

# Stress in African American Pregnancies: Testing the Roles of Various Stress Concepts in Prediction of Birth Outcomes

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## ABSTRACT

**Background:** The persistently higher rates of adverse birth outcomes among African American women are a major public health concern. **Purpose:** The purpose of this study was to explore the relations among psychosocial stress, socioeconomic status, and birth outcomes in African American women. **Methods:** A prospective survey research design was used to measure stress exposure, subjective responses to stressors, including intrusive effects of life events, and medical and sociodemographic variables in a sample of 178 pregnant African American women. Birth outcomes were obtained from medical charts. **Results:** Life event exposure was high, but levels of perceived stress and negative emotional responses were low to moderate. Lower income African American women reported significantly greater pregnancy undesirability than higher income African American women. Educational attainment was not related to any of the stress variables, and neither income nor

educational attainment was significantly related to birth outcomes. Number of stressful life events significantly predicted 3% additional variance in gestational age after controlling for potential confounders. Psychosocial stress variables altogether accounted for 7% additional variance in gestational age-adjusted birth weight, with event distress and intrusive thoughts concerning severe life events emerging as the significant independent stress predictors. **Conclusions:** These results contribute to our understanding of the complex etiological processes involved in African American birth outcomes and set the stage for further research into their reproductive health status.

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## INTRODUCTION

The reproductive health status of African American women is a major public health concern. African American infants have two times the rate of infant mortality (1), two times the rate of preterm delivery (< 37 weeks gestation), four times the rate of very preterm delivery (< 28 weeks gestation), two times the rate of low birth weight (< 2,500 g or 5 lb 8 oz), and three times the rate of very low birth weight (< 1,500 g or 3 lb 4 oz) of their White counterparts (2). With the U.S. Surgeon General's call to eliminate health disparities across social groups in the new millennium, understanding why African American women have such comparatively poor birth outcomes is a critical issue (3).

## Stress and African American Birth Outcomes

Psychosocial stress may be a key factor in understanding African American women's poorer reproductive outcomes. In the pregnancy literature, there is mounting evidence that psychosocial stress influences birth outcomes (4-6). Various stress concepts, including stressful life events, event distress, perceived stress, state anxiety, and pregnancy-related anxiety have been linked to both earlier delivery (7-10) and lower birth weight

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(11,12). Further studies show that African Americans carry a greater burden of stress than do other groups in terms of frequency, quantity, and severity of exposure to stressors (13–15).

A few investigators have studied stress and pregnancy in African Americans with mixed results. Barbosa (16) did not find an association between life events and gestational age in her sample of nearly 500 low-income African American women, and Murrell (17) reported that daily hassles were not a significant predictor of gestational age or infant birth weight in her study of 147 low-risk pregnant African American women. In their predominantly African American sample, McCormick et al. (18) did not observe a relation between stressful life events and birth weight either. However, other studies have demonstrated a significant effect of stressors on birth weight. Orr et al. (19) conducted a prospective investigation of stress and pregnancy, using a sample of 1,861 urban pregnant women, and found that measures of both acute life events and chronically stressful life conditions significantly predicted low birth weight, but only in the African American subsample. Reeb, Graham, Zyzanski, and Kitson (20) and Collins et al. (21) also found that stressful life events were significantly related to low birth weight in African Americans.

Besides objective stressors, studies have also examined African American women's emotions and emotional responses to stressors during pregnancy. Norbeck and Anderson (22) reported that effects of state anxiety on birth weight held only for the African American women in their sample, not for Whites or Hispanics. Zambrana, Dunkel-Schetter, Collins, and Scrimshaw (23) documented that life event distress and perceived stress mediated the relation between ethnicity and birth weight in their study of pregnant African American and Mexican-origin women. Although they did not explore relations with birth outcomes, Stancil, Hertz-Picciotto, Schramm, and Watt-Morse (24) found that pregnant African American women's levels of perceived stress predicted blood pressure at 32 to 36 weeks gestation.

Thus, in the preponderance of available studies, various aspects of stress have been linked to African American birth outcomes (birth weight most consistently), although notable nonreplications exist. It is unclear which stress variables pose the greatest threat to African American pregnancies, though, and few studies have compared the power of multiple stress indicators to predict risk. Such comparisons must consider assessment of stress exposures, stress responses, general chronic stress, and context-specific stressors such as pregnancy-specific stress. In addition, traumatic stress and its effects have not been investigated adequately, although traumatic experiences have been linked to pregnancy outcomes (25,26). There are indications that traumatic stressors, and the psychological distress they cause, may be high in African Americans (27,28).

### Role of Socioeconomic Status

The poor are more likely to experience both acute life events and chronically stressful life conditions (29). As a result, the poor are more likely to suffer from psychological distress and disorder (30). It is also well established that lower socioeconomic status (SES) is related to adverse health outcomes (31).

Compared to Whites, African Americans are three times more likely to be poor (32), and have lower average incomes, smaller net worths, and fewer net financial assets (33). Although socioeconomic indicators have been found to be related to pregnancy outcomes in African American women (17,34), not all investigations have noted such a relation (19,35). Despite the lack of consistent findings, SES constitutes an important factor to consider in studying issues of race, stress, and birth outcomes.

### This Study

It has been argued that the focus on comparative investigations of various ethnic or racial groups has slowed our understanding of ethnic health disparities by assuming the groups under study are relatively homogenous (36). Intragroup analyses, on the other hand, focus on the variability within particular population groups and are therefore able to uncover distinctive patterns of risk. The specific aims of this study were to (a) assess stress exposure and stress responses in pregnant African American women, (b) explore socioeconomic differences in stress and birth outcomes, and (c) determine whether stress predicts birth outcomes in this group, controlling for medical and socio-demographic risk factors. Several psychosocial variables were assessed and tested in this study, including measures of exposure to stress, stress responses such as state anxiety, chronic stress, and context-specific measures such as anxiety about pregnancy and degree of undesirability of the pregnancy. A measure of response to traumatic stress, intrusive thoughts concerning severest life events, was also included.

The study hypotheses were that higher levels of stress would be associated with lower SES and poorer birth outcomes, especially lower birth weight and growth retardation in utero. Although in the general stress and pregnancy literature psychosocial stress has been more consistently related to gestational age (4,5), we expected stronger effects of stress on birth weight because prior work has pointed more to birth weight or intrauterine growth effects in African Americans. Orr et al. (19) presented two possible mechanisms by which stressors could influence African American birth weights: indirectly, through clinical and behavioral risk factors such as higher rates of smoking, and directly, through physiological stress responses, such as elevated levels of catecholamines, which may decrease blood flow to the uterus. They further suggest that African Americans may be more vulnerable to the negative effects of stress on health, which may help to explain long-standing Black/White disparities in birth outcomes. The hypothesis that lower SES would be related to poorer outcomes is consistent with broader theories of SES and health and is examined here within an African American sample varying in SES. This provides clarification of the distinct roles of SES and ethnicity that is frequently not available.

## METHOD

### Design

The Behavior in Pregnancy Study was a 3-year prospective investigation of stress in pregnancy and its effects on birth outcomes. Women in the Los Angeles, California area who

spoke either English or Spanish fluently, were 17 years of age or older, and were less than 20 weeks gestation were recruited from private, public, and HMO prenatal clinics. Trained interviewers and research nurses collected psychosocial and medical data three times prenatally (Time 1: 18–20 weeks, Time 2: 24–26 weeks, Time 3: 32–36 weeks) and once 6 to 8 weeks postpartum.

Of the 609 women in the overall sample, 234 self-identified as "Black or African American." Of these 234, this investigation examined a subset of 178 who were U.S.-born, gave birth to a live infant, and had complete data on all study variables. The 56 Black women excluded from this sample were compared on all study variables to the 178 who were retained. The only difference between the two groups was age; excluded women were significantly younger ( $M = 25.30$ ,  $SD = 5.58$ ) than women included in the sample ( $M = 27.25$ ,  $SD = 5.24$ ),  $F(1, 228) = 5.296$ ,  $p < .05$ . Age was not associated with the significant stress predictors or birth outcomes, however.

### Stress Variables

In assessing psychosocial stress, we included a variety of measures to operationalize stress exposure (e.g., life events), stress responses (e.g., anxiety), and chronic stress (e.g., perceived stress). Instruments were extensively pilot-tested on a similar population and had been used in prior studies.

*Stressful life events.* A 24-item stressful life events inventory, completed at Time 1 and Time 3, was adapted from measures used in Lobel (6) and Zambrana et al. (23) to measure the number of stressful life events (SLEs) that participants experienced 1 year prior to, and during the course of, the pregnancy. The scores from Time 1 and Time 3 were averaged into a summary life events count.

*Events distress.* For each SLE that occurred, participants were asked to rate how undesirable it was for them personally on a scale ranging from 1 (*not at all*) to 4 (*very much*). Undesirability ratings were averaged across life events and across time points to obtain a summary events distress score.

*Intrusive thoughts.* Each participant reviewed her list of SLEs and selected the two that were the most distressing. She then answered five questions adapted from the seven-item Intrusion subscale of the Impact of Events scale (37), which is a valid and reliable measure (38,39), about each of these two particular events to assess subjective distress manifested as intrusive thoughts. A summary score was calculated by averaging scores across the two events and then across the two time points. This subscale exhibited very high internal consistency at each time point, with Cronbach's alphas ranging from 0.90 to 0.92.

*Perceived stress.* An eight-item shortened version of the Perceived Stress Scale (PSS) (40) was used to assess feelings of chronic stress "during the past week" at each of the three prenatal time points using a 5-point scale from 1 (*never*) to 5 (*almost*

*always*). This measure has been used in previous studies of stress and pregnancy and has been shown to be psychometrically sound (10,11,23,41). A summary score was calculated by averaging responses across time points. The scale exhibited good reliability at each time point, with Cronbach's alphas in the low 0.80s.

*State anxiety.* General feelings of anxiety "during the past few days" were assessed on a 4-point scale from 1 (*not at all*) to 4 (*very much*) at each of the three prenatal time points using the 10-item shortened version of the Spielberger State-Trait Anxiety Inventory (STAI) (42). This measure is psychometrically sound and has often been used in pregnancy research (5,9). Scores were averaged over time points. This scale demonstrated good internal consistency at each assessment, ranging from 0.84 to 0.90.

*Pregnancy-specific anxiety.* Pregnancy-specific anxiety was assessed at all three prenatal time points with a set of items developed by the researchers to assess various affective responses to the pregnancy. Participants were asked how often in the past week they had felt anxious, concerned, fearful, and panicky about the pregnancy, using a 5-point scale from 1 (*never*) to 5 (*always*). Internal consistency estimates ranged from 0.51 to 0.69.

*Pregnancy undesirability.* Four questions were created for this study to assess whether the pregnancy was planned, whether the respondent had ever considered abortion or adoption, how the respondent currently felt about the pregnancy, and whether she ever wished she were not pregnant. Responses were standardized and summed into an index of pregnancy undesirability with higher scores indicating less desirable pregnancies. Cronbach's alpha was 0.68.

### Sociodemographic and Medical Variables

Demographic information included age, employment status, and cohabitation status. SES was approximated with measures of educational attainment and income. Educational attainment was classified as no degree, high school diploma, more than high school but no 4-year college degree, and 4-year college degree or more. Annual household income was assessed using a 10-point scale ranging from less than \$2,500 per year to over \$80,000 per year. It was adjusted for household size by dividing the income score by the number of people in the home, yielding a per capita income score.

Medical risk was the number of 32 possible risk conditions from past obstetrical history, past medical history, and this pregnancy that were present. The list of conditions was based on previous research (43,44) and the consensus of the medical experts on the team. A complete listing is available from the authors. Weight gain, parity, and substance use also served as control variables.

### Birth Outcomes

Birth weight in grams and gestational age in weeks were the outcomes of interest. Because birth weight varies significantly

with gestational age (Pearson's  $r$  in this sample was .70,  $p < .01$ ), it was regressed onto gestational age, and the residual scores were used to represent gestational age-adjusted birth weight, an indication of fetal growth. This procedure is in line with previous investigations (45,46).

## RESULTS

### Statistical Procedure

Data analysis included univariate, bivariate, and multivariable techniques. Frequencies and descriptive statistics were used to summarize the data. Correlational analyses were used to test bivariate relations and to decide which variables to enter into regression models. Hierarchical multiple regression was used to test for significant predictors of birth outcomes.

### Descriptive Statistics

The mean age of the sample was 27.3 years ( $SD = 5.24$ ) with a range of 18 to 42 years. A little over 40% of the sample was employed outside of the home either part or full time. Although only 33% of the sample was married to the baby's father, two thirds were living with him.

Regarding highest degree attained, 12% had no degree, 65% had a high school diploma, 14% had post-high-school training but no college degree, and 8% had a 4-year college degree or better. According to 2000 census figures, 22.8% of African American women age 15 and older had less than a high school education, 32.2% had a high school diploma, and 13.6% had at least a 4-year college degree (47). Thus, in comparison to African American women in the general population, this sample of African American women was more likely to have completed high school, probably because the youngest person in the sample was 18 and not 15, but less likely to have completed college.

Median annual household income was \$20,001 to \$30,000, ranging from under \$2,500 to over \$80,000 per year. When compared to 2000 census figures for African American median household earnings (48) and poverty levels (49), the African American women in this study earned less money and were more likely to be living below the poverty level than the general African American population.

With regard to medical and health-related factors, 30% of the sample was nulliparous. The average number of medical risk conditions was 2 ( $SD = 1.07$ ) with a range of 0 to 3. Only 13% of the sample had no medical risk conditions. The sample gained an average of 12½ kg (28 lb) ( $SD = 15.09$ ), during pregnancy, ranging from a loss of 5 kg (11 lb) to a gain of 35½ kg (79 lb). Twelve percent reported they smoked cigarettes, 23% that they drank alcohol, and 18% that they used illicit drugs. The African American women in this sample were less likely to smoke, but more likely to drink or use illicit drugs during pregnancy, than has been noted elsewhere in a similar sample of African American women (50).

Participants reported an average of 6.66 ( $SD = 2.89$ ) stressful life events (range = 1–16). This is twice the number of life events that other researchers have thought indicated a stressful pregnancy (21,51). These events were deemed to be somewhat stressful overall ( $M = 3.17$ ,  $SD = .58$ ) with participants reporting

on average that they sometimes (vs. *never/rarely* or *often/always*) had intrusive thoughts ( $M = 2.91$ ,  $SD = .86$ ) about their most distressing life events. Interestingly, everyone in the sample reported exposure to at least one SLE, and each event listed in the life events inventory was selected by at least one person as "the most distressing" when completing the intrusive thoughts measure. Participants perceived relatively little chronic stress (PSS:  $M = 2.38$ ,  $SD = .55$ ), were somewhat anxious in general (STAI:  $M = 2.04$ ,  $SD = .54$ ), and somewhat anxious about the pregnancy itself ( $M = 2.87$ ,  $SD = .84$ ). Nearly 70% of the sample did not intend to get pregnant, but only 7% seriously considered abortion or adoption, only 2% did not want to have a baby now that they were pregnant, and only 5% often or almost always wished they were not pregnant.

Infants were born around 39 weeks gestation ( $SD = 1.81$ ), with 12% being born prematurely (< 37 weeks), a rate much smaller than the national average of 17.6% for African Americans (52). The average birth weight was 3,254.88 g ( $SD = 607.31$ ). The 10.6% low birth weight (< 2,500 g) rate for this sample of African American women is slightly lower than the 11.4% national average for African Americans (52).

### Socioeconomic Differences in Study Variables

Because both adjusted income ( $r = .27$ ,  $p < .01$ ) and education,  $F(3, 174) = 6.92$ ,  $p < .01$ , varied significantly with age, socioeconomic differences in all the study variables were explored, controlling for age, using nested chi-square, nested  $F$  tests, and partial correlations (see Table 1). More highly educated women were more likely to be employed, having a baby for the first time, and less likely to use substances during the pregnancy. Women with higher per capita incomes were more likely to work ( $r = .49$ ,  $p < .01$ ) and to be giving birth for the first time ( $r = -.42$ ,  $p < .01$ ). Neither educational attainment nor income was even marginally related to stress or birth outcomes, controlling for age, except that higher income women had significantly lower pregnancy undesirability scores ( $r = -.28$ ,  $p < .01$ ).

### Predictive Models

We used zero-order Pearson product-moment correlations to reduce the number of variables used in the regression analyses so that parsimonious models could be tested. Control variables and stress variables at least marginally associated ( $p < .10$ ) with birth outcomes were retained. Weight gain, substance use, parity, event distress, intrusive thoughts, and state anxiety were tested as predictors of gestational age-adjusted birth weight, whereas medical risk, weight gain, and number of life events were tested as predictors of gestational age. Employment status, cohabitation status, adjusted income, education, perceived stress, pregnancy anxiety, and pregnancy undesirability did not reach marginal significance in bivariate tests with either outcome so these variables were not entered in the regression models. The intercorrelations of all study variables are shown in Table 2.

*Gestational age-adjusted birth weight.* To determine whether stress predicted gestational age-adjusted birth weight,

TABLE 1  
Socioeconomic Differences in Study Variables Controlling for Age

	Educational Attainment				F or $\chi^2$
	No Degree <sup>a</sup>	High School <sup>b</sup>	Less Than College <sup>c</sup>	College or More <sup>d</sup>	
Control variables					
Employed <sup>e</sup>	4.5%	45.7%	52.0%	60.0%	18.06**
Cohabiting	45.5%	57.8%	60.0%	86.7%	5.82
Nulliparous <sup>e</sup>	9.1%	34.5%	28.0%	40.0%	9.55*
Substance user	36.4%	43.1%	16.0%	33.3%	7.83*
Income (adjusted)	0.81 (0.41)	1.78 (1.19)	1.88 (1.37)	3.02 (1.45)	0.18
Age <sup>e,f</sup>	24.08 (5.25)	26.83 (5.00)	29.15 (4.69)	31.54 (5.07)	8.58** <sup>g</sup>
Medical risk	1.95 (1.09)	1.90 (1.08)	1.96 (1.02)	1.47 (1.06)	-0.04
Stress variables					
Stressful life events	6.91 (3.24)	6.21 (2.87)	5.82 (2.47)	5.40 (2.92)	-0.02
Event distress	3.14 (0.48)	3.10 (0.58)	3.01 (0.42)	3.30 (0.39)	-0.02
Intrusive thoughts	2.88 (0.90)	2.92 (0.83)	2.86 (1.04)	2.95 (0.83)	0.00
Perceived stress	2.59 (0.49)	2.34 (0.53)	2.31 (0.68)	2.26 (0.38)	-0.03
State anxiety	2.12 (0.43)	2.03 (0.51)	1.93 (0.58)	1.88 (0.49)	-0.01
Pregnancy anxiety	2.75 (0.91)	2.91 (0.76)	2.84 (0.83)	2.45 (0.60)	-0.03
Pregnancy undesirability <sup>e</sup>	0.20 (2.91)	0.01 (2.87)	-0.44 (3.12)	-1.10 (2.06)	-0.01
Birth outcomes					
Birth weight	3,395.32 (437.33)	3,192.04 (667.71)	3,469.96 (467.77)	3,200.67 (484.43)	-0.05 <sup>h</sup>
Gestational age	39.44 (1.49)	38.75 (1.96)	39.32 (1.32)	39.24 (1.53)	-0.0

Note. Values are percentages or means with standard deviations in parentheses.

<sup>a</sup>*n* = 22. <sup>b</sup>*n* = 116. <sup>c</sup>*n* = 25. <sup>d</sup>*n* = 15. <sup>e</sup>Significantly related to adjusted income. <sup>f</sup>Post hoc tests showed that those with a college degree or better differed significantly in age from those with no degree and those with a high school diploma. <sup>g</sup>*F* value based on a one-way analysis of variance rather than a nested *F* test because age served as the control variable in analyses for the other variables. <sup>h</sup>*F* value for adjusted birth weight is -0.03.

\**p* < .05. \*\**p* < .01.

controlling for potential confounders, parity, weight gain, substance use, and age were entered together in Step 1 of the regression. Parity, weight gain, and substance use were significant predictors of adjusted birth weight, with the step accounting for 9% of the variance. Events distress, intrusive thoughts, and state anxiety were entered together in Step 2, accounting for a significant amount of additional variance, with intrusive thoughts the significant predictor (see Table 3). To estimate the separate effects of each of the three stress variables entered in Step 2, separate models were run for each variable because of their high intercorrelations. Results of these analyses showed that both intrusive thoughts ( $\beta = -.25, p < .01$ ; *F* change = 12.47, *p* < .01) and events distress ( $\beta = -.19, p < .05$ ; *F* change = 6.52, *p* < .05) were significant predictors of adjusted birth weight after controlling for parity, weight gain, substance use, and age, whereas state anxiety was not ( $\beta = -.10, p > .10$ ; *F* change = 1.69, *p* > .10). Thus, African American women who had previously given birth, who did not use substances during the pregnancy, who gained more weight, and who had fewer intrusive thoughts and less distress concerning life events, had bigger babies.

**Gestational age.** Based on bivariate analyses, stressful life events was the only stress variable entered into the regression model predicting gestational age. Medical risk, weight gain, and age were entered together in Step 1 of the regression and stressful life events in Step 2. Step 1 accounted for a 5% of variance, with weight gain the significant predictor. Stressful life events

accounted for a significant amount of additional variance over and above Step 1 (see Table 4). Therefore, African American women who gained more weight during the pregnancy and experienced fewer stressful life events had longer gestational lengths, controlling for medical risk and age.

## DISCUSSION

This study examined the relations among stress, SES, and birth outcomes in a sample of African American pregnant women. Although a majority of their pregnancies were unintended and they experienced a high number of stressful life events, these women reported experiencing relatively low amounts of subjective stress and anxiety. This discrepancy may be due to a variety of factors operating individually or in combination, such as a general tendency, which has been noted in African Americans, to deny stress by not disclosing it (53). It may also reflect the cultural expectation that a "strong, Black woman" skillfully shoulders life's myriad demands (54-56) or the availability of strong psychosocial resources, such as social support and mastery, which have been shown to have beneficial effects on the birth outcomes studied here (9,45,57).

We hypothesized that higher SES African American women would report less stress than lower SES African American women. In past research, SES indicators have been associated with stress in pregnant African American samples (17,24). However, there were no significant stress-SES relationships in

TABLE 2  
Intercorrelations of Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Adjusted BW	---															
2. GA	.01	---														
3. Employed	-.09	.10	---													
4. Cohabiting	-.07	.01	.10	---												
5. Parity <sup>a</sup>	.17**	.01	-.31***	-.01	---											
6. Substance use <sup>a</sup>	-.21***	-.01	-.16**	-.06	-.03	---										
7. Adj. income	-.08	-.02	.49***	.13*	-.42***	-.12	---									
8. Age <sup>b</sup>	-.04	-.11	.12	.10	.11	.03	.27***	---								
9. Wt gain <sup>a</sup>	.22***	.23***	-.16**	-.18**	-.14	-.22***	-.02	.34***	---							
10. Medical risk <sup>a</sup>	-.10	-.14*	-.16**	.02	.20***	.13*	-.05	.14*	-.11	---						
11. SLEs <sup>a</sup>	-.04	-.23***	-.07	-.17**	.15*	.15**	-.03	-.06	-.00	.21***	---					
12. Distress <sup>a</sup>	-.19**	-.03	-.09	-.01	.16**	-.02	-.05	.17**	-.07	.16**	.32***	---				
13. Intr thts <sup>a</sup>	-.24***	.03	-.06	-.07	.14*	.10	-.08	-.04	-.06	.04	.35***	.32***	---			
14. PSS	-.07	-.09	-.10	-.03	.11	.00	-.11	-.10	.12	.18**	.32***	.27***	.19**	---		
15. STAI <sup>a</sup>	-.13*	-.09	-.09	.04	.09	.14*	-.12	-.16**	-.04	.09	.34***	.24***	.37***	.59***	---	
16. Preg anx	-.06	-.10	-.09	-.03	-.01	.12	-.09	-.18**	-.14*	.04	.18**	.09	.28***	.21***	.55***	---
17. Preg und	.07	-.06	-.06	-.16**	.24***	.10	-.28***	-.07	-.02	.09	.24***	.11	.21***	.29***	.28***	.14*

*Note.* The correlation coefficients reported above are zero-order Pearson correlations. Pearson correlations between continuous variables and dichotomous variables are the same as point-biserial correlations. The dichotomous variables in the correlation matrix are employed (0 = not working outside of the home part time/full time, 1 = working outside of the home part time/full time), cohabiting (0 = not cohabiting with the baby's father, 1 = cohabiting with the baby's father), parity (0 = nulliparous, 1 = multiparous) and substance use (0 = did not use cigarettes, alcohol, or illicit drugs during the pregnancy; 1 = did use cigarettes, alcohol, or illicit drugs during the pregnancy). BW = gestational age-adjusted birth weight; GA = gestational age; adj. income = income adjusted for household size; wt gain = total weight gained during the pregnancy; SLEs = stressful life events; intr thts = intrusive thoughts; PSS = Perceived Stress Scale score; STAI = State/Trait Anxiety Scale score; preg anx = pregnancy anxiety score; preg und = pregnancy undesirability score.

<sup>a</sup>Predictor entered in regression models. <sup>b</sup>Age was also included as a predictor in the regression models at a reviewer's request.

\* $p < .10$ . \*\* $p < .05$ . \*\*\* $p < .01$ .

TABLE 3  
Predictive Model of Gestational-Age-Adjusted Birth Weight

Step and Variables	$\beta$	Adjusted $R^2$	F Change
Step 1		.09	5.49**
Multiparous	.18*		
Weight gain	.20**		
Substance use	-.18*		
Age <sup>a</sup>	-.03		
Step 2		.15	4.96**
Event distress	-.12		
Intrusive thoughts	-.22**		
State anxiety	.01		

<sup>a</sup>Age, although not significantly correlated with outcomes at  $p < .10$ , was included in the model at a reviewer's request. Whether age is included in the model or not, the effects of the other variables on outcomes are comparable.

\* $p < .05$ . \*\* $p < .01$ .

TABLE 4  
Predictive Model of Gestational Age

Step and Variables	$\beta$	Adjusted $R^2$	F Change
Step 1	.05	3.79*	
Medical risk	-.06		
Weight gain	.20*		
Age <sup>a</sup>	-.08		
Step 2		.08	7.98**
SLEs	-.21**		

Note. SLEs = stressful life events.

<sup>a</sup>Age, although not significantly correlated with outcomes at  $p < .10$ , was included in the model at a reviewer's request. Whether age is included in the model or not, the effects of the other variables on outcomes are comparable.

\* $p < .05$ . \*\* $p < .01$ .

this study, other than the finding that lower income African American women were less likely to desire this pregnancy. With regard to birth outcomes, we expected lower SES to be related to poorer outcomes but did not confirm this. Although significant relations between income and birth weight (17) and education and low birth weight and preterm delivery (34) have been found in pregnant African American women, null effects of both education (19) and income (35) on birth weight and on gestational age (17), similar to this study, have also been reported.

Because SES effects, or the lack thereof, have been noted in some past research, our results may reflect the fact that using traditional indicators of SES—current income, education, and sometimes occupation—may be too simplistic an approach for capturing a true picture of the SES of African Americans. Not until the mid-1960s and the passage of the Civil Rights Act was middle-class status an attainable goal for many African Americans (58); thus, African Americans are more likely to be newly arrived into rather than generationally established in the middle class. Higher SES, as traditionally conceived, may have been gained too late to confer much positive health benefit. Considering length of time in social position may be a better method

for capturing SES effects on African American women's health (59). Because SES and social position were not main foci in the parent study, we did not have extensive measures on them. Recent developments in the study of these important constructs can be very useful in further investigating the relation between SES and birth outcomes in African American women.

We further expected that higher levels of stress would be associated with poorer birth outcomes. We found partial support for this hypothesis. Life event exposure and subsequent distress were associated in bivariate tests to outcomes, and predictive models showed that stress was able to account for a significant amount of additional variance in outcomes over and above control variables. Specifically with regard to gestational age, the more life events a woman experienced, the shorter the length of the pregnancy, independent of medical risk and weight gain. Life events have been linked to gestational age in other samples as well (7,60,61). In addition, the more life event distress and the more intrusive thoughts a woman had about her most stressful life events, the smaller her baby, independent of how much weight she gained, whether she had previously given birth, and whether she reported that she used substances during the pregnancy. This intrusive thoughts finding is new to the literature, to our knowledge, and was not due to confounding of intrusion with depression, a concern that has been expressed about such effects (62).

Intrusive thoughts are unintended thoughts, images, and even strong waves of feelings (37) outside of the conscious control of the person that may occur in response to mild, moderate, or traumatic stressors (63). Along with avoidant behaviors, intrusive thoughts are part of the rumination process whereby one attempts to work through a crisis, to manage it, and to extract some meaning from it (64,65) by dealing with the traumatic situation as one feels able (66,67). Although this study focused only on the intrusive thought component of rumination, it may be that the sample was high in avoidance as well. This possibility merits follow-up in future research, especially given the finding that despite a high number of life events, this sample reported relatively little emotional distress. It may be a useful window into the true experiences of stress in African Americans—a glimpse beyond what is often masked by norms and coping processes.

It appears that intrusive thoughts were more potent than life event occurrence and anxiety in predicting gestational age-adjusted birth weight. However, anxiety has been identified as a risk factor in Latina and White pregnancies (9–11). An intriguing possibility is that different stress indicators may be associated with different outcomes (i.e., preterm delivery vs. fetal growth). In addition, these results suggest that different ethnic groups may have different psychosocial risk factors, a matter deserving much greater attention.

Not only does the intrusive thought process tap into a unique and potent aspect of stress response, it may also provide insight into the biological mechanisms by which stress negatively impacts outcomes of pregnancy. Glynn, Christenfeld, and Gerin (68) showed that ruminating about a stressful experience, especially an emotionally charged one, can significantly slow

physiological recovery immediately following exposure to a stressor and reactivate the physiological response process even when the stressor is not present. In pregnancy, elevated levels of the stress hormones CRH, ACTH, and cortisol have been associated with preterm labor and subsequent early delivery (10,69,70) as well as restricted fetal growth (71-73).

The findings discussed herein should be viewed in light of the study's limitations. Because all of the women initiated prenatal care prior to 20 weeks gestation, this sample may not be completely representative of lower income, pregnant African American women in the general population who tend to initiate care later. Financial, cultural, and systems barriers can all contribute to the later initiation (74). The women in this sample were insured, however, and thus it was assumed that they were receiving regular prenatal care throughout the pregnancy. Early and consistent prenatal care could reduce stress and anxiety about the pregnancy and would likely contribute to better birth outcomes.

The lack of SES effects could have been due to limited range or variability on the SES variables or to small sample size or to both. Although the mode for level of education was a high school diploma with some achieving higher levels than this, there was better range on income. With low-, middle-, and upper middle-income earners all represented, 50% of the sample fell below the poverty level, and 32% earned incomes at or above African American median household earnings reported in the 2000 census (48). Regarding the size of the sample, SES effects have been present in smaller samples and absent in much larger samples. For example, Murrell's (17) study of 147 low-risk African American pregnant women reported that income was a significant predictor of birth weight, whereas Orr et al.'s (19) study of 1,861 predominantly African American urban pregnant women did not find an effect of education on birth weight. Thus, SES may not be as major a factor within the African American pregnant population as in other groups because of historical disadvantages that affect all African Americans. On the other hand, this issue is a complex one and deserves further in-depth examination in the future.

Racism may be one source of stress of particular salience to pregnant African American women (75) that was not investigated here. Myers (15) maintained that the health of minority groups is inextricably linked to the high stress states created by a social system plagued by racial discrimination. Perceived interpersonal discrimination (76,77) residential segregation (78,79), political disempowerment, and economic disenfranchisement (80) are all forms of racism that have been associated with African American birth outcomes. For a complete assessment of stress in African American women's lives it is critical that future research efforts incorporate measures of racism as well.

## CONCLUSION

The results of this study add to a small but growing body of literature that has investigated the impact of psychosocial stress on pregnancy outcomes among African American women. These findings highlight the need to further investigate stress processes in this group and to better understand how they con-

tribute to the poorer relative birth outcomes of African Americans. By elucidating the unique psychosocial experiences of pregnant women from diverse social groups, we may gain a better understanding of the etiological factors driving persistent ethnic disparities in reproductive health.

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