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The impact of symptoms of depression and walking on gestational age at birth in African American women

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Abstract

Background—Symptoms of depression have been related to lower gestational age and preterm birth (less than 37 completed weeks gestation). Leisure time physical activity may have protective effects on preterm birth; however, less has been published with regard to other domains of physical activity such as walking for a purpose (e.g., for transportation) or the pathways by which symptoms of depression impact gestational age at birth.

Methods—This was a secondary analysis of available data of African-American women. Women were interviewed within three days after birth. We proposed a model in which walking for a purpose during pregnancy mediated the effects of symptoms of depression (measured by the 20-item Center for Epidemiologic Studies-Depression, CES-D, scale) on gestational age at birth in a sample of 1382 African-American women.

Results—Using structural equation modeling (SEM), we found that the direct effect of CES-D scores 23, which have been correlated with major depression diagnosis, on gestational age at

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birth was -4.23 ($p < .001$). These results indicate that symptoms of depression were associated with a decrease in gestational age at birth of 4.23 days. Walking for a purpose mediated the effect of CES-D scores ≥ 23 on gestational age at birth.

Conclusion—Compared with African-American women without symptoms of depression, African-American women who had symptoms of depression walked less for a purpose during their pregnancy and delivered infants with lower gestational age at birth. If not medically contraindicated, clinicians should incorporate walking as part of prenatal care recommendations and reassure women about safety of walking during pregnancy.

Keywords

symptoms of depression; walking; gestational age at birth; African American

Introduction

Preterm birth (less than 37 completed weeks gestation) rates in the United States have remained much higher than rates in other developed countries. Rates are particularly high for African-American women, who experience preterm birth at rates nearly double that of white women (13.3% vs. 8.9%, in 2014) (Hamilton, Martin, Osterman, Curtin, & Mathews, 2015). Researchers have struggled to identify ameliorable factors that could reduce the risk of preterm birth. A notable exception has been physical activity. A growing body of research suggests that physical activity has a protective effect on risk of preterm birth and this may occur by decreasing symptoms of depression, a risk factor for preterm birth. We review briefly below what is known about pregnant women's symptoms of depression, physical activity, the relationship between them, and the pathway from both to preterm birth. As our study sample was exclusively African American, we also note issues particular to this very high risk group of women.

Symptoms of depression are prevalent among pregnant women. Two meta-analyses of studies conducted in different countries including the United States reported depression prevalence rates during pregnancy ranging from 7 to 13% (H. A. Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Gavin et al., 2005). Specific to the United States, individual studies suggest that pregnant African-American women report more symptoms of depression than pregnant non-Hispanic white women (Holzman et al., 2006; Mustillo et al., 2004; Seng, Kohn-Wood, McPherson, & Sperlich, 2011). In fact, Orr et al. found that up to 50% of pregnant African-American women reported experiencing symptoms of depression (Orr, Blazer, & James, 2006). Symptoms of depression have been linked to negative birth outcomes, including lower gestational age at birth and preterm birth, in the general population (Grote et al., 2010) and in African-American women specifically (Giurgescu, Engeland, & Templin, 2015; Misra, Strobino, & Trabert, 2010).

The American Congress of Obstetricians and Gynecologists (ACOG) (American Congress of Obstetricians and Gynecologists, 2002, 2009) and the American Dietetic Association (ADA) (Kaiser, 2008) recommend that pregnant women who do not have medical or obstetric conditions that might limit physical activity should incorporate 30 minutes or more of moderate physical activity appropriate for pregnancy on most, if not all, days of the week.

Despite this recommendation, and in contrast with symptoms of depression, physical activity is not very prevalent among pregnant women in the United States (Evenson & Wen, 2010). Furthermore, based on the 2003-2006 National Health and Nutrition Examination Survey, rates of moderate to vigorous leisure time physical activity were significantly lower among minority pregnant women and this group was much less likely to meet recommendations for physical activity (Evenson & Wen, 2010). Data from the 2000-2009 Behavioral Risk Factor Surveillance Survey are consistent with this report; pregnant African-American women were found to be less likely to engage in leisure time physical activity compared with pregnant white women (Zhao et al., 2012). Walking has been reported as the most common leisure time physical activity among pregnant women (Evenson, Savitz, & Huston, 2004). Less has been published with regard to other domains of physical activity such as walking for a purpose (e.g., for transportation). Results from the National Household Travel Survey demonstrated that racial and ethnic minority populations, those with low income, and those living in urban areas were more likely to spend at least 30 minutes per day walking to and from public transportation (Besser & Dannenberg, 2005). Walking for a purpose is likely a relevant physical activity domain for African-American women, particularly those with low incomes.

Leisure time physical activity may have protective effects on preterm birth (Berkowitz, Kelsey, Holford, & Berkowitz, 1983; Domingues, Barros, & Matijasevich, 2008; Domingues, Matijasevich, & Barros, 2009; Evenson et al., 2004; Hegaard et al., 2008; Juhl et al., 2008; Jukic et al., 2012; Leiferman & Evenson, 2003). However, research specifically focused on the relationship between walking for a purpose and preterm birth in African-American women is limited and the results are inconclusive. In a prior study of low income African-American women in Baltimore, the researchers found an increased odds of preterm birth for women who walked for a purpose four days or more per week (Misra, Strobino, Stashinko, Nagey, & Nanda, 1998). In contrast, another study in the same city (different institution) reported that African-American women who walked for a purpose for more than 30 minutes per day during pregnancy had lower risk of preterm birth (Sealy-Jefferson, Hegner, & Misra, 2014). Misra and associates (1998) defined walking for a purpose as the average number of days per week in the first and second trimesters combined that a woman spent walking for a purpose and did not collect duration of walking for a purpose (i.e., minutes per day). In contrast, Sealy-Jefferson and colleagues (2014) asked open-ended questions about the duration of walking for a purpose (minutes per day) which may have decreased recall bias. Duration of walking for a purpose (minutes per day) may be a better measure to use when examining the association between walking for a purpose and gestational age at birth.

There is a growing body of literature supporting associations between reductions in symptoms of depression with leisure time physical activity during pregnancy (Daley et al., 2014) as well as evidence of a link between symptoms of depression and risk of preterm birth (Grote et al., 2010). However, the potential mediating role of walking on the association of symptoms of depression with gestational age at birth has not been examined. We hypothesize that walking for a purpose is in the pathway between symptoms of depression and gestational age at birth, and may explain associations between symptoms of depression and earlier gestational age at birth. While women who are depressed may lack

the energy to engage in activity, walking for a purpose may be necessary which may make it a particularly salient activity to examine to understand the pathways. Therefore, the purpose of this study was to examine whether walking for a purpose mediated associations between symptoms of depression and gestational age at birth in African-American women. We hypothesize that women who had symptoms of depression walked less for a purpose and had lower gestational age at birth.

Materials and Methods

Design and Sample

This present study is a secondary analysis of a retrospective cohort study of African-American women participating in the Life-course Influences on Fetal Environments (LIFE) study conducted in the Detroit Metropolitan area (Giurgescu, Misra, et al., 2015; Sealy-Jefferson, Giurgescu, Helmkamp, Misra, & Osypuk, 2015). Women were included in the LIFE study if they self-identified as Black or African American, were 18 to 45 years old and were within three days postpartum. Women were excluded if they: (1) did not understand English, (2) had serious cognitive deficits or significant mental illness on the basis of history or any prior records, or (3) were currently incarcerated. Women were recruited from Labor and Delivery and Postpartum units of a Detroit suburban hospital from June 2009 to December 2011. The main purpose of the original study was to examine the impact of racism on preterm birth for African-American women. A description of the methods for this study is provided in detail elsewhere (Giurgescu, Misra, et al., 2015; Sealy-Jefferson et al., 2015). The symptoms of depression scale was administered at enrollment with an indicated recall period of the past week and the walking for a purpose question was administered in the same interview with the recall period of the entire pregnancy. The final study sample included 1,411 women, which represented 71% of the women approached for study participation. A sample of 1,383 women (98% of the interviewed sample) had symptoms of depression data available for this secondary data analysis. Due to the very low rate of missing data for CES-D ($n=23$), we excluded these participants from this secondary data analysis rather than imputing their CES-D data. One woman did not have data available for gestational age at birth. The analytic sample included 1,382 women who had data available for symptoms of depression and gestational age at birth.

Measures

Symptoms of depression—The Center for Epidemiologic Studies Depression Scale (CES-D)(Radloff, 1977) measures the presence of salient symptoms of depression within the past seven days (e.g., bothered by things more than usual, felt lonely). The CES-D has 20 items each rated on a 4-point scale referring to frequency of symptoms (0=*rarely*, 1=*some of the time*, 2=*occasionally*, 3=*most of the time*) with a total possible score ranging from 0-60. CES-D scores ≥ 23 have been correlated with major depression diagnosis (Orr, Blazer, James, & Reiter, 2007; Radloff & Locke, 1986). In the current secondary data analysis, the CES-D was used as both continuous and dichotomous (CES-D scores < 23 , CES-D scores ≥ 23) variables. Internal consistency reliability of the 20-item CES-D measure was 0.85.

Walking for a purpose—Walking for a purpose was assessed with the following question: “During your pregnancy, how many minutes per day did you spend walking outside of the house that was not part of an exercise program? For example walking for ‘a purpose’ such as to get to the bus, to the store, etc.?” In the current secondary data analysis, walking for a purpose was used as a continuous variable (minutes per day) and also as a categorical variable (0 minutes, less than 20 minutes, 20 minutes to less than 40 minutes, 40 minutes to less than 2 hours and at least 2 hours).

Gestational age at birth—Gestational age at birth was collected from medical records. Gestational age was computed based on the reported start date of the participant's last menstrual period (LMP) and corroborated using ultrasound measurements of the crown-rump length (American College of Obstetricians and Gynecologists, 2014; Taipale & Hiilesmaa, 2001). Early ultrasounds provide a gestational age estimate with an error of ± 5 -7 days (American College of Obstetricians and Gynecologists, 2014). The estimate was based on the early ultrasound dating, if there was inconsistency between LMP and the ultrasound. LMP was used when a gestational age estimate based on an early ultrasound was not available (n=460). If both the ultrasound and LMP were missing, we used the provider's estimate from a late ultrasound (after 20 weeks gestation)(n=165), the provider's estimate of gestation at birth (n=61), or gestational age from the birth records, if everything else was missing (n=21).

Maternal sociodemographic, medical and obstetrical characteristics—*Maternal sociodemographic characteristics* included self-reported maternal age (continuous), marital status (single vs. married or cohabiting), years of education (continuous), educational attainment (less than high school, graduated high school, some college or graduated college), and household income (\$19,000, \$20,000-39,000, or \$40,000). *Maternal medical and obstetrical characteristics* included pre-pregnancy Body Mass Index (BMI) [calculated based on pre-pregnancy weight and height (kg/m^2), continuous and categorical], history of prior preterm birth (yes vs. no, categorical), and hypertensive disorders during their pregnancy (chronic hypertension, gestational hypertension, or preeclampsia; coded as yes vs. no). See Table 1 for details.

Analytic Techniques

Data were analyzed using SPSS 21 (SPSS Inc., Chicago, IL) and Stata 12 (StataCorp, College Station, Texas). Descriptive statistics (mean, standard deviation, frequency distribution) were used to analyze maternal sociodemographic, medical and obstetrical characteristics. Pearson r correlation coefficients and point biserial correlations were used to examine the relationships among symptoms of depression, walking for a purpose, gestational age at birth and maternal characteristics. Natural log transformations for walking for a purpose data were conducted to normalize their distribution. Structural equation modeling (SEM) was used to estimate the extent to which walking for a purpose mediated the effects of symptoms of depression (CESD scores < 23, CESD scores ≥ 23) on gestational age at birth. Maternal age, marital status, years of education, household income, pre-pregnancy BMI, history of prior preterm birth and hypertensive disorders were included as potential confounders. The fit of the model was evaluated using a strategy recommended

by Hu and Bentler (Hu & Bentler, 1999). Specifically, Hu and Bentler proposed using the standardized root mean squared residual (SRMR) and one additional measure of fit (Hu & Bentler, 1999). Because the root mean square error of approximation (RMSEA) is generally regarded today as one the most informative of fit indexes we selected it to go with SRMR (Byrne, 2013). The recommended cut-off values for this two-index strategy were SRMR 0.09, and RMSEA 0.06 (Hu & Bentler, 1999). In addition, the chi-square goodness of fit statistic and comparative fit index (CFI) were reported. The indirect effect of CES-D on gestational age at birth was tested using bias corrected bootstrap method. In Figure 1, we showed raw coefficients on the SEM pathways so that the effects could be readily interpreted in terms of gestational age at birth.

Results

Maternal Descriptive Characteristics

The mean age of women in the LIFE study was 27 [standard deviation (SD)= 6.20] years. The majority of women were married or cohabiting (54%), had a mean of 14 years of education and had an annual household income of less than \$40,000 (63%). The mean gestational age at birth was 38 (SD = 2.5) weeks. The mean score for CES-D was 15.33 (SD = 9.71). Twenty percent (N =280) of women had CES-D scores ≥ 23 , a level that has been correlated with major depression diagnosis. Thirty-four percent (N = 469) of women walked for a purpose between 20 minutes and two hours per day and 25% (N = 342) of women walked for a purpose at least two hours per day (see Table 1). Women who had higher CES-D scores were younger (r = -.096, p < .001), single (r = -.104, p < .001), less educated (r = -.159, p < .001), and had lower household income (r = -.151, p < .001). Women with lower gestational age at birth were more likely to have hypertensive disorders (r = -.124, p < .001), a history of prior preterm birth (r = -.176, p < .001), and CES-D scores ≥ 23 (r = -.103, p < .001). The other maternal sociodemographic, medical and obstetrical characteristics were not related to gestational age at birth. Walking for a purpose was not related to maternal characteristics.

Structural equation (SEM) model

The mediation model consisted of symptoms of depression (CES-D scores ≥ 23 , CES-D scores ≥ 23), walking for a purpose (minutes per day), gestational age at birth (in days) and the potential confounders to the endogenous variables. There were seven potential confounders (maternal age, years of education, married/cohabiting, household income, pre-pregnancy BMI, hypertensive disorders, and history of prior preterm birth) and 14 possible pathways from the potential confounders to the endogenous variables. The pathway between married/cohabiting and walking for a purpose was significant (.23, p =.047). The pathways between hypertensive disorders and gestational age at birth (-6.61, p < .01), and history of prior preterm birth and gestational age at birth (-9.03, p < .01) were significant. The other pathways between the confounders and endogenous variables were not significant. The model fit well ($\chi^2_{(18)}$ = 4.59, p < .01; RMSEA= .05; CFI= .95; SRMR = .04).

The direct effect of CES-D scores ≥ 23 on gestational age at birth was significant (-4.23, p < .001), i.e, depression was associated with a decrease in gestational age at birth of 4.23

days. The direct effects of CES-D scores ≥ 23 on walking for a purpose was also significant ($-.29, p=.031$), indicating that depression was associated with a 29% decrease in minutes per day in walking for a purpose. Finally, the direct effect of walking for a purpose on gestational age at birth was significant (.63, $p=.007$), indicating a .63 days increase in gestational age at birth for a doubling in the minutes per day of walking for a purpose. For example, women with preterm birth had a median walking for a purpose duration of 20 minutes per day; doubling this to 40 minutes per day is predicted to result in a .63 day increase in gestational age at birth. It is interesting to note that women with full term birth had a median walking for a purpose duration of 30 minutes per day. The significance of these two pathways (CES-D scores $\geq 23 \rightarrow$ walking for a purpose; walking for a purpose $\rightarrow$ gestational age at birth), suggests that walking for a purpose mediated the effect of CES-D scores ≥ 23 on gestational age at birth. This indirect effect of CES-D scores ≥ 23 on gestational age at birth was tested using the bias corrected bootstrap method and found significant ($p=.03$). Thus, African-American women who had symptoms of depression walked less for a purpose and delivered infants with lower gestational age at birth compared with African-American women without symptoms of depression.

Discussion

The purpose of this study was to examine whether walking for a purpose mediated associations between symptoms of depression and gestational age at birth in African-American women. We hypothesized that women who had symptoms of depression walked less for a purpose and had lower gestational age at birth. The results of this study support our hypothesis. Walking for a purpose mediated the effect of CES-D scores ≥ 23 on gestational age at birth. Women who had CES-D scores ≥ 23 , which have been correlated with major depression diagnosis (Orr et al., 2007; Radloff & Locke, 1986), walked less for a purpose and had lower gestational age at birth compared with women who had CES-D scores < 23 . CES-D scores ≥ 23 were associated with a 29% decrease in minutes per day of walking for a purpose and a four day decrease in gestational age at birth. Women who walked for a purpose had a statistically significantly higher gestational age at birth. A recent meta-analysis found that women with depression were more likely to have preterm birth (RR= 1.24, 95%CI: 1.04-1.47)(Grote et al., 2010). In contrast, a recent study reported that African-American women who walked for a purpose for more than 30 minutes per day during pregnancy had lower risk of preterm birth (Sealy-Jefferson et al., 2014). To our knowledge, this is the first study to examine the mediating effect of walking for a purpose on the effects of symptoms of depression on gestational age at birth.

Pregnant African-American women are more likely to live in neighborhoods with high poverty, violent crime and abandoned buildings compared with pregnant white women (Laraia et al., 2006; Messer, Kaufman, Dole, Herring, & Laraia, 2006; Pickett, Ahern, Selvin, & Abrams, 2002; Reagan & Salsberry, 2005). African-American women living in neighborhoods with high vacancy rates and violent crime rates have a higher risk of preterm birth (Giurgescu et al., 2012; Messer, Kaufman, Dole, Herring, et al., 2006; Messer, Kaufman, Dole, Savitz, & Laraia, 2006; Reagan & Salsberry, 2005). African-American women reported their neighborhoods were less safe and pleasant for leisure time physical activity than their white counterparts, irrespective of the racial make-up of the neighborhood

(Boslaugh, Luke, Brownson, Naleid, & Kreuter, 2004). It is not surprising that chief among the barriers to outdoor physical activity in low-income communities is a lack of safety and of social processes that encourage physical activity (G. G. Bennett et al., 2007; Franzini et al., 2010). Indeed, barriers to leisure time physical activity identified by pregnant women included lack of neighborhood environments that promote physical activity (e.g., there are few places for me to be active; programs do not have hours that work for me)(Da Costa & Ireland, 2013; Krans & Chang, 2011). Therefore, neighborhood environment needs to be taken into consideration when examining the relationship between physical activity and preterm birth in African-American women.

Maternal characteristics and social support may influence physical activity for pregnant women. In our study, walking for a purpose was not related to maternal characteristics. However, research suggests that pregnant women who are single, have less than high school education and report being in fair/poor health are less likely to participate in physical activity (Donahue, Zimmerman, Starr, & Holt, 2010; Gaston & Cramp, 2011; Gaston & Vamos, 2013). Barriers to physical activity also include fatigue, physical limitations, discomforts, and fear of injury (Da Costa & Ireland, 2013; Groth & Morrison-Beedy, 2013; Krans & Chang, 2011, 2012; Marshall, Bland, & Melton, 2013). While obese women generally are more likely to report “lack of motivation” as a barrier to exercise (Genkinger, Jehn, Sapun, Mabry, & Young, 2006), pregnancy may be motivational for these women to improve their health (Phelan, 2010). Social support from friends has also been identified as a significant predictor of physical activity among pregnant women. One study found that pregnant women reported less family support for exercise as a barrier to physical activity (Da Costa & Ireland, 2013). Another study found that pregnant African-American women did not participate in physical activity because family discouraged them from these activities due to safety concerns (Krans & Chang, 2012). Future research should consider maternal characteristics and social support when examining physical activity in pregnant African-American women.

Limitations

This study has a few limitations. The symptoms of depression scale had an indicated recall period of the past week and the walking for a purpose question had a recall period of the entire pregnancy. Research suggests that symptoms of depression do not change across pregnancy (Giurgescu, Zenk, et al., 2015; Wilusz, Peters, & Cassidy-Bushrow, 2014); therefore, it is likely that women who had symptoms of depression in the week prior to birth also had symptoms of depression earlier in their pregnancy. Because this is a retrospective cohort study where women were enrolled after birth, it is also possible, but not likely, that women may have differentially reported their symptoms of depression and walking for a purpose based on birth outcomes. Future studies should consider a prospective design and examine the impact of symptoms of depression and walking for a purpose during pregnancy on gestational age at birth. Furthermore, depression severity may also influence walking behavior and should be considered in future studies. Walking for a purpose was measured by one question that asked women to estimate minutes per day spent walking outside of the house that was not part of an exercise program. Our measure does not inquire about weekly walking duration, which may be a better estimate of walking for a purpose. We also did not

examine changes in walking duration over the course of the pregnancy. While we have data on total leisure time exercise, we do not have data specifically on walking for exercise within this cohort. Women's motivation may also explain the mediating effect of walking for a purpose on the association between symptoms of depression and gestational age at birth, and should be considered in future studies. Three percent of women had a history of depression prior to pregnancy. The LIFE study does not include diagnostic mental health measures, which are considered the gold standard for mental health assessment. Since the CES-D is a screening tool, the measure may capture symptoms that are correlated with, but not exclusively, those of major depression (Orr et al., 2007; Radloff & Locke, 1986). This was an observational study to examine associations among CES-D scores, walking for a purpose and gestational age at birth. However, this methodology does not allow one to draw any conclusions about causality. Future studies should consider a randomized controlled trial to examine the impact of a walking intervention for pregnant women with symptoms of depression on gestational age at birth. Maternal characteristics (e.g., age, marital status, employment, BMI) were not related to walking for a purpose. However, we did not capture distance between home and destination or access to vehicles that would have influenced walking duration. This cohort is heterogeneous with regard to both education and income. While our cohort is not limited to low income women, it includes a substantial proportion of women with household incomes below the federal poverty level. Despite these limitations, these findings suggest that walking for a purpose may improve birth outcomes.

Implications for Practice

ACOG recommends at least 150 minutes per week of moderate-intensity physical activity for pregnant women who do not have medical or obstetrical complications (American Congress of Obstetricians and Gynecologists, 2002, 2009). The ADA also recommends that pregnant women who do not have medical or obstetric conditions that might limit physical activity should incorporate 30 minutes or more of moderate physical activity appropriate for pregnancy on most, if not all, days of the week (Kaiser, 2008). However, pregnant women may have fears that physical activity may negatively affect the fetus. If not medically contraindicated, clinicians should incorporate walking as part of prenatal care recommendations and reassure women about the safety of walking during pregnancy. Twenty percent of women in our study had CES-D scores ≥ 23 that have been correlated with major depression diagnosis. Sedentary behavior has been related to symptoms of depression in pregnant women. For example, sitting time (e.g., watching television, surfing the internet) had a trend of an increased risk for depression in a sample of pregnant women ($p = .06$) (Watts, Miller, & Marshall, 2013). Other researchers also found that pregnant women who were less likely to engage in leisure time physical had more symptoms of depression compared with pregnant women who participated in leisure time physical activity (Downs, DiNallo, & Kirner, 2008; Orr, James, Garry, & Newton, 2006). These results suggest the need for screening pregnant women for symptoms of depression as well as their physical activity levels, which should include both leisure time and walking for a purpose. Clinicians should make appropriate mental health referrals for women with symptoms of depression. Finally, depression has been related to preterm birth. Therefore, clinicians should monitor closely women who have depression and assess for signs and symptoms of preterm labor.

Conclusion

Symptoms of depression are prevalent in pregnant women and have been related to negative birth outcomes. Walking for a purpose may improve birth outcomes. The results of this study suggest that women who walked for a purpose had higher gestational age at birth. Future research should test the impact of a walking intervention during pregnancy on gestational age at birth.

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Figure 1.

Structural equation model for gestational age at birth outcome as a function of CESD and walking for a purpose with seven potential confounders. All coefficients are in the raw score metric. The double headed arrows are covariance terms and the unlabeled arrows are residuals on endogenous variables. Note: * $p < .05$.

Table 1**Maternal characteristics (N=1382)**

Variable		
	<i>M (SD)</i>	<i>Range</i>
Age	27.34 (6.20)	18-45
Years of education	13.75 (1.95)	7-17
Pre-pregnancy Body Mass Index (BMI)(kg/m ²)	28.96 (7.57)	16-67
	<i>N (%)</i>	
Marital status		
Single	637 (46.1)	
Married or cohabiting	745 (53.9)	
Level of education		
Less than high school	141 (10.2)	
Graduated high school	301 (21.8)	
Some college or graduated college	940 (68.0)	
Household income		
Less than \$19,999	390 (28.2)	
\$20,000-39,999	476 (34.5)	
More than \$40,000	516 (37.3)	
History of prior preterm birth		
Yes	152 (11.0)	
No	1230 (89.0)	
History of hypertensive disorders ^a		
Yes	102 (7.4)	
No	1222 (88.4)	
History of depression prior to pregnancy		
Yes	39 (2.8%)	
No	1343 (97.2%)	
Pre-pregnancy BMI (categories) ^b		
Underweight (BMI<18.5 kg/m ²)	32 (2.3)	
Normal weight (BMI 18.5-24.9 kg/m ²)	445 (32.2)	
Overweight (BMI 25-29.9 kg/m ²)	367 (26.5)	
Obese (BMI ≥30 kg/m ²)	500 (36.2)	
	<i>M (SD)</i>	<i>Range</i>
CES-D ^c	15.34 (9.71)	0-53
Walking for a purpose (minutes per day) ^d	90.38 (143.06)	0-840
Gestational age at birth (days)	269.10 (17.56)	167-307
	<i>N (%)</i>	
CES-D score		
<23	1102 (79.7)	

Variable		
	<i>M (SD)</i>	<i>Range</i>
23	280 (20.3)	
Walking for a purpose ^d		
0 minutes	308 (22.3)	
Less than 20 minutes	223 (16.1)	
20 minutes to less than 40 minutes	251 (18.2)	
40 minutes to less than 2 hours	218 (15.8)	
At least 2 hours	342 (24.7)	

Note:

^aData available for 1,324 women

^bData available for 1,344 women

^cCenter for Epidemiological Studies-Depression

^dData available for 1,342 women