Extended Abstract

Not So Supportive? Black-White Differences in the Protective Effect of Social Support on Birthweight and Preterm Delivery*

Courtney S. Thomas
Vanderbilt University

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Background & Significance

In the United States, a disparity in infant mortality between the African American and non-Hispanic white populations has been documented since 1940 (Giurgescu et al. 2011). Moreover, black infants are more than twice as likely to be born low birthweight (Collins et al. 2004; Mustillo et al. 2004) and nearly three times as likely to be born prematurely (Paneth 1995; Lu and Chen 2004). Given the sheer magnitude of these disparities and their immediate and long-term consequences, there are few issues that warrant greater research attention. In addition, the fact that premature delivery and subsequently, infant birthweight are primary determinants of infant mortality risk, accounting for more than 63% of the black-white gap in infant mortality in the United States, investigation of its causes is of utmost importance (Schempf et al. 2007).

There is a demonstrated association between adverse birth outcomes and a number of factors including education, age, socioeconomic status, maternal health behaviors (i.e. alcohol consumption, smoking and drug usage), prenatal care and spirituality, among others (Colen et al 2006, Giurgescu et al. 2011). However, none of these factors fully account for observed racial disparities in pregnancy. Consequently, recent research has turned to stress as a more plausible explanation, as the chronic social stress experienced by many black women is thought to produce a weathering effect (Geronimus 1996, Geronimus et al. 2006), which, over time, can cause a physiological wear and tear on the body known as allostatic load. Disparities in pregnancy could be linked to the cumulative effects of allostatic load over the course of a woman's life (Giurgescu et al. 2011).

Social support has long been cited as a buffer to the negative effects of stress on health, including pregnancy outcomes (Nuckolls et al. 1972,Cassel 1976, Cobb 1976, Turner et al. 1990). Previous evidence suggests that perceived support can be especially beneficial for pregnant women, providing a buffer against the stress and anxiety that often accompanies the major life changes associated with pregnancy (Campos et al. 2008). However, while social support can have a positive effect on a woman's pregnancy, there is also evidence that such an effect does not occur equally in all women, with noted differences in effectiveness across socioeconomic position, marital status, and level of stress exposure (Turner and Lloyd 1999, Aneshensel 2009, Feldman et al 2000).

The vast majority of the research on social support and pregnancy outcomes has focused on identifying group differences in support and how such differences might account for variations in outcomes. According to Lincoln and colleagues (2003), merely accounting for race differences by introducing factors that are thought to "explain away" differences in outcomes tends to overlook the possibility that social and psychological factors may operate differently within specific racial and ethnic groups. Thus, the purpose of the present study is to investigate the effectiveness of social support as a buffer against the negative effects of stress in the pregnancies of black and white women. Explicitly, I examine black-white differences in the moderation or buffering effects of social support in the stress-pregnancy relationship. Given findings from previous studies, I expect there to be racial differences in the extent to which social support moderates the effects of stress on pregnancy with a reduced buffering effect for black women, who tend to be at higher risk for chronic stress exposure. This study seeks to move beyond past research, which has largely focused on direct relationships between stress, social support and pregnancy, by examining the ways in which social support processes differ for black and white women, and how these differences impact the continued racial disparity in pregnancy outcomes.

Data & Methods

Sample

The data for this study come from the Pregnancy Risk Assessment Monitoring System (PRAMS), which is a US federal-state cooperative survey conducted by the Centers for Disease Control (CDC). PRAMS surveys women who recently delivered a live infant, assessing issues related to pregnancy including maternal attitudes and experiences before, during and immediately after her most recent pregnancy. This study utilizes data from Phase 5 of PRAMS data, which was collected during 2004-2008. For this study, a subsample of only black and white mothers was selected, controlling for Hispanic ethnicity and singleton births. The sample was further limited by those who responded to selected social support questions, which were only given to respondents in New York City, Delaware and Oklahoma. The total effective sample size for this study was 9,152 women. Additional analyses were conducted comparing the total PRAMS Phase 5 black-white sample (with the same exclusion criteria previously mentioned) to the selected subsample. Chi-squared tests of proportion equality indicate that there are some significant differences in the demographic characteristics and health behaviors between the subsample and the larger Phase 5 sample (See Appendix A). Given the nature of these differences, results may be biased. Such biases are addressed in the full manuscript.

Measures

Birth outcomes. The primary outcome variables were birthweight and preterm delivery. Birthweight is measured in grams and taken from birth certificate records. Infants born with a weight less than 2500 grams are defined as low birthweight (LBW), while very low birthweight (VLBW) is any weight below 1500 grams. Normal birthweight is any weight greater than 2500 grams. Preterm delivery is measured by gestational age, which is typically estimated in weeks from the mother's last menstrual cycle. A full term pregnancy is at least 40 weeks. Infants who are born at less than 37 weeks are considered preterm (PTB), whereas those born before 32 weeks are very preterm (VPTB).

Stress. Stress was measured in a checklist of recent life events. Respondents were told, "This question is about things that may have happened during the 12 months before your new baby was born" and asked to select from a list of 13 possible stressors. Included in the list were "a close family member was very sick and had to go into the hospital", " I moved to a new address", "I had a lot of bills I couldn't pay", and "my husband or partner said he didn't want me to be pregnant." The total number of events was summed and respondents were coded as having a "low perceived stress level."

Social support. The level of perceived availability of support during pregnancy was assessed by a single item stating, "During your most recent pregnancy, would you have had the kinds of help listed below if you needed them?" Respondents were to answer yes or no to the following situations assessing both tangible and emotional types of support: "someone to loan me $50"(financial support), "someone to help me if I were sick and needed to be in bed"(care support), "someone to take me to the clinic or doctor's office if I needed a ride"(transportation support), and "someone to talk with about my problems"(emotional support). An alpha coefficient of 0.81 indicated very good reliability between the items, and factor analysis confirmed that the four items loaded highly on one factor.

Sociodemographic and Health Factors. Other maternal sociodemographic and health history factors were assessed during this investigation. Sociodemographic measures included mothers' race, which was assessed as either non-Hispanic white (coded 0) or non-Hispanic black (coded 1), maternal age, marital status (married vs. non-married), education measured in years completed, and yearly household income. Health factors that might impact pregnancy outcomes were assessed as well, including medical risk, smoking habits, body mass index (BMI), and prenatal care adequacy.

Analytic Strategy

The data was analyzed using R Version 2.14.1 (The R Foundation for Statistical Computing). Descriptive and bivariate analyses were conducted to account for race differences in maternal characteristics, health status, and birth outcomes (Tables 1 and 2). Separate stepwise multinomial logistic regression analyses were conducted to assess the relationships between the covariates and birthweight (Table 3) and preterm delivery (Table 4) respectively. For each regression, odds ratios and 95% confidence intervals are presented. In step 1 of the regression, mother's race predicts risk of LBW and VLBW (or PTB and VPTB) relative to normal birthweight (or full term birth). Next (step 2), the outcomes were regressed on the controls, race, and perceived stress level. In step 3, the full model is presented, which includes the controls, race, perceived stress level, and perceived social support. Tables 5a-c test interaction effects between stress and race, stress and social support, and social support and race respectively, on birthweight. These tests for preterm delivery are shown in Tables 6a-c. Additional analyses (not shown) were conducted in which a three-way interaction effect between stress, social support and race was tested. This investigates the possibility of race differences in the interaction of stress and social support, the main hypothesis of this study. A significant three-way interaction would indicate that there are significant race differences in the moderation or buffering effect of social support on the stress-pregnancy outcome relationship. Separate black-white analysis of the stress-social support interaction effect would further explain the magnitude of the difference (Tables 7 and 8).

Results

There were significant differences in maternal characteristics, health factors, and birth outcomes by race (Table 1). Overall, black women had worse pregnancy outcomes than white women, with significantly higher proportions of LBW, VLBW, PTB, and VPTB. Black women were also more likely to be in the "high stress" category. There were slight, but significant differences in the amount and type of social support reported by black and white women. White women had slightly higher percentages of perceived support in all four types (i.e. financial, care, transportation, and emotional), and were more likely to report having all four types of support compared to black women (89% vs. 86%). These results are consistent with previous studies of social support and pregnancy (Norbeck and Tilden 1983; Sagrestano et al 1999; Campos et al 2008 and Dunkel-Schetter and Rini 2004).

In stepwise multinomial logistic regression analyses (Tables 3 and 4), the effects of race, stress and social support on birthweight and preterm delivery were tested. Maternal age, education, household annual income, medical risks, smoking, BMI, and prenatal care adequacy were included as controls. Table 3 shows the estimated odds ratios for birthweight. Step 1 illustrates a significant

increased risk of LBW and VLBW by race, showing that for black women, relative to having an infant with normal birthweight, the odds of having a LBW infant increases by 109% and the odds of having an VLBW infant increases by 61% . Steps 2 and 3 show the effect of adding perceived stress level and perceived social support to the model. These effects are not significant predictors of LBW and VLBW. Similar, results for premature delivery are shown in Table 4. However, there is evidence of a significant effect of perceived social support on VPTB (step 3). Holding other variables constant, for every additional type of social support reported the odds of VPTB decreases by 6%. These models suggest that perceived stress level does not have a significant effect on pregnancy outcome, while perceived social support only has a significant effect on the worst level of preterm delivery: VPTB. Race is consistently a significant predictor of each outcome. Overwhelmingly, the odds of poor pregnancy outcomes are very high for black women.

Tables 5a-c show the interaction effects between race, stress and social support, and their effect on infant birthweight. Only the test of interaction between stress and social support yielded significant results. The effect of the stress-social support interaction only has a moderately significant effect on LBW (OR: 0.91; 95% CI: 0.82, 1.00), but the interaction has a significant effect on the odds of VLBW. For every additional type of social support reported, the odds of VLBW for those in the high perceived stress category decreases by 16%. This is evidence of a buffering effect of social support on the stress-birthweight relationship. Tables 6a-c present similar results for preterm delivery. There were no significant results yielded in the test of the stress-race interaction (Table 6a) or the social support-race interaction (Table 6c). However, in Table 6b, there is evidence of a significant stress-social support interaction effect on preterm delivery. There is a moderately significant effect of the stress-social support interaction on PTB (OR: 0.89; 95% CI: 0.79, 1.01) and a significant effect on VPTB. For every additional type of social support reported, for those in the high stress category, the odds of VPTB decreases by 14%. These results suggest that although there is no evidence of a direct relationship between perceived stress level and pregnancy outcomes, or even a direct relationship between perceived social support and birthweight, there is evidence of a social support buffering effect.

Examining this relationship further, additional analyses were conducted to test the study's main hypothesis: race differences exist in the moderation effect of social support in the stress-pregnancy relationship. Testing this with a three-way interaction between stress, social support and race, I find no significant differences for preterm delivery, but marginally significant interaction term for birthweight (OR:0.95, 95% CI: 0.90, 1.00). Investigating this further, separate black and white analyses were conducted in order to observe the magnitude of the differences. The results of the separate models are included in Tables 7 and 8. For birthweight (Table 7), there are no significant interaction effects for black women, but for white women, the stress-social support interaction effect is significant (OR: 0.71, 0.95). This indicates that for white women only, higher levels of social support correspond with an 18% decrease in the odds of VLBW in the presence of high perceived stress. These results are consistent with black-white differences in the stress-social support interaction effect on preterm birth (Table 8). Although there was not a significant difference, it should also be noted that there were race differences in effects (not shown). For black women, there was no evidence of a buffering effect, while for white women there was a marginally significant stress-social support interaction effect on PTB (OR: 0.87; 95%

CI: 0.75, 1.01) and a significant effect on VPTB. For white women only, higher levels of social support corresponded to a 16% decrease in the odds of VPTB in the presence of high perceived stress. Conclusions and implications for future research are included in the full manuscript, but taken together, these results suggest that the protective effects of social support during pregnancy differ for black and white women.

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Table 1

Distribution of Selected Maternal Characteristics, Health Behaviors, and Birth Outcomes by Race* (N=9,152)

Characteristic, behavior, outcome	Black Women (N=2,055)	White Women (N=7,097)
Age***		
17 or younger	4%	3%
18-24	35%	33%
25-29	26%	29%
30-34	19%	22%
35-39	12%	11%
40+	4%	3%
Marital Status***		
Nonmarried	69%	28%
Married	31%	72%
Education Level***		
less than high school	17%	12%
high school	38%	33%
college	28%	23%
graduate level	18%	33%
Income***		
less than $25K	63%	40%
$25-$49.9K	22%	23%
$50K+	15%	37%
Medical Risk***		
no risk factors	58%	66%
one or more risk factors	42%	34%
Smoking***		
smokes	91%	85%
does not smoke	9%	15%
BMI***		
underweight	11%	14%
normal	40%	49%
overweight	15%	12%
obese	34%	24%
PNC Adequacy***		
inadequate PNC	18%	10%
intermediate PNC	13%	12%
adequate PNC	33%	43%
adequate-plus PNC	36%	35%
Perceived Stress Level***		
low (2 or fewer stressors)	58%	67%
high (more than 2 stressors)	42%	33%
Perceived Social Support (by type)***		
financial support	80%	86%
care support	87%	89%
*transportation support***	84%	92%
emotional support	86%	89%
Perceived Social Support (count)***		
0	5%	4%
1	4%	3%
2	7%	5%
3	15%	9%
4	68%	79%
Birthweight***		
normal BW (> 2500 g)	46%	63%
LBW (<2500g)	34%	22%
VLBW (< 1500g)	20%	15%
Preterm Delivery***		
full term (>37 weeks)	58%	70%
PTB (< 37 wks)	16%	12%
VPTB (<32 wks)	26%	18%

**May not add up to 100% because of rounding*

****p <0.001 **p< 0.01*

Table 2

Correlation Matrix of All Study Variables Included in the Multivariate Models

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	1.00												
2. Marital status	0.32 ***	1.00											
3. Education	0.43 ***	0.41 ***	1.00										
4. Income	0.44 ***	0.50 ***	0.57 ***	1.00									
5. Medical Risks	0.04 ***	-0.05 ***	-0.05 ***	-0.05 ***	1.00								
6. Smoking	-0.14 ***	-0.22 ***	-0.29 ***	-0.25 ***	0.03 **	1.00							
7. BMI	0.08 ***	0.02	-0.02 *	-0.04 ***	0.11 ***	-0.05 ***	1.00						
8. PNC Adequacy	0.09 ***	0.12 ***	0.11 ***	0.12 ***	0.06 ***	-0.06 ***	0.05 ***	1.00					
9. Mother's race	-0.01	-0.36 ***	-0.12 ***	-0.22 ***	0.07 ***	-0.08 ***	0.10 ***	-0.07 ***	1.00				
10. Perceived stress level	-0.22 ***	-0.30 ***	-0.25 ***	-0.35 ***	0.05 ***	0.21 ***	0.03 **	-0.05 ***	0.08 ***	1.00			
11. Perceived social support	0.06 ***	0.14 ***	0.16 ***	0.22 ***	-0.01	-0.11 ***	-0.02 *	0.05 ***	-0.07 ***	-0.16 ***	1.00		
12. Birthweight	-0.07 ***	-0.16 ***	-0.16 ***	-0.16 ***	0.27 ***	0.10 ***	0.01	0.18 ***	0.13 ***	0.09 ***	-0.05 ***	1.00	
13. Preterm delivery	-0.06 ***	-0.12 ***	-0.13 ***	-0.12 ***	0.27 ***	0.05 ***	0.04 ***	0.21 ***	0.10 ***	0.07 ***	-0.05 ***	0.85 ***	1.00

**p <0.05 (two-tailed test)*

***p< 0.01 (two-tailed test)*

****p <0.001 (two-tailed test)*

Table 3

Estimated Odds Ratios for Birthweight◊: Stepwise Multinomial Logistic Regression Analyses

	Step 1				Step 2				Step 3			
	LBW		VLBW		LBW		VLBW		LBW		VLBW	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Mother's race	2.09	(1.83, 2.39)	1.61	(1.83, 1.89)	2.09	(1.83, 2.39)	1.61	(1.38, 1.89)	2.09	(1.83, 2.39)	1.61	(1.37, 1.89)
Perceived stress level					1.04	(0.93, 1.16)	1.07	(0.93, 1.23)	1.04	(0.92, 1.17)	1.06	(0.93, 1.22)
Perceived social support									1.00	(0.95, 1.05)	0.96	(0.91, 1.02)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and prenatal care adequacy

◊Normal birthweight (> 2500g) is the reference group

Table 4

Estimated Odds Ratios for Preterm Delivery◊: Stepwise Multinomial Logistic Regression Analyses

	Step 1				Step 2				Step 3			
	PTB		VPTB		PTB		VPTB		PTB		VPTB	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Mother's race	1.57	(1.33, 1.85)	1.47	(1.28, 1.69)	1.57	(1.33, 1.85)	1.47	(1.28, 1.70)	1.57	(1.33, 1.85)	1.47	(1.27, 1.69)
Perceived stress level					1.10	(0.95, 1.27)	1.06	(0.94, 1.20)	1.09	(0.94, 1.27)	1.05	(0.93, 1.19)
Perceived social support									0.98	(0.92, 1.04)	0.94	(0.89, 0.99)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and prenatal care adequacy

◊Full term birth (> 36 weeks) is the reference group

Table 5a

Estimated Odds Ratios for Birthweight◊

*Stress*Race Interaction*

	LBW		VLBW	
	OR	95% CI	OR	95% CI
Mother's race	1.97	(1.36, 2.85)	1.51	(0.97, 2.37)
Perceived stress level	0.98	(0.70, 1.38)	1.01	(0.67, 1.50)
Perceived social support	1.00	(0.95, 1.05)	0.96	(0.91, 1.02)
Stress*Race	1.04	(0.82, 1.33)	1.04	(0.78, 1.40)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and PNC adequacy

◊Normal birthweight (>2500g) is the reference group

Table 5b

Estimated Odds Ratios for Birthweight◊

*Stress*Social Support Interaction*

	LBW		VLBW	
	OR	95% CI	OR	95% CI
Mother's race	2.10	(1.84, 2.40)	1.62	(1.38, 1.90)
Perceived stress level	1.43	(1.00, 2.05)	1.94	(1.27, 2.96)
Perceived social support	1.14	(0.98, 1.33)	1.25	(1.03, 1.50)
Stress*Social Support	0.91	(0.82, 1.00)	0.84	(0.74, 0.94)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and PNC adequacy

◊Normal birthweight (>2500g) is the reference group

Table 5c

Estimated Odds Ratios for Birthweight◊

*Social Support*Race Interaction*

	LBW		VLBW	
	OR	95% CI	OR	95% CI
Mother's race	1.84	(1.24, 2.73)	1.85	(1.17, 2.92)
Perceived stress level	1.04	(0.92, 1.17)	1.06	(0.93, 1.22)
Perceived social support	0.95	(0.82, 1.10)	1.02	(0.85, 1.21)
Social Support*Race	1.04	(0.93, 1.16)	0.96	(0.84, 1.09)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and PNC adequacy

◊Normal birthweight (>2500g) is the reference group

Table 6a

Estimated Odds Ratios for Preterm Delivery◊:

*Stress*Race Interaction*

	PTB		VPTB	
	OR	95% CI	OR	95% CI
Mother's race	1.37	(0.86, 2.19)	1.50	(1.00, 2.24)
Perceived stress level	0.97	(0.63, 1.48)	1.07	(0.75, 1.54)
Perceived social support	0.97	(0.91, 1.04)	0.94	(0.89, 0.99)
Stress*Race	1.10	(0.81, 1.49)	0.99	(0.78, 1.28)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and PNC adequacy

◊Full term birth (> 36 weeks) is the reference group

Table 6b

Estimated Odds Ratios for Preterm Delivery◊:

*Stress*Social Support Interaction*

	PTB		VPTB	
	OR	95% CI	OR	95% CI
Mother's race	1.57	(1.33, 1.85)	1.47	(1.28, 1.70)
Perceived stress level	1.61	(1.02, 2.53)	1.78	(1.22, 2.60)
Perceived social support	1.15	(0.94, 1.40)	1.18	(1.00, 1.40)
Stress*Social Support	0.89	(0.79, 1.01)	0.86	(0.77, 0.95)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and PNC adequacy

◊Full term birth (> 36 weeks) is the reference group

Table 6c

Estimated Odds Ratios for Preterm Delivery◊

*Social Support*Race Interaction*

	PTB		PTB	
	OR	95% CI	OR	95% CI
Mother's race	1.45	(0.89, 2.38)	1.40	(0.93, 2.12)
Perceived stress level	1.09	(0.94, 1.27)	1.05	(0.93, 1.19)
Perceived social support	0.95	(0.79, 1.14)	0.93	(0.79, 1.08)
Social Support*Race	1.02	(0.89, 1.17)	1.01	(0.90, 1.14)

Maternal characteristics controlled include: maternal age, marital status, education level, income, medical risk, smoking, BMI, and PNC adequacy

◊Full term birth (> 36 weeks) is the reference group

Table 7

Estimated Odds Ratios for Birthweight◊: Black vs. White Stress*Social Support Interaction Effect

	Black Women				*White Women*			
	LBW		VLBW		LBW		VLBW	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Perceived stress level	1.41	(0.73, 2.74)	1.64	(0.78, 3.46)	1.42	(0.92, 2.19)	2.05	(1.22, 3.44)
Perceived social support	1.15	(0.86, 1.53)	1.11	(0.79, 1.54)	1.12	(0.93, 1.35)	1.31	(1.04, 1.65)
Stress*Social Support	0.92	(0.76, 1.11)	0.89	(0.72, 1.10)	0.91	(0.81, 1.03)	0.82	(0.71, 0.95)

Maternal characteristics controlled include: age, marital status, education level, income, medical risk, smoking, BMI, & PNC adequacy

◊Normal birthweight (>2500g) is the reference group

Table 8

Estimated Odds Ratios for Preterm Delivery◊: Black vs. White Stress*Social Support Interaction Effect

	Black Women				*White Women*			
	PTB		VPTB		PTB		VPTB	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Perceived stress level	1.37	(0.60, 3.11)	1.50	(0.76, 2.93)	1.70	(0.98, 2.92)	1.89	(1.19, 3.00)
Perceived social support	1.06	(0.74, 1.51)	1.09	(0.81, 1.48)	1.18	(0.93, 1.50)	1.22	(1.00, 1.48)
Stress*Social Support	0.95	(0.76, 1.20)	0.91	(0.75, 1.09)	0.87	(0.75, 1.01)	0.84	(0.74, 0.95)

Maternal characteristics controlled include: age, marital status, education level, income, medical risk, smoking, BMI, & PNC adequacy

◊Full term birth (>36 weeks) is the reference group