HHS Public Access
Author manuscript
Womens Health Issues. Author manuscript; available in PMC 2015 November 11.

Published in final edited form as:
Womens Health Issues. 2014 ; 24(4): e389–e395. doi:10.1016/j.whi.2014.04.007.

Linking Nontraditional Physical Activity and Preterm Delivery in Urban African-American Women

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Abstract

Background—Traditional risk factors for preterm delivery (PTD) do not account for the disparate rates among African-American women. Physical activity during pregnancy may protect women from PTD, but few studies exist in African Americans. Our objective was to examine the relationships between PTD and intensity and duration of leisure time physical activity (LTPA) as well as non-LTPA such as stair climbing and walking for a purpose during pregnancy.

Methods—Data were from a hybrid retrospective/prospective cohort study of urban low-income African-American women enrolled from 2001 to 2004 in the Baltimore PTD Study (n = 832). PTD was defined as birth before 37 completed weeks of gestation. Study participants reported physical activity during prenatal (n = 456) and post-partum (n = 376) interviews.

Findings—The rate of PTD was 16.7%. In unadjusted log-binomial regression models, we found no significant associations. However, in models adjusted for illicit drug use, locus of control, and a validated family resources scale, we found a significant decrease in prevalence of PTD for women who walked for a purpose more than 30 min/d (prevalence ratio, 0.64; 95% CI, 0.43–0.94), compared with women who walked less than or equal to 30 min/d.

Conclusions—These results suggest that walking for a purpose during pregnancy may confer protection against PTD among urban low-income African Americans.

Preterm delivery (PTD), defined as birth before 37 completed weeks of gestation, is a leading cause of infant death in the United States (Centers for Disease Control and Prevention, 2013). Babies born preterm are more likely to suffer from physical, behavioral, and cognitive developmental disabilities (Centers for Disease Control and Prevention, 2013), as well as chronic diseases in adulthood (Chiavaroli et al., 2009; Leduc, Levy, Bouity-Voubou, & Delvin, 2010). Persistent disparities in PTD rates exist for African Americans compared with non-Hispanic Whites, and are not completely explained by traditional demographic, socioeconomic or clinical risk factors (Dominguez, 2011).

Although the effects of behavioral factors on PTD have been widely studied, a causal relationship has only been established for tobacco smoking (Savitz & Murnane, 2010). Leisure time physical activity (LTPA) may influence PTD, as several existing studies

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suggest a protective association among non-Hispanic Whites (Berkowitz, Kelsey, Holford, & Berkowitz, 1983; Domingues, Matijasevich, & Barros, 2009; Evenson, Savitz, & Huston, 2004; Jukic et al., 2012; Leiferman & Evenson, 2003; Savitz & Murnane, 2010); however, only two studies are focused on the African-American population (Misra, Strobino, Stashinko, Nagey, & Nanda, 1998; Orr, James, Garry, & Newton, 2006). Misra and colleagues (1998) in a cohort including low-income African Americans from the University of Maryland clinics from 1988 to 1989 (n = 1,172), reported decreased odds of PTD for women who participated in LTPA for 60 or fewer days during the first and second trimesters of pregnancy (combined; odds ratio [OR], 0.51; 95% CI, 0.27–0.95), and increased odds of PTD for women who climbed stairs 10 or more times per day (OR, 1.60; 95% CI, 1.05–2.46), and walked for a purpose 4 or more days per week (OR, 2.10; 95% CI, 1.38–3.20; Misra et al., 1998). Most recently, Orr and co-workers (2006), using data collected from 1993 to 1995 from five hospital-based prenatal clinics in Baltimore, Maryland (n = 922), reported no association between exercise and PTD (OR, 0.93; 95% CI, 0.63–1.38) among low-income African Americans. However, in this study, no distinction was made between LTPA and non-LTPA (such as walking for a purpose and stair climbing). Because low-income African-American women often walk for transportation (Ross, 2000), a more comprehensive ‘physical activity’ definition should be considered for this group. Furthermore, neither of the two previously discussed studies considered the influence of intensity of LTPA on PTD.

Our objective was to examine the relationships between PTD and intensity and duration of LTPA and non-LTPA such as stair climbing and walking for a purpose, during pregnancy. For this analysis, we used a recent cohort of low-income African-American women enrolled in a study at the Johns Hopkins University Medical Institution from 2001 to 2004.

Methods

Study Design and Sample

This study was approved by institutional review boards at both Johns Hopkins University and the University of Michigan. Details about the Baltimore Preterm Delivery Study have been previously described (Misra, Trabert, & Atherly-Trim, 2006). Briefly, this hybrid retrospective/prospective cohort study was limited to African-American women residing in Baltimore City, Maryland, from March 2001 through July 2004. Women were eligible to participate if they received prenatal care at a Johns Hopkins Medical clinic or delivered at Johns Hopkins Hospital after receiving insufficient or no prenatal care (however, the majority of the women had sporadic contact with medical professionals during the index pregnancy). Pregnant women underwent two in-person interviews. During the first (between 22 and 28 weeks’ gestation), information on obstetric history, health behaviors, sociodemographic, and psychosocial factors were collected. During the second (postpartum), women were asked to report any changes in behavior and exposures during their final weeks of pregnancy. Women who were enrolled postpartum with insufficient prenatal care (and as a result were difficult to reach during the prenatal recruitment) were only interviewed once, immediately post-delivery before hospital discharge, and were asked questions about their entire pregnancy. Our cohort was composed of 872 women (which represented 68% of the women recruited), of whom 456 were enrolled prenatally and 376 postpartum. Women who had multiple births (n = 24) or were lost to follow-up (n = 16) were excluded. As a result, our analytic sample included 832 women.

Measurement of Key Variables

Preterm birth was defined as delivery before 37 weeks gestation. Gestational age (GA) based on last menstrual period (from medical record) was systematically compared with other estimates of GA in a hierarchical fashion to improve the validity of our estimates (Misra et al., 2006). In the event of inconsistencies in GA approximations (roughly 5% of sample), the initial estimate based on early ultrasonography was used. If estimates were consistent, the last menstrual period from the medical record was used to estimate GA.

Study participants were asked four questions to assess physical activity: 1) “How many minutes per week, on average, did you exercise during your pregnancy”; 2) “what activities did you do for exercise during your pregnancy” (only interviewers had pre-identified categories), 3) “how many times per day during your pregnancy did you usually climb stairs,” and 4) “how many minutes per day do you now spend walking that is not part of an exercise program? For example, walking for ‘a purpose’ such as to get to the bus, to the store, etc.” Intensity of LTPA was derived from study participants’ first three responses to the question about type of LTPA. Light/moderate and high-intensity categories were created using metabolic equivalent (MET) values based on the Compendium of Physical Activities, which quantify the energy costs of physical activities (Ainsworth et al., 2011). Light/moderate intensity LTPAs (1.6–5.9 METs) included walking, bicycle riding, and basketball or volleyball; high-intensity LTPA (≥6 METs) included swimming or water exercises, aerobics or aerobic dancing, social or nightclub dancing, and jogging or running. Unfortunately, instruments to assess self-reported physical activity have mostly been developed and validated in White populations (Sallis & Saelens, 2000; Wolin, Fagin, Ufere, Tuchman, & Bennett, 2010).

For women recruited prenatally, physical activity represented that for the first two trimesters. For women recruited post-partum only, physical activity represented the average in all three trimesters. Given that the four physical activity questions were asked separately during the interview, as well as the potential for different influences of physical activity type on PTD (Domingues et al., 2009), we modeled the variables separately.

Measurement of Covariates

The Family Resource Scale (Dunst & Leet, 1987; 25 items, higher score = more resources; Cronbach’s alpha, 0.90), measures the extent to which women have the time and/or money to meet their needs, and was used (versus income, education, or insurance type) because it provides a more nuanced assessment of the socioeconomic status of the low-income women in this cohort, given that the majority received Medicaid insurance and income and education were relatively invariant.

Using the Center for Epidemiologic Studies Depression scale (Eaton, Muntaner, Smith, & Tien, 2004; 16 items, larger score = greater level of depression; Cronbach’s alpha, 0.88), women were asked to report symptoms of depression with a recall period of 1 week. Acute stress during pregnancy was assessed using the Prenatal Psychosocial Profile Hassles scale (Curry, Campbell, & Christian, 1994; 12 items, lower score = lower level of stress; Cronbach's alpha, 0.80), which includes potential sources of stress including problems related to money, family, neighborhood crime, and so on.

The Pregnancy Beliefs scale (Tinsley & Holtgrave, 1989) was used to measure locus of control (internal subscale; 7 items, lower score = decreased locus of control; Cronbach's alpha, 0.71), which refers to a woman's beliefs about the health of her baby, and the degree to which she (versus powerful others or fate) can control the outcome of her pregnancy. Age, education, and cigarette smoking during pregnancy were self-reported.

Illicit drug use during pregnancy and acute pregnancy complications were self-reported or abstracted from the medical records. History of chronic diseases (including diabetes, thyroid disease, and asthma) was abstracted from the medical records.

Statistical Analysis

We calculated univariate and bivariate descriptive statistics to describe the data, and compared categorical variables using χ^2 tests, and continuous variables with Wilcoxon rank-sum tests. The distribution of each physical activity variable was positively skewed. After exploring continuous and dichotomous (using a median split), exposure definitions, the best fit models had physical activity defined in the following manner: Any LTPA (yes/no), duration of weekly LTPA (0, 1–60, >60 min/wk), intensity of LTPA (none, light/moderate, vigorous), stair climbing (≤10, >10 times per day), and walking for a purpose (≤30, >30 min/d). Variables were considered as potential confounders if they were associated with PTD in our sample and/or in the literature on physical activity and PTD and included maternal age (continuous), education (≤12, >12 years), prenatal drug use (yes/no), prenatal tobacco smoking (yes/no), chronic disease history (yes/no), family resource scale (quartiles), locus of control (quartiles), stress (Hassles score: ≤16, >16), as well as stress from neighborhood crime (none, some, moderate, severe), the Center for Epidemiologic Studies Depression scale using established cut-points (Hoffman & Hatch, 2000; Orr & Miller, 1995), as well as study recruitment time (prenatal or postpartum). The 10% change-in-estimate criterion was used to identify confounding covariates for inclusion in our fully adjusted models (Rothman, Greenland, & Lash, 2008). To avoid overadjustment, we only included variables that confounded each separate physical activity–PTD association, which resulted in different control variables for each analysis.

Because the prevalence of PTD in our cohort was 16.7%, the rare disease assumption for logistic regression (outcome prevalence < 10%) was not met (Greenland, 1987). We instead estimated unadjusted and adjusted prevalence ratios (PRs) and their associated CIs for associations between each physical activity variable and PTD, using log-binomial regression models (Deddens & Petersen, 2008; Spiegelman & Hertzmark, 2005). The PRs (also known as prevalence proportion ratios) estimated the ratio of the PTD prevalence in women who engaged in physical activity during pregnancy, compared with women who did not (Skov, Deddens, Petersen, & Endahl, 1998). Specifically, the probability of PTD is modeled as $P(Y = 1|X_1, X_2, \ldots X_k) = e^{x\beta}$, where $X\beta = \beta_0+\beta_1X_1+\beta_2X_2+\ldots+\beta_kX_k$, and $\exp(\beta_1)$ = PR for a 1 unit increase in X_1, adjusted for other covariates (Deddens & Petersen, 2008). Log-binomial models were also stratified by recruitment time. Two-sided *p*-values <.05 and CIs that did not include 1 were considered significant. All analyses were conducted using SAS version 9.3 for Windows (SAS Institute Inc., Cary, NC).

Results

Table 1 presents physical activity levels, as well as sociodemographic, behavioral, and clinical characteristics by PTD. Women who had a PTD were more likely to smoke during their second trimester ($p = .003$), be depressed ($p = .03$), have a lower locus of control ($p = .01$), and have more needs met by resources ($p = .02$) than women without a PTD. On the other hand, there was no difference in terms of drug use during pregnancy or stress by PTD status. Physical activity levels did not differ by PTD status; however, there was a trend toward a higher proportion of women with term deliveries, who walked for a purpose longer than 30 min/d compared with women with a PTD ($p = .05$). The type of LTPA most often reported was walking (38%). Women who were recruited prenatally (compared with postpartum) were only more likely to report climbing stairs more than 10 times per day ($p = .02$). We found no other differences in the levels of other relevant factors by recruitment time (data not shown).

Table 2 shows the unadjusted and adjusted PRs and associated 95% CIs for associations between physical activity type and PTD. Bivariate analyses revealed inverse associations between each domain of physical activity and PTD; however, none were significant. The association between high-intensity LTPA (compared with no LTPA) and reduction in PTD was large and approached statistical significance in fully adjusted models (PR, 0.35; 95% CI, 0.11–1.01). A model adjusted for drug use, locus of control, and family resources revealed a sizeable and significant inverse association between walking for a purpose >30 min/d and PTD prevalence (PR, 0.64; 95% CI, 0.43–0.94). Women who reported walking for a purpose for longer than 30 min/d were less likely to report increased stress from crime in their neighborhood ($p < .0001$), but more likely to have vaginal bleeding ($p < .0001$), smoke ($p < .0001$), use drugs ($p < .0004$), be depressed ($p = .04$), have higher overall stress ($p = .0003$), have more needs met by resources ($p = .001$), participate in weekly LTPA ($p < .0001$), and climb stairs more than 10 times/d compared with women who walked 30 or fewer minutes per day. No differences in education, chronic disease, other pregnancy complications, receipt of welfare, or employment status were apparent for women who reported walking for a purpose more than 30 min/d compared with those who did not. No heterogeneity in the associations between physical activity and PTD, by recruitment time was apparent (Table 3). Specifically, the associations between PTD and LTPA, stair climbing, and walking for a purpose were not significant for either women recruited for study participation in the prenatal or postpartum period, before or after multivariable adjustment.

Discussion

The impact of physical activity on the disparate PTD rates in African Americans has not been well-studied. We are the first to report a significant decrease in PTD rates for women who walked for a purpose for more than 30 min/d, in models adjusted for drug use, locus of control, and family resources. Further, our null associations between LTPA, intensity of LTPA, or stair climbing and PTD, are mostly in contrast to the existing studies performed in similar populations.

Misra et al (1998), in a retrospective cohort study comprised mainly of low-income African Americans recruited from 1988 to 1989, reported an increased odds of PTD for women who walked for a purpose at least four times per week and climbed stairs at least 10 times per day. In this study, women were asked to select one of five categories that most closely estimated the frequency of stair climbing in the second trimester. Additionally, walking for a purpose was defined using the average number of days per week in the first and second trimesters combined. In contrast, we asked open-ended questions about both stair climbing (times per day) and walking for a purpose (min/d), which may have decreased the recall bias of our physical activity measurements. Furthermore, Misra and associates did not collect duration of purposive walking (i.e., min/d), which precluded a more detailed exploration of the relation with PTD. The authors also reported significant protection from PTD for women who participated in 60 or more days of LTPA during the first and second trimester (roughly three times per week; adjusted OR, 0.51; 95% CI, 0.27–0.95). However, it was noted that the study participants were often unable to recall the duration of LTPA, which necessitated the investigators' use of a dichotomous variable.

On the other hand, in the most recent study of LTPA and PTD among African-American women, Orr and colleagues (2006), using data collected from 1993 to 1995, reported no associations (in unadjusted or adjusted models) between strenuous and nonstrenuous physical activity before or during pregnancy and PTD. However, the authors did not consider the sources of physical activity that are likely more relevant or salient for low-income African-American women, such as walking for a purpose or climbing stairs. Further, the use of a dichotomous, strenuous versus nonstrenuous LTPA variable may have been subjected to more measurement error than our method of defining intensity using MET values of the women's reported type of physical activity. Another caveat in comparing our results to those of Orr and co-workers is that roughly 72% of the women in the latter cohort had at least a high school education, and nearly 30% had a history of chronic disease, whereas our cohort had 10% and 15%, respectively.

Physical activity during pregnancy may confer several benefits (U.S. Department of Health and Human Services and Physical Activity Guidelines Advisory Committee, 2008), including increased psychological well-being (Pivarnik et al., 2006), decreased risk of pregnancy complications (such as gestational diabetes, preeclampsia, and excessive weight gain; Downs, Chasan-Taber, Evenson, Leiferman, & Yeo, 2012), as well as reduced risk of adverse birth outcomes, such as PTD (Savitz & Murnane, 2010). It is recommended that pregnant women engage in 150 minutes of moderate intensity physical activity per week (U.S. Department of Health and Human Services and Physical Activity Guidelines Advisory Committee, 2008), although few women meet this recommendation. Using data from the 2000 Behavioral Risk Factor Surveillance System, Evenson and associates (2004) reported walking as the most common LTPA among pregnant women. Besser and Dannenberg (2005), using the 2001 National Household Travel Survey, found (in adjusted models) that minorities, those with low income (<$15,000 per year), those living in large urban areas, and rail users were more likely to spend at least 30 min/d walking to and from public transportation. As a result, walking for a purpose is likely a relevant physical activity domain for low-income African-American women.

Although quantitative research on physical activity during pregnancy among African-American women is scarce, qualitative studies have begun to provide insight into the unique barriers to traditionally defined LTPA participation in this group. In one recently conducted study, Krans and Chang (2011) highlighted issues that served as obstacles to physical activity among African-American women, such as a lack of "personal time" that is inherent with single parenting, inadequate knowledge about the safety of physical activity during pregnancy, residential environments with limited healthy food and physical activity options, financial constraints, and negative cultural perceptions about thinner body types. The association we reported between walking for a purpose and PTD seems to be negatively confounded by drug use, family resources, and locus of control, as evident by the null association in unadjusted models, and a significant inverse relationship after adjustment. These results are conceivable given that we found a significant positive association between drug use and walking for a purpose. Although drug use has been associated with PTD (Savitz & Murnane, 2010), our results were in the expected direction, but did not attain significance. Next we found a significant negative association between the extent to which a woman has the time and/or money to meet her needs (family resource scale) and PTD, and a similar (but nonsignificant) association with walking for a purpose. Finally, we found a significant inverse relationship between a woman's beliefs about the health of her baby and the extent to which she believes she can control the outcome of her pregnancy (locus of control), and PTD rates, and a significant positive association between locus of control and walking for a purpose. If walking for a purpose is indeed protective for PTD, as we reported, failing to account for the positive and negative associations between these confounders and our exposure and outcome would result in an overall association that is spuriously close to the null, as can be seen in our unadjusted models. A more detailed discussion of negative confounding can be found elsewhere (Mehio-Sibai, Feinleib, Sibai, & Armenian, 2005).

Our study has several strengths. First, we investigated the associations between PTD and dose of LTPA (including type, duration, and intensity), as well as physical activity done as part of daily life (stair climbing and walking for a purpose), in a cohort of low-income African-Americans, which allowed us to examine the variability of PTD within this subpopulation, which often cannot be done in research studies seeking to make race/ethnic comparisons. Currently, the reasons for the disproportionate increase in PTD among African Americans are unknown, because traditional risk factors do not completely explain the disparity. However, it is promising that our results suggest protection from PTD with walking for a purpose longer than 30 min/d, and possibly for high intensity LTPA in African Americans.

In terms of study limitations, we did not have adequate information on pre-pregnancy body mass index of our study participants, which prohibited us from examining any potential modification or confounding by this variable of the PTD–physical activity associations. Data collection for this cohort occurred in the early part of last decade, and despite our careful abstraction of medical records, data on pre-pregnancy weight was frequently missing. Because pre-pregnancy body mass index has been negatively associated with participation in physical activity (Downs et al., 2012), and the increased prevalence of overweight/obesity among African Americans compared with non-Hispanic Whites, future studies on physical activity and PTD by body mass index are warranted. Further, we used MET values to define intensity of LTPA, which do not account for the increased energy costs during pregnancy (Ainsworth et al., 2011). However, this method is most commonly used in research on pregnant women with reasonable reliability and validity (Evenson, Chasan-Taber, Symons Downs, & Pearce, 2012), is correlated with pregnancy outcomes (Pivarnik et al., 2006) and offers the advantage of assessing LTPA type. Next, our study was not longitudinal in nature, which precluded us from examining physical activity measured at different time points before and during pregnancy, or making causal inferences. Residual confounding by unmeasured factors also cannot be ruled out. Because of our hybrid retrospective/ prospective cohort study design, the generalizability of our results may be limited to women with similar sociodemographic characteristics; however, this group is largely understudied. It has previously been reported that no significant differences in important demographic variables exist by recruitment time, in this cohort (Misra & Trabert, 2007; Misra et al., 2006). Had we restricted our study population to women who received regular prenatal care, we would miss women at higher risk for PTD (for reasons related and unrelated to prenatal care). As a result, our ability to detect significant associations would have been reduced, and the improvement of our understanding of the epidemiology of this adverse birth outcome, among African-American women would have been limited. Further, we assert that results from our hybrid study design may be more generalizable to urban-dwelling African-American women, in contrast with a cohort composed of only women who received regular prenatal care. As an example, findings from the Pregnancy, Infection and Nutrition study suggested that white women who were recruited between 24 and 29 weeks gestation had similar risk of PTD as those in the area population, but prenatally enrolled African-American study participants had substantially lower PTD rates than the area population (Savitz et al., 2004). Although we did not observe differences in key demographic and behavioral variables by recruitment time in our cohort, the physical activity variables were defined based on subjective versus objective measurements, and may still be subject to recall bias, which could threaten internal validity, especially among women recruited for study participation during the postpartum period. However, we reported models stratified by recruitment period and did not find evidence that the protective association between walking for a purpose and PTD was owing to recall bias of women recruited postpartum. Finally, our null findings between PTD and LTPA (including intensity) are likely a consequence of our sample size. A prospective study among a representative sample of African-American women, with both objective and subjective measures of physical activity would be necessary to overcome the methodological limitations of the current study.

Implications for Practice and/or Policy

We found that women who reported walking for a purpose for longer than 30 min/d had significantly reduced PTD rates. These women were also more likely to engage in behaviors that are mechanisms to cope with stress, such as smoking and drug use, as well as weekly LTPA and stair climbing (>10 times/d). Women who use walking as a source of transportation may be more physically able to engage in LTPA (Wanner, Götschi, Martin-Diener, Kahlmeier, & Martin, 2012). These results add to our understanding of nontraditional sources of physical activity and how they might be linked to PTD among a group that has largely been understudied. Health care practitioners serving African-American women should encourage traditional as well as nontraditional sources of physical activity and educate women about the safety of participating in different types of activity during pregnancy. Policies aimed at improving urban areas (including safety, healthy food availability, walkability, etc.) should improve the overall health of residents, and may positively impact birth outcomes through the reduction in overall stress. A more complete understanding of the determinants of physical activity among African-American women is necessary to inform future PTD interventions.

Acknowledgments

Funding source: NIH grant # 1R01HD058510-01.

Shawnita Sealy-Jefferson, PhD, had full access to all data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1

Descriptive Characteristics and Physical Activity Level by Preterm Delivery (PTD) Status Among Study Participants: Baltimore Preterm Delivery Study (2001–2004)

Characteristic	Term, n (%) or Mean (SD)	PTD, n (%) or Mean (SD)	*p*
Mean age*	23 (6)	23 (6)	.86
Education (y)			.82
≤12	623 (90)	126 (91)	
>12	69 (10)	13 (9)	
Employment status			.96
Unemployed	335 (48)	67 (49)	
Employed	358 (52)	71 (52)	
Recruitment			.55
Prenatal	383 (55)	73 (53)	
Postpartum	310 (45)	66 (48)	
Previous PTD			.0004
≥1	72 (10)	31 (22)	
None	457 (66)	76 (55)	
Nulliparous	164 (24)	32 (23)	
Chronic disease history			.54
No	506 (73)	98 (71)	
Yes	187 (27)	41 (30)	
Acute pregnancy complications			<.0001
No	539 (78)	85 (61)	
Yes	154 (22)	54 (39)	
Smoking during 2nd trimester			.003
No	572 (83)	97 (72)	
Yes	119 (17)	38 (28)	
CES-D			.03
<16 (not depressed)	412 (60)	69 (50)	
≥16 (depressed)	281 (41)	70 (50)	
Drug use during pregnancy			.50
No	510 (77)	99 (74)	
Yes	151 (23)	34 (26)	
Mean hassles score*	18 (6)	19 (6)	.12
Mean locus of control*	23 (3)	22 (3)	.01
Mean family resource scale*	46 (15)	50 (16)	.02
Any LTPA			.18
No	420 (61.2)	91 (67)	
Yes	266 (38.8)	44 (33)	
LTPA (min/wk)			.40
0	420 (61)	91 (67)	

Characteristic	**Term, n (%) or Mean (SD)**	**PTD, n (%) or Mean (SD)**	***p***
1–60	182 (27)	30 (22)	
>60	84 (12)	14 (10)	
Intensity of LTPA			.17
None	420 (61)	91 (67)	
Light/moderate	212 (31)	39 (29)	
High	54 (8)	5 (4)	
Walking for a purpose (min/d)			.05
≤30	457 (67)	102 (76)	
>30	225 (33)	33 (24)	
Stair climbing (times/d)			.34
≤10	584 (85)	110 (82)	
>10	105 (15)	25 (19)	

Abbreviations: CES-D, Center for Epidemiologic Studies Depression scale; LTPA, leisure time physical activity; SD, standard deviation.

Percentages may not sum to 100 owing to rounding errors.

*Mean (SD).

Table 2

Unadjusted and Adjusted Associations Between Physical Activity During Pregnancy and Preterm Delivery in Total Cohort: Baltimore Preterm Delivery Study (2001–2004)

Physical Activity Type	Unadjusted		Adjusted	
	PR	95% CI	PR	95% CI
Any LTPA*				
No (Referent)				
Yes	0.80	0.57, 1.11	0.86	0.61, 1.23
LTPA (min/wk)†				
0 (Referent)				
1–60	0.79	0.54, 1.16	0.91	0.61, 1.36
>60	0.80	0.48, 1.35	0.77	0.44, 1.36
Intensity of LTPA‡				
None (Referent)				
Light/moderate	0.89	0.63, 1.25	1.01	0.71, 1.44
High	0.48	0.20, 1.12	0.35	0.11, 1.01
Stair climbing (times/d)§				
≤10 (Referent)				
>10	0.93	0.67, 1.29	0.82	0.57, 1.16
Walking for a purpose (min/d)||				
≤30 (Referent)				
>30	0.70	0.49, 1.01	0.64	0.43, 0.94

Abbreviations: LTPA, leisure time physical activity; PR, prevalence ratio.

*Adjusted for drug use, cigarette smoking (2nd trimester), locus of control, family resource scale.

†Adjusted for locus of control, family resource scale.

‡Adjusted for locus of control, family resource scale, cigarette smoking, drug use, depression.

§Adjusted for locus of control, family resource scale, cigarette smoking, drug use.

||Adjusted for drug use, locus of control, family resource scale.

Table 3

Unadjusted and Adjusted Associations Between Physical Activity During Pregnancy and Preterm Delivery, Stratified by Study Enrollment Period: Baltimore Preterm Delivery Study (2001–2004)

Physical Activity Type*	Prenatal (n = 456)				Postpartum (n = 376)			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Any LTPA†								
No (Referent)								
Yes	0.83	0.53, 1.29	0.92	0.57, 1.49	0.76	0.47, 1.25	0.79	0.47, 1.34
LTPA (min/wk)‡								
0 (Referent)								
1–60	0.67	0.38, 1.17	0.76	0.42, 1.37	0.96	0.57, 1.61	1.21	0.68, 2.13
>60	1.19	0.66, 2.14	1.33	0.70, 2.53	0.37	0.12, 1.13	0.25	0.06, 0.98
Stair climbing (times/d)§								
≤10 (Referent)								
>10	1.00	0.64, 1.54	0.96	0.61, 1.50	0.85	0.51, 1.44	0.65	0.36, 1.16
Walking for a Purpose (min/d)‖								
≤30 (Referent)								
>30	0.69	0.42, 1.13	0.62	0.37, 1.05	0.72	0.42, 1.23	0.63	0.36, 1.13

Abbreviations: CI, confidence interval; LTPA, leisure time physical activity; PR, prevalence ratio.

* Intensity of LTPA omitted owing to sparse data.

† Adjusted for drug use, cigarette smoking (2nd trimester), locus of control, family resource scale.

‡ Adjusted for locus of control, family resource scale.

§ Adjusted for locus of control, family resource scale, cigarette smoking, drug use.

‖ Adjusted for drug use, locus of control, family resource scale.