

Cumulative Inequality and Race/Ethnic Disparities in Low Birthweight: Differences by Early
Life SES

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ABSTRACT

The current study applies Cumulative Inequality theory to investigate whether differences in black, white, and Hispanics mothers' early life socioeconomic status (SES) account for disparities in infants' risk of low birthweight (LBW). This study uses three-generation linked data that come from the National Longitudinal Survey of Youth 1979 (1979-1995) and the NLSY Young Adult sample (1994-2010) and contain information on the mothers and grandmothers of 2,332 singleton infants. Controlling for mothers' health and adult SES, I assess the unique association between childhood low SES, in terms of both cumulative economic hardship (i.e., household poverty status from ages 0 to 14) and social status (i.e., grandmothers' education and marital status), and LBW probability. I also examine differences in LBW probability between black, white, and Hispanic women from similar childhood socioeconomic backgrounds. Overall, results indicate that childhood socioeconomic factors do not account for race/ethnic disparities in LBW. Rather, childhood low SES increases the probability of LBW for whites but is not significantly predictive of LBW for blacks or Hispanics. In fact, pairwise comparisons indicate the greatest LBW disparities exist between black and white women who experienced the least socioeconomic disadvantage during early life.

Cumulative Inequality and Race/Ethnic Disparities in Low Birthweight: Differences by Early Life SES

Decades of interdisciplinary research documents the link between low birthweight (LBW) and life chances demonstrating the importance of a healthy start for children's later adult health and success (Conley and Bennett 2000; Haas 2007). LBW infants experience poorer health (Haas 2007; Oreopoulos et al. 2008) and worse developmental outcomes (Boardman et al. 2002) throughout childhood and adolescence and achieve less academic and professional success as adults (Behrman and Rosenzweig 2004; Conley and Bennett 2000). Yet huge race/ethnic disparities in LBW exist especially between children born to non-Hispanic white and non-Hispanic black mothers, hereafter referred to as white and black mothers respectively, such that black infants are twice as likely to be born LBW compared to white infants (Martin et al. 2013). In contrast, infants born to mothers of Hispanic descent generally experience LBW rates similar to or better than their white counterparts, though there is considerable variation in rates of LBW within this diverse group (Martin et al. 2013). These disparities in LBW are especially troubling given the intergenerational nature of this issue. Specifically, because LBW infants experience greater risk of poor adult health and low educational and economic attainment they predispose their subsequent offspring to an increased risk of LBW. Hence, poverty and poor health may be passed down to future generations.

Numerous studies have sought to identify the causal factors driving race/ethnic disparities in LBW, yet what fuels these patterns remains poorly understood. Most existing research attempts to explain racial and ethnic disparities in LBW in terms of mothers' differential adult risk and protective factors. Differences in mothers' prenatal health behaviors, prenatal care, and socioeconomic characteristics by race/ethnicity do indeed contribute to the observed patterns of

race/ethnic disparities in LBW, yet these factors only partially account for the gaps. In other words, race/ethnic differences in maternal risk and protective factors do not fully explain either the excess rates of LBW among blacks or the favorable rates of LBW among Hispanics compared to their white counterparts (Gorman 1999; Reichman et al. 2008).

An abundance of research also demonstrates the importance of early life SES for adult health (Kuh and Ben-Shlomo 2004), but the evidence linking maternal early life circumstances to LBW remains quite limited. Scholars have struggled to apply lifecourse perspectives and truly longitudinal designs to the study of LBW largely because sufficiently detailed longitudinal data for such investigations remains in short supply. Nonetheless, existing research points to a link between maternal childhood SES and infant birthweight (Astone et al. 2007; Gavin et al. 2011; Gisselmann 2006) but fails to explore LBW disparities by race/ethnicity. Despite this, evidence from at least one study suggests mothers' differential experiences of neighborhood poverty during childhood may in fact drive race/ethnic disparities in LBW between white and black infants (Love et al. 2010). Yet this study stands as the sole inquiry into this question. As such, it remains uncertain whether race/ethnic patterns in LBW are a function of lifelong socioeconomic inequalities not previously captured by extant studies, or if equivalent childhood socioeconomic circumstances result in differential LBW risk for black, white, and Hispanic mothers.

Thus, the aims of this study are threefold – first, to provide a comprehensive examination of the unique contribution of maternal childhood SES to infant LBW for blacks, whites, and Hispanics by accounting for mothers' SES in both early life and adulthood; second, to determine the extent to which race/ethnic disparities in LBW are attributable to differences in childhood SES; and finally, to assess whether analogous childhood SES experiences among black, white, and Hispanic mothers correspond to similar LBW probability for their infants. In this paper, I

assess these questions using three-generation linked data that contain detailed longitudinal information on the mothers and grandmothers of 2,332 singleton infants. To date, no inquiry into LBW disparities has employed measures of maternal early life circumstances that capture the range of life history from birth to childbearing age. Using this multigenerational data allows me to gauge mothers' early life SES in terms of both cumulative economic hardship (i.e., household poverty status from ages 0 to 14) and social position (i.e., grandmothers' education and marital status), as well as to control for important confounders such as the potential heritability of LBW, as few extant studies have been able to.

BACKGROUND

Early Life Socioeconomic Status and Low Birthweight

The lifecourse perspective has rarely been utilized in LBW studies, though a small body of research provides evidence of its salience for the study of maternal and infant health. A study of Swedish births (Gisselmann 2006), for one, clearly demonstrates that childhood social class elicits an independent impact on LBW. The authors report that infants whose mothers came from lower class backgrounds had higher odds of LBW independent of their mothers' adult social class. This evidence supports the notion that low childhood social class has a lasting detrimental impact on maternal and infant health and that the negative health consequences of childhood experiences cannot be undone even for mothers who achieve some degree of upward social mobility. Other studies corroborate these findings using different measures of childhood SES. Research finds, for example, that infants born to mothers who grew up in low SES households, indicated by household poverty and low parental education, have lower birthweights than infants whose mothers were more advantaged during childhood (Astone et al. 2007; Gavin et al 2011). Like Gisselmann, these studies find the effect of mother's childhood SES operates independently

of and exerts a greater influence on LBW than adult SES. Together these studies suggest the same pattern—that mothers’ childhood socioeconomic circumstances have lasting health impacts, which are in turn transmitted to the next generation in terms of LBW. However, Astone and colleagues (2007) reportedly found no evidence of race/ethnic differences in LBW, which would suggest that childhood socioeconomic inequality functions *similarly* among different race/ethnic groups to structure LBW risk. Following this logic, mothers’ experience of low childhood SES therefore poses a *uniform* threat to infants of all race/ethnic backgrounds, and excessively high rates of LBW among blacks, for example, stem from processes of racial stratification that disproportionately place mothers of color in low SES circumstances from early life onward.

Race/Ethnicity and Low Birthweight

Race/ethnic disparities in LBW have stably persisted for decades (Martin et al. 2013), and a vast body of research attempts to explain these disparities in terms of adult risk and protective factors, such as SES. To be sure, the impact of adult maternal SES on infant LBW is well-documented (see Blumenshine et al. 2010 for a review), yet despite this, accounting for group differences in adult circumstances — socioeconomic or behavioral — does not explain race/ethnic disparities in LBW, particularly between black and white infants (Lu and Halfon 2003, 2010). Even so, research into the adult socioeconomic drivers of LBW does hint at the possibility that SES operates differently for black, white, and Hispanic. Virtually no studies, however, examine how the distinctive early life experiences of black, white, and Hispanic women, especially with regard to their differential exposure to socioeconomic advantages and disadvantages, might explain racial and ethnic differences in LBW. Yet decades of evidence demonstrates the extent to which childhood circumstances differ between blacks, whites, and

Hispanics. For one, stark patterns of residential segregation in the U.S., specifically during the era in which mothers in the current study were coming of age, suggest that black, white, and Hispanic women grow up in different neighborhoods (Iceland, Weinberg and Steinmetz 2002) and experience substantially different socioeconomic contexts (Macartney 2011).

Hispanic-White Comparisons in Low Birthweight

Adult SES among Hispanic mothers has proved to have limited utility in explaining the incidence of LBW for this group. Despite Hispanics' lower socioeconomic resources compared to whites (DeNavas-Walt et al. 2013; Ryan and Siebens 2012), Hispanic women tend to experience similar, or even lower rates of LBW. Only in 2012 did the LBW rate for whites drop to the rate observed among Hispanics (i.e. just below 7 percent). In past decades, LBW rates have been consistently lower for Hispanics compared to whites (Martin et al. 2013). In general, Hispanic mothers experience LBW rates more favorable than their levels of income, education, and health insurance coverage might predict. Favorable rates of LBW among Hispanics are often explained by focusing on subgroups within this population—for example, by ethnicity or nativity—that tend to have lower rates of LBW. Case in point, past studies indicate that much of the LBW advantage among Hispanics is driven by low rates of LBW among Mexican mothers (Acevedo-Garcia et al. 2007; Gorman 1999; Reichman et al. 2008), as Mexicans constitute the largest Hispanic subgroup in the U.S. (Ennis et al. 2011). According to previous studies, Mexican mothers owe a sizeable portion of their LBW advantage to better health and behavior during pregnancy (Gorman 1999; Reichman et al. 2008). Low rates of LBW among Hispanics are also partially driven by foreign-born mothers. Consistent with the healthy migrant theory, foreign-born Mexican-origin mothers, for example, have much lower rates of LBW compared to their U.S.-born counterparts (Acevedo-Garcia et al 2007). The reason for migrant mothers' better

outcomes, however, remains largely obscured, as no studies have yet examined the possibility that favorable outcomes among this group may be due to advantages stemming from childhood.

Black-White Disparities in Low Birthweight

The majority of research on LBW risk among black and white women attempts to identify the causal factors driving differences in LBW risk and incidence between these groups. Unlike the case for Hispanics, while adult SES does play an important role in driving black-white disparities in LBW, it fails to account for a significant portion of the gap (Lu and Halfon 2003, 2010). Rather, substantial evidence suggests the relationship between adult SES and LBW is exacerbated by racial minority status (Geronimus 1996; Rauh et al. 2001). For example, Geronimus (1996) demonstrated that LBW disparities between black and white mothers widens with increasing maternal age due to black mothers' worsening health profiles during prime childbearing years (i.e. the phenomenon referred to as 'weathering'). One of the key conclusions from Geronimus' pioneering study of 'weathering', however, was that SES exerted a stronger influence on LBW for African American mothers residing in low-income areas compared to those in more advantaged neighborhoods. Others have since corroborated the finding that poor maternal socioeconomic conditions increase infants' risk of poor health outcomes, especially for mothers who experience additional facets of social disadvantage, specifically racial minority status (Rauh et al. 2001).

The explanation that emerges from these studies is that health deterioration is more pronounced among poor black women compared to either higher income blacks or whites, because of the combined disadvantage of being both poor and a racial minority. Thus, this combined disadvantage erodes poor black women's health and leads to excess risk of LBW among black infants.

Subsequent evidence, however, challenges this explanation by questioning the salience of racial or ethnic minority status in structuring LBW risk. Rich-Edwards and colleagues (2003), for example, do find evidence of a divergence in health deterioration between black and white women indicated by infant LBW—consistent with the ‘weathering’ hypothesis. Yet they also find that the black-white difference in LBW is not significant after accounting for interactions with maternal age and several markers of disadvantage in terms of socioeconomic hardship (i.e. being unmarried, and living in a poor neighborhood) and health during pregnancy (i.e. smoking while pregnant, and receiving inadequate prenatal care). Instead, they find that the risk of LBW is higher among disadvantaged women, regardless of race, and suggest that various economic hardships and health risks act cumulatively upon all women to threaten reproductive health. Thus, according to this study, higher LBW risk among blacks compared to whites is attributable to blacks’ disproportionate levels of disadvantage. Rich-Edwards and colleagues speculate, however, that maternal early life socioeconomic conditions not captured in their study may have driven the pattern of their findings. As with many studies, because adult SES is related to, albeit not wholly reflective of, childhood SES, failing to account for childhood conditions may lead researchers to incorrectly attribute a causal pathway between adult circumstances and health, even though both child and adult SES have been shown to independently predict adult health (Hayward and Gorman 2004) and infant LBW (Astone et al. 2007; Gavin et al. 2011; Gavin et al. 2012).

Nonetheless, support for ‘weathering’ bolsters the notion that childhood SES is related to LBW risk, as ‘weathering’ demonstrates how the embodiment of social disadvantage happens over time. Yet whether similar socioeconomic circumstances among black and white women result in similar LBW risk is not a given, despite Rich-Edwards and colleagues’ evidence to the

contrary. Other studies suggest that SES operates differently for black and white women to structure LBW risk. For example, data from the California Maternal and Infant Health Assessment (MIHA) indicate the relative disparity in LBW between African American and white women is largest among those who are affluent (Braveman 2011). Specifically, black and white mothers with the highest income and education levels experience the most pronounced differences in LBW risk.

In research that takes a more life course approach, Colen and colleagues (2006) examine the relationship between socioeconomic mobility and black-white disparities in LBW. Evidence from their study challenges the notion that black and white women receive equal health benefits from higher SES. Specifically, among a national sample of white and black women who were poor at age 14, only white mothers experienced reduced LBW risk associated with higher adult income. Thus, socioeconomic gains did not translate into reduced LBW risk for black women who grew up poor, but they did for white women. Love and colleagues (2010) find evidence of a similar pattern using neighborhood income measures. They examine LBW risk between black and white women from both poor and nonpoor neighborhoods in the Chicago area. Black women who were born into poor neighborhoods but moved into upper income neighborhoods as adults failed to experience a reduction in LBW risk. Interestingly though, black women who lived in upper income neighborhoods at both time points (i.e. birth and adulthood) exhibited LBW patterns similar to white women. Thus, Love and colleagues' findings suggest that socioeconomic contexts can indeed operate similarly to influence LBW risk for black and white women, but only under certain conditions—i.e. a lifetime of advantage.

These studies collectively point to an interaction between race, childhood socioeconomic circumstances, and LBW risk, such that early life socioeconomic disadvantage may pose a

permanent risk to black mothers' reproductive health, whereas similar early life disadvantages may not be so enduring for white mothers. Thus according to this premise, black and white mothers from more affluent childhood backgrounds should exhibit similar LBW patterns, and LBW differences should be found only among black and white mothers from disadvantaged backgrounds. Still, both childhood and adult factors are likely to be important here. With regard to adult circumstances, unmeasured SES factors, such as wealth, for example, could partially drive observed black-white disparities in LBW. Research shows that at any given income level African American women possess only a fraction of the wealth that whites hold (Braveman 2011). Black mothers might also experience fewer health benefits from high adult SES. Parallel socioeconomic circumstances may very well expose black and white women to entirely different experiences in terms of risk and opportunity. Black women who are well off according to traditional measures of socioeconomic standing, for example, might experience health-damaging stress related to racial discrimination (Braveman 2011) that could have acute impacts during pregnancy. Yet the impact of adult socioeconomic factors on LBW does not preclude the special relevance childhood circumstances may hold in better understanding these relationships.

Socioeconomic inequality during childhood could indeed be a key unmeasured factor driving differences in LBW risk for black and white women. This possibility is bolstered by the fact that at any given current income or education level, African American women are more likely than their white counterparts to have grown up in worse socioeconomic conditions (Braveman et al. 2005). Relative to poor white adolescents, for example, poor black adolescents reside in neighborhoods with higher poverty concentrations, and among black and white women with a college degree, white women are twice as likely to have a college-graduate parent compared to their black counterparts (Braveman et al. 2005). In general, what these patterns

suggest is that current SES conditions may be especially poor reflections of black women's childhood circumstances and may systematically underestimate the deleterious health effects of low SES for blacks. As we know from the many studies of 'weathering', disadvantage manifests over time, (Geronimus 1996; Rauh et al. 2001; Rich-Edwards et al. 2003; Love et al. 2010) and begins its toll on the body during early life.

Lifecourse and Cumulative Inequality Theory

A substantial body of literature demonstrates early life circumstances have lasting impacts on adult health (Kuh and Ben-Shlomo 2004), and the linkages between childhood socioeconomic factors and adult health conditions (e.g., cardiovascular disease and mortality) are well documented (see Elo et al. 1992 and Kuh et al. 2004 for reviews). Further, numerous lifecourse models theorize the pathways from early life to adult health. In general, most theories hold that social circumstances expose individuals to health risks (or benefits), and these negative (or positive) exposures accumulate throughout the lifespan and lead to divergent health trajectories (Ben-Shlomo and Kuh 2002). Health differentials in later life are conceptualized as the product of cumulative disadvantages and/or advantages, and the concomitant risks and/or opportunities experienced throughout the lifecourse (Dannefer 1987; Kuh and Ben-Shlomo 2004). The processes posed by these frameworks are often described as 'chains of risks,' whereby exposure to one risk factor increases one's likelihood of exposure to another (Ben-Shlomo and Kuh 2002). Being born into poverty, for example, would increase one's likelihood of experiencing poor nutrition as a child, which in turn would increase one's chances of becoming obese, and thereby one's risk of chronic disease. In addition, stress and negative psychosocial experiences also operate within these 'chains of risks.' For instance, poverty and

financial hardship are stressful experiences that may wear down the body as well as increase one's likelihood of substance abuse.

Cumulative Inequality (CI) theory (Ferraro and Shippee 2009) builds upon past lifecourse models to refine the conceptual pathways by which early life circumstances influence later health outcomes. CI theory holds that individuals' health trajectories are shaped by the accumulation of risk and/or opportunity resulting from social advantages or disadvantages but also stipulates additional theoretical axioms (Ferraro and Shippee 2009). Three components of these axioms are applied in the current study. First, CI theory emphasizes the importance of capturing the how the duration of exposure to advantage or disadvantage structures individuals' health risks or opportunities. Second, CI theory foregrounds the family as a critical social realm in which individuals are exposed to risk and opportunity during childhood. Family lineage, in terms of both genetics and social environments, is important for understanding the etiology of adult health conditions. Third and finally, CI theory stipulates that social advantage and disadvantage are not opposites. Instead, individuals' social positions and resources expose them to different experiences (i.e., risks and opportunities). Lower income individuals, for example, do not just have less money than higher income individuals but are exposed to qualitatively different social processes that correspond to different risks and opportunities. Case in point, black, white, and Hispanic women at similar levels along the socioeconomic spectrum may face different risks and opportunities because of their social location within racial and ethnic hierarchies (Williams 2012). In other words, conceptualizing advantage or disadvantage as circumstances that expose individuals to entirely different social processes allows us to understand how socioeconomic parity among race/ethnic minorities and whites may not equate to similar experiences in terms of risk and opportunity.

CI theory has received considerable empirical support (Goosby 2013), though mostly in the field of gerontology and has seldom been applied to the study of health at younger ages, though there have been explicit calls to do so (Ferraro and Shippee 2009). The current study applies CI theory to the study of LBW—an outcome that reflects both women’s and infants’ health—because it creates space for understanding the health impacts of social risks and opportunities with more nuance than other life course theories; yet, CI theory should be considered an extension of rather than a divergence from life course theory more broadly. CI theory embodies two distinguishing features that make it specially relevant for understanding racial and ethnic differences in LBW etiology—first and most significantly, CI theory acknowledges that social risks and opportunities lead to different rather than necessarily opposite experiences and consequences across groups (e.g. race/ethnicity), and second, CI theory emphasizes the role families play in transmitting risks and opportunities to later generations.

Hypotheses

Given the empirical evidence exhibiting the salience of childhood socioeconomic circumstances for later adult health (Hayward and Gorman 2004; Kuh and Ben-Shlomo 2004) and infant LBW (Astone et al. 2007; Gavin et al. 2011; Gisselmann 2006), as well as the potential for this relationship to differ by race/ethnicity (Braveman 2011; Colen et al. 2006; Love et al. 2010), I expect that low SES during mothers’ early lives will exert a deleterious influence on infant birthweight above and beyond mothers’ current health and SES. I also expect that childhood SES factors will partially account for LBW disparities by race/ethnicity. Informed by CI theory and the literature regarding race/ethnic birthweight disparities, however, I expect the relationship between maternal childhood socioeconomic circumstances and infant LBW to differ for black, white, and Hispanic mothers, such that analogous childhood circumstances among black, white,

and Hispanic women will not correspond to similar LBW probability for their infants. However, the inconsistent support for the existence of a differential relationship between SES and LBW for blacks and whites as well as the limited understanding of LBW etiology for Hispanics compels me to formulate no a priori expectations regarding the strength or directionality of this hypothesized interaction. Instead, the current study attempts to reconcile the mixed findings reported in previous studies by widening the scope of inquiry to encompass early life socioeconomic circumstances. My formal hypotheses are as follows:

Hypothesis 1: Mothers' low childhood SES, indicated by economic hardship (i.e. poverty exposure to poverty from ages 0 to 14) and low social status (i.e. grandmothers' unmarried status and low educational attainment), will predict greater LBW risk for whites, blacks, and Hispanics independent of mothers' current SES.

Hypothesis 2: Mothers' low childhood SES will partially account for LBW differences between white, black, and Hispanic infants.

Hypothesis 3: Equivalent childhood SES circumstances among black, white, and Hispanic mothers will *not* correspond to similar LBW probability for their infants.

DATA AND METHODS

This study uses linked data from the National Longitudinal Survey of Youth 1979 (NLSY79) and the National Longitudinal Survey of Youth, Young Adult (NLSY-YA) cohorts to examine the contribution of women's early life socioeconomic inequality to racial disparities in LBW.

This study constructs intergenerational longitudinal data by linking female NLSY79 respondents to their female NLSY-YA offspring who have had at least one live birth. Hence, data for this analysis draw from information regarding three generations of NLSY respondents—grandmothers in the NLSY79 cohort, mothers in the NLSY-YA cohort, and infants born to

NLSY-YA mothers. Throughout the paper, I use generational terms to distinguish between cohorts, referring to NLSY79 respondents as grandmothers, NLSY-YA respondents as mothers, and offspring of NLSY-YA respondents as births or infants.

In 1979, the original NLSY79 began surveying a nationally representative cohort of youth whose ages ranged from 14 to 22 at the time of first interview (N=12,686). Respondents were surveyed annually from 1979 to 1994, biannually thereafter, and are still being followed. Respondents were born between 1957 and 1964 and were ages 45 to 53 in 2010. The survey was initially funded by the U.S. Bureau of Labor Statistics to collect information on youth labor force experiences, but has since collected extensive other information relevant to the focus of this study (e.g. income, educational experiences, and family life). The NLSY79 had multiple original sampling frames beyond the primary cross-sectional samples designed to represent the non-institutionalized civilian population of adolescents aged 14 to 22 in 1979. Additional frames included an oversample of blacks, Hispanics, and economically disadvantaged whites of the same age, and a subsample of military service men and women ages 17 to 21. The entire oversample of economically disadvantaged whites and nearly all military subsample respondents have since been dropped from the survey. No births included in this analysis are the grandchildren of these dropped sample respondents. Black and Hispanic births are over-represented in the current study, as the NLSY79 retained the black and Hispanic oversamples. Additionally, births to poor whites are also slightly over-represented in the current study, as the NLSY79 retained the cross-sectional sample of economically disadvantaged whites after dropping the oversample. More detailed information regarding NLSY79 sample design and procedures is publicly available in the technical sampling report (Frankel et al. 1983).

In 1986, offspring of all female NLSY79 respondents were incorporated into the NLSY Child and Young Adult survey. In 1994, offspring ages 15 or older were given a biannual survey designed for young adults—the NLSY-YA. This survey was modeled after the original NLSY79 and includes extensive information regarding respondents’ socioeconomic circumstances, family life, health, and fertility. Children and young adults born to female NLSY79 respondents continue to be incorporated into the Child and Young Adult surveys and are estimated to represent 95% of children ever born to the original cohort of women. The current study draws from all available years of NLSY-YA survey data (1994 to 2010) reported by female NLSY-YA respondents who have had one or more live births. To construct measures of these mothers’ early life circumstances, the current study also draws from all available years of NLSY79 survey data (1979 to 2010) reported by *their* mothers, i.e., the infants’ grandmothers, in the original 1979 cohort of women.

All reported live births to NLSY-YA mothers as of the 2010 survey were included in the current study if they met the following criteria: 1) were singleton births, 2) were to mothers ages 15 or older, and 3) were to mothers born in 1975 or later. Multiple births and births to very young mothers were excluded due to their atypical birthweight patterns (Martin et al. 2012). Births to NLSY-YA mothers born prior to 1975 were excluded because these mothers were older than 3 years at the time the survey began in 1979. Consequently, poverty status for these mothers during their very young – and potentially crucial – ages is unavailable. Of 2,746 total eligible births, 414 births were excluded via listwise deletion because of missing data across included covariates². The exception was mothers’ marital status at the time of birth, given its relevance as

² These 414 excluded births were somewhat distinctive from the remaining 2,332 sample births, insofar that higher social status characteristics (i.e. married, college-educated) were

a key predictor for this study; missingness on this item was included as a control, and these cases were not excluded³. Analyses were conducted on a final sample of 2,332 births to 1,215 mothers of 933 grandmothers. Sample NLSY-YA mothers were born between 1975 and 1993, and were ages 17 to 34 in 2010. The majority of sample mothers were still in their young twenties in 2010 and not yet past childbearing ages, which biases the sample to some degree. Additionally, the youthful bias among NLSY-YA mothers is likely to persist even as existing NLSY-YA mothers age because young adult offspring continue to be incorporated into the survey.

Measures

Low birthweight. The dependent variable, low birthweight, is a measure indicating infant birthweight less than 2,500 grams (approximately 5.5 lbs.) and is widely considered a reliable marker of infant health and viability (Institute of Medicine 1985). Though maternal reports of infant birthweight are subject to some recall bias, they have been used in numerous previous investigations and are considered valid (Conley and Bennett 2000). Additionally, because surveys were administered biannually, the time between infant's birth and mother's recall was less than two years in most cases, which should bolster the credibility of birthweight reports. A dichotomous measure, LBW is constructed by first converting mother reports of infant birthweight reported in pounds and ounces into grams, and then by recoding infant birthweight as an indicator variable (1 = LBW).

overrepresented among black grandmothers in the sample relative to grandmothers who were excluded.

³ Information regarding the pregnancy and birth of sample infants was reported by mothers in a series of question loops. Absent from these series of loops was any question regarding mothers' marital status at the time of birth. As such, mothers' marital status at birth was inferred based on matched reports before and after the infants' birth year. Missingness on this item is high because many mothers were not surveyed during the years surrounding the birth of their children.

Maternal early life socioeconomic circumstances. A set of explanatory variables capture different facets of women's early life socioeconomic circumstances and are taken from NLSY79 grandmother reports. These measures include *early life poverty exposure*, *grandmother's educational attainment*, and *grandmother's marital status*. Early life poverty exposure represents the percentage of time NLSY-YA mothers were living below the poverty line from ages 0 to 14. Constructed poverty indicator variables are available for each survey year, from 1979 to 2010. Using the constructed poverty indicator variables, early life poverty exposure is constructed by first dividing the total number of years NLSY79 grandmothers' reported annual incomes below the poverty line while their children, NLSY-YA mothers, were growing up (from ages 0 to 14) by the total number of measurements. The total number of poverty measurements varies by the number of surveys in which NLSY79 grandmothers participated and by NLSY-YA mothers' birth year. The number of possible poverty observations for NLSY-YA mothers varies by mothers' birth year due to the transition from annual to biannual surveys in 1994. This continuous measure is then divided into ordered categories ranging from 0 to 11, which measure poverty exposure in 10 percent intervals with separate categories for mothers who spent none and all of their early lives in poverty (0 = none; 1 = 1-10% ... 10 = 91-99%; 11 = 100 %). Grandmother's educational attainment is measured in categories representing NLSY79 grandmothers' lifetime highest grade completed and coded into dummy variables for less than high school, high school graduate, and some college or more (reference). Grandmother's marital status is coded as a dummy variable indicating whether grandmothers were married or unmarried at the time of birth of each NLSY-YA mother (1 = unmarried).

Maternal characteristics. Race/ethnicity is taken from NLSY-YA mothers' self-reported responses and coded with dummy variables for non-Hispanic white, non-Hispanic black, and

Hispanic⁴. Additionally, several sets of control variables capture mothers' health, the prenatal environment, and mothers' socioeconomic circumstances at the time of birth. Controls for mothers' health include maternal age at birth, measured continuously (ages 15 to 33), and maternal low birthweight status, measured dichotomously (1 = LBW) and indicating whether mothers themselves weighed less than 2,500 grams at birth. The inclusion of maternal age at birth as a control is necessitated by the well-documented higher incidence of LBW among teens and older mothers and the tendency of these characteristics to vary along lines of race/ethnicity (Martin et al. 2013). Maternal LBW is included as a control because the biological predisposition of LBW mothers to deliver LBW infants is confounded with race/ethnicity (Conley et al. 2003). Unlike most other studies, maternal LBW is taken from grandmothers' reports, typically reported only a or two year after birth in which recall bias is likely to quite low relative to mothers' retrospective self-reports. Three dummy variables measure risks to the prenatal environment, which often vary by race/ethnicity and are known to reduce infant birthweight (Kramer 1987); these include the timing of the first prenatal care visit (1 = 3rd trimester or none, 0 = 1st or 2nd trimester), any alcohol use during pregnancy (1 = yes), and any smoking during pregnancy (1 = yes).

Current socioeconomic circumstances. Three socioeconomic control variables capture the mother's own educational attainment, marital status, and health insurance coverage. A categorical measure, mother's educational attainment reflects her highest grade completed at the

⁴ These are based on constructed variables from the NLSY. The NLSY 'non-Hispanic white' category is formally referred to as the 'non-Hispanic, non-black' category and does include Asians and other races. The vast majority of sample infants' mothers who were classified as 'non-Hispanic, non-black' identified their origin as American or European. Thus, I refer to this group as non-Hispanic white but it is important to acknowledge that a very small number of cases in this group are Asian or other race.

time of birth and is coded into three dummy variables indicating less than high school, high school graduate, and some college or more (reference). Mother's marital status is coded as a dummy variable indicating whether mothers were married or unmarried at the time of each birth (1 = unmarried). Health insurance is also coded as a dummy variable indicating the source of health insurance coverage for each pregnancy and birth (1 = Medicaid or no insurance, 0 = private health insurance).

Infant characteristics. Finally, two variables control for salient infant characteristics. Infant gender is included as a control (1 = male), as LBW is more prevalent among girls than boys (Kramer 1987). And birth order, measured continuously (1 to 8), is included as a control, as higher incidence of LBW is observed among first births (Martin et al. 2013).

Estimation

Sample percentages and means for all model parameters were calculated and then tested for differences by race/ethnicity using chi-square and t-tests. Next, a series of logistic regression models predicting LBW were estimated. Models first estimated associations between LBW and each individual childhood predictor alone, and then between LBW and race/ethnicity and all childhood predictors together. From there, a model building sequence was employed that estimated associations between LBW and each cluster of control variables, net of all childhood predictors, followed by a model including only adult predictors, and then the full model. To investigate whether the relationship between mothers' early life circumstances and infant LBW differed by race/ethnicity, a series of models were then estimated to test interactions between race/ethnicity and each childhood predictor.⁵ To interpret the pattern of results from these

⁵ As a sensitivity test, race/ethnic stratified models were also estimated, and the results were substantively the same.

interaction models and examine differences in LBW probability at different socioeconomic levels, predicted probabilities of LBW were calculated from each interaction model and differences within and between race/ethnicity in the predicted probability of LBW were tested. All analyses were performed using Stata 12.0 (StataCorp LP 2010). Sensitivity tests were performed that ran all analyses using multiply imputed data, and the pattern of findings was unchanged, thus all results presented here were estimated using non-imputed data. Additionally, all descriptive and analytic results presented here were estimated using unweighted data, per recommendation of the NLS. Survey weights for the current study sample – infants born to NLSY-YA mothers – are not available via the NLS, but if available, would only adjust the sample to represent the grandchildren born to a nationally representative sample of young adults in 1979⁶.

RESULTS

Descriptive Results

Table 1 presents unweighted means and proportions for the analytic sample of births stratified by race/ethnicity and includes tests of significance between blacks and Hispanics, and whites. The table reveals some descriptive differences in LBW between black and white infants, such that a significantly higher proportion of black infants were born LBW (11.6 percent) compared to white infants (7.2 percent). The difference in proportion of LBW births between white and Hispanic infants (1 percent) was not significant. Sample proportions of LBW and race/ethnic comparisons are consistent with national trends (Martin et al. 2013). Additionally, Table 1 indicates significant differences in several childhood socioeconomic characteristics

⁶ Additionally, the NLS recommends using survey weights only for descriptive purposes. See the NLS documentation on sample weights for NLSY 1979 Children and Young Adults for further information.

between infants' mothers across race/ethnicity, whereby black and Hispanic infants' mothers experienced greater childhood disadvantage than white infants' mothers. The average time spent living below the poverty line was far greater for mothers of black (59.3 percent) and Hispanic (45.7 percent) infants compared to mothers of white infants (28.4 percent). Almost one in five black infants and one in three Hispanic infants had grandmothers who completed less than high school, compared to approximately one in seven white infants. Additionally, about 55 percent of white infants' grandmothers graduated from high school compared to only 46 percent of black and 37 percent of Hispanic infants' grandmothers. Nearly three times the proportion of black infants' were to mothers who themselves were nonmarital births (69.3 percent) compared to the proportion of white infants (25.7 percent). The proportion of Hispanic infants whose mothers were nonmarital births (37.2 percent) was also greater than the proportion of white infants, though by a much smaller margin.

Racial and ethnic differences in mothers' adult status characteristics generally followed expected patterns and mirrored descriptive results for childhood SES. Compared to white infants, both black and Hispanic infants' mothers were slightly disadvantaged relative to whites in terms of education, yet results indicated more pronounced educational differences between whites and Hispanics than whites and blacks. Substantial differences were observed in terms of marital status, such that black infants' mothers were more likely than white infants' mothers to be unmarried at the time of birth by a margin of nearly 30 percent. The proportion of Hispanic infants born to unmarried mothers (44 percent) was also significantly higher than for whites (30.1 percent). Additionally, the majority of births among all race/ethnic groups were covered by Medicaid or no insurance, though proportions were higher for blacks (82 percent) and Hispanics (72.8 percent) than for whites (60.6 percent).

On average, black and Hispanic infants were born to mothers at younger ages compared to white infants, though the difference in the average maternal age at birth between whites and Hispanics was only marginally significant. Striking differences in maternal LBW also reflected that half the proportion of white infants' mothers were themselves born LBW (2.1 percent) compared to black (5.5 percent) and Hispanic (5.4 percent) infants' mothers. Further, black infants were disadvantaged in terms of the timing of their mothers' first prenatal care visit relative to whites, such that 17.9 percent of black infants' mothers received none or only 3rd trimester prenatal care compared to 11.6 percent of white infants' mothers. In contrast, white infants were disadvantaged in terms of mothers' prenatal health behaviors, with roughly double the proportion of white infants' mothers smoking (41.4 percent) and drinking (38.7 percent) during pregnancy, relative to the proportions for blacks (15.8 percent smoking and 20.2 percent drinking) and Hispanics (15.6 percent smoking and 21.9 percent drinking).

Finally, unexpected differences were observed for infant gender, as a smaller proportion of Hispanic infants were boys (48.2 percent) compared to white infants (55.1 percent). And, the average birth order was higher for blacks (1.8) and Hispanics (1.8) relative to whites (1.6).

[Table 1 about here]

Logistic Regression

Table 2 displays logistic regression models with odds ratios predicting LBW. The bivariate column indicates mothers' odds of having a low birthweight child for race/ethnicity and each childhood predictor, absent all other controls. As expected, there is a significant disparity in the odds of LBW between whites and blacks, such that black infants experience a sizeable excess in the odds of LBW relative to whites. Among the childhood bivariate relationships, only grandmother's marital status at mother's birth is associated with infant LBW. The odds of LBW

are significantly greater for infants whose grandmothers were unmarried at the time of their mother's birth, compared to those whose grandmothers were married at birth. Model 1 indicates the significant disparity in black and white mother's odds of having a LBW child is unchanged after accounting for all childhood indicators of disadvantage. Model 1 also indicates that when race/ethnicity and childhood circumstances are considered together, only race/ethnicity is related to infants' odds of LBW.

Models 2 through 6 investigate the extent to which adult factors account for differences in LBW by race/ethnicity, holding constant childhood circumstances. As expected, Models 2 through 6 demonstrate that boys have consistently lower odds of LBW compared to girls (Kramer 1987). Both smoking during pregnancy and receiving late or no prenatal care are also stable predictors of increased odds of LBW across models. Surprisingly, controls for maternal health and SES are not related to the odds of LBW. The non-significance of these relationships, however, may be driven by the relative youth of sample mothers (i.e., the majority of sample births were to mothers in their prime childbearing years, and many were to teen mothers who had not yet completed high school). Notably, the disparity in odds of LBW between white and black infants remains relatively unchanged in Models 2 through 6. Black infants experience significantly higher odds of LBW compared to whites, even after controlling for mothers' experience of childhood disadvantage as well as all other adult covariates.

[Table 2 about here]

A series of logistic regression models individually tested interactions between race/ethnicity and each childhood disadvantage measure, holding constant all adult covariates. Model 8 detects a significant interaction between race/ethnicity and grandmothers' education, such that grandmothers' educational attainment is associated with differential LBW risk for

blacks, whites, and Hispanics. Predicted probabilities were calculated from Model 8 in order to provide a substantive interpretation of the differential association between grandmothers' education and LBW among blacks, whites, and Hispanics. Models 7 and 9 indicate no significant differences in the overall effects of poverty exposure or grandmothers' marital status on LBW between whites and blacks, or whites and Hispanics. However, tests of regression coefficients use a single test to indicate whether the overall effect of a variable differs across groups, whereas multiple tests of predicted probabilities are needed indicate whether the effect of a variable differs across groups at different levels of that predictor (Long 2009). Of key interest is whether analogous maternal childhood SES circumstances equate to similar LBW probability for blacks, whites, and Hispanics (Hypothesis 3). Thus, predicted probabilities were calculated from Model 7 to test whether the effect of poverty exposure differs by race/ethnicity across levels of exposure.

Predicted Probabilities

Table 3 displays predicted probabilities of LBW by race/ethnicity and level of mothers' early life poverty exposure calculated from Model 7. Table 3 reveals significant differences in the predicted probability of LBW between white and black infants whose mothers experienced low to moderate levels of poverty from ages 0 to 14. Among black and white infants born to mothers who spent none of their early lives in poverty, black infants have a .06 excess probability of LBW compared to white infants. The magnitude of this difference, however, decreases as mother's level of early life poverty exposure increases. Comparisons between black and white mothers at matched levels of poverty exposure reveal that the margin of difference in LBW probability is narrower between black and white mothers at zero poverty exposure, compared to black and white mothers at 71 to 80 percent poverty exposure. The difference in

LBW probability becomes non-significant for black and whites infants whose mothers spent more than 80 percent of their early lives in poverty. No differences in LBW probability by level of mothers' early life poverty were detected between whites and Hispanics. Figure 1 depicts these results graphically, excluding Hispanics, and highlighting statistically significant differences in the predicted probability of LBW between blacks and whites at matched levels of poverty exposure. The pattern is clear from Figure 1—the LBW gap between blacks and whites is greatest among mothers who experienced the *least* childhood poverty, and the gap diminishes with increasing levels of childhood poverty exposure. In other words, the association between childhood poverty exposure and LBW probability does differ for whites and blacks, but only at low to moderate levels of exposure. In contrast, the relationship between poverty exposure and LBW probability is statistically indistinguishable for white and black mothers who spent nearly all of their early lives living below the poverty line. Thus, these results provide support for Hypothesis 3, as it appears that similar early life SES experiences do *not* correspond to similar LBW probability for black and white women. Of note, however, is that despite the differential probability of LBW for blacks and whites at matched levels of poverty exposure, tests for differences in the probability of LBW *within* race/ethnicity indicated no main effects for early life poverty exposure, leaving Hypothesis 2 unsupported with regard to poverty exposure. Maternal childhood poverty exposure is not a significant predictor of LBW probability for black, white, or Hispanic mothers, after accounting for maternal conditions proximate to birth.

[Table 3 about here]

[Figure 1 about here]

Table 4 displays predicted probabilities of LBW by race/ethnicity and grandmother's education level calculated from Model 8. The relationship between grandmother's education and

infant LBW is significant ($p < .05$) only for whites, such that white infants whose grandmothers completed less than high school have three times the probability of LBW compared to those whose grandmothers completed some college or more. Grandmother's education is unrelated to the probability of LBW for black and Hispanic infants. Between race/ethnic differences in LBW probability at matched levels of grandmother's education, however, are significant between blacks and whites, and Hispanics and whites—but only among those whose grandmothers completed some college or more. Specifically, comparing infants whose grandmothers completed some college or more, LBW among blacks is more than three times as likely compared to whites, and LBW among Hispanics is more than twice as likely compared to whites. Figure 2 shows these differences graphically, highlighting statistically significant differences between blacks, whites, and Hispanics. Figure 2 clearly shows how the probability of LBW for white infants with college-educated grandmothers is significantly lower than that for blacks and Hispanics, perhaps in part because grandmother's education is protective for white infants LBW risk but has no significant effect for blacks or Hispanics.

[Table 4 about here]

[Figure 2 about here]

DISCUSSION

The consequences of LBW endure across lifetimes and generations, as LBW functions simultaneously as both driver and manifestation of social and health inequality. The current study builds upon decades of scholarly inquiry by testing the extent to which race/ethnic LBW disparities derive from disparate socioeconomic experiences beginning in childhood, and whether similar childhood conditions correspond to similar LBW probability for black, white, and Hispanic mothers. Taking advantage of detailed longitudinal and intergenerational data

regarding women's childhood socioeconomic circumstances, I find evidence of a independent association between childhood disadvantage and LBW risk—yet only for whites. Contrary to prior notions (Lu and Halfon 2003), greater childhood socioeconomic disadvantage does not correspond to greater LBW probability for blacks or Hispanics. Nor does blacks' disproportionate socioeconomic disadvantage in childhood account for their excess LBW risk relative to whites. Instead, evidence from the current study suggests an altogether different pattern operating among blacks, such that greater childhood disadvantage is actually associated lesser LBW risk, yet this association fails to reach statistical significance. Further and most notably, results indicate that the same socioeconomic advantages and disadvantages in childhood correspond to substantially different LBW probability for blacks and whites at certain levels, such that black and white women who were the most advantaged in early life exhibit the greatest disparities in LBW probability. Consistent with CI theory, these results underscore how similar socioeconomic circumstances correspond to disparate life experiences—and subsequently, distinct health consequences—for mothers of different racial and ethnic backgrounds.

Importantly, findings from the current study contrast with some but not all past empirical research. Most prior research has examined the impact of maternal childhood SES on LBW among women irrespective of race or ethnicity. These studies, while few, have generally shown that mothers' early life experiences of socioeconomic advantage or disadvantage exert a significant influence on the health of their children at birth in terms of LBW (Astone et al. 2007; Gavin et al. 2011; Gisselmann 2006). Yet evidence from the current study solidly supports this conclusion only for whites. I test three facets of early life socioeconomic circumstances and only one (i.e. grandmothers' educational attainment) is found to exhibit a statistically significant influence on women's risk of having a LBW child independent of women's current health and

SES circumstances. Neither early life poverty exposure, nor grandmother's marital status, demonstrate a significant bearing on later risk of having a LBW infant for black, white, or Hispanic women.

Yet it possible that differences between mothers' childhood and current socioeconomic experiences were not substantial enough to detect an independent association between childhood SES and LBW, in which case the effects of childhood SES on LBW may have been nullified by information on mothers' current SES. Indeed, most women in the sample who were low SES as children remained that way as adults⁷. It is also possible that sample sizes within certain ranges of poverty exposure in the current study were insufficient to identify a significant relationship to LBW risk. Yet even though it is somewhat puzzling that the childhood socioeconomic circumstances captured in the current study are statistically unassociated with LBW risk for blacks and Hispanics given prior evidence of the detrimental impact of low childhood SES on offspring birthweight, previous studies have measured these circumstances differently by either constructing socioeconomic indices or measuring social class more broadly. Very few studies have examined the influence of childhood poverty exposure or grandmothers' marital status on any physical adult health outcome. The current study tests these facets of disadvantage separately in order to assess which childhood factors are most salient for women's later risk of delivering a LBW child. Yet despite differences in measurement, childhood SES was expected to influence LBW risk and failure to do so runs counter to expectations.

However, one rather salient component of maternal childhood SES, grandmothers' low education, did predict increased probability of LBW among whites. Among white infants, those

⁷ Sensitivity analyses indicate that mothers' who lived below the poverty line during early life or were raised by mothers with less than a high school education received some form of public assistance at the time of the birth of their child.

whose grandmothers were college-educated had a significantly lower probability of LBW than those whose grandmothers never finished high school. This finding is consistent with prior research insofar as grandmother's education has been found predictive of LBW (Astone et al. 2007; Gavin et al. 2011). Curiously, however, previous studies reporting a protective effect of higher SES for LBW have differed quite drastically in the racial and ethnic composition of their samples, making it somewhat difficult to draw comparisons between past research and the current findings. Even so, it is perhaps not altogether unsurprising that white women who were raised by college-educated mothers experience lower likelihood of having a LBW child given the many health and social benefits well-educated parents bestow to their children (Link and Phelan 1995).

Unlike the pattern for whites, no measure of maternal childhood socioeconomic circumstances examined in the current study was associated with infant LBW for blacks or Hispanics. Rather the pattern observed for blacks might suggest that maternal low childhood SES is somehow protective for black women's later risk of having a LBW infant, though these results were statistically insignificant. Still, black infants' disproportionate risk of LBW relative to whites persisted after accounting for black mothers' greater childhood SES disadvantage. For Hispanics, differences in LBW relative to whites did not emerge until grandmother's education was taken into account. Instead, Hispanics exhibited more favorable LBW patterns than their childhood socioeconomic characteristics would predict, consistent with earlier evidence that the 'epidemiologic paradox' extends to LBW (Fuentes-Afflick et al. 1999).

However, the lack of an association between childhood SES and LBW for blacks and Hispanics is perhaps unsurprising. For Hispanics, prior research demonstrates the limited utility of education and income in predicting Hispanics' health, as Hispanics consistently fare better

than their education or income levels would predict (Markides and Eschbach 2005). But why might the current study find no clear evidence of a relationship between childhood low SES and LBW for blacks? There are several possible reasons. The sample of black women in the current study may not have been sufficiently diverse in their childhood socioeconomic composition to detect an association with LBW. Previous studies that examine the relationship between race, adult SES, and LBW have typically resulted in one of two conclusions, both which link low SES in adulthood to higher incidence of LBW among blacks—either that low SES is equally detrimental for blacks and whites (Rich-Edwards et al. 2003) and poorer outcomes for Blacks are due to the disproportionate share of this group being low SES; or, that low SES has greater adverse consequences on LBW for blacks (Geronimus 1996). Yet, past studies have typically relied upon birth certificate data and very large sample sizes to conduct their analyses.

A second reason may be—and as the current study directly suggests—that childhood poverty and SES may be less relevant for black mothers' risk of having a LBW child compared to whites when assessed alongside current SES conditions. Indeed, prior research has found that LBW incidence is highest among affluent black women (Bravemen), thus paradoxically linking *high* SES in adulthood to *higher* LBW incidence among blacks. Childhood socioeconomic disadvantage among blacks, for example, has been shown to negatively impact infant birthweight, such that low SES in childhood produces a scarring effect that cannot be undone with later socioeconomic gains in adulthood (Colen et al. 2006; Love et al. 2010). This finding suggests that high SES does not confer the same health benefits to blacks as it does to whites. Sensitivity tests performed in the current study indeed reveal that very few sample mothers made substantial SES gains. One explanation for why high SES may not be as beneficial for blacks in terms of reducing LBW risk could be that LBW for black women has more to do with the

consequences of their disadvantaged racial position rather than their socioeconomic circumstances per se.

In fact, the chief finding of this study is that childhood socioeconomic advantage magnifies the LBW gap between black and whites and exposes a LBW gap between whites and Hispanics, albeit a lesser one. Specifically, black and white women with high levels of childhood disadvantage exhibited similar likelihood of having a LBW child. The only observed differences in LBW risk were between black and white women who were socioeconomically advantaged during childhood. And importantly, the difference in LBW risk was most pronounced between black and white women with the greatest childhood privilege; among blacks and whites who never lived in poverty as children, blacks had nearly twice the risk of LBW, and among those whose mothers were college-educated, blacks' risk of LBW was more than three times greater than whites. A similar but less extreme pattern was observed between Hispanics and whites, such that among women whose mothers were college-educated, Hispanics' risk of LBW was more than double that for whites. This evidence is consistent with the notion that racial minority status and the accompanying stress and discrimination typically associated with such marginalization, may drive black women's LBW risk more so than their SES.

Why might LBW disparities between blacks and whites not only persist after accounting for childhood socioeconomic conditions, but also be seemingly exacerbated by childhood advantage? The answer potentially lies within factors unmeasured in the current study—namely, racial stress and discrimination. There is prior basis for the seemingly paradoxical finding that the greatest LBW disparities exist between black and white women who were relatively affluent during childhood. Braveman (2011) documents the same pattern with respect to black and white mothers' adult income and education. Yet Braveman also found, in subsequent qualitative focus

groups, that African American women, both poor and nonpoor, were chronically aware of and anxious about the potential for experiencing racial discrimination and hostility. Additional studies evince the detrimental impact of racially-based stress on LBW for black women. To be specific, perceived racism and stress have been linked to worse birth outcomes among black women and even attenuated black-white differences in LBW independent of maternal health and sociodemographic controls (Dominguez et al. 2008). Given the deleterious consequences of racism-related stress on LBW and the possibility that black women may weather this stress even in the absence of actual discriminatory events or encounters, it perhaps makes sense that LBW would be higher for blacks, especially among those from more advantaged childhood backgrounds. Childhood socioeconomic advantage, for black women, may not equate to reduced stress, but rather the opposite. Black women from affluent childhood backgrounds are more likely to have grown up among whites, and thus more likely to have experienced racial discrimination and acute awareness of their racial minority status (Braveman 2011). As CI theory argues, one cannot assume that socioeconomic resources correspond to the same health benefits for race/ethnic minorities and whites. Unfortunately, racial and ethnic hierarchies complicate and curtail the opportunities blacks, and perhaps to a lesser degree, Hispanics, are able to translate into positive health outcomes for themselves and for their children.

Importantly though, the current study cannot elaborate empirically on the extent to which racially-based (or perhaps ethnically-based) stress among race/ethnic minorities during childhood is structured by socioeconomic position or drives racial disparities in LBW. Measures of interpersonal racial discrimination in early life are simply not available in this data, but if they were, would not necessarily capture the extent to which black women are physically harmed by chronic anticipation of discriminatory events (Williams and Mohammed 2009). Broader based

forms of marginalization among black women like the patterns descriptively documented in the current study (i.e., disproportionate poverty) are themselves manifestations of racial discrimination and their bodily destruction is hard to quantify. What the current study offers instead is a more definitive examination of one of the primary competing explanations for LBW disparities—that often unmeasured childhood socioeconomic conditions account for the wide gulf in LBW incidence between blacks and whites. The current study finds not only a lack of support for this hypothesis, but also compelling evidence to the contrary. In fact, the principal finding provided here is that black-white disparities in LBW are exacerbated rather than accounted for by childhood socioeconomic factors. It appears this is because the etiology of LBW differs for black, white, and Hispanic infants.

The current study adds to the evidence that childhood matters for LBW, though not perhaps in the same way or to the same extent for mothers of all race/ethnic backgrounds. For white infants, the drivers of LBW can be traced back to their mothers' childhood SES. For blacks, however, race continues to matter for LBW above and beyond the traditional risk and protective factors located in their mothers' childhood socioeconomic histories or adult experiences. For Hispanics, the origins of LBW remain obscured to large extent, though the current study raises the possibility that considering ethnicity and childhood SES together, in addition to other specially relevant factors (e.g. nationality, foreign-born status), may aid future studies. Finally, the current study joins with others (Braveman 2011; Williams and Mohammad 2009) to call for new data collection that considers more carefully the unique circumstances and social positioning of race/ethnic minorities, and the corresponding health implications. Above all, the current study underscores the importance of the lifecourse perspective and CI theory, in particular, in understanding and eliminating health disparities. Birth marks a crucial moment in

which health and opportunity are passed on to future generations, and even though some facets of inequality may prove more salient for certain groups than others, the physical vestiges of social inequality mothers carry and pass down, be they economic or racial, originate in early life.

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Table 1. Sample Characteristics by Race/Ethnicity, Means (Standard Deviations) and Percentages			
	White (N=725)	Black (N=1,019)	Hispanic (N=588)
Race¹	31.1%	43.7%	25.2%
Low Birthweight	7.2%	11.6%**	8.2%
Childhood SES			
Poverty Exposure ²	28.4 (31.2)	59.3 (34.5)***	45.7 (35.4)***
Grandmother's Education ³			
Less than high school	14.9%	18.7%*	33.3%***
High school graduate	55.9%	46.2%***	36.6%***
Some college	29.1%	35.1%**	30.1%
Grandmother's Marital Status at Mother's Birth			
Married	74.3%	30.7%***	62.8%***
Unmarried	25.7%	69.3%***	37.2%***
Adult SES			
Mother's Education ⁴			
Less than high school	31.6%	36.1%+	43.7%***
High school graduate	37.8%	37.9%	32.8%+
Some college	30.5%	26.0%*	23.5%**
Mother's Marital Status at Birth			
Married	30.1%	7.3%***	20.7%***
Unmarried	37.0%	66.5%***	44.0%*
Unknown	32.9%	26.3%**	35.2%
Health Insurance ⁵			
No insurance/Medicaid	60.6%	82.0%***	72.8%***
Private insurance	39.4%	18.0%***	27.2%***
Maternal Health			
Maternal Age at Birth	22.2 (3.5)	21.5 (3.5)***	21.8 (3.7)+
Maternal LBW	2.1%	5.5%***	5.4%**
Prenatal Health			

Prenatal Care			
Late/No Prenatal Care	11.6%%	17.9%***	13.9%
1 st Trimester Prenatal Care	88.4%	82.1%***	86.1%
Prenatal Health Behaviors			
Smoking	41.4%	15.8%***	15.6%***
Alcohol use	38.7%	20.2%***	21.9%***
Infant Characteristics			
Gender (male)	55.1%	52.1%	48.2%*
Birth Order	1.6 (.9)	1.8 (1.0)**	1.8 (1.0)***

Source: National Longitudinal Survey of Youth 1979 (1979 to 2010) and National Longitudinal Survey of Youth, Young Adult (1994 to 2010)

Note: Means and percentages based on unweighted sample births. (Births: N=2,332; Mothers: N=1,215; Grandmothers: N=934)

¹ Racial percentages for sample births based on mother's self-reported race.

² Poverty exposure indicates the percentage of time mothers spent in poverty from ages 0 to 14.

³ Grandmother's education reflects her highest level of education completed at the time of the most recent survey year (2010).

⁴ Mother's education reflects the highest level of education completed at the time of the baby's birth.

⁵ Health insurance indicates the source of insurance used to cover the mother's pregnancy and baby's birth.

+p<.1, *p<.05, **p<.01, ***p<.001 (reference=white)

Table 2. Logistic Regression Models with Odds Ratios Predicting Infant Low Birth Weight (N=2,332)

	Bivariates	Model 1 (Childhood)	Model 2 (+Health)	Model 3 (+Prenatal)	Model 4 (+SES)	Model 5 (Adult)	Model 6 (Full)	Interactions		
								Model 7 (Poverty)	Model 8 (Education)	Model 9 (Marital)
Race (ref: white)										
Black	1.69**	1.65**	1.62*	1.82**	1.52*	1.68**	1.70*	1.57	3.59**	1.65+
Hispanic	1.15	1.10	1.06	1.23	1.05	1.21	1.19	1.26	2.60*	1.08
Childhood SES										
Poverty Exposure	1.01	0.98	0.98	0.98	0.97		0.97	0.96	0.97	0.97
Grandmother Unmarried at Mother's Birth	1.33*	1.18	1.16	1.16	1.16		1.15	1.15	1.11	1.01
Grandmother's Education (ref: some college+)										
Grandmother <HS	1.05	1.16	1.15	1.12	1.14		1.14	1.12	3.10*	1.15
Grandmother HS Grad	0.81	0.85	0.85	0.85	0.83		0.84	0.83	1.75	0.85
Infant Male			0.76+	0.78+	0.76+	0.77+	0.78+	0.78+	0.78+	0.78+
Maternal Health										
Age at Birth			0.97			0.99	0.99	0.99	0.99	0.99
Parity			1.10			1.05	1.04	1.05	1.03	1.04
Maternal Low Birth Weight			0.99			0.95	0.98	0.97	1.03	0.99
Prenatal Health										
Late/No Prenatal Care				1.56*		1.53*	1.52*	1.52*	1.54*	1.52*
Alcohol use				1.04		1.07	1.06	1.06	1.07	1.06
Smoking				1.52*		1.48*	1.46*	1.47*	1.45*	1.46*
Maternal SES										
Medicaid/No Insurance					1.37	1.25	1.30	1.31	1.27	1.31
Mother's Education (ref: some college+)										
Mother <HS					1.14	0.97	1.00	1.00	1.04	1.00
Mother HS Grad					0.95	0.86	0.88	0.88	0.89	0.88
Marital Status at Child's Birth (ref: married)										
Mother Unmarried					1.12	1.06	1.06	1.06	1.05	1.06
Mother Unknown Marital Status					0.76	0.72	0.71	0.71	0.70	0.71
Interactions										
Poverty Exposure * Race										
Poverty Exposure * Black								1.02		
Poverty Exposure * Hispanic								0.99		
Grandmother's Education * Race										
Grandmother <HS x Black									0.24**	
Grandmother HS Grad x Black									0.43+	
Grandmother <HS x Hispanic									0.33+	
Grandmother HS Grad x Hispanic									0.30*	
Grandmother Unmarried at Mother's Birth * Race										
Grandmother Unmarried x Black										1.13
Grandmother Unmarried x Hispanic										1.31

Source: National Longitudinal Survey of Youth 1979 (1979 to 2010) and National Longitudinal Survey of Youth, Young Adult (1994 to 2010) (NLSY Investigator)
 +p≤.1, *p≤.05, **p≤.01, ***p≤.001

Table 3. Predicted Probability Estimates of LBW [95% Confidence Intervals] by Race/Ethnicity and Early Life Poverty Exposure

	Predicted Probability of LBW		
	White	Black	Hispanic
Early Life Poverty Exposure			
None	.08 [.04, .12]	.14 [.09, .20] ⁺	.09 [.05, .14]
1-10%	.08 [.05, .11]	.14 [.09, .19]*	.09 [.05, .13]
11-20%	.07 [.05, .10]	.13 [.09, .17]*	.09 [.06, .12]
21-30%	.07 [.05, .10]	.13 [.09, .16]*	.09 [.06, .12]
31-40%	.07 [.05, .09]	.12 [.09, .15]*	.08 [.06, .11]
41-50%	.07 [.04, .09]	.12 [.09, .14]*	.08 [.05, .11]
51-60%	.06 [.04, .09]	.11 [.08, .14]*	.08 [.05, .11]
61-70%	.06 [.03, .09]	.10 [.08, .13]*	.08 [.04, .11]
71-80%	.06 [.03, .09]	.10 [.07, .13] ⁺	.07 [.03, .11]
81-90%	.06 [.02, .09]	.10 [.07, .13]	.07 [.03, .12]
91-99%	.05 [.02, .09]	.09 [.06, .12]	.07 [.02, .12]
100%	.05 [.01, .09]	.09 [.05, .12]	.07 [.01, .12]

⁺p<.1, *p<.05, **p<.01, ***p<.001 (reference=white)

NOTE: Results from within-race difference tests for whites, blacks, and Hispanics indicated no significant differences in predicted probability of LBW by level of early life poverty exposure (100% compared to none).

Figure 1. Predicted Probability of Low Birthweight by Race/Ethnicity and Maternal Early Life Poverty Exposure

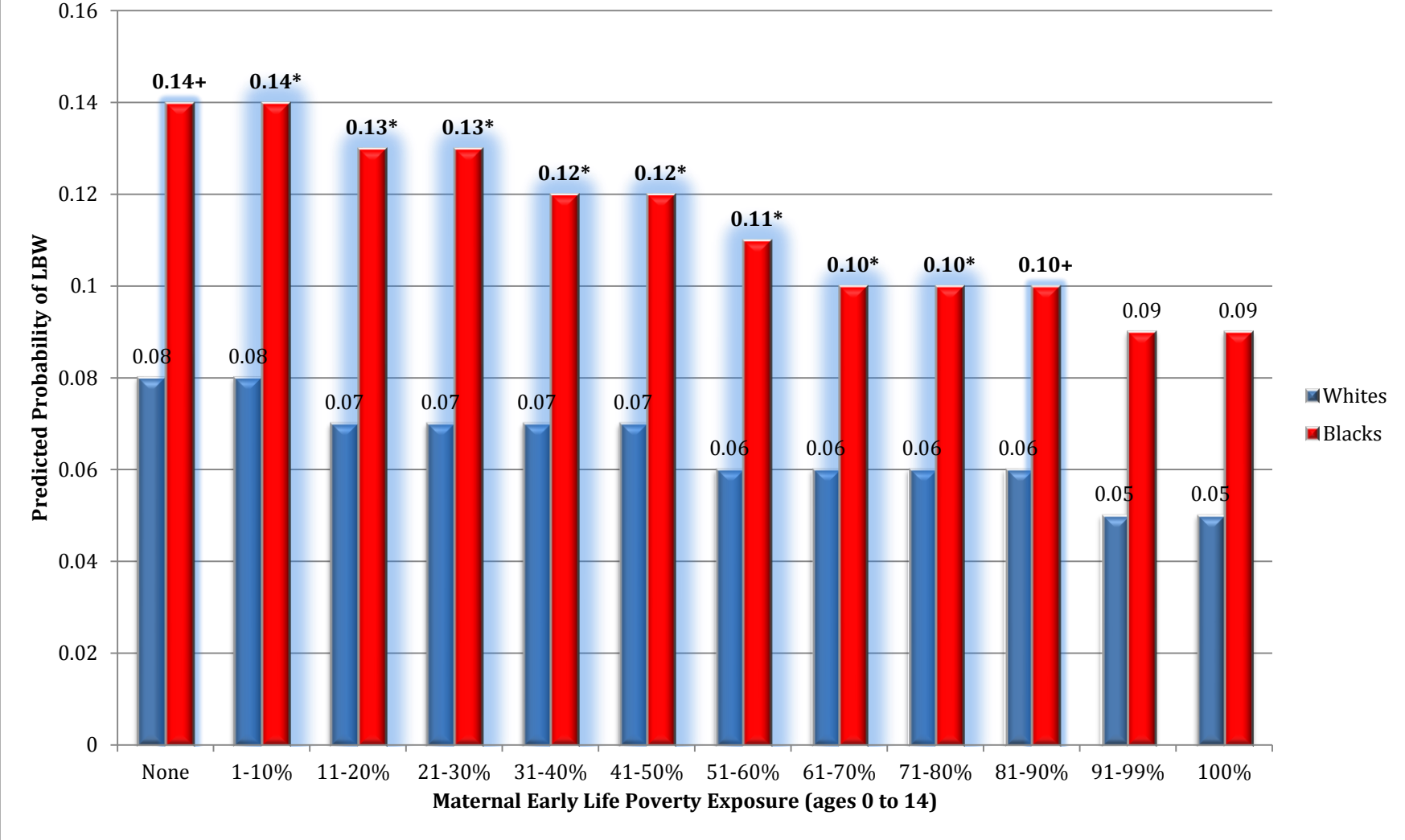


Table 4. Predicted Probability Estimates of LBW [95% Confidence Intervals] by Race/Ethnicity and Grandmother's Education Level

	Predicted Probability of LBW		
	White	Black	Hispanic
Grandmother's Education			
Less than high school	.12 [.06, .18]	.10 [.06, .15]	.10 [.06, .15]
High school graduate	.07 [.04, .10]	.11 [.08, .13]	.06 [.03, .09]
Some college or more	.04 [.01, .07]	.13 [.10, .17]***	.10 [.06, .15]*

+p<.1, *p<.05, **p<.01, ***p<.001 (reference=white)

NOTE: Results from within-race difference tests for whites, blacks, and Hispanics indicated significant differences in the predicted probability of LBW by grandmother's education for whites (some college or more compared to less than high school; p=.023). No within-race differences in the predicted probability of LBW by grandmother's education were significant for blacks.

Figure 2. Predicted Probability of Low Birthweight by Race/Ethnicity and Grandmother's Education

