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Role of Perceived Stress on the Occurrence of Preterm Labor and Preterm Birth among Urban Women

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Abstract

Introduction—This study examined whether prenatal perceived stress levels during pregnancy were associated with preterm labor (PTL) or preterm birth (PTB).

Methods—Perceived stress levels were measured at 16 weeks gestation or less and between 20 and 24 weeks gestation in a sample of 1,069 low-income pregnant women attending Temple University prenatal care clinics. Scores were averaged to create a single measure of prenatal stress. PTB was defined as the occurrence of a spontaneous birth prior to 37 weeks gestation. PTL was defined as the occurrence of regular contractions between 20 and 37 weeks of pregnancy that were associated with changes in the cervix.

Results—Independent of potential confounding factors, prenatal perceived stress was not associated with PTL (OR 1.10; 95% CI 0.69–1.78, $P = .66$); however, prenatal stress trended toward an association with PTB (OR 1.49; 95% CI: 1.00–2.23, $P = .05$). The strongest predictor of preterm labor was a history of preterm labor in a prior pregnancy. Women with a history of PTL were two times more likely to experience PTL in the current pregnancy than women who did not have a PTL history (OR 2.16; 95% CI 1.05–4.41, $P = .04$). Historical risk factors of PTB, such as African American race, a history of abortion or a history of PTB were not related to PTL. The strongest predictor of PTB was having a history of PTB in a prior pregnancy (OR 2.55; 95% CI 1.54–4.24, $P < .001$).

Discussion—Prenatal perceived stress levels may be a risk factor for PTB independent of PTL; however, prenatal stress was not associated with PTL. Risk factors for PTL may be different from those of PTB.

Keywords

Vulnerable Populations; Labor Support; Preventive Health Care

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INTRODUCTION

Infant mortality rate among African American women in the United States is more than two-fold greater than the rate reported among Caucasian women (13.7 versus 5.7 deaths per 1000)¹ and much of this disparity is attributable to higher levels of preterm birth and low-birth weight.^{2, 3} Preterm birth (PTB), accounting for up to 70% of all neonatal morbidity;^{4, 5} increases the likelihood of low birth weight, underdeveloped organs, respiratory distress syndrome, and neurological handicaps such as cerebral palsy.⁶ Given that approximately one half of all PTB cases are caused by preterm labor, defined as regular contractions between 20 and 37 weeks of pregnancy,⁷ elucidating the etiology of PTL and PTB among pregnant African American women may represent an important pathway to address the racial disparity in infant mortality.

Although determinants of PTB such as the extremes of maternal age, multiple pregnancies, a history of PTB in a previous pregnancy, a history of induced abortion, and racial discrimination and psychological distress,^{8, 9} have been well elucidated, more than one-half of women who experience PTB do not present with any of these risk factors.⁶ Psychological distress and specifically perceived stress may be of particular relevance to low-income women who may experience high levels of anxiety and depressive symptoms which may add to a higher overall level of prenatal stress.¹⁰ High prenatal stress may increase levels of epinephrine and norepinephrine which have been shown to reduce blood flow and oxygen to the fetus, which in turn could promote preterm labor.^{11, 12} While the relationship between prenatal stress and preterm birth has been documented,¹²⁻¹⁵ less clear is the relationship between perceived stress and the occurrence of preterm labor, since much of the literature to date does not focus on preterm labor as a primary outcome.

To address this gap in knowledge, this study evaluated whether prenatal perceived stress influences the occurrence of PTL or PTB in a sample of low-income pregnant women and evaluated whether risk factors for PTB are the same as risk factors for PTL.

METHODS

Study Design and Procedures

The relationship between prenatal perceived stress during pregnancy and preterm labor or preterm birth was evaluated via a secondary data analysis using data from a prospective, repeated measures cohort study of pregnant low-income, predominantly African American women. Participants in the parent study, which was conducted between July 2008 and September 2011, were enrolled in a prospective cohort study to evaluate the role of bacterial vaginosis (BV) and BV-associated bacteria early in pregnancy and the risk of spontaneous preterm birth. Pregnant women were recruited from three Temple University Obstetric Clinics. Women attending their first prenatal care appointment who were prior to 16 weeks gestation were approached by a trained research assistant and invited to participate in the study. Eligible, consenting women completed a baseline questionnaire prior to 16 weeks gestation and a follow-up questionnaire between 20 and 24 weeks gestation. Information about preterm labor and preterm birth outcomes was collected via medical chart review. An ancillary validity study was conducted and found excellent medical record reproducibility

for pregnancy outcome information comparing two medical record abstractors. Only participants who delivered at Temple University Hospital (N=1,069 out of 1,560) were included in this assessment of stress and pregnancy outcomes. All study procedures received institutional IRB approval.

Study Participants

Eligible women lived in Philadelphia and reported a singleton pregnancy less than 16 weeks gestation at baseline as determined by last menstrual period (LMP) and confirmed by ultrasound. Women who lived outside of Philadelphia, who chose to have an elective abortion, or who experienced an ectopic pregnancy, multiple gestations or a molar pregnancy were excluded. Women diagnosed with a bicornate uterus or fibroids and women who were non-English or non-Spanish speaking were also excluded.

Study Measures

Background/ Covariates

Demographics: Participant age, race, marital status and educational attainment, which served as a proxy for socio-economic status, were evaluated at baseline.¹⁶

Potential Confounders: Information on a history of previous preterm birth, preterm labor, or induced abortions, pre-pregnancy body mass index (BMI), current smoking status, current use of marijuana, and history of hypertension or preeclampsia during a previous pregnancy, were assessed at baseline. Additionally, detection of vaginal infections such as bacterial vaginosis, trichomoniasis, candida, or *Chlamydia trachomatis* during the current pregnancy, cervical length as measured at the first recorded ultrasound, and treatment with drugs for preterm labor were evaluated during the medical chart review. All variables were included in the analysis to assess for confounding since prior studies have indicated that these factors have been related to the occurrence of PTB.¹⁶⁻¹⁹

Risk Factor of Interest

Perceived stress: During both baseline and follow-up interviews, maternal perceived stress during the pregnancy was measured using the four-item Cohen's Perceived Stress Scale (PSS).²⁰ Each item in the scale was rated using a 5-point scale ranging from *never* (0) to *very often* (4). To obtain a prenatal PSS score, scores across the two collection points were averaged as has been done by previous investigators.¹² A median split of the sample was used to generate a dichotomous prenatal stress score: participants either had a prenatal stress level during the pregnancy below/equal to the median average stress score or above the median average stress score.

Outcomes

Preterm Labor: Preterm labor was defined as the occurrence of regular contractions between 20 and 37 weeks of pregnancy that were associated with changes in the cervix.⁶ The outcome of preterm labor was assessed via medical chart review using hospital labor and delivery medical records.

Preterm Birth: Consistent with the standard definition for preterm birth set by the American College of Obstetrics and Gynecology, preterm birth was defined as a birth prior to 37 completed weeks gestation.²¹ The outcome of preterm birth was assessed via chart review of the hospital labor and delivery medical records. Last menstrual period per the first ultrasound was used as the gold standard to assess gestational age at both enrollment and delivery.

Statistical Analysis

All statistical analyses were performed using SPSS version 20 (SPSS for Windows, Chicago, IL). Frequency distributions were constructed for prenatal perceived maternal stress during the pregnancy, the occurrence of preterm birth, history of preterm labor, potential covariates and potential confounding factors. Second, bivariate associations between the main independent variable (prenatal stress during the pregnancy) and the occurrence of preterm labor or preterm birth were assessed using binary logistic regression analyses. The comparison group included women who did not experience preterm labor, premature rupture of membranes or preterm birth; thus, women without pregnancy complications were compared to women experiencing PTL or PTB. Additionally, comparisons of medians of PSS scores by the two separate outcome categories were performed using the Mann-Whitney test, as the distribution of prenatal perceived stress was found to be non-normally distributed. Variables identified as related to PTL or PTB in the univariate analyses ($P < .10$) were entered into a separate multivariate regression analysis for the particular outcome. For the multivariate regression analysis, odds ratios and 95% confidence intervals were computed. A list-wise deletion method was used to handle missing data (ie, only participants with follow up and outcome data were used for the respective analysis).

RESULTS

Sample Characteristics

There were 1,069 eligible women included in this analysis. Sixty-four percent (64%) of the sample was African-American and the majority were young and single (Table 1). Forty-one percent of participants had less than a high school education and based on pre-pregnancy BMI, one quarter (25%) of participants were overweight and 30% were obese. About one-quarter of the sample reported having reported an elective abortion (24%), 11% previously had at least one preterm birth, and 9% had a history of being treated for preterm labor. As shown in Table 1, the median (SE) level of prenatal perceived stress during the pregnancy, as averaged across the two collection periods, was 4.5 (2.5), which was consistent with the mean PSS levels seen in similar pregnancy populations.²²

Outcomes

Eighty-three percent (n=890) of the women delivered at term and 17% (n=179) experienced a preterm birth (Table 1). Of the women who experienced a preterm birth, 31% (n=56) experienced preterm labor and 28% (n=51) experienced premature rupture of membranes; 15% (n=27) experienced both preterm labor and premature rupture of membranes. Of the preterm births experienced by women enrolled in this study, 55% were not precipitated by

either preterm labor or premature rupture of membranes. These births were likely medically indicated based on fetal distress or maternal complications, although reasons were not always found in the medical record review. Of the women who delivered at term, only 3% (n=28) experienced preterm labor and 1% (n=8) experienced premature rupture of membranes.

In this sample, only 8% (n=84) of patients experienced symptoms of preterm labor during the pregnancy. Of those subjects who experienced symptoms of preterm labor, thirty-three percent (33%) delivered at term and the remaining two-thirds (66%) delivered prior to 37 weeks gestation.

Bivariate relationships of Perceived Stress during the Pregnancy and Occurrence of Preterm Labor or Preterm Birth

Preterm Labor: To identify the risk factors for preterm labor, women who experienced preterm labor were compared to women who did not experience pregnancy complications (i.e., no PTL, no PTB and no premature rupture of membranes). Median prenatal perceived stress during the pregnancy did not differ significantly between women who experienced preterm labor and the comparison group of women without major pregnancy complications (4.75 versus 4.5 respectively, $U=62$, $P=.54$). A history of preterm birth showed a non-significant trend toward association with preterm labor (odds ratio [OR] 1.90; 95% confidence interval [CI] 1.01-3.60, $P=.05$). Having a history of preterm labor was significantly associated with preterm labor (OR 2.47; 95% CI 1.34-4.55, $P<.001$).

Preterm Birth: Median prenatal perceived stress levels during pregnancy were significantly related to the occurrence of preterm birth. Specifically, median (SE) perceived stress levels among women who delivered at term was 4.5 (2.5) compared to 5.0 (2.6) among women who experienced preterm birth ($U=2.81$, $P=.01$). Other variables that were associated with preterm birth included single marital status (OR 0.62; 95% CI 0.41-0.94, $P=.02$), history of preterm birth (OR 2.60; 95% CI 1.70-3.99, $P<.001$), chlamydia during pregnancy (OR .45; 95% CI .22-.91, $P=.03$), treatment for preterm labor during the pregnancy (OR 9.72; 95% CI 5.26-17.96, $P<.001$). The average prenatal PSS score (OR 1.43; 95% CI 1.04-1.98, $P=.03$), African American race (OR 1.43; 95% CI 1.00-2.01, $P=.05$), and history of induced abortion (OR 1.71; 95% CI 1.07-2.73, $P=0.02$) were related to PTB.

Multivariate Models for Perceived Stress during the Pregnancy and Occurrence of Preterm Labor or Preterm Birth

Preterm Labor: In the final regression model predicting preterm labor, a history of preterm labor was the strongest predictor of experiencing preterm labor in the current pregnancy (OR 2.16; 95% CI 1.05-4.41, $P=.04$) (Table 2). Contrary to our hypothesis, prenatal perceived stress was not significantly related to the risk of preterm labor.

Preterm Birth: In the final regression model predicting preterm birth, perceived stress retained a modest but non-significant association with the risk of preterm birth, independent of other demographic and behavioral risk factors such as race and history of preterm birth (Table 3) (OR 1.49, 95% CI 1.00-2.23, $P=.05$). As expected, another factor predictive of

preterm birth in this sample was having a history of preterm birth (OR 2.55; 95% CI 1.54-4.28, $P < .001$) which is consistent with the literature.²³

DISCUSSION

This study examined the relationship between prenatal perceived stress and the occurrence of preterm labor and preterm birth in a sample of low-income minority women. These results suggested a role for perceived prenatal stress in increased risk in preterm birth even after adjusting for the treatment of PTL in the pregnancy (as indicated by a trend toward increased risk), but the study found no relationship between prenatal perceived stress and preterm labor. The finding that prenatal perceived stress in the prenatal period was related to preterm birth but not preterm labor has not been previously reported.

To date, the relationship between perceived prenatal stress and preterm labor and preterm birth has been somewhat unclear with some studies reporting a positive relationship,¹⁶ while a small number of studies have shown no relationship.^{24, 25} These mixed findings have been partially attributed to challenges surrounding the measurement of stress, the variation in assessment tools used, and the timing of stress assessment in the prenatal and postpartum period.²⁶ The current study adds some clarity to this literature by demonstrating that prenatal perceived stress was associated with the incidence of preterm birth independent of other established correlates of preterm birth such as history of preterm birth, history of preterm labor, history of spontaneous abortion and race. Secondly, these data suggest that the role of perceived prenatal stress impacts preterm labor differently than preterm birth and it suggests that researchers should separately examine factors linked to PTB, not due to PTL. Furthermore, the fact that over one-half of the preterm births experienced in this cohort were not precipitated by preterm labor or premature rupture of membranes provides further support to the notion that other underlying causes for early delivery must be addressed in particular fetal distress and maternal comorbidities.

Results from this study have some potential clinical implications. Not surprisingly, medical history characteristics such as history of preterm birth and preterm labor were significant contributors to the incidence of current preterm birth and preterm labor. In light of the negative health effects of preterm labor and preterm birth, and the disproportionate incidence of these negative outcomes among low-income women, these data underscore the importance of access to and utilization of appropriate prenatal care that seeks to decrease or minimize stress in this medically underserved population, and promotes preventive activities to reduce the risk of the initial occurrence of PTL and/or PTB.

Interpretation of these data should consider the fact that the timing of the assessments for prenatal stress were conducted early in pregnancy and may not reflect stress perceptions later in pregnancy. While some research has shown that stressors experienced early in pregnancy are more likely to precede preterm birth than stressors experienced later in pregnancy,²⁷ future research that assesses stress more frequently during the course of a pregnancy may provide further clarity regarding the role that stress plays in preterm birth. In this study, the measure of stress was self-reported; future studies should include both self-reported and biological measures (ie, cortisol levels) of stress across the full 40 weeks of

pregnancy in order to further elucidate the relationship between stress and preterm birth. In addition, while Cohen's perceived stress scale is a validated measure of stress, the use of this scale as a measure of prenatal stress has not been validated. The chart review diagnosis of preterm labor in this study did not differentiate between medically induced labor and naturally occurring labor. Finally, given that the definition of PTL was based on a documented occurrence of PTL in the medical record, it is possible that some cases of PTL were under-reported.

As this study was a secondary data analysis and exploratory in nature, these results may not be generalized to the larger population of pregnant women. Additionally, it is possible that a relationship between prenatal perceived stress and PTL was not observed due to a lack of power even in this large sample. Future research using more precise measures of prenatal stress and preterm labor are warranted.

Despite these limitations, the current study supports an understanding of the role that prenatal stress plays in the incidence of preterm birth but suggests that prenatal stress does not impact preterm labor risk. Stress-reduction interventions, such as yoga and meditation, may address prenatal stress in at risk populations, and contribute to a prenatal care strategy to avoid preterm birth²⁸. However, future research should focus differentiating risk factors for preterm birth from those for preterm labor, and develop appropriate intervention strategies for reducing the risk of preterm labor.

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References

1. Martin JA, Kung HC, Mathews TJ, Hoyert DL, Strobino DM, Guyer B, et al. Annual summary of vital statistics: 2006. *Pediatrics*. 2008; 121:788–801. [PubMed: 18381544]
2. Martin JA, Hamilton BE, Ventura SJ, Osterman MJ, Kirmeyer S, Mathews TJ, et al. Births: final data for 2009. *Natl Vital Stat Rep*. 2011; 60:1–70. [PubMed: 22670489]
3. Martin JA, Hamilton BE, Sutton PD, Ventura AJ, Menacker F, Kirmeyer S, et al. Births: Final data for 2005. *National Vital Statistics Reports*. 2007; 56
4. Hamilton BE, Martin JA, Ventura SJ. Births: Preliminary data for 2009. *Natl Vital Stat Rep*. 2010; 59
5. Mathews, T.; MacDorman, M. Infant mortality statistics from the 2005 period linked birth/infant death data set. Hyattsville, MD: National Center for Health Statistics; 2008.
6. Gabbe, SG.; Niebyl, JR.; Simpson, JL. Pocket Companion to Obstetrics Normal and Problem Pregnancies. 3. Philadelphia, PA: Churchill Livingstone; 1999.
7. ACOG. ACOG Practice Bulletin. Clinical management guidelines for obstetrician-gynecologist. Number 43, May 2003. Management of preterm labor. *Obstet Gynecol*. 2003; 101:1039–47. [PubMed: 12738177]
8. Giurgescu C, Zenk SN, Dancy BL, Park CG, Dieber W, Block R. Relationships among Neighborhood Environment, Racial Discrimination, Psychological Distress, and Preterm Birth in African American Women. *J Obstet Gynecol Neonatal Nurs*. 2012

9. Anum EA, Retchin SM, Strauss JF 3rd. Medicaid and preterm birth and low birth weight: the last two decades. *J Womens Health (Larchmt)*. 2010; 19:443–51. [PubMed: 20141370]
10. Gennaro S, Shults J, Garry DJ. Stress and preterm labor and birth in Black women. *J Obstet Gynecol Neonatal Nurs*. 2008; 37:538–45.
11. Bragonier, J.; Cushner, I.; Hobel, C. Social and personal factors in the etiology of preterm birth. In: Fuchs, F.; Stubblefield, P., editors. *Preterm birth: Causes, prevention and management*. New York, NY: MacMillan; 1984.
12. Lobel M, Dunkel-Schetter C, Scrimshaw SC. Prenatal maternal stress and prematurity: a prospective study of socioeconomically disadvantaged women. *Health Psychol*. 1992; 11:32–40. [PubMed: 1559532]
13. Sanchez SE, Puente GC, Atencio G, Qiu C, Yanez D, Gelaye B, et al. Risk of spontaneous preterm birth in relation to maternal depressive, anxiety, and stress symptoms. *J Reprod Med*. 2013; 58:25–33. [PubMed: 23447915]
14. Copper RL, Goldenberg RL, Das A, Elder N, Swain M, Norman G, et al. The preterm prediction study: maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks' gestation. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. *Am J Obstet Gynecol*. 1996; 175:1286–92. [PubMed: 8942502]
15. Hedegaard M, Henriksen TB, Sabroe S, Secher NJ. Psychological distress in pregnancy and preterm delivery. *BMJ*. 1993; 307:234–9. [PubMed: 8369684]
16. Ko YL, Wu YC, Chang PC. Physical and social predictors for pre-term births and low birth weight infants in Taiwan. *J Nurs Res*. 2002; 10:83–9. [PubMed: 12119592]
17. Anum EA, Retchin SM, Garland SL, Strauss JF 3rd. Medicaid and preterm births in Virginia: an analysis of recent outcomes. *J Womens Health (Larchmt)*. 2010; 19:1969–75. [PubMed: 20831442]
18. Azlin MI, Bang HK, An LJ, Mohamad SN, Mansor NA, Yee BS, et al. Role of phIGFBP-1 and ultrasound cervical length in predicting pre-term labour. *J Obstet Gynaecol*. 2010; 30:456–9. [PubMed: 20604646]
19. Bagga R, Takhtani M, Suri V, Adhikari K, Arora S, Bhardwaj S. Cervical length and cervicovaginal HCG for prediction of pre-term birth in women with signs and symptoms of pre-term labour. *J Obstet Gynaecol*. 2010; 30:451–5. [PubMed: 20604645]
20. Cohen SKT, Mermelstein R. A Global Measure of Perceived Stress. *Journal of Health and Social Behavior*. 1983; 24:385–96. [PubMed: 6668417]
21. Butler, AS.; Santa, E.; Cox, T. *Preterm Birth: Causes, Consequences and Prevention*. Washington, D.C.: Institute of Medicine of the National Academies; 2006.
22. Kramer MS, Lydon J, Seguin L, Goulet L, Kahn SR, McNamara H, et al. Stress pathways to spontaneous preterm birth: the role of stressors, psychological distress, and stress hormones. *Am J Epidemiol*. 2009; 169:1319–26. [PubMed: 19363098]
23. Lau Y. The effect of maternal stress and health-related quality of life on birth outcomes among Macao Chinese pregnant women. *The Journal of perinatal & neonatal nursing*. 2013; 27:14–24. [PubMed: 23360937]
24. Paarlberg K, Vingerhoets A, Passchier J, Heinen A, Dekker G, van Geijn H. Psychosocial factors as predictors of maternal well-being and pregnancy-related complaints. *Journal of Psychosomatic Obstetrics and Gynaecology*. 1996; (2)
25. Wadhwa PD, Sandman CA, Porto M, Dunkel-Schetter C, Garite TJ. The association between prenatal stress and infant birth weight and gestational age at birth: a prospective investigation. *Am J Obstet Gynecol*. 1993; 169:858–65. [PubMed: 8238139]
26. Gennaro S, Hennessy MD. Psychological and physiological stress: impact on preterm birth. *J Obstet Gynecol Neonatal Nurs*. 2003; 32:668–75.
27. Torche F, Kleinhaus K. Prenatal stress, gestational age and secondary sex ratio: the sex-specific effects of exposure to a natural disaster in early pregnancy. *Hum Reprod*. 2012; 27:558–67. [PubMed: 22157912]

Quick Points

- Prenatal perceived stress levels may be a risk factor for preterm birth independent of treatment for preterm labor in low-income women
- Risk factors for preterm labor may be different from those of preterm birth
- Prenatal stress management should be considered a prenatal care strategy to avoid preterm birth

Table 1

Characteristics of a Sample of 1,069 Women in a Prenatal Clinic

Demographic Characteristics	Values
African American race, n (%)	684 (64)
Age, mean, SD, y	22.6 (5.4)
Single marital status, n (%)	930 (87)
Less than High School Education, n (%)	438 (41)
Pre-pregnancy obesity, n (%)	321 (30)
Prior Pregnancy Outcomes	
At least one elective abortion, n (%)	256 (24)
At least one PTB, n (%)	117 (11)
At least one episode of PTL, n (%)	96 (9)
At least one preeclampsia diagnosis, n (%)	32 (3)
Stress during Pregnancy	
Perceived Stress Scores ^a , median (SE)	4.5 (2.5)
Perceived Stress Scores (range)	0-13
Current Pregnancy Outcomes	
Term births, n (%)	887 (83)
with PTL	32 (3)
with PROM	11 (1)
Preterm births, n (%)	181 (17)
with PTL	331 (31)
with PROM	299 (28)

Abbreviations: PTB: Preterm Birth, PTL: Preterm Labor, PROM: Premature rupture of membranes

^aPerceived stress measured by the Cohen Perceived Stress Scale at two time periods. Scores across the two collection points were averaged to create the score.

Table 2Multivariate analysis^a of determinants of Preterm Labor in a sample of low income women

Variable	OR	95% CI	P-value
Single Marital Status	0.83	0.43-1.59	.58
Smoked Marijuana since LMP	1.70	0.92-3.14	.09
Vaginal Candidiasis	0.35	0.08-1.47	.15
<i>Chlamydia trachomatis</i> in the current pregnancy	0.61	0.24-1.56	.30
History of Preterm Birth	1.44	0.69-2.99	.33
History of Preterm Labor	2.16	1.05-4.41	.04
Shortened Cervical Length in current pregnancy	2.92	0.92-9.21	.07
Prenatal Stress ^b	1.10	0.69-1.78	.66

Abbreviations: OR: Odds Ratio, CI: Confidence Interval, LMP: Last Menstrual Period date

^a Adjusted for: Marital Status, Smoked Marijuana since LMP, Candida, Chlamydia, History Preterm Birth, History of Preterm Labor, Shortened Cervical Length and Prenatal Stress Score^b Perceived stress measured by the Cohen Perceived Stress Scale at two time periods. Scores across the two collection points were averaged to create the score.

Table 3Multivariate analysis^a of the determinants of Preterm Birth in a sample of low income women

Variable	OR	95% CI	P-value
Race	1.69	1.09-2.62	.02
Marital Status	0.49	0.30-0.81	.01
Less than High School Education Level	1.16	0.79-1.69	.46
Current Smoker	1.48	0.92-2.38	.11
History of Abortion	1.13	0.72-1.77	.60
Pre-Pregnancy BMI	0.79	0.64-0.99	.04
History of Preeclampsia during any pregnancy	1.60	0.65-3.92	.30
History of Preterm Birth	2.55	1.54-4.24	<.001
Bacterial Vaginosis in current pregnancy	0.59	0.27-1.32	.20
Vaginal candidiasis in the current pregnancy	0.52	0.18-1.50	.23
<i>Chlamydia trachomatis</i> in the current pregnancy	0.55	0.23-1.29	.17
Preterm Labor in current pregnancy	10.7	5.45-21.05	<.001
Prenatal Stress ^b	1.49	1.00-2.23	.05

Abbreviations: OR: Odds Ratio, CI: Confidence Interval, BMI: Body Mass Index

^a Adjusted for: Race, Marital Status, Education Level, Current Smoker, History of Preeclampsia, History of Preterm Birth, History of Abortion, Pre-Pregnancy BMI, Bacterial Vaginosis, Candida, Chlamydia, Treated for PTL and Prenatal Stress Score^b Perceived stress measured by the Cohen Perceived Stress Scale at two time periods. Scores across the two collection points were averaged to create the score.