcomes for teenage mothers compared to older mothers occurs to some degree because of biological factors (Fraser, Brockert, & Ward, 1995; Chen, et al., 2007). However, additional research indicates that this disparity does not exist among African American women due to higher average exposure to social and environmental disadvantage compared to whites (Geronimus, 1987; 1996). These explanations suggest that unfavorable birth outcomes among teenage compared to older mothers are the norm, from which African American mothers deviate as a result of lower socioeconomic status (SES). The role of social disadvantage in understanding young mothers' risks of compromised birth outcomes is examined, particularly relating to the selection of more disadvantaged teenagers into childbearing. As such, the ways young maternal age is associated with unfavorable birth outcomes is considered, both across and within racial/ethnic groups.

Four research questions are considered. First, how do teenage mothers' risks of LBW differ across racial/ethnic groups? Second, do teenage mothers within each racial/ethnic group have greater risk of LBW than older mothers? Third, what factors explain differences in teenage mothers' LBW risk across racial/ethnic groups? Fourth, what factors explain teenage mothers' differential LBW risk within each racial/ethnic group?

2. Previous Research

2.1. Low Birth Weight, Age, and Race/Ethnicity

This study uses low birth weight (LBW) as the birth outcome of interest. LBW is associated with neonatal mortality in more developed countries and is also linked to developmental delays and compromised health outcomes later in life (Boardman, et al., 2002; Conley & Bennett, 2000; Paneth, 1995). Furthermore, LBW is highly correlated with preterm birth, with the two factors together accounting for half of all costs for infant hospitalization in the U.S. (Russell et al. 2007). LBW is a single indicator of birth outcomes and does not predestine a child to compromised health. Nonetheless, it remains one of the most widely available and accurate measures of birth outcomes (David, 2001; Wilcox, 2001).

Research indicates that mothers at the younger and older ends of the childbearing age range are at increased risk for LBW. This study focuses on the younger ages. Fraser, et al. (1995) find mothers under age 20 are at increased risk for having a LBW child. Although their sample is limited to white mothers in Utah, a replication using data for the entire United States that controlled for a number of factors including race/ethnicity and socio-economic status (SES) reports similar findings (Chen, et al., 2007). However, these analyses do not account for the possibility that associations between young maternal age and LBW risk vary by race/ethnicity.

LBW prevalence in U.S. births in 2007 is relatively uniform for most racial/ethnic groups (white, Asian, American Indian, Hispanic), ranging from 6.9% to 8.1%. The exception is African American women, for whom LBW is 13.8% (Hamilton, Martin, & Ventura, 2009). Whereas LBW prevalence by race/ethnicity documents a substantial racial disparity, these statistics provide little insight into how risk may differ between younger and older mothers within each group or within age categories across racial/ethnic groups.

Sociological and demographic research finds evidence from multiple data sources that teenage mothers are not uniformly at risk of compromised birth outcomes across racial/ethnic groups, although most research has focused on white and African American mothers. Geronimus (1987) first notes this difference using infant mortality statistics, finding that while white teenage mothers exhibited higher infant mortality risk than white mothers in their mid 20s, African American teenage mothers exhibited lower infant mortality risk than their counterparts in their mid- to late-20s. The replication of these findings in LBW outcomes led Geronimus (1992; 1996; 2001) to develop the weathering hypothesis, which maintains that exposure to high levels of social stressors, combined with negative coping behaviors, has led to accelerated health deterioration among African American women, contributing to compromised birth outcomes. Additional analyses find that LBW risk among African American mothers increases consistently beginning at around ages 18–19 (Reichman & Pagnini, 1997; Rich-Edwards, Buka, Brennan, & Earls, 2003). This pattern is quite dissimilar to that of white mothers, whose risk across age groups typically follows a U-shaped pattern similar to that found by Fraser et al. (1995). The aforementioned studies use vital statistics data which contain limited information about the mother's or child's life circumstances. Because of these data constraints, few individual-level mechanisms behind increased LBW risk, including but not limited to family background, current SES, smoking, and prenatal care, have been studied. The in-depth survey data in this study allows for examination of the influence of these factors on LBW.

A more limited body of research addresses maternal age gradients in LBW prevalence for racial/ethnic groups other than whites and African Americans. Using the 1989-91 NCHS Linked Birth/Infant Death Files and comparing bivariate LBW levels for U.S.- and foreign-born Mexican women aged 15–34, Wildsmith (2002) finds no evidence of weathering in these groups. Whereas foreign-born Mexican mothers exhibit a consistent advantage in LBW risk by age compared to U.S.-born Mexican-origin women, within each group mothers under age 20 exhibit persistently higher LBW prevalence than mothers in their mid-20s. Limited evidence for weathering among U.S.-born Mexican-origin women exists in the bivariate relationship between maternal and neonatal mortality, with increasing risk between

ages 17 and 23, but findings are otherwise inconclusive (Wildsmith, 2002). Collins, Rankin, and Hedstrom (2012) similarly find no evidence of weathering among Mexican American women in Illinois. However, Powers (2013) finds infant mortality rates among U.S.- and foreign-born Mexican women exhibit certain elements of weathering. Mexican American women's infant mortality rates are more favorable than whites at younger ages, although this relative advantage reverses at later ages. Understanding acculturation effects in the Hispanic population remains difficult, because it is difficult to measure the effects of duration in the U.S. as well as age at migration (Ceballos & Palloni, 2010).

A more extensive literature examines Hispanic birth outcomes in reference to the Hispanic Health Paradox (Frisbie, Forbes, & Hummer, 1998; Hummer, et al., 2007). Women from immigrant Hispanic groups have lower risk for infant mortality than U.S.-born non-Hispanic whites, whereas U.S.-born Mexican American women have slightly higher infant mortality risk than non-Hispanic whites but lower risk than non-Hispanic African Americans (Hummer, et al., 2007). LBW findings are mixed: LBW prevalence is similar between most Hispanic groups and non-Hispanic whites, but with controls for various behavioral and socioeconomic characteristics, Hispanic mothers demonstrate a slightly higher LBW prevalence than whites (Frisbie, et al., 1998; Frisbie & Song, 2003). Few studies that examine maternal age patterns in birth outcomes among Hispanics include comparisons with other racial/ethnic groups, a gap that the present study addresses (Collins, Rankin, & Hedstrom, 2012; Wildsmith, 2002).

2.2 Explaining Differences in Low Birth Weight

Several explanations exist for the relationship between social factors and LBW risk. The weathering hypothesis attributes the negative relationship between maternal age and favorable birth outcomes to exposure to social stressors resulting from different long-term experiences with social disadvantage. Current and former SES represents a major part of this disadvantage (Geronimus, 1992). Evidence exists that SES magnifies the negative outcomes that exemplify weathering. Rauh, Andrews, and Garfinkel (2001) find that the positive association between maternal age and moderately low birth weight (1500–2499 grams) is most pronounced among poor African American women. Geronimus (1996) finds that African American women in the poorest neighborhoods show the largest increase in LBW risk between 15 and 25 year olds. The theoretical framework of weathering is complex at the intersection of SES and race/ethnicity because they are often conflated in U.S. society. Race also affects birth weight independently of SES through the impact of discrimination. As a result of continued experiences with racism and sexism, even African American women at higher SES levels may experience compromised health outcomes (Mullings, 2009). Women of average and high SES also exhibit a positive relationship between very LBW and maternal age (Geronimus, 1996). Further research is needed to explain differential age patterns in LBW by race/ethnicity.

A number of social and behavioral factors are tested in the present study, including maternal marital status at birth, current and former SES, tobacco use during pregnancy, and delayed prenatal care (Kramer, 1987; Padilla & Reichman, 2001; Parker, Schoendorf, & Kiely, 1994; Reichman & Kenney, 1998; Sung, et al., 1993; Zimmer & Zimmer 1998). Geronimus (1996)

suggests that the differential age patterns in smoking among white and African American women may explain some of the disparity. This study does not focus on biological processes associated with LBW, although some physiological variables associated with social characteristics are examined. The available physiological variables include maternal BMI before pregnancy, maternal weight gain during pregnancy, maternal height, and past pregnancy terminations (Abrams & Selvin, 1995; Komlos & Breitfelder, 2008; Kramer, 1987; Kramer, et al., 2000; Ogunyemi, et al., 1998; Shah & Zao, 2009). Improved understanding of how these social, behavioral, and physiological factors relate to age, race/ethnicity, and LBW informs our understanding of the factors that contribute to birth outcomes in a diverse population.

3. Method

3.1 Data

This study uses data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative sample ($N \approx 10,700^2$) of live births in the U.S. in 2001 (U.S. Department of Education, 2006). The survey was conducted when the child was 9 months, 24 months, age 4, and at the start of kindergarten, providing extensive data on the children's lives and developmental outcomes. However, the present study requires only data from Wave 1 (conducted 9 months postpartum), which provides information coded from the birth certificate as well as retrospective reports from the mother regarding events before and during the pregnancy. The ECLS-B is a valuable data set for studying differences in birth outcomes by maternal age, as it provides a substantial subsample of children whose mothers were aged 15 to 19 at their birth ($N \approx 1,200$), including both primiparous and multiparous births. Children whose mothers were under age 15 at their birth were excluded from the sample for reasons of confidentiality, although this demographic comprises a very small proportion of the population (Hamilton, et al., 2009).

The ECLS-B includes approximately 8,850 singleton births. However, foreign-born white and African American mothers are excluded to avoid selection bias in immigrant health. The Hispanic subpopulation is large enough to be divided by nativity, and is split as such in the analysis. Native American, Asian American, and multiracial mothers are excluded because sample numbers are insufficient for analysis broken out by maternal age groups, leaving 6,450 cases. The analysis sample is comprised of approximately 6,150 cases of the possible 6,450 (94.9%) following the exclusion of cases with missing values for the explanatory variables.

3.2 Variables

Birth outcomes are measured using a common dichotomous indicator of LBW, measured as any birth weight less than 2500 grams, or 5.5 lbs (Kramer, 1987). Although LBW is a broad indicator of birth outcomes, it is preferable to more fine-grained alternatives in this study to maintain adequate statistical power for analysis.

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Race/ethnicity is divided into four categories, U.S.-born whites, African Americans, and foreign- and U.S.-born Hispanic mothers. To examine the heterogeneity of the Hispanic ethnicity, sensitivity analyses were performed on U.S- and foreign-born Mexican American mothers only, finding that LBW prevalence was very similar to women with corresponding nativity in the broader Hispanic category. As the sample size for Mexican Americans was not adequate to examine maternal age patterns in all analyses, this study uses the broader Hispanic designation throughout this study. Maternal age at birth is derived from birth certificate reports, although a few cases without birth certificate data are retrieved by subtracting the child's age from the mother's age at Wave 1.

Two variables from Wave 1 maternal reports serve as broad indicators of past exposure to socioeconomic disadvantage. The first is the mother's report of her own mother's educational level, dichotomized by identifying children whose grandmothers never finished high school, assuming that mothers whose own mother did not have a high school diploma by Wave 1 should have experienced more socioeconomic disadvantage over their lifetimes, on average, than those whose mothers have at least a high school diploma. The second measure is derived from the mother's report of whether her family was on welfare at any point during the time when she was 5 to 16 years old. A substantial number of cases are retained with missing information on these variables by including dichotomous missing indicators for grandmother's education and maternal welfare status.

Whereas the aforementioned measures are intended to indicate background disadvantage, a composite measure comprised of maternal and paternal education, occupation, and household income is used to assess current SES. This SES measure is assessed at Wave 1, when the child was 9 months old, although it is presumed that household SES is unlikely to have changed a great deal in a single year. To account for household structure, a dichotomous measure of marital status at birth is included in regression models (coded as married or not married).

Our dichotomous variable indicating maternal smoking during pregnancy reflects a yes answer to either or both of two questions: a birth certificate question reporting whether the mother used tobacco during pregnancy, and a Wave 1 question whether she smoked during the last 3 months of her pregnancy. Delayed prenatal care is defined as no prenatal care visit until after the end of the first trimester, or no prenatal care at all.

Maternal BMI before pregnancy is calculated using the mother's retrospective reports at Wave 1 of her height and weight before the pregnancy, and is coded into four categories: underweight ($<18.5 \text{ kg/m}^2$), normal weight ($18.5 \text{ kg/m}^2 \text{ \& } <25 \text{ kg/m}^2$), overweight ($25 \text{ kg/m}^2 \text{ \& } <30 \text{ kg/m}^2$), and obese ($\geq 30 \text{ kg/m}^2$), with normal weight serving as the reference category. Maternal weight gain during pregnancy is also obtained from the mother's retrospective reports, and is divided into categories of low, adequate, and high weight gain, with adequate weight gain serving as the reference group. Low, adequate, and high weight gain are defined using Institute of Medicine (2009) guidelines for weight gain during pregnancy. Finally, a dichotomous indicator of past pregnancy termination is obtained from the birth certificate, although the specific type (induced or spontaneous) is not available.

Parity is obtained from birth certificate reports about previous live and non-live births. This control is a dichotomous indicator of first birth vs. second or later birth, to account for the fact that first-born children typically weigh less than second or later born ones (Malik, et al., 1997; Phung, et al., 2003). A control is included for the sex of the child because male children have higher average birth weights (Kramer, 1987).

3.3 Analysis Plan

Questions 1 and 2 are addressed using bivariate analysis comparing teenage mothers to their 20–34-year-old counterparts by race/ethnicity. Next, binary logistic regression is used to estimate the odds of LBW across maternal age and racial/ethnic groups with interactions between the two to allow the effects of maternal age to vary by racial/ethnic group. The age group 25–29 serves as the reference group in all regression models because it is a rough midpoint for the age groups and because the average age of first childbearing the United States was 25 years in 2006 (Martin, et al., 2009). All analyses account for complex survey design using Stata 11.0 with replication and probability weights to make findings representative of U.S. births in 2001. Mothers aged 35 and over are included in the tables and figures, although due to small sample size and the longer interval of this group, they are not addressed in the text.

Analysis for Questions 3 and 4 adds explanatory variables into the logistic regression models first individually, and later all together in a full model. Due to space considerations, these variables are presented as a block of results, discussing important individual variables as necessary. Post-hoc significance tests are performed after each regression to compare maternal age groups by race/ethnicity, in an effort to determine the impact of each variable on the relationships of maternal age and LBW within and across racial/ethnic groups.

4. Results

Question 1: How do teenage mothers' risk of LBW differ across racial/ethnic groups?

Table 1 presents descriptive statistics by race/ethnicity for teenage mothers and those aged 20 to 34 at the child's birth, with significance tests comparing the two groups by race/ethnicity. LBW prevalence is relatively similar for white, African American, and U.S.-born Hispanic teenage mothers, ranging from approximately 10% to 12% of the population. About 6% of births to foreign-born Hispanic teenagers are LBW, lower than each of the other three groups at a statistically significant level.

Question 2: Do teenage mothers within each racial/ethnic group have greater risk of LBW than older mothers?

Comparing 15–19 and 20–34 year-old mothers in LBW prevalence, Table 1 shows that white and U.S.-born Hispanic teenage mothers have significantly higher LBW risk than their older counterparts. In contrast, African American and foreign-born Hispanic teenage mothers exhibit almost identical LBW prevalence compared to their older counterparts. However, the circumstances surrounding these two groups are quite different, as both 15–19 and 20–34 year-old African American mothers exhibit high relative LBW prevalence,

whereas the two age groups among foreign-born Hispanic mothers are relatively low. Figure 1 displays LBW prevalence by race/ethnicity in 5-year age categories.

Table 1 adds description relating to social, demographic, and physiological characteristics between the two maternal age groups. On almost every measure, white mothers aged 15–19 exhibit less favorable characteristics than their older counterparts, but the differences between teenage and older mothers among other racial/ethnic groups are less often significant. This lack of significance is not due to smaller sample sizes among minority groups—the teenage and older mothers’ means on these variables are considerably more similar among non-white mothers. For most SES measures, teenage mothers of different races/ethnicities look similar, but older white mothers are much more advantaged than any other group.

All four racial/ethnic groups of teenage mothers are significantly more likely to fall in the bottom SES quintile than their 20–34 year-old counterparts, although absolute differences exist across racial/ethnic groups as well. For example, both teenage and older mothers among foreign-born Hispanics have a high likelihood of being in the bottom SES quintile, although this appears to be driven in large part by this group’s low educational attainment.

Table 2 introduces logistic regression models predicting LBW, with the first model providing coefficients for age and race/ethnicity, then a model interacting the two factors, followed by 4 models introducing explanatory variables. As expected, Model 1 indicates that LBW prevalence by maternal age for all mothers exhibits a weak U-shaped risk pattern, with increased LBW risk before age 20 and after age 35 ($p < 0.10$ and $p < 0.05$, respectively).

Table 2, Model 2 introduces interactions by maternal age and race/ethnicity, controlling only for parity and child gender. This model indicates that white teenage mothers have 62%³ higher odds of LBW than their 25–29 year-old counterparts. Post-hoc significance tests, reported in Table 3, indicate that white teenage mothers also have 43%⁴ and 72% higher odds of LBW than white 20–24 and 30–34 year-olds, respectively. As indicated in Table 3, no significant within-race age disparities are found in Model 2 for other racial/ethnic groups.

Question 3: What factors explain differences in teenage mothers’ LBW risk across racial/ethnic groups?

Table 2, Model 3 introduces background disadvantage indicators into the model, and Model 4 adds SES indicators, smoking, marital status, and delayed prenatal care. The differences in teenage mothers’ LBW prevalence by race/ethnicity are best discerned from the post hoc tests displayed in Table 3. Moving from Model Model 3 to Model 4, the difference between African American and white teenage mothers transitions from marginally significant to statistically significant at the $p < 0.05$ level, with higher LBW risk among African American teen mothers. Controlling for socioeconomic disadvantage and smoking magnifies the differences in LBW prevalence between these two groups, as the controls substantially reduce the LBW prevalence among white teenage mothers, whose unfavorable birth outcomes are more strongly associated with socioeconomic disadvantage and smoking than African American mothers.

Table 3 indicates that the primary teenage mother group with meaningful differences from the other groups is that of foreign-born Hispanic mothers. Foreign-born Hispanic teenage mothers exhibit a consistently lower LBW prevalence compared to African American teenage mothers, and this statistically significant disparity persists through each regression model. Differences also exist between foreign-born Hispanic teenage mothers and their white and U.S.-born Hispanic counterparts, although to a lesser degree. When background SES is controlled in Model 3, foreign-born Hispanic teenage mothers exhibit lower LBW prevalence than white teenage mothers at the $p < .10$ level, a difference that is eliminated when current socioeconomic and behavioral factors are added in Model 4. This disparity is reduced again to marginally significant levels in the full model (Model 6). Finally, U.S.-born Hispanic teenage mothers exhibit higher LBW prevalence compared to their foreign-born counterparts, first at marginally significant levels (Models 2, 3 & 4), and then at statistically significant levels (Models 5 & 6). Potential explanations for the consistently favorable birth weights of foreign-born Hispanic mothers will be considered in the discussion.

Question 4: What factors explain teen mothers' differential LBW risk within each racial/ethnic group?

Our final analysis looks at disparities in LBW within racial/ethnic groups, with particular focus on the comparison of teenage mothers to their older counterparts. Early models with minimal controls found white teenage mothers to have more unfavorable birth weight outcomes than their older counterparts. Table 2, Model 3, provides a picture of how background socioeconomic disadvantage impacts LBW prevalence for each racial/ethnic group. Importantly, the statistically significant coefficient for white teenage mothers from Model 2 is reduced to marginal significance ($p < 0.10$), such that the likelihood of LBW for white teenage mothers, relative to 25–29 year-olds, is reduced by about 29%. Among African American and U.S.- and foreign-born Hispanic mothers, background social disadvantage accounts for about a 20% decrease in the likelihood of LBW. These findings suggest that selection of more disadvantaged women into teenage motherhood is a meaningful contributor to the likelihood of LBW in all four groups of teenage mothers.

Table 2, Model 4, and the accompanying post hoc tests in Table 3, show that including controls for current SES, smoking, and marital status fully explains the elevated LBW risk among white teenage mothers relative to older white mothers. The individual inclusion of each covariate suggests that current SES, smoking during pregnancy, and marital status each play a distinct role in explaining LBW among white mothers. Supplementary analysis, not shown, indicates that white mothers aged 15–19 are more likely to be in the bottom SES quintile, smoke during pregnancy, and be unmarried than their older counterparts, confirming that each of these factors partially mediates the relationship between young maternal age and LBW risk among white mothers (Baron & Kenny, 1986). No single covariate fully eliminates the increased LBW risk among white teenage mothers, but when they are included together, no disparity remains.

Results in Tables 2 and 3 suggest support for the weathering hypothesis: African American teenage mothers do not exhibit higher LBW prevalence than their older counterparts in the early logistic regression models, although after controlling for current SES, marital status,

and smoking in Model 4, 15–19 year-old African American mothers exhibit significantly more favorable LBW risk than their 25–29 year-old counterparts. This disparity remains in Model 6 as well. Model 6 also indicates a marginally significant difference in LBW risk between 15–19 and 30–34 year-old African American mothers. Taken together, these findings suggest moderate support for the weathering hypothesis. No single covariate fully explains these fluctuations in LBW risk, although teen mothers' lower current SES explains some of the disparity. Background disadvantage and current SES being equal, African American teenage mothers exhibit more favorable birth outcomes than their older counterparts.

Finally, post-hoc tests in Table 3 demonstrate no age disparities among foreign- or U.S.-born Hispanic mothers. As such, these groups do not fit into the same age pattern of LBW prevalence as either whites or African Americans. Based on findings from Question 2, U.S.-born Hispanics resemble whites to some degree in their slightly elevated LBW risk among teenage mothers, although this disparity does not persist once controls are added. Foreign-born Hispanic mothers, alternatively, exhibit no increased LBW risk at ages 15–19, and LBW prevalence at all ages remains relatively low.

5. Discussion

The current study set out to explore maternal age patterns in LBW prevalence by racial/ethnic group using new nationally representative U.S. data. LBW risk among teenage mothers compared to their older counterparts was examined, expanding previous analyses of white and African American mothers to U.S.- and foreign-born Hispanics. Additionally, analyses investigated whether selection into early childbearing, socioeconomic factors related to weathering, prenatal behaviors, and physiological factors explained the observed disparities. ECLS-B provides a rich data source for these analyses, as it adds retrospective reporting on proxy indicators of background SES, current SES, prenatal care, and physiological controls relating to pre-pregnancy weight and weight gain during pregnancy, which are not available in vital statistics data.

Our results for white mothers confirm previous studies' findings that white teenage mothers have increased risk for LBW compared to their counterparts between the ages 20 and 34 (Fraser, , 1995). However, the differential risk patterns by maternal age across other racial/ethnic groups indicate that estimating maternal risk by age with only simple controls for race/ethnicity may mask variation within these groups (Chen, et al., 2007). In other words, the associations between various social factors and LBW appear to differ by racial/ethnic group, indicating that continued disparities in LBW by race/ethnicity may be driven by underlying social or environmental conditions that remain unmeasured in most research. Among white teenage mothers, background socioeconomic disadvantage, smoking during pregnancy, current low SES, and being unmarried contributed significantly to unfavorable birth outcomes compared to older mothers, whereas among other racial/ethnic groups these factors had a decidedly smaller impact. The separately meaningful impact of both background socioeconomic disadvantage and current SES and health behaviors among white teenage mothers suggests an important role of selection into teenage motherhood among whites. Specifically, these findings assert that little to no biological disadvantage is apparent

in 15–19 year-old mothers' births; rather, long-term exposure to socioeconomic disadvantage explains the majority, if not all, of the disparity. The importance of factors related to selection into teenage childbearing echoes similar findings in research on the socioeconomic and mental health consequences of teenage motherhood, and not just its consequences for birth outcomes (Furstenberg, Brooks-Gunn, & Morgan, 1987; Geronimus & Korenman, 1992; Mollborn & Morningstar, 2009; Turley, 2003). Existing disparities do not stem exclusively from social disadvantage, but given that the sample excludes mothers under age 15, and that a majority of the teenage mothers are ages 17 and up, biological immaturity does not appear to be a primary factor in LBW disparities. The addition of pre-pregnancy weight and weight gain during pregnancy account for physiological factors, although they do not affect maternal age patterns in LBW in a significant way.

Findings among African American mothers are indicative of patterns associated with the weathering hypothesis. After controlling for these teenage mothers' lower SES and other factors, African American teenage mothers' lower LBW risk than their older counterparts indicated evidence of weathering. One's interpretation of the weathering hypothesis itself is important in discerning the results from these analyses though. Whereas African American and white teens have comparable LBW prevalence, the risk does not decrease for African American mothers with increased age as it does among white mothers. Therefore, if the weathering hypothesis means that there is no perceivable benefit to delaying childbearing among African American women, the theory is supported.

Age disparities in LBW for African American women were not attenuated by controls for socioeconomic, behavioral, and physiological risk factors, but increased after including these controls. A small amount of the white/African American disparity in LBW was explained when all potential mediating factors were included. For example, the odds ratio in LBW risk for African American mothers aged 25–29 compared to white mothers aged 25–29 decreased from 2.66 in the base model to 1.99 in the full model (Table 2, Models 2 and 6). The likelihood of LBW for African American teenage mothers was about 39% higher than for white teen mothers before adding covariates (Model 2), and was reduced to about 34% with all covariates added (Model 6). Despite smaller disparities at the younger ages, the important finding is that a racial disparity remains after controlling for available covariates, suggesting that factors unmeasured here account for remaining differences. One contribution of these analyses is that they indicate that social processes driving birth outcomes are not one-dimensional across racial/ethnic groups, but rather that white teenage mothers, for example, have specific risk factors relative to African American and Hispanic mothers. The challenge remains to identify what factors are driving disparities among non-white mothers, given that few of the covariates included in the analysis have a meaningful impact on the age patterns.

U.S.-born Hispanic mothers were largely similar to whites in LBW patterns by maternal age, with marginally increased risk of LBW among teenage mothers. Foreign-born Hispanic teenage mothers exhibited more favorable LBW prevalence than other racial/ethnic groups, largely consistent with literature on the Hispanic Health Paradox. In particular, these findings suggest potential selection processes accompanying migration that result in favorable birth outcomes in this population. Very little evidence suggests that U.S.- or

foreign-born Hispanics' higher average levels of socioeconomic disadvantage relative to whites produced differing LBW patterns by maternal age. The data do not provide the option of assessing acculturation processes, and whether increased time in the U.S. leads to more unfavorable birth outcomes for immigrant mothers, but future work should examine the extent to which social disadvantage in the U.S. context is a contributor.

We hope this research improves understanding of processes associated with LBW and help frame future inquiries. While LBW assesses maternal health only indirectly, factors such as lifelong low SES and smoking are likely to affect maternal health as well as birth outcomes. Future research should examine how more fine-grained birth weight distinctions, for example very low birth weight, moderately low birth weight, and high birth weight, may be associated with maternal age and race/ethnicity. Despite the substantial sample size of ECLS-B, differences in maternal health at young ages may not be large enough to reach statistical significance because of smaller numbers than in vital statistics data. The exclusion of babies who died prior to data collection at 9 months postpartum, many of whom were likely LBW births, may also bias the ECLS-B data. However, the individual-level survey data provides new insight into some of the fine-grained processes associated with LBW risk by maternal age and race/ethnicity. Future survey data may allow for more detailed testing of these issues and provide new approaches to studying this topic that are not afforded by ECLS-B.

This study is relevant for policy in signaling that the risk factors that contribute to unfavorable birth outcomes appear to be different by racial/ethnic group and by maternal age. Specifically, public health interventions relating to smoking should be directed toward groups with the highest prevalence, specifically white teenage mothers. Results suggest that smoking reduction in this group might lower their LBW outcomes substantially. The continued disparity in LBW for African American mothers compared to other racial/ethnic groups remains a major public health issue, and the fact that only a small amount of this difference was accounted for with individual-level controls signals that continued research and public health work is needed to understand and address this disparity. Better knowledge of how maternal age and race/ethnicity relate to birth outcomes is vital to reducing health disparities among disadvantaged groups. The accumulation of inequalities in health and their transmission across generations are important areas of inquiry, and the study of birth outcomes holds promise for learning how to address some of these inequalities before they have fully taken hold in the next generation.

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Figure 1. Proportion of LBW by five-year age group and race/ethnicity
Source: Early Childhood Longitudinal Study-Birth Cohort (2001)

Table 1

Descriptive characteristics by race/ethnicity and maternal age at birth

	White			African American			U.S.-born Hispanic			Foreign-born Hispanic		
	15-19	20-34	Sig.	15-19	20-34	Sig.	15-19	20-34	Sig.	15-19	20-34	Sig.
Proportion of sample	0.06	0.53		0.03	0.11		0.02	0.08		0.02	0.14	
Low birth weight	0.10	0.05	**	0.12	0.11		0.11	0.06	*	0.06	0.07	
First child	0.86	0.40	**	0.75	0.30	**	0.73	0.35	**	0.81	0.35	**
Mother on welfare during childhood	0.18	0.08	**	0.30	0.26		0.21	0.18		0.10	0.05	
Grandmother no high school diploma	0.39	0.22	**	0.40	0.31	*	0.57	0.52		0.84	0.83	
Maternal education at birth	10.98	13.74	**	10.76	12.70	**	10.59	12.66	**	9.32	9.87	*
Bottom SES Quintile	0.42	0.08	**	0.55	0.33	**	0.47	0.17	**	0.64	0.47	**
Married at birth	0.27	0.80	**	0.04	0.31	**	0.19	0.61	**	0.38	0.63	**
Smoked during pregnancy	0.34	0.19	**	0.09	0.11		0.11	0.09		0.03	0.00	
Mom low BMI pre-pregnancy	0.14	0.05	**	0.07	0.04		0.09	0.04		0.12	0.06	
Mom overweight pre-pregnancy	0.11	0.24	**	0.21	0.24		0.24	0.27		0.20	0.30	*
Mom obese pre-pregnancy	0.09	0.14	*	0.07	0.28	**	0.11	0.25	**	0.08	0.13	
Late prenatal care	0.12	0.06	**	0.20	0.12	**	0.20	0.09	*	0.13	0.10	
Low weight gain during pregnancy	0.17	0.15		0.26	0.22		0.20	0.16		0.21	0.24	
High weight gain during pregnancy	0.54	0.49		0.42	0.46		0.48	0.54		0.37	0.39	
Past pregnancy termination	0.13	0.26	**	0.11	0.32	**	0.05	0.27	**	0.05	0.15	**

Notes:

* p < .05

** p < .01

Source: Early Childhood Longitudinal Study - Birth Cohort 2001-2002

Significance indicated for tests between 15-19 & 20-34 year-old mothers within each race/ethnicity

Table 2

Logistic regression coefficients predicting LBW for children of U.S. White, African American, U.S.-Born Hispanic, and Foreign-born Hispanic mothers in 2001 with stepwise addition of mediators

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Maternal age (25–29=ref)						
15–19	0.22	0.48	0.34	–0.01	0.26	–0.09
20–24	0.02	0.12	0.04	–0.18	0.02	–0.21
30–34	–0.05	–0.06	–0.03	0.10	–0.03	0.11
35+	0.26	0.12	0.20	0.36	0.17	0.33
Maternal race/ethnicity (White=ref)						
African American	0.73	0.98	0.89	0.83	0.76	0.69
U.S.-born Hispanic	0.21	0.08	–0.07	0.01	–0.33	–0.25
Foreign-born Hispanic	0.25	0.28	0.16	0.23	0.04	0.12
Child female	0.15	0.16	0.16	0.15	0.15	0.14
First child	0.35	0.36	0.44	0.52	0.50	0.57
African American X 15–19		–0.65	–0.63	–0.41	–0.60	–0.40
African American X 20–24		–0.41	–0.40	–0.29	–0.33	–0.21
African American X 30–34		–0.08	–0.16	–0.17	–0.09	–0.11
African American X 35+		0.03	–0.13	–0.26	–0.05	–0.18
U.S.-born Hispanic X 15–19		–0.10	–0.01	0.06	0.04	0.12
U.S.-born Hispanic X 20–24		–0.29	–0.20	–0.20	–0.12	–0.10
U.S.-born Hispanic X 30–34		0.00	0.01	–0.04	–0.01	–0.05
U.S.-born Hispanic X 35+		0.28	0.21	0.08	0.36	0.22
Foreign-born Hispanic X 15–19		–0.57	–0.49	–0.32	–0.43	–0.25
Foreign-born Hispanic X 20–24		0.13	0.17	0.30	0.20	0.32
Foreign-born Hispanic X 30–34		0.25	0.24	0.12	0.28	0.15
Foreign-born Hispanic X 35+		0.79	0.71	0.57	0.72	0.56
Maternal grandmother's education						
<HS (HS diploma=ref)			–0.02	–0.07	–0.07	–0.12
Some college			–0.48	–0.40	–0.50	–0.43

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
College degree			-0.47***	-0.33**	-0.46***	-0.32***	**
Education missing			0.55***	0.43**	0.53**	0.40**	*
Mother on welfare as a child			0.25**	0.17**	0.28**	0.20**	*
Maternal welfare status missing			0.56*	0.46	0.62**	0.51**	*
SES Quintile 1 (Quintile 3=ref)				0.04		0.02	
SES Quintile 2				0.03		0.05	
SES Quintile 4				-0.09		-0.09	
SES Quintile 5				-0.38		-0.38	
Late prenatal care				0.31**		0.29*	*
Smoked during pregnancy				0.61***		0.56***	***
Married at birth				-0.18**		-0.21**	**
Mom low BMI pre-pregnancy					0.43**	0.41**	**
Mom overweight pre-pregnancy					-0.06	-0.05	
Mom obese pre-pregnancy					-0.05	-0.11	
Mom low pregnancy weight gain					0.62***	0.59***	***
Mom high pregnancy weight gain					-0.32***	-0.34***	***
Maternal height centered (cm)					-0.03***	-0.03***	***
Past pregnancy termination					0.25***	0.20***	**
Constant	-3.07***	-3.11***	-3.01***	-2.97***	-3.06***	-2.94***	***

N≈6,150

Notes:

* p<.10,

** p<.05,

*** p<.01,

two-tailed tests

Source: Early Childhood Longitudinal Study-Birth Cohort 2001–2002

Table 3

Statistically significant post hoc tests by maternal age and race/ethnicity, derived from logistic regression models in Table 2 predicting low birth weight prevalence

Maternal age groups by race/ethnicity ^J	Model 2 - Base interaction model	Model 3 - Base + background SES	Model 4 - Base & SES, married, smoking, prenatal care	Model 5 - Base & Physiological characteristics	Model 6 - Full model
W 15–19 > W 20–24	**	*	NS	NS	NS
W 15–19 > W 30–34	**	NS	NS	NS	NS
AA 15–19 > W15–19	**	*	**	NS	NS
W 15–19 > FBH 15–19	*	*	NS	**	*
AA 15–19 > FBH 15–19	***	***	**	***	***
NBH 15–19 > FBH 15–19	*	*	*	**	**
AA 25–29 > AA 15–19	NS	*	**	*	**
AA 30–34 > AA 15–19	NS	NS	NS	NS	*

Legend - White (W), African American (AA), U.S.-Born Hispanic (NBH), Foreign-Born Hispanic (FBH)

* p<.10,
** p<.05,
*** p<.01,

NS=not significant, two tailed tests

^J Group comparisons with no significant differences are not shown

Note: Example interpretation - In Model 2, white mothers age 15–19 have increased LBW prevalence compared to white mothers age 20–24 at the p<.05 significance level