Title
Symptoms of Depression and Preterm Birth Among Black Women.

Journal
MCN: The American Journal of Maternal/Child Nursing, 43(5)

Authors
Slaughter-Acey, Jaime
Giurgescu, Carmen
Misra, Dawn
et al.

Publication Date
2018

DOI
10.1097/NMC.0000000000000464

Peer reviewed

Published in final edited form as:

MCN Am J Matern Child Nurs. 2018 ; 43(5): 252–258. doi:10.1097/NMC.0000000000000464.

Symptoms of Depression and Preterm Birth among Black Women

Jerry John Nutor, PhD, RN,

Student College of Nursing and Health Professions, Drexel University, 1601 Cherry Street Mailstop 31055, 3rd Floor, Philadelphia, PA 19102, Phone: (530) 220-0661

Jaime C. Slaughter-Acey, PhD, MPH,

Assistant Professor College of Nursing and Health Professions, Drexel University, 1601 Cherry Street Mailstop 71044 7th Floor, Philadelphia, PA 19102, Phone: (267) 359-5822

Carmen Giurgescu, PhD, RN, WHNP, and

Associate Professor College of Nursing, The Ohio State University, 236 Newton Hall, 1585 Neil Avenue, Columbus, OH 43210

Dawn Misra, PhD

Professor and Associate Chair of Research Department of Family Medicine and Public Health Sciences, Wayne State University, 6135 Woodward Avenue, Room 1119, Detroit, MI 48202

Abstract

Objective—To investigate the relationship between depressive symptoms and preterm birth (PTB) while adjusting for social support, both general and from the father of the baby.

Design—Retrospective study design.

Setting—Participants of the Life-course Influences of Fetal Environments study (LIFE) were recruited from a suburban hospital in Metropolitan Detroit, Michigan.

Participants—The LIFE data consisted of 1,410 self-identified Black women age 18-45 years; 1,207 women were included in this analysis. Listwise deletion was used for all variables with missing data except income due to the degree of missingness for this variable

Methods—Women were interviewed using a structured questionnaire administered 24–48 hours after birth during their postpartum hospitalization. Data on the newborns and their mothers' health were collected through medical record abstraction. The Center for Epidemiological Studies-Depression (CES-D) was used to measure symptoms of depression. The CES-D scores ≥23 were considered severe symptoms of depression. Modified-Poisson regression models were built using a step-wise approach to assess association between symptoms of depression and PTB.

Results—Approximately, 17% of women had a PTB and exactly a fifth of women in the sample had a CES-D scores ≥23. Women who had CES-D score ≥23 were about 70% more likely to have a PTB compared with women with CES-D scores <23 (PR=1.68, 95%CI: 1.24-2.16) after adjustment for both general social support and father of the baby support.

Conclusion—Women with CES-D scores ≥23, were almost twice more likely to have PTB compared with women with CES-D scores <23. Referrals for mental health providers might

benefit women with symptoms of depression and improve birth outcomes. Nurses should encourage women to seek support beyond the father of the baby.

Keywords

Depression; Preterm birth; Support; Birth outcome

Introduction

Preterm birth (PTB), birth occurring at less than 37 completed weeks of gestation, is a leading cause of perinatal morbidity (Accortt, Cheadle, & Schetter, 2015; Martin, Hamilton, Osterman, Driscoll, & Drake, 2018). While rates of PTB in the United States have significantly declined since 2006, they are still higher than in other western developed countries such as Canada and the United Kingdom (Garn, Nagulesapillai, Metcalfe, Tough, & Kramer, 2015). An additional concern is the unequitable distribution PTB between race/ethnic groups. In 2016, the PTB rate in the United States was 9.8%, however it was 13.8% for non-Hispanic Black or African American women 8.88% for non-Hispanic White women (Martin et al., 2018). Though medical conditions (e.g., hypertensive disorders) and social determinants of health (e.g. low levels of education, and lack of social support) have been linked to a higher risk for PTB, these factors do not entirely account for the disparities in PTB between non-Hispanics Black and African Americans (hereafter referred to as Black) and non-Hispanic White women (hereafter referred to as White). Symptoms of depression may play a role in this health disparity.

Symptoms of depression among pregnant women continue to be a major problem in the United States. It is estimated that roughly 14% of pregnant women experience major and minor depression during pregnancy as compared to 8 - 16% of non-pregnant reproductive-aged women (Gaynes et al., 2005). Rates of symptoms of depression for Black and White women in the United States have been reported with considerable variability between groups. Some investigators found higher prevalence of symptoms of depression among pregnant White women (Cook et al., 2010; Mora et al., 2009), while others have reported higher prevalence of symptoms of depression among pregnant Black women (Cubbin, Heck, Powell, Marchi, & Braveman, 2015; Liu, Setse, Grogan, Powe, & Nicholson, 2013). Variability may be because pregnant Black women are less likely to seek and receive specialist mental health care compared to their White counterparts (Ward, Wiltshire, Detry, & Brown, 2013). Research on the impact of symptoms of depression on pregnant women's perinatal outcomes has increased over the recent years (Ibanez et al., 2012), but the impact of maternal symptom of depression on risk of PTBs among Black women is less understood.

Pregnant women with poor financial status are negatively affected when there is a disruption in their social support network (Liu et al., 2013). In absence of support from a domestic partner, pregnant women may depend on their friends as the main source of social support throughout the period of pregnancy and childbirth (Byrd-Craven & Massey, 2013). Most women with low socioeconomic status as compared with those with high socioeconomic status are exposed to stressors such as financial problems, conflict with partners, and unemployment (Ibanez et al., 2012). At the same time their social support network tends to

be more restricted which increases their chances of symptoms of depression (Byrd-Craven & Massey, 2013).

The purpose of this study was to investigate the relationship between symptoms of depression and PTB while adjusting for social support, both general and from the father of the baby (FOB). We also examined whether measures of socioeconomic status such as level of education and perceived financial situation modify the association.

Methods

Design and Sample

The Life-course Influences of Fetal Environments (LIFE) study used a retrospective cohort study design and was conducted between June 2009 and December 2011; details on LIFE have been previously published (Slaughter-Acey et al., 2016). Women were eligible for this study if they self-identified as Black or African American women, were age 18 to 45 years, and recently gave birth to a singleton at a suburban hospital in Metropolitan Detroit, Michigan. Women were excluded if they had intellectual disability, serious cognitive deficits, or significant mental illness, on the basis of history or any prior records, did not speak English or were currently incarcerated. Data were collected using a 1-hour structured questionnaire that was administered by trained study staff and through medical record abstraction. The questionnaire collected information on social, psychosocial, and behavioral factors and was administered to participants 24-48 hours post-birth. Eligible women were approached (n=1,999) during the postpartum stay for recruitment; 1,410 (70.5%) women consented and participated in interviews. The study was approved by university and hospital institutional review boards.

Measures

Exposures—Using the Centers for Epidemiologic Studies Depression Scale (CES-D), the study assessed self-reported symptoms of depression on a continuous scale designed for use in general population depression surveys (Radloff, 1977). The CES-D is a 20-item instrument; participants report how often during the past week they experienced symptoms of depression (e.g. I thought my life had been a failure, I felt sad and I had crying spells) using a 4-point Likert scale (0 = “rarely” to 3 = “most or all of the time”). The CES-D summary score ranges from 0–60; a score ≥23 reflects severe symptoms of depression and is correlated to depression diagnosis (Hoffman & Hatch, 2000). The Cronbach α for the CES-D for the sample was 0.87.

Outcome—Preterm birth was defined as birth prior to 37 completed weeks of gestation. Gestational age based on early ultrasound (6–20 week’s gestation), which was abstracted from the medical record, was prioritized as the gold standard (American College of Obstetricians and Gynecologists, 2014) (Slaughter-Acey et al., 2016).

Modifiers—The following three measures were used to assess socioeconomic status (SES): educational attainment (< high school, high school graduate, > high school), total family income (< $35,000; ≥$35,000; or missing) and current subjective financial situation (coded

as 1 = “very poor”, 2 = “barely enough to get by”, 3 = “enough to get by”, 4 = “more than enough” and 5 = “well to do”). The median income reported among LIFE participants was $35,000.

Covariates—Two types of social support were included in the analysis: general and FOB social supports. *General social support* was measured by the modified Medical Outcomes Study Social Support Survey using pregnancy as the recall period (Misra, O’Campo, & Strobino, 2001; Sherbourne & Stewart, 1991). This scale uses a 5-point Likert scale (1 = “none of the time” to 5 = “all of the time”) for respondents to answer 11 items on general social support (e.g. someone to help you if you were confined to bed, someone to take you to the doctor if you needed it). The social support score can range from 11 to 55, with higher scores representing higher levels of social support. The instrument was reliable in our study (11 items; $\alpha = 0.76$).

To examine the support from the *FOB*, two subscales from the Social Networks in Adult Relations Questionnaire (Antdnucci, 1986) were used to examine quality of paternal and maternal relationships. The FOB supportive social support subscale includes five items representing the degree to which the father/mother relationships are supportive; items focus on maternal perceptions of father as a confidant, their closeness to each other, reciprocity in sharing of feelings, sharing problems with each other, and an overall good relationship with each other. The FOB conflict social support subscale includes four items that measure the level of conflict in the father-mother relationship; items reflected the mothers’ evaluation of the father criticizing other, father criticizing mother’s friends, making each other feel tense in the relationship, and fighting or arguing as a couple. Factor analysis using orthogonal varimax rotation was used to reduce FOB support into subscales with each factor having an eigenvalue greater than 1.0 (Pedhazur & Schmelkin, 2013). Combined FOB scales had a Cronbach $\alpha = .84$.

Other covariates included in analyses as potential confounders were maternal age (continuous), marital status (single vs. married or cohabiting), smoking (never smoked vs. smoked in during pregnancy or in past 12 months), parity (no previous live births vs 1 previous live birth or ≥2 previous live births), history of PTB (no previous live births vs. prior PTB).

Data Analysis

We used STATA version 13 (College Station, TX) for data analysis. Descriptive statistics were used to summarize the variables. To examine the distribution of PTB by maternal characteristics, we conducted bivariate analyses using modified Poisson regression models to estimate the unadjusted prevalence ratio (PR) and associated 95% confidence interval (CI). In multivariate analyses, models were built using a stepwise approach: Model 1 included depressive symptoms; Model 2 adjusted for maternal age, marital status, education, financial situation, income, smoking, and previous PTB; and Model 3, controlled for general social support and FOB social support in addition to variables in the previous models. We examined effect modification by stratifying regression models by each potential SES effect modifier. All variables included in the analysis were assessed for missing values.

Participants with missing income (11.2%) were treated as a separate category. Fewer than 5% of women had missing data on covariates (except income), CES-D, and PTB; hence listwise deletion was performed. Women with missing data (n=203) were not different from those in the final analytic sample (n = 1,207)

Results

Sample Characteristics

Sample characteristics are described in Table 1. Of the 1,207 women in sample, 17.1% had PTB and 20% had CES-D scores ≥ 23. The mean CES-D score for the sample was 15.3±9.8. Women in the sample were relatively young (M=27.3±6.20) and the majority were married (18.39%). The sample was socioeconomically diverse; 20.2% were above the median income ($35,000), 34% > high school education, and 15.5% reported their financial situation as more than enough/well to do. Thirty-one percent of the women had high social support.

Symptoms of Depression, Support and Preterm Birth

Bivariate analysis showed a significant association between PTB and symptoms of depression (Table 1). Women with CES-D score ≥ 23 were about 70% more likely have a PTB than women with CES-D scores < 23 (PR=1.68, 95% CI: 1.24-2.16). General support was not associated with PTB (PRN=0.94, 95% CI: 0.81 -10.9) nor was FOB support (PR=1.50, 95%CI: 0.77- 2.94). Neither maternal education nor financial situations were significantly associated with PTB, however, women with income < $35,000 were 40% more likely to have PTB than women with income ≥ $35,000 (PR=1.4, 95% CI: 1.01 – 1.80).

Multivariate analysis (Table 2) showed that after adjustment for socio-demographics and both general and FOB social support, there was a significant association between symptoms of depression and PTB. Probability of PTB for women experiencing severe symptoms of depression was 84% greater than women with CES-D scores <23 (PR 1.84, 95% CI, 1.40 – 2.40). Neither general social support nor the FOB supportive subscale was significantly related to the rate of PTB. However, the FOB conflict subscale was significantly associated with the rate of PTB. Women with greater FOB conflict were 21% more likely to have PTB compared with women reporting less conflictive relationships with the FOB (PR 1.21, 95% CI, 1.04 - 1.40).

Stratification by Education—The percentage of women with CESD ≥ 23 was 18.52 %, 16.65% and 17.51% for women with no college education, some college education, and those with at least an associate's degree, respectively (Table 3). Among women with some college education, greater symptoms of depression were associated with the rate of PTB (PR 1.66, 95% CI, 1.17 - 2.35). This association was not observed among women with no college education (PR 1.98, 95% CI 1.04 -3.77) or women who had at least an associate degree (PR 0.94, 95% CI, 0.29 - 3.06).

Stratification by Financial Status—Women who reported their financial situation as "poor" or "not enough to get by" were more likely to have a CES-D score ≥ 23 (21.88%) than women who reported having "enough to get by" (17.36%) or "more than enough to get

by" (15.81%). In analyses stratified by women's financial situation (Table 3), a significant association between symptoms of depression and PTB was found among women who perceived their financial status as "poor" or "not enough" (PR 0.94, 95%CI, 0.58 - 1.51) or among women reporting having "enough to get by" (PR 0.94, 95%CI, 0.72 - 1.23). However, among women who perceived their financial situation as "more than enough" or "well-to-do", women with CES-D scores ≥23 were twice as likely to have PTB compared with women with CES-D scores < 23 (PR 2.18, 95% CI, 1.36 - 3.49).

Stratification by Income—Women with household income < $35,000 had a higher frequency of symptoms of depression than women with reported income ≥$35,000 (51.7% vs 32.6%). In regression models stratified by income, depressive symptoms were significantly associated with PTB among women who had a household income of ≥ $35,000 (PR=1.73, 95% CI 1.05 – 2.86) and those who had their income data missing (PR=3.41, 95%CI 1.34 – 8.63), but strength of the association differed between groups. Among women with household income <$35,000, women with CES-D scores ≥ 23 were 1.34 (95% CI 0.91 – 1.99) times more likely to have PTB compared with women with CES-D scores < 23.

Discussion and Clinical Implication

We explored the relationship between symptoms of depression and PTB in the presence of social support. Women who reported having CESD scores ≥ 23, which indicate severe symptoms of depression during pregnancy, had increased odds of PTB as compared with women who had CES-D scores < 23. Our results are similar to previous studies which found an association between symptoms of depression and PTB (Giurgescu et al., 2015; Orr, James, & Blackmore Prince, 2002). Maternal-child nurses should assess for symptoms of depression in pregnant Black women. Referrals for mental health providers might benefit these women and improve birth outcomes (see Table 4).

Lack of social support has been related to higher risk of PTB (Nkansah-Amankra et al., 2010). We did not find a relationship between general social support or supportive FOB support and PTB. However, we found that women who reported conflict with the FOB were more likely to have PTB. Similarly, Steinberg, Sanders, and Cousens (2016) found that women in unstable relationships with the father of the baby were more likely to have small for gestational age infants compared with women in stable relationship. These findings suggest that conflict with the FOB increases the risk of adverse pregnancy outcomes. Our findings showed that after simultaneous adjustment for all socioeconomic and social support (both general and FOB); there was a significant association between symptoms of depression and PTB. Maternal-child nurses should encourage fathers to participate at prenatal visits, to ask questions about the pregnancy and birth, and to prepare for the birth of their infants. Nurses should encourage women to seek support beyond the father of the baby. Family and friends, churches and community members could offer support to pregnant women in order to improve mental health and birth outcomes for these women.

Strengths and Limitations

As an observational study, there are limitations. Since we recruited and interviewed women 24-48 hours postpartum, we are not able to infer a causal relationship between symptoms of

depression and PTB as this is a time order threat to causality. Our measure asks about depressive symptoms in the prior seven days, which includes the last days of pregnancy. However, enrolling women immediately during their postpartum hospital stay may increase generalizability of our results as we were able to include women with late, interrupted, or sporadic prenatal care with this approach (Osypuk, Slaughter-Acey, Kehm, & Misra, 2016). We aggregated all PTBs rather than stratifying on the severity of PTB (e.g., early PTB <34 weeks, late PTB 34-36 weeks). Despite these limitations, our study highlights negative effects of symptoms of depression among Black women during pregnancy on PTB and shows the importance of the role of partner support in PTB for women with symptoms of depression.

References

Accortt EE, Cheadle AC, Schetter CD. Prenatal depression and adverse birth outcomes: an updated systematic review. Maternal and Child Health Journal. 2015; 19(6):1306–1337. DOI: 10.1007/s10995-014-1637-2 [PubMed: 25452215]

American College of Obstetricians and Gynecologists. Method for estimating due date (Committee Opinion No 611). Obstetrics and Gynecolology. 2014; 124(4):863–866. DOI: 10.1097/01.AOG.0000454932.15177.be

Antonucci TC. Social support: A hierarchical mapping technique. Generations. 1986; 10(2):10–1. doi: 1988-09430-001.

Breeman LD, Jaekel J, Baumann N, Bartmann P, Wolke D. Preterm cognitive function into adulthood. Pediatrics. 2015; 136(3):415–423. DOI: 10.1542/peds.2015-0608 [PubMed: 26260714]

Byrd-Craven J, Massey AR. Lean on me: Effects of social support on low socioeconomic-status pregnant women. Nursing & Health Sciences. 2013; 15(3):374–378. DOI: 10.1111/nhs.12043 [PubMed: 23656532]

Martin JA, Hamilton BE, Osterman MJ, Driscoll AK, Drake P. Births: Final data for 2016. National Vital Statistics Report. 2018; 67(1):1–55.

Cook CAL, Flick LH, Homan SM, Campbell C, McSweeney M, Gallagher ME. Psychiatric disorders and treatment in low-income pregnant women. Journal of Women's Health. 2010; 19(7):1251–1262. DOI: 10.1089/jwh.2009.1854

Cubbin C, Heck K, Powell T, Marchi K, Braveman P. Racial/Ethnic disparities in depressive symptoms among pregnant women vary by income and neighborhood poverty. AIMS Public Health. 2015; 2(3):411.doi: 10.3934/publichealth.2015.3.411 [PubMed: 29546117]

Eapen DJ. Doctoral dissertation. University of Kansas; 2016. A qualitative description of pregnancy related social support experiences of low-income mothers with low birth weight babies.

Garn JV, Nagulesapillai T, Metcalfe A, Tough S, Kramer MR. International comparison of common risk factors of preterm birth between the US and Canada, using PRAMS and MES (2005–2006). Maternal and Child Health Journal. 2015; 19(4):811–818. DOI: 10.1007/s10995-014-1576-y [PubMed: 25060811]

Gaynes BN, Gavin N, Meltzer-Brody S, Lohr KN, Swinson T, Gartlehner G, Miller WC. Perinatal depression: Prevalence, screening accuracy, and screening outcomes. Evidence Report/Technology Assessment (Summary). 2005; 119:1–8.

Giurgescu C, Misra DP, Sealy-Jefferson S, Caldwell CH, Templin TN, Slaughter-Acey JC, Osypuk TL. The impact of neighborhood quality, perceived stress, and social support on depressive symptoms during pregnancy in African American women. Social Science & Medicine. 2015; 130:172–180. DOI: 10.1016/j.socscimed.2015.02.006 [PubMed: 25703670]

Hoffman S, Hatch MC. Depressive symptomatology during pregnancy: evidence for an association with decreased fetal growth in pregnancies of lower social class women. Health Psychology. 2000; 19(6):535.doi: 10.1037/0278-6133.19.6.535 [PubMed: 11129356]

Ibanez G, Charles MA, Forhan A, Magnin G, Thiebaugeorges O, Kaminski M, Group, E. M. C. C. S. Depression and anxiety in women during pregnancy and neonatal outcome: data from the EDEN

mother–child cohort. Early Human Development. 2012; 88(8):643–649. DOI: 10.1016/j.earlhumdev.2012.01.014 [PubMed: 22361259]

Liu L, Setse R, Grogan R, Powe NR, Nicholson WK. The effect of depression symptoms and social support on black-white differences in health-related quality of life in early pregnancy: the health status in pregnancy (HIP) study. BMC Pregnancy and Childbirth. 2013; 13(1):1.doi: 10.1016/j.earlhumdev.2012.01.014 [PubMed: 23324161]

Misra DP, O'Campo P, Strobino D. Testing a sociomedical model for preterm delivery. Paediatric and Perinatal Epidemiology. 2001; 15(2):110–122. DOI: 10.1046/j.1365-3016.2001.00333.x [PubMed: 11383575]

Mora PA, Bennett IM, Elo IT, Mathew L, Coyne JC, Culhane JF. Distinct trajectories of perinatal depressive symptomatology: evidence from growth mixture modeling. America Journal of Epidemiology. 2009; 169(1):24–32. DOI: 10.1093/aje/kwn283

Nkansah-Amankra S, Dhawain A, Hussey JR, Luchok KJ. Maternal social support and neighborhood income inequality as predictors of low birth weight and preterm birth outcome disparities: analysis of South Carolina Pregnancy Risk Assessment and Monitoring System survey, 2000–2003. Maternal and Child Health Journal. 2010; 14(5):774–785. DOI: 10.1007/s10995-009-0508-8 [PubMed: 19644741]

Orr ST, James SA, Blackmore Prince C. Maternal prenatal depressive symptoms and spontaneous preterm births among African-American women in Baltimore, Maryland. America Journal of Epidemiology. 2002; 156(9):797–802. DOI: 10.1093/aje/kwf131

Osypuk TL, Slaughter-Acey JC, Kehm RD, Misra DP. Life-course Social Mobility and Reduced Risk of Adverse Birth Outcomes. American Journal of Preventive Medicine. 2016; 51(6):975–982. DOI: 10.1016/j.amepre.2016.09.008 [PubMed: 27866597]

Pedhazur EJ, Schmelkin LP. Measurement, design, and analysis: An integrated approach. Lawrence Erlbaum Associates; Hillsdale, NJ: 2013.

Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1(3):385–401. DOI: 10.1177/014662167700100306

Rochat TJ, Tomlinson M, Bärnighausen T, Newell ML, Stein A. The prevalence and clinical presentation of antenatal depression in rural South Africa. Journal of Affective Disorders. 2011; 135(1):362–373. DOI: 10.1016/j.jad.2011.08.011 [PubMed: 21880372]

Sanchez SE, Puente GC, Atencio G, Qiu C, Yanez D, Gelaye B, Williams MA. Risk of spontaneous preterm birth in relation to maternal depressive, anxiety and stress symptoms. The Journal of Reproductive Medicine. 2013; 58:25. [PubMed: 23447915]

Sherbourne CD, Stewart AL. The MOS social support survey. Social Science & Medicine. 1991; 32(6):705–714. DOI: 10.1016/0277-9536(91)90150-B [PubMed: 2035047]

Slaughter-Acey JC, Sealy-Jefferson S, Helmkamp L, Caldwell CH, Osypuk TL, Platt RW, Misra DP. Racism in the form of micro aggressions and the risk of preterm birth among black women. Annals of Epidemiology. 2016; 26(1):7–13.e11. (2016). DOI: 10.1016/j.annepidem.2015.10.005 [PubMed: 26549132]

Steinberg JR, Sanders L, Cousens S. Small-for-Gestational-Age Births are Associated with Maternal Relationship Status: A Population-Wide Analysis. Maternal and Child Health Journal. 2016; 20(8):1651–1661. DOI: 10.1007/s10995-016-1964-6 [PubMed: 27007984]

Wang SY, Chen CH. The association between prenatal depression and obstetric outcome in Taiwan: A prospective study. Journal of Women's Health. 2010; 19(12):2247–2251. DOI: 10.1089/jwh.2010.1988

Ward E, Wiltshire JC, Detry MA, Brown RL. African American men and women's attitude toward mental illness, perceptions of stigma, and preferred coping behaviors. Nursing Research. 2013; 62(3):185.doi: 10.1097/NNR.0b013e31827bf533 [PubMed: 23328705]

Wilusz MJ, Peters RM, Cassidy-Bushrow AE. Course of Depressive Symptoms across Pregnancy in African American Women. Journal of Midwifery and Women's Health. 2014; 59(4):411–416. DOI: 10.1111/jmwh.12057

Callouts

Maternal-child nurses should assess for symptoms of depression in pregnant Black women.

Symptoms of depression among pregnant Black women are associated with preterm birth.

Partner support for pregnant women with symptoms of depression could help reduce preterm birth.

Socioeconomic status modifies the association between depressive symptoms and preterm birth

Pregnant women experiencing symptoms depression should be referred to mental health care providers.

Table 1

Socio-demographic and Unadjusted Analysis of Women with Preterm Birth (N=1,207)

Characteristics	Preterm Birth (n=206) n (%)	PR (95% CI)
Age (years)		
35+	40 (23.26)	Referent
18 – 19	14 (12.96)	0.65 (0.30– 1.02)
20– 29	113 (16.19)	0.70 (0.49 – 1.00)
30 – 34	39 (17.03)	0.73 (0.47 – 1.14)
Marital status		
Married	64 (18.39)	Referent
Cohabitating	49 (16.01)	0.87 (0.60 – 1.26)
Single	93 (16.82)	0.91 (0.67 – 1.26)
Educational Status		
Associate degree and above	31 (17.51)	Referent
No college	35 (18.52)	1.03 (0.64 – 1.64)
Some College	140 (16.65)	0.91 (0.63 – 1.33)
Financial Situation		
More than enough or well-to-do	80 (15.81)	Referent
Poor or not enough	21 (21.88)	1.33 (0.85 - 2.14)
Enough	105 (17.36)	1.06 (0.80 - 1.41)
Income		
≥35,000	77 (14.98)	Referent
<35,000	113 (20.21)	1.35 (1.01 - 1.80)
Missing	16 (11.27)	0.80 (0.47 - 1.67)
Smoking		
Never smoked	157 (17.56)	Referent
Past 12 months, not during pregnancy	25 (13.59)	0.77 (0.51 – 1.18)
During pregnancy	24 (18.60)	1.06 (0.69 - 2.37)
Parity		
No previous live birth	92 (17.50)	Referent
1 previous live birth	52 (13.30)	0.61 (0.42 – 0.89)
2 or more previous live births	62 (20.60)	1.73 (0.49 – 1.06)
Previous PTB		
No previous live births	157 (14.54)	Referent
Prior PTB	49 (38.58)	2.65 (1.95 – 3.60)
Symptoms of Depression		
CES-D scores < 23	145 (15.03)	Referent
CES-D scores ≥ 23	61 (25.21)	1.68 (1.24 – 2.26)
Social Support Quartiles		

Characteristics	Preterm Birth (n=206) n (%)	PR (95% CI)
> **54**	44 (16.00)	Referent
≤ **45**	48 (16.00)	1.00 (0.66 – 1.50)
46- 50	61 (21.94)	1.37 (0.93 – 2.02)
51 – 54	53 (14.97)	0.94 (0.63 -1.40)
Father of the Baby (FOB)		
FOB supportive social support		0.94 (0.81 – 10.9)
FOB conflict social support		1.14 (0.96 – 1.35)

Table 2

Results of Multivariate Analysis for Women with Preterm Birth

N = 1207		Model 1	Model 2	Model 3
Characteristics	N (%)	PR (95% CI)	PR (95% CI)	PR (95% CI)
Symptoms of Depression				
CES-D scores < 23	154 (14.6)	Referent	Referent	Referent
CES-D scores ≥ 23	63 (23.51)	1.68 (1.24 2.26)	1.71 (1.32 - 2.25)	1.84 (1.40 - 2.40)
Age (years)	41 (20.71)		Referent	Referent
35+	14 (12.73)		0.57 (0.31 –1.05)	0.58 (0.32 – 1.07)
18 – 19	122 (16.07)		1.70 (0.50 -0.97)	0.71 (0.51 – 0.99)
20- 29	40 (20.71)		0.73 (0.49 - 1.08)	0.73 (0.49- 1.09)
30 – 34				
Marital status	66 (17.55)		Referent	Referent
Married	94 (15.51)		0.94 (0.68 –1.30)	1.06 (0.76 –1.48)
Single	57 (16.76)		0.89 (0.62 - 1.28)	0.89 (0.63 - 1.29)
Cohabitating				
Educational Status				
≥ **Associate degree**	33 (17.37)		Referent	Referent
No college	38 (17.84)		0.88 (0.53 - 1.35)	0.88 (0.55 - 1.40)
Some College	146 (15.89)		0.87 (0.62 - 1.23)	0.86 (0.61 - 1.22)
Financial Situation				
More than enough/Well-to-do	86 (15.52)		Referent	Referent
Poor/ Not enough	21 (20.59)		0.94 (0.58 - 1.51)	1.06 (0.65 - 1.73)
Enough	110 (16.52)		0.94 (0.72 - 1.23)	0.95 (0.73 - 1.25)
Income				
≥ **$35,000**	81 (14.29)		Referent	Referent
< **$35,000**	120 (19.58)		1.40 (1.02 -1.91)	1.40 (1.00 - 1.91
Missing	16 (11.27)		0.97 (0.56 -1.67)	0.97 (0.51 - 1.68)
Smoking				
Never smoked	165 (16.96)		Referent	Referent
Past 12 months, not during pregnancy	26 (12.87)		0.74 (0.51 –1.08)	0.78 (0.54 –1.13)

N = 1207		Model 1	Model 2	Model 3
During pregnancy	26 (17.69)		0.92 (0.62 -1.39)	0.99 (0.65 –1.50)
Previous PTB				
No previous live births	163 (13.87)		Referent	Referent
Prior PTB	54 (36.73)		2.46 (1.86 -3.24)	2.39 (1.81 - 3.14)
Social Support Total				
> **54**	46 (15.28)			Referent
≤ **45**	51 (15.41)			1.00 (0.67 -1.48)
46- 50	63 (20.59)			1.31 (0.92 -1.85)
51 – 54	57 (14.84)			0.95 (0.66 –1.36)
Father of the Baby (FOB)				
FOB supportive				0.89 (0.75 -1.06)
FOB conflict				1.21 (1.04 -1.40)

Table 3

Association between Severe Symptoms of Depression (CES-D scores ≥ 23) and PTB Stratified by Education, Income and Financial Status.

Stratified by Education			
No College (n=216) OR (95%CI)	**Some College (n=947) OR (95%CI)**	**≥ Associate Degree (n=192) OR (95%CI)**	**Interaction p-value**
1.98 (1.04 -3.77)	1.66 (1.17 -2.35)	0.94 (0.29 - 3.06)	0.28
Stratified by Income			
< $35,000 (n=626) OR (95%CI)	≥ $35,000 (n=580) OR (95%CI)	Missing (n=149) OR (95%CI)	Interaction p-value
1.34 (0.91 - 1.99)	1.73 (1.05 -2.86)	3.41 (1.34 - 8.63)	0.78
Stratified by Perceived Financial Situation			
Poor/Not Enough n=105 OR (95%CI)	Enough n=682 OR (95%CI)	More than Enough/Well-to-do n=565 OR (95%CI)	Interaction p-value
1.04 (0.42 - 2.59)	1.43 (0.95 -2.13)	2.18 (1.36 - 3.49)	0.62

Note: All models were adjusted for age, marital status, smoking, previous PTB and social support.

Table 4

Clinical Implication

Nurses should assess the quality of the relationship between the mother and the father of the baby
Maternal and child nurses should refer women who have conflict with their partners to couple and family therapists or marriage counselors
Close monitoring of pregnant women with prior PTB may improve the birth outcomes.
Educate mothers on stress reduction interventions and refer those with stress and depression to mental health providers