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Racial Differences in Birth Outcomes: The Role of General, Pregnancy, and Racism Stress

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Abstract

Objective—This study examined the role of psychosocial stress in racial differences in birth outcomes.

Design—Maternal health, sociodemographic factors, and 3 forms of stress (general stress, pregnancy stress, and perceived racism) were assessed prospectively in a sample of 51 African American and 73 non-Hispanic White pregnant women.

Main Outcome Measures—The outcomes of interest were birth weight and gestational age at delivery. Only predictive models of birth weight were tested as the groups did not differ significantly in gestational age.

Results—Perceived racism and indicators of general stress were correlated with birth weight and tested in regression analyses. In the sample as a whole, lifetime and childhood indicators of perceived racism predicted birth weight and attenuated racial differences, independent of medical and sociodemographic control variables. Models within each race group showed that perceived racism was a significant predictor of birth weight in African Americans, but not in non-Hispanic Whites.

Conclusions—These findings provide further evidence that racism may play an important role in birth outcome disparities, and they are among the first to indicate the significance of psychosocial factors that occur early in the life course for these specific health outcomes.

Keywords

stress; racism; pregnancy; birth weight; health disparities

African Americans are twice as likely as non-Hispanic Whites, the most common referent group, to die before their first birthday (Mathews, Menacker, & MacDorman, 2004). In this

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country, low birth weight (LBW; <2,500 g) and preterm delivery (PTD; <37 weeks) are leading causes of infant death in the overall population, behind congenital anomalies, and the leading causes of death for African American infants (Mathews et al., 2004). Compared with White infants, African American infants have two times the rate of LBW and PTD, and three times the rate of very low birth weight (<1,500 g) and very preterm delivery (<32 weeks) (Martin et al., 2005). These poorer birth outcomes have serious implications not only for infant survival, but also for childhood growth and development (e.g., Botting, Powls, Cooke, & Marlow, 1998) and some important health outcomes in adulthood (e.g., Rich-Edwards et al, 1997). Thus, understanding and eventually eliminating racial disparities in adverse birth outcomes is a major public health priority in the United States (U.S. Department of Health & Human Service, 2000).

Psychosocial Stress and Pregnancy

Well-known sociodemographic, medical, and behavioral risk factors do not fully explain the racial disparity in adverse birth outcomes (e.g., Goldenberg et al., 1996), which has stimulated interest in the role of psychosocial factors in pregnancy, especially stress (Hogan & Ferre, 2001; Rowley & Tosteson, 1993). Our research has shown that pregnant African Americans experience a greater number of life events (Feldman, Dunkel-Schetter, Woo, & Hobel, 1997) and are more distressed by them (Zambrana, Dunkel-Schetter, Collins, & Scrimshaw, 1999) than other racial or ethnic groups. There is also evidence to suggest that stress may be more detrimental to African American pregnancies (Orr et al., 1996).

Stress is a multidimensional construct that has been conceptualized as person– environment transactions involving exposure to a stressor, one's perception of how threatening and unmanageable the stressor is, and emotional, behavioral, and physiological responses commensurate with that appraisal (Lazarus & Folkman, 1984). Another common definition of stress is “environmental demands that tax or exceed the adaptive capacity of an organism, resulting in psychological and biological changes that may place the organism at risk for disease” (Cohen, Kessler, & Gordon, 1995, p. 3). These definitions guide our work.

Although research on stress and human pregnancy has been accumulating for several decades, the empirical support for a definitive link between the two has not been consistent. Critical reviews of the literature point to methodological issues, such as the use of retrospective and cross-sectional designs, inadequate control of potential confounds, and reliance on unidimensional measures of stress (Lobel, 1994; Paarlberg, Vingerhoets, Passchier, Dekker, & Van Geijn, 1995). Nevertheless, there is considerable evidence that psychosocial stress, commonly operationalized as stressful life events, daily hassles, state anxiety, and/or pregnancy-related anxiety, is negatively associated with birth weight (e.g., Pagel, Smilkstein, Regen, & Montano, 1990; Parker Dominguez, Dunkel-Schetter, Mancuso, Rini, & Hobel, 2005) and gestational age at delivery (see review by Institute of Medicine, 2006).

Past research on stress and pregnancy, however, offers limited guidance for explaining persistent racial disparities in poor birth outcomes. Racism is an obvious, additional stressor that racial minorities encounter simply because they are racial minorities (Myers, Lewis, & Parker Dominguez, 2003). Therefore, excluding it from consideration may seriously misjudge the amount of stress in African American women's lives (Giscombe & Lobel, 2005). Racism affects health independent of general stress variables (e.g., Williams, Yu, Jackson, & Anderson, 1997), yet only a handful of studies have considered the impact of racism stressors on birth outcomes (see review by Giscombe & Lobel, 2005). In the search for underlying causes of persistent racial disparities in health, many scientists consider racism to be an essential component of any etiologic model (e.g., James, 2003; Myers et al., 2003).

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Racism as a Stressor

Racism has been defined as a multidimensional construct that involves the oppression, domination, and denigration of individuals by other individuals and by social institutions on the basis of skin color and/or membership in a particular ethnic group (Krieger, Rowley, Herman, Avery, & Phillips, 1993). Racism may pose a particularly noxious threat to well-being because it is an undeniably negative, demeaning, and threatening reaction to an immutable personal characteristic (Landrine & Klonoff, 1996). Studied most often in African Americans, racism can be conceptualized as an individual-level psychosocial stressor, operationalized most frequently in the literature as perceived exposure to racial prejudice and discrimination (Clark, Anderson, Clark, & Williams, 1999; Williams, Neighbors, & Jackson, 2003). It has been linked to a variety of mental and physical health outcomes (see reviews by Harrell, Hall, & Taliaferro, 2003; Williams et al., 2003), including maternal stress during pregnancy, LBW, and PTD (see review by Giscombe & Lobel, 2005)

Complexities of Socioeconomic Confounds

When investigating the role of stress in racial differences in health, it is a matter of course to separate out the confounding influence of socioeconomic status (SES), insomuch as stress (Bruce, Takeuchi, & Leaf, 1991), race (Oliver & Shapiro, 1995), and health (Adler et al., 1994) are all associated with SES. This methodological consideration is considerably more complex than it may seem initially, however. Institutionalized racism—macro-level barriers to racial and ethnic minority inclusion and advancement—is fundamental to the ways in which opportunity is socially structured (Nazroo, 2003). As a result, African Americans are unlikely to derive the same economic (Oliver & Shapiro, 1995) and health (Schoendorf, Hogue, Kleinman, & Rowley, 1992; Williams, 2002) benefits from a given level of SES as their White counterparts do. Thus, when attempting to account for the role of SES in race-based health differentials, investigators must carefully consider not only racial differences in absolute levels of SES, but also racial differences within specified levels of SES by taking into account such things as the number of people supported by a household's income (Krieger, Chen, & Selby, 1999), discrepancies in earnings for a given level of education (Collins, Herman, & David, 1997), and the influence of intergenerational factors (Foster et al., 2000).

Current Study

The present investigation examined the roles that general, pregnancy, and racism stress play in racial differences in birth weight and gestational age. It was hypothesized that African American women would report more exposure to general, pregnancy, and racism stressors and higher levels of chronic stress and anxiety than non-Hispanic White women. It was further expected that associations of stress, particularly racism stress, with outcome would vary by race and that these psychosocial differentials would help to explain any observed racial differences in birth outcomes, controlling for medical and sociodemographic risk factors.

Method

Procedures and Sample

A prospective, repeated-measures observational study design was used to collect psychosocial and medical data at 18–20 weeks (Time 1), 24–26 weeks (Time 2), and 30–32 weeks (Time 3) gestation via structured interview and chart review. Potential participants were either approached by a research nurse in the prenatal clinic of a large, urban medical center in Los Angeles County or they were referred by private practitioners with admitting privileges to this medical center. A special effort was made to recruit women considered to be at high risk for PTD. To be eligible, potential participants had to be 18 years or older, fluent in English, and

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at no more than 18 weeks gestation with a singleton pregnancy. Smokers and drug users were excluded from participation because physiological mechanisms of stress were a major focus of the parent study and substance use can affect stress hormone levels. All participants received $15, complimentary parking, and a meal voucher at each study visit.

Of the 430 women approached about the study, 13% (n = 55) were ineligible.[1] Seventy-eight percent of eligible women (n = 294) signed an informed consent form and participated in the study. For the present investigation, we examined data on the subset of participants who self-identified as "African American or Black" or "Non-Hispanic White" (85 excluded),[2] were born in the United States (28 additional women excluded), delivered a live-born infant (2 additional women excluded), had complete birth outcome data (46 additional women excluded),[3] and attended all three time points (9 additional women excluded).[4] Therefore, the findings of the present study are based on data from 51 African American women and 73 non-Hispanic White women.

Although 15 private physicians referred their patients to the study, 1 physician was responsible for referring most of the private patients in this sample (67% of African American private patients and 83% of White private patients). The distribution across private practices did not differ by race, whether examined across all 15 physicians, $\chi^2(14, N = 90) = 19.90$, $p > .10$, or when the practice with the most referrals was compared with all others, $\chi^2(1, N = 90) = 2.46$, $p > .10$. Although clinic patients (n = 34) and private patients (n = 90) received their prenatal care in different locations, both groups of participants were interviewed in the medical center by the same set of trained female interviewers and most delivered at the medical center (1 clinic patient and 11 private patients delivered elsewhere). A significantly higher percentage of African American women (59%) than non-Hispanic White women (6%) were recruited in the prenatal clinic of the medical center, $\chi^2(1, N = 124) = 42.93$, $p < .05$. Clinic patients were at significantly higher sociodemographic and medical risk than private patients, and they reported significantly more chronic stress and less desire for the pregnancy. Recruitment site was not significantly associated with stressful life events, state anxiety, pregnancy anxiety, perceived racism, or birth outcomes. Nevertheless, to control for potential differences in the quality of prenatal care that clinic and private patients received and to protect against any possible confounding with race, recruitment site was entered into all predictive models.

Measures

Medical and Sociodemographic Risk Factors—Participants were assessed for the presence of 21 medical risk conditions, covering medical history (e.g., diabetes), pregnancy history (e.g., previous preterm delivery), and the current pregnancy (e.g., preterm labor). The medical risk score was the number of conditions that were present.[5] Weight gained through

[1]Of the 55 women who were ineligible, 17 were smokers, 8 had a miscarriage, 7 were at more than 20 weeks gestation, 5 were not fluent in English, 5 planned to terminate the pregnancy, 3 had a multiple gestation, 3 used illicit drugs, 2 had hepatitis, 1 was HIV positive, and 4 were ineligible for "other" reasons (e.g., planning to move from the area).

[2]Six women self-identifying as "multiracial" in the interview but as "African American or Black" on the hospital admissions form were also included to augment the number of African Americans in the sample. Independent-samples t tests confirmed that the multiracial women did not differ significantly from the African American women on any of the major study variables.

[3]Of the 46 women who were missing birth outcome data, 12 did not deliver at the medical center and 34 had not yet delivered their babies at the time the sample was assembled for analysis. Women delivering elsewhere were less likely than women in the final sample to be cohabitating. Women who had yet to deliver were significantly more likely than those in the final sample to be non-Hispanic White (85% vs. 59%), so comparative analyses with this set of women were stratified by race. African American women who had not yet delivered (n = 5) were significantly lower in pregnancy anxiety and White women who had not delivered were significantly higher in per capita income than their respective groups in the final sample.

[4]On the basis of comparative analyses, women excluded because they did not attend all three time points did not differ significantly from the final sample in sociodemographic, medical, or psychosocial risk or in birth outcomes.

[5]The list of medical risks, available from us, was based on prior research (see Hobel, Youkeles, & Forsythe, 1979) and the consensus of medical experts on the research team.

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Time 3 (30–32 weeks), age, cohabitation with the baby's father, and part- or full-time employment at Time 1 were also assessed. Race was based on self-identification.

To better capture the confounding influence of SES, we used childhood and adulthood indicators of SES, a per capita indicator of income, and a measure of income incongruity. Both the educational attainment of the respondent's current household and the educational attainment of her childhood household were categorized as high school or less (0) or more than high school (1) on the basis of the attainment level of the head(s) of household.[6] Current gross annual household income was self-reported on a 12-point scale ranging from 1 (*less than $5,000*) to 12 (*more than $100,000*) and was divided by household size. Finally, income incongruity, the discrepancy in earnings for a given level of education (Collins et al., 1997), was considered present when the respondent's per capita income was at least 1 standard deviation below (negative incongruity) or above (positive incongruity) the median per capita income of non-Hispanic White participants at the same level of education.

General Psychosocial Stress

Stressful life events: A 24-item stressful life events inventory was completed at Time 1 and Time 3 to assess the number of stressful life events participants, and/or someone close to them, had been exposed to in the previous year and during the course of the pregnancy. Events were summed for each time point separately, as well as across time points, so that an overall indication of general stress exposure could be examined.

Perceived stress: A 12-item brief version of the Perceived Stress Scale (PSS) was developed for this study to assess subjective feelings of chronic stress at Time 1 and Time 3. This measure consisted of the 10-item brief version of the PSS (Cohen & Williamson, 1988), plus two additional questions that were included on the original 14-item scale (Cohen, Kamarck, & Mermelstein, 1983): “How often have you dealt successfully with day-to-day problems and hassles?” and “How often have you felt that you were coping well or effectively handling the important changes that were occurring in your life?” The 12-item measure used here was highly correlated with the 10-item brief version ($r = .99$ at Time 1 and $r = .99$ at Time 3). The PSS has been used in previous studies of stress and pregnancy and has demonstrated very good reliability (e.g., Lobel, Dunkel-Schetter, & Scrimshaw, 1992; Zambrana et al., 1999). Scores did not differ significantly by time point, $t(116) = -.22$, $p > .10$, and were averaged to form a composite indicator of chronic stress. In this study, Cronbach's alphas were very good (overall sample, .90 at Time 1 and .94 at Time 3; for both African Americans and Whites, .89 at Time 1 and .93 at Time 3).

State anxiety: A 10-item brief version (see Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999) of the Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, 1983) was used at all three time points to measure general feelings of anxiety. Scores were highest at Time 2 and lowest at Time 3, $t(1 \text{ vs. } 2) = -.26$, $p < .05$; $t(2 \text{ vs. } 3) = 4.19$, $p < .01$; and $t(1 \text{ vs. } 3) = .21$, $p < .05$, respectively, and were averaged to form a composite indicator of general anxiety. The STAI has been used in other studies of stress and pregnancy and has demonstrated good reliability (e.g., Lobel et al., 1992; Rini et al., 1999). The STAI demonstrated good internal consistency in the current study as well (overall sample, .88 at Time 1 and .91 at Times 2 and 3; African Americans, .85 at Time 1 and .89 at Times 2 and 3; Whites, .87 at Time 1, .91 at Time 2, and .92 at Time 3).

[6]Educational attainment was originally classified into four categories (high school or less, more than high school but no bachelor's degree, bachelor's degree, and graduate degree) that were subsequently collapsed after one-way analyses of variance showed that outcomes differed only by whether education exceeded high school. The lowest category was predominantly composed of those with a high school education. For married or cohabitating households, both partners had to fall into the “high school or less” category for the household to be classified in this category.

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Pregnancy-Related Stress

Pregnancy anxiety: Pregnancy anxiety was assessed at all three time points using an instrument developed for a previous study (e.g., Rini et al., 1999) to measure anxious feelings related to the pregnancy course, the health of the baby, labor and delivery, and caring for a newborn. Scores were significantly higher at Time 1, but did not differ from Time 2 to Time 3, $t(1 \text{ vs. } 2) = 3.07$, $p < .01$; $t(2 \text{ vs. } 3) = .61$, $p > .10$; and $t(1 \text{ vs. } 3) = 3.61$, $p < .01$, respectively. They were averaged across time points into a composite score. This measure has demonstrated good reliability in prior research (e.g., Rini et al. 1999) and in the current study (overall sample, .75 at Time 1 and .81 at Times 2 and 3; African Americans, .70 at Time 1, .85 at Time 2, and .84 at Time 3; Whites, .76 at Time 1 and .75 at Times 2 and 3).

Pregnancy wantedness: An index of pregnancy wantedness was formed from responses to four questions at Time 1 that asked whether the respondent wanted to get pregnant, whether the respondent had ever considered abortion or adoption, how she felt about having a baby now, and whether she ever wished she were not pregnant. A similar measure was used in a prior study (e.g., Gurung, Dunkel-Schetter, Collins, Rini, & Hobel, 2005) to assess the degree to which the pregnancy was considered a psychosocial stressor. By indicating greater wantedness, higher scores signify lower levels of pregnancy-related stress. Cronbach's alpha was .78 in the overall sample, .76 in African Americans, and .62 in non-Hispanic Whites.

Racism Stress—A measure of perceived racism, incorporated into the Time 2 interview, assessed racism exposure across general life domains and was loosely based on items developed by Krieger (1990) to assess self-reported racism exposure in different situational contexts. Our measure included an “other” category to capture as many types of experiences as possible, referred to specific periods of the life course to aid recall, and assessed racism indirectly experienced through a close other, similar to items in our stressful life events inventory. These features of our measure were responsive to measurement issues raised in the literature (e.g., Blank, Dabady, & Citro, 2004; Meyer, 2003; Williams et al., 2003), and items were extensively pretested with White, Latina, and African American pregnant women.

In four separate sets of questions, participants were asked whether as a child (age 16 and younger) and then as an adult (older than 16), they had ever felt that they or someone close to them had been discriminated against or the target of prejudice because of their race. If so, they were then asked to indicate (0 = *no*, 1 = *yes*) whether they had experienced personal, educational, employment, housing, or “other” types of racial discrimination. If not, a code of “0” was recorded for each racism domain. For close others they felt had been targets of racism, respondents were asked to specify the race or ethnicity of and their relationship to the person (s). Responses within each set of items were summed to produce subscores by type (direct or vicarious) and timing (childhood or adulthood) of perceived racism exposure. Given positive skew (ranging from 1.65 to 1.74) and high kurtosis (ranging from 1.73 to 2.41), the maximum scores in each subscore distribution were recoded. Recoded subscores were summed into a lifetime score (skewness = 1.30, kurtosis = 1.05).

Measures that assess racism across different contexts or life domains have demonstrated good reliability and validity in formal psychometric studies. For example, Krieger's items were recently shown to be reliable and significantly associated with psychological distress in African Americans, Latinos, and Whites (Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005). Her measure also has good convergent validity, based on its association with scores on the Schedule of Racist Events (Klonoff & Landrine, 1999), a validated instrument for African Americans that was generalized to apply across ethnic groups and then validated in African Americans, Whites, Latinos, and Asian Americans (Landrine, Klonoff, Corral, Fernandez, & Roesch, 2006).

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Birth Outcomes—Research nurses collected birth outcome data from medical charts. Because the study was not powered to test models of clinical outcomes (i.e., LBW and PTD), the continuous outcomes of birth weight in grams and gestational age at delivery in weeks were the focus of this investigation.

Results

Analytic Procedure

Mean substitutions were made for missing values using racial group averages to preserve statistical power and maintain the consistency of the data. Artificially constraining the variance on those variables was not a concern given the small number of missing values.[7] Racial differences were examined using one-way analyses of variance and chi-squares. Bivariate relationships among the major study variables were tested next with zero-order Pearson product–moment correlations. On the basis of high intercorrelations, a multidimensional stress index was formed from the standardized scores of the general and pregnancy stress variables, those traditionally found in pregnancy research. Although correlated with the other stress variables, perceived racism was not included in the index so that its unique contributions could be ascertained. Hierarchical linear regression models were tested using variables correlated with birth outcomes. Medical and sociodemographic risk factors were entered in Step 1, general and pregnancy stress in Step 2, and perceived racism in Step 3 to test whether it would predict variance in outcomes over and above the more traditional stress variables. Race was not entered in these models initially so that the independent association of the hypothesized mediator (i.e., stress) with birth outcomes could be established. Race was included in models that tested interactions of race and the significant stress predictors. Finally, the stress variables that significantly predicted birth outcomes were tested as potential mediators of racial differences in those outcomes.

Racial Differences

Table 1 provides descriptive information on the major study variables by racial group. African American women had significantly more sociodemographic and medical risk factors[8] than non-Hispanic White women. According to recent census figures, this sample earned more (African Americans, $40,001–$50,000 vs. $30,439; non-Hispanic Whites, $80,001–$90,000 vs. $45,904; DeNavas-Walt & Cleveland, 2002) and was better educated (African Americans, 28% vs. 15%, with a college degree or higher; non-Hispanic Whites, 84% vs. 24%, with a college degree or higher; Newburger & Curry, 2000) than the general population of their respective groups. African Americans also had less favorable birth outcomes than their non-Hispanic White counterparts. Their rate of singleton PTD was slightly higher than their national rate (16%), whereas the White sample's rates of singleton LBW and PTD were substantially smaller than their national rates (5% and 9%, respectively; Martin et al, 2005). Regarding the psychosocial variables, the groups differed on indicators of all three types of stress, particularly perceived racism stress. African Americans and Whites most frequently perceived vicarious racism exposure in childhood via family members, usually parents, who were the same race or ethnicity as they themselves were. In adulthood, Whites most often named friends and romantic partners who were African American, Latino, or Asian as targets, although a few

[7]There were no missing data on any of the medical and sociodemographic risk factors, Time 1 stressful life events; Time 2 STAI; or Time 2 pregnancy anxiety, birth weight, or gestational age. Less than 1% of the data were missing for PSS, STAI, and pregnancy anxiety at Time 1, pregnancy wantedness and perceived racism; 5% of the data were missing at Time 3 for PSS, STAI, and pregnancy anxiety; and 8% of the data were missing for Time 3 stressful life events.

[8]The groups differed significantly in 9 of 21 conditions, with African Americans being higher risk in all cases. The most frequent medical risk condition in African Americans was two or more therapeutic abortions (27%, $n = 14$), whereas in Whites it was vaginal bleeding (15%, $n = 11$).

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mentioned Jewish and Latino family members. African Americans typically mentioned family members and friends who were also African American.

Testing Predictive Models

The regression analysis focused on predictive models of birth weight as the groups did not differ significantly in gestational age at delivery. Gestational age at delivery and whether labor was spontaneous were entered as control variables to better approximate models of birth weight as an indicator of fetal growth. Whether the participant was recruited from the prenatal clinic in the medical center (vs. a private physician's office) was also entered in the models to protect against possible confounding. On the basis of significant correlations with birth weight, medical risk and parents' education were identified as additional control variables, and perceived racism was tested as a stress predictor. PSS and STAI were marginally associated with birth weight, so these were included in the regression models as well. The intercorrelations of the major stress variables, birth outcomes, and the control variables are presented in Table 2.

Predictors of Birth Weight—In Step 1, the control variables predicted 47% of the variance in birth weight ($p < .001$) with gestational age at delivery emerging as the only significant independent predictor ($\beta = 0.65$, $p < .001$). PSS and STAI did not predict a significant amount of additional variance when entered together in Step 2 ($\Delta R^2 = .005$, $p > .10$). Because these stress composites were just marginally associated with birth weight, we examined their correlations with outcome by time point. Only their Time 3 scores were significantly related to birth weight (see Table 2), but when they were tested in Step 2, the Time 3 scores did not add to the predicted variance either ($\Delta R^2 = .006$, $p > .10$). The amount of variance being predicted was significantly increased when the perceived racism lifetime score was added in Step 3 to the model already containing the control variables and the general stress composites ($\Delta R^2 = .023$, $\beta = -0.17$, $p < .05$). Each unit increase in lifetime perceived racism was associated with a 39.59-g decrease in birth weight. To determine which components of the perceived racism lifetime score were driving this association, we tested the four subscores together in Step 3. The correlations between the subscores ranged from .33 to .60, *ps* < .001. Correlations with birth weight are noted as part of Table 2. Childhood-direct racism ($\beta = 0.17$, $p < .10$) was a marginal predictor, with each unit increase being associated with a 137.10-g increase in birth weight, and childhood-vicarious racism ($\beta = -0.25$, $p < .01$) was a significant predictor, with each unit increase being associated with a 167.85-g decrease in birth weight.

Interaction Models—Interaction models were tested to determine whether the relation of the significant stress predictors to birth weight differed by race. Separate models were run for the perceived racism lifetime score and the childhood-vicarious subscore. To be thorough, we also tested an interaction model using the childhood-direct subscore, even though it was not significantly associated with birth weight and was only a marginal predictor in the initial regression analysis. Race was entered in Step 1 with the control variables, the perceived racism variable was entered in Step 2, and the interaction term was entered in Step 3. Race was a significant predictor in Step 1 ($\beta = -0.25$, $p < .05$), with African American infants weighing an average of 280.84 g less than White infants, controlling for medical risk, gestational age, spontaneous labor, recruitment site, and parents' education. In Step 2, the perceived racism lifetime score was a marginal predictor ($\Delta R^2 = .012$, $\beta = -0.12$, $p < .10$), and the childhood-vicarious subscore was a significant predictor ($\Delta R^2 = .020$, $\beta = 0.15$, $p < .05$), when each was tested in its respective model. The childhood-direct subscore did not predict significant additional variance ($\Delta R^2 = .000$, $\beta = 0.01$, $p > .10$) in Step 2 of its model. In Step 3, none of the interaction terms were significant (Race × Lifetime: $\Delta R^2 = .004$, $\beta = -0.13$, $p > .10$; Race × Childhood-Vicarious, $\Delta R^2 = .000$, $\beta = -0.01$, $p > .10$; Race × Childhood-Direct, $\Delta R^2 = .003$, $\beta = -0.09$, $p > .10$). Because inadequate power may have been responsible for the nonsignificant

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interactions, we examined separate racism models for each group. Both the lifetime and childhood-vicarious perceived racism scores predicted significant additional variance in birth weight over and above the control variables in African Americans, but not in non-Hispanic Whites (see Table 3). The childhood-direct subscore did not predict significant additional variance in either group (African Americans, $\Delta R^2 = .007$, $\beta = -0.09$, $p > .10$; Whites, $\Delta R^2 = .004$, $\beta = 0.07$, $p > .10$).

Mediation Models—The significant stress predictors (lifetime and childhood-vicarious perceived racism) were each tested in separate models as mediators of racial differences in birth weight. There was a marginally significant decrease in the standardized regression coefficient for race when the lifetime perceived racism score was added to the model (the beta for race changed from −0.25, $p < .01$, to −0.20, $p < .05$, $\Delta R^2 = .012$, $p < .10$; Sobel test = −1.53, $p < .10$, one-tailed). When the childhood-vicarious score was added to the model, the standardized coefficient for race was significantly attenuated (the beta for race changed from −0.25, $p < .01$, to −0.19, $p < .05$, $\Delta R^2 = .020$, $p < .05$; Sobel test = −1.88, $p < .05$, one-tailed).

Because one of the goals of this study was to better account for the role of SES in racial disparities in birth outcomes, we also tested models controlling for the entire set of SES variables. In these models, the standardized regression coefficient for race was larger ($\beta = -0.30$, $B = -340.55$ g, $p < .01$) than it was in the models that included parents' education as the only SES variable. The childhood-vicarious subscore remained a significant predictor of birth weight and mediator of racial differences ($\Delta R^2 = .017$, $p < .05$; Sobel test = −1.74, $p < .05$, one-tailed). The lifetime score did not predict a significant amount of additional variance in birth weight when all of the SES variables were included in the model, but a marginal attenuation in the coefficient for race was still evident ($\Delta R^2 = .009$, $p > .10$; Sobel test = −1.38, $p < .10$, one-tailed).

Discussion

The main findings of this study are that perceived racism across the lifetime and perceived racism vicariously experienced as a child predict birth weight in African Americans and help to account for racial differences in birth weight, controlling for medical and sociodemographic risk factors. Although perceived racism's association with birth weight outcomes has been reported previously in the literature, including attenuation of racial differences (e.g., Mustillo et al., 2004), none of the prior racism and pregnancy studies, to our knowledge, have explicitly examined racism exposure in childhood or direct versus vicarious experiences, and none have included an “other” domain to capture as many events as possible or considered as broad an array of socioeconomic factors. Thus, our results not only lend further empirical support to a link between perceived racism and birth weight, but they also provide richer and more detailed insights into their possible connection.

The fact that a third of Whites perceived that they had been the direct target of unfair treatment because of race is a somewhat surprising statistic, but it is fairly comparable with White rates reported in other studies (e.g., Krieger et al., 2005; Mustillo et al., 2004), is less than a majority, and is considerably lower than that for African Americans, in accordance with hypothesized racial differences. In addition, the African Americans and Whites studied here exhibited a similar pattern of association between perceived racism and the other stress variables (for Whites, *r*s ranged from .24 for pregnancy anxiety to .44 for stressful life events; for African Americans, *r*s ranged from .29 for pregnancy anxiety to .53 for stressful life events), suggesting that racism is a form of stress that can be validly assessed in both groups. Indeed, if racism's role in health disparities is of scientific interest, then measuring it in Whites, as well as people of color, is a scientific imperative (Landrine et al., 2006). That the groups did not exhibit similar patterns of association between racism and birth outcomes is likely a function of vast

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differences in their sociopolitical histories. Gee (2002) posits that racism's influence is threshold dependent and that African Americans' level of exposure is high enough, given their pervasive and long-standing experience of discrimination, to trigger both mental and physical health consequences.

A particularly notable finding of this research is that racism vicariously experienced in childhood, most often via a parent or guardian, was the only component of the perceived racism lifetime score that was a significant independent predictor of birth weight, even after using the most stringent controls for SES. This finding underscores the critical need to examine the developmental context within which racism is experienced, as certain periods of the life course may be more sensitive to racism than others. From an attachment perspective, children's sense of security and emotional stability is inextricably linked to their parents' well-being (Sroufe, 1996); therefore, threats to the parents are likely to be quite salient and personally threatening to the child. From a socialization standpoint, many African American parents believe they must arm their children against racial discrimination by cultivating pride in their ethnic heritage, as well as by exposing them to the horror and injustice of racism, past and present (Hughes et al., 2006). Despite parents' protective intentions, certain racial messages might heighten children's threat perception and inadvertently trigger chronic states of hyperarousal (Hughes et al., 2006). Repetti, Taylor, and Seeman (2002) argued that exposure to highly threatening situations in childhood may generate stress-induced emotional and physiological changes that have long-range mental and physical health consequences. At the same time, our findings for lifetime perceived racism suggest that the accumulation of racism stress across the life course should be considered as well. Lu and Halfon (2003) proposed a health trajectory model of racial disparities in birth outcomes that conceptualizes reproductive health longitudinally by combining sensitive periods of development with the cumulative toll of adaptation to stressors.

In contemplating the findings reported here, it is important to consider the limitations of the study. This study design excluded women who reported smoking cigarettes or using drugs or alcohol. Such women are not only at higher risk for poor pregnancy outcomes, but they may also be using substances as a way of coping with stress. In addition, the African American and White women studied here were of higher than average SES than their respective groups in the general population, and they were getting early and regular prenatal care. Thus, our sample is likely to represent a healthier subset of pregnant women, both psychosocially and physically. This could explain the absence of some hypothesized racial differences in general and pregnancy stress, as this sample had greater socioeconomic resources than our previous samples (e.g., Feldman et al., 1997; Zambrana et al., 1999). The higher SES of the sample may also be a reason we found few associations between birth outcomes and the more traditional stress variables.

Another issue concerns assessment of the different stress variables. Because it was measured over the life course, perceived racism may have been a more robust stress predictor than the general and pregnancy stress variables, whose time frames were focused on the perinatal period. Although we based our perceived racism measure on existing literature on the issue, our measure is still an imperfect indicator of perceived exposure to racism and does not assess specific racism events, the emotional distress associated those events, the frequency with which they occur, or the stress associated with knowing that as a racial minority the possibility always exists that one will be discriminated against. An additional limitation of our measure of racism was its exclusive focus on perceived interpersonal experiences. Institutional forms of racism (e.g., Massey & Denton, 1993; Smedley, Sith, & Nelson, 2003), in contrast, are concealed in the day-to-day operation of systems and pose a macro-level threat to health regardless of personal perception (Clark et al., 1999). Although studies of racism and health are proliferating, very few have incorporated measures of racism at both the interpersonal and the institutional

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levels, although both forms have been shown to independently affect health outcomes when studied concurrently (e.g., Gee, 2002).

The major findings of this study involve racial differences in continuous levels of birth weight. The largest adjusted difference in birth weight between non-Hispanic Whites and African Americans was 340.55 g, or 0.75 lb. Although seemingly trivial, this difference holds important clinical implications. Variations in normal-range birth weight have been associated in large-scale studies with several indicators of child health and development (Institute of Medicine, 2006), including cognitive function (Richards, Hardy, Kuh, & Wadsworth, 2001), ocular development (Saw et al., 2004), and school performance (Kirkegaard, Obel, Hedegaard, & Henriksen, 2006), independent of confounding factors. Moreover, this finding was evident in a relatively healthy sample of pregnant women with disproportionately low-risk pregnancies and above-average levels of education and income. That racial differences would persist in this context is most notable. Even more interesting, perceived racism predicted 6% additional variance in birth weight in African American women, suggesting that it may be a particularly potent type of stress with important consequences for African American women's reproductive health, regardless of whether their pregnancies culminate in an adverse outcome. Thus, this study's prediction of gradations in normal birth weight is clinically relevant, despite its focus on subclinical levels of birth outcomes.

The racial disparity in adverse birth outcomes is a public health conundrum that continues to challenge the medical and academic communities. The results of this study demonstrate that perceived racism is a significant predictor of African American birth weight and a significant mediator of racial differences in birth weight. These findings further suggest that a life course approach could prove particularly useful for identifying risk factors and etiological processes early in the life trajectory that are involved in these specific health outcomes.

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Table 1

Racial Differences in Study Variables

	African American		Non-Hispanic White		
Variable	***M***	***SD***	***M***	***SD***	***F* or χ^2**
Medical and sociodemographic variables					
Medical risk	2.67	2.23	1.12	1.42	22.08***
Weight gain	34.53	25.73	34.18	11.18	0.01
Age	28.65	5.14	31.43	4.07	11.24**
Cohabitating (%)	67		95		16.56***
Employed (%)	47		81		16.47***
Clinic patient (%)	59		6		42.93***
Adjusted income[a]	2.35	1.66	4.17	1.47	41.07***
Current education (%)					44.97***
High school or less	28		4		
Some college	45		12		
College degree	24		37		
Graduate degree	4		47		
Parents' education (%)					20.45***
High school or less	28		14		
Some college	51		29		
College degree	20		27		
Graduate degree	2		30		
Income incongruity (%)					18.68***
Negative	55		18		
None	29		55		
Positive	16		27		
Stress variables					
Psychosocial stress					
Stressful life events[b]	7.17	4.63	5.72	3.98	3.52†

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	African American		Non-Hispanic White		
Variable	***M***	***SD***	***M***	***SD***	***F* or χ^2**
Perceived stress[c]	2.45	0.60	2.06	0.50	15.42***
State anxiety[c]	2.10	0.39	1.98	0.40	2.73
Pregnancy stress					
Pregnancy anxiety[c]	1.79	0.47	1.76	0.37	0.10
Pregnancy wantedness	−1.79	3.50	1.27	1.98	38.25***
Perceived racism					
Lifetime score[c]	2.88	2.84	1.31	1.78	14.26***
% exposed	73		48		7.46**
Child-direct	.53	0.80	.32	0.55	3.12†
% exposed	35		27		0.88
Child-vicarious	.73	0.97	.27	0.62	10.30**
% exposed	48		18		8.24**
Adult-direct	.77	0.99	.32	0.62	9.76**
% exposed	45		23		5.67**
Adult-vicarious	.85	1.03	.40	.70	8.34**
% exposed	49		29		5.28**
Birth outcomes					
Birthweight	3,216.86	508.72	3,488.75	558.99	7.64*
Gestational age	38.65	1.93	39.05	1.60	1.62
Low birth weight (%)	10		1		4.64*
Preterm delivery (%)	18		3		8.25*

Note. Low birthweight, < 2,500 g; preterm delivery, < 37 weeks.

[a]Figures correspond to $5,000–$10,000 per person per year for African Americans and $20,000–$30,000 per person per year for non-Hispanic Whites.

[b]Sum of Time 1 and Time 3.

[c]Composite score.

†p<.10.

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* $p<.05$.

** $p<.01$.

*** $p<.001$.

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Table 2

Intercorrelations of Birth Outcomes, Major Stress Variables, and Control Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Birthweight	—												
2. Gestational age	.68***	—											
3. Medical risk	−.35***	−.47***	—										
4. Spontaneous labor	.12	.19*	−.27**	—									
5. Clinic patient	.00	.03	.23*	−.03	—								
6. Parents' education	.23**	.27**	−.12	−.10	−.07	—							
7. Stressful life events[a]	−.06	.08	.16†	−.05	.16†	.00	—						
8. Perceived stress[a]	−.16†	−.15†	.19*	−.08	.25**	−.17†	.50***	—					
9. State anxiety[a]	−.15†	−.14	.16†	.03	.17†	−.22*	.48***	.77***	—				
10. Pregnancy anxiety[a]	−.10	.00	−.02	.00	.06	−.20*	.36***	.47***	.65***	—			
11. Pregnancy wantedness	.06	−.02	−.10	.02	−.24*	.22*	−.36***	−.47***	−.46***	.21*	—		
12. Perceived racism[b]	−.26**	−.14	.20*	.03	.06	.04	.50***	.40***	.35***	.25**	−.26**	—	
13. Stress	−.15	−.08	−.13	−.03	.14	−.13	.68***	.78***	.84***	.78***	−.17†	.43***	—

Note. Zero-order Pearson correlations between continuous variables and dichotomous variables are the same as point-biserial correlations. The dichotomous variables are spontaneous labor (0 = *no*, 1 = *yes*), clinic patient (0 = *no*, 1 = *yes*), and parents' education (0 = *high school or less*, 1 = *more than high school*). Stress = general and pregnancy stress index.

[a]Composite score; examined by time point, none of the general and pregnancy stress variables were significantly correlated with outcomes except Time 3 Perceived Stress Scale (birth weight, $r = -.22$, $p < .05$; gestational age, $r = -.26$, $p < .01$) and Time 3 State-Trait Anxiety Inventory (birth weight, $r = -.21$, $p < .05$; gestational age, $r = -.22$, $p < .05$).

[b]Lifetime score; subscore correlations with birth weight: child-direct, $r = -.06$, $p > .10$; child-vicarious, $r = -.29$, $p < .01$; adult-direct, $r = -.24$, $p < .01$; and adult-vicarious, $r = -.19$, $p < .05$. None of the subscores were significantly correlated with gestational age.

†$p < .10$.

*$p < .05$.

**$p < .01$.

***$p < .001$.

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Table 3

Hierarchical Linear Regression Models for Testing Lifetime and Childhood-Vicarious Racism as Predictors of Birthweight

	Lifetime (β)				Childhood-vicarious (β)			
	African American		Non-Hispanic White		African American		Non-Hispanic White	
Variable	**Step 1**	**Step 2**	**Step 1**	**Step 2**	**Step 1**	**Step 2**	**Step 1**	**Step 2**
Gestational age	.56***	.52***	.80***	.80***	.56***	.52***	.80***	.79***
Medical risk	−.10	−.05	.17†	.17	−.10	−.05	.17†	.16
Spontaneous labor	.07	.10	−.10	−.11	.07	.09	−.10	−.08
Clinic patient	−.16	−.08	−.06	−.06	−.16	−.09	−.06	−.06
Parents' education	.10	.19	−.07	−.07	.10	.18	−.07	−.08
Perceived racism		−.28*		−.01		−.26*		−.07
R^2	.50	.56	.52	.52	.50	.56	.52	.52
ΔR^2	.50***	.06*	.52***	.00	.50***	.06*	.52***	.00

† $p < .10$.

* $p < .05$.

*** $p < .001$.