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Psychosocial and demographic predictors of postpartum physical activity

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Abstract

Background: Physical activity promotes better health outcomes across the lifespan, and provides physical and mental health benefits for women who have recently given birth. However, research has not adequately characterized physical activity levels or risk factors for inadequate physical activity during the postpartum period.

Purpose: The objective of the present study was to describe levels and correlates of physical activity at six months postpartum in mothers of diverse race/ethnicity (55% African American, 23% White, 23% Hispanic/Latina), with the majority living in or near poverty.

Methods: We analyzed data collected by the five-site Community Child Health Network study. Women (n = 1581) were recruited shortly after the birth of a child. Multinomial logistic regression models tested associations of demographic factors and self-reported stress in several life domains with total physical activity levels at six to nine months postpartum, including activities done at work, at home, for transportation, and leisure.

Results: Thirty-five percent of participants in this sample reported low levels of physical activity. African American race, Latina ethnicity, and living in a rural area were associated with low levels of physical activity, whereas working outside the home was associated with high physical activity.

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Conflicts of Interest: All authors declare no conflicts of interest.

Ethical Approval: All procedures performed in this study were in accordance with the ethical standards of the institutional research committees and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

Contrary to hypotheses, chronic stress was not associated with physical activity with the exception of financial stress, which predicted *greater* likelihood of being highly physically active.

Conclusions: These findings suggest that optimal postpartum care should integrate physical activity promotion, and that African American, Latina, and rural-dwelling women may benefit most from efforts to promote activity following birth.

A large body of research demonstrates the health benefits of physical activity for people of all ages (Bauman, 2004; Fishman et al., 2016; Fox, 1999; Sallis, Prochaska, & Taylor, 2000; Vogel et al., 2009; Warburton, Nicol, & Bredin, 2006). For example, physical activity in adults has been associated with reduced risk of and improvement in cardiovascular disease (Hagberg, Park, & Brown, 2000; Jolliffe et al., 2001; Thompson et al., 2003), better management of diabetes (Boulé, Haddad, Kenny, Wells, & Sigal, 2001; Orchard et al., 2005), and lower risk of major depressive disorder (Cooney et al., 2013; Rebar et al., 2015). Accordingly, physical activity is important for women's health throughout the lifespan, and especially during the postpartum period.

After the birth of a child, physical activity may help women to lose excess weight that was gained during pregnancy, which has implications for long-term metabolic and cardiovascular health. For example, women who resume physical activity during the postpartum period are less likely to retain excess weight gained during pregnancy (O'Toole, Sawicki, & Artal, 2003; Olson, Strawderman, Hinton, & Pearson, 2003). Physical activity is particularly important during the postpartum period because the year after the birth of a child may set the stage for the adoption of lifestyle habits that could either promote or impair long-term health and well-being in new mothers as well as in their children (Hinkley, Crawford, Salmon, Okely, & Hesketh, 2008; Moore et al., 1991). Physical activity may also be effective for preventing and treating postpartum depression in mothers (Armstrong & Edwards, 2003; Daley, MacArthur, & Winter, 2007; Davis & Dimidjian, 2012; Sampselle, Seng, Yeo, Killion, & Oakley, 1999).

Despite the extensively documented physical and mental health benefits of physical activity, most Americans do not meet the criteria set forth in the 2008 Physical Activity Guidelines for Americans (Carlson, Fulton, Schoenborn, & Loustalot, 2010). These guidelines advise all healthy adults to accumulate 150 minutes (2 hours and 30 minutes) each week of moderate-intensity aerobic physical activity (such as brisk walking or tennis), 75 minutes each week of vigorous-intensity aerobic physical activity (such as jogging or swimming laps), or an equivalent combination of moderate- and vigorous-intensity aerobic physical activity (U.S. Department of Health and Human Services, 2008). The American College of Obstetricians and Gynecologists recommends that women gradually return to physical activity 4-6 weeks after delivery (American College of Obstetrics and Gyencology, 2015), after which the suggested guidelines are the same as for the general population. However, cross-sectional and longitudinal studies indicate that new mothers are especially at risk of not meeting physical activity guidelines for an extended time, likely due to barriers such as such as fatigue, lack of time, and need for childcare (Brown, Heesch, & Miller, 2009; Evenson, Aytur, & Borodulin, 2009; Pereira et al., 2007).

The high proportion of women who do not meet physical activity recommendations during the year following childbirth suggests a need for effective interventions to provide education, reduce barriers, and integrate of physical activity recommendations into routine postpartum care. Yet little research has explored predictors of physical activity during the postpartum period and thus it is unclear which women are most in need of interventions to promote adequate activity.

Patterns of physical activity may also be important for understanding pervasive disparities in maternal-child health outcomes, Specifically, low-income women and African-American women are at greater risk of delivering low birth weight and preterm infants. Adverse pregnancy and birth outcomes are in turn associated with poorer postpartum cardiovascular and metabolic health in mothers, which heightens risk of chronic illness across the lifespan (O'Campo et al., 2016; Perng et al., 2015; Wu et al., 2016)).

In seeking to understand the mechanisms that underlie health disparities, several theoretical models propose that the social disadvantages associated with racial/ethnicity minority identities and low socioeconomic status result in increased exposure to psychosocial stressors, including discrimination, financial stress, and other chronic burdens and evidence supports this association (Dunkel Schetter et al., 2013). Greater stress exposure, in turn, is posited to increase the likelihood that an individual will engage in health-compromising behaviors such as smoking, poor diet, and substance use (Adler & Snibbe, 2003; Mezuk et al., 2013; Myers, 2009).). While such models also emphasize more direct pathways involving biological stress processes, health-undermining behaviors including physical inactivity, of interest here, may also serve as an important mechanism underlying health disparities.

The current study addresses the need for research to understand how demographic factors and stress processes relate to physical activity patterns during the postpartum period in a large cohort of African American/Black, Latino/Hispanic, and non-Hispanic/White mothers, a majority of whom had household incomes near or below the federal poverty level. The data used in these analyses were collected by the Community Child Health Network (CCHN), funded by The Eunice Kennedy Shriver National Institutes of Child Health and Human Development of the National Institutes of Health. The overall goals of CCHN were to gain new insights into disparities in maternal health and child development and improve the health of families through community-based participatory research. This longitudinal study, which is unusual and valuable because of its sample demographics, assessed levels and correlates of physical activity in mothers from different parts of the United States.

Prior work by CCHN researchers has demonstrated that exposure to chronic stress and demands varies as a function of race/ethnicity and socioeconomic status (Dunkel Schetter et al., 2013), and that African-American women and women living in poverty have higher levels of allostatic load during the first postpartum year (O'Campo et al., 2016). The present study sought to build on these prior findings, and examine whether chronic stressors associated with low SES and race/ethnicity contribute to patterns of physical activity during the first postpartum year, which would support the idea that health behaviors are one mechanism underlying the association between social disadvantage and poorer health..

Physical activity is defined as “any bodily movement produced by skeletal muscles that results in energy expenditure” (Caspersen, Powell, & Christenson, 1985, p. 126) and includes leisure physical activity, transportation, childcare, occupational activity, yard work and household chores. Although the term exercise is often used as a synonym for physical activity, exercise is a more narrowly defined as physical activity that is planned, repetitive and purposive. Exercise is a structured, leisure-time type of physical activity, whereas physical activity also arises in domestic or occupational tasks.

Our hypotheses were aligned with models of the social determinants of health, which posit that disparities in health and health behaviors are the result of the stressful conditions in which vulnerable populations live. Specifically, we hypothesized that lower socioeconomic status (SES), indexed by measures of family income and educational attainment, was expected to predict lower likelihood of sufficient physical activity (King et al., 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002). We also expected that African-American and Latina women would report lower levels of physical activity compared to non-Hispanic white women. The multi-site nature of the CCHN study also allowed us to further explore how the nature of the communities in which women live (rural, suburban, or urban) might be associated with physical activity. Based on prior findings (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; James et al., 2013; Parks, Housemann, & Brownson, 2003; Wilcox, Castro, King, Housemann, & Brownson, 2000), women living in urban areas were expected to report higher levels of physical activity than individuals living in suburban and rural sites because of greater walkability in urban settings. Finally, we hypothesized that higher levels of stress would be associated with lower levels of physical activity. Individuals experiencing more chronic strains typically have less time and fewer opportunities as well as lowered motivation to engage in health-promoting behaviors. Consistent with this, general population studies show that stress adversely affects health behaviors (Hellerstedt & Jeffery, 1997; Ng & Jeffery, 2003; Stults-Kolehmainen & Sinha, 2014). but this issue has not been studied in diverse samples of postpartum women.

Methods

The sample was drawn from the larger pool of participants in the Community Child Health Network (CCHN) study, a prospective, longitudinal, multi-site study of 2,510 mothers and 1,436 of the fathers of their children. More detailed information about eligibility and recruitment procedures can be found in the CCHN core papers (Dunkel Schetter et al., 2013; O’Campo et al., 2016; Ramey et al., 2015). Briefly, the five study sites included three urban sites (Washington, DC; Baltimore, MD; Los Angeles County, CA); one suburban site (Lake County, IL); and one rural site (seven counties in eastern North Carolina). Women residing in the target areas were recruited and enrolled during their postpartum hospital stay following the birth of an index child (except in North Carolina where participants were recruited in clinics during pregnancy or after delivery). Mothers who met the following criteria were eligible to participate: (1) between 18 and 40 years of age; (2) self-identification as either White/Caucasian, Latina/Hispanic, and/or African American/Black; (3) ability to converse in either English or Spanish; (4) residence in one of the target zip codes for at least 6 months; (5) 4 or fewer children; and (5) no plans to be surgically sterilized following the birth of the index child.

The study design was longitudinal over up to two years following a birth with assessments scheduled roughly every six months. Data for the present analyses come from structured interviews administered during in-home visits when the index children were approximately 1 month (T1) and 6 months (T2) of age. Community members experienced or trained in community research or clinical service delivery conducted interviews in the participant's choice of English or Spanish. Data were collected between June 2008 and December 2011.

Participants

1688 participants completed the 24-39 weeks postpartum (T2) study visit. We excluded those who were pregnant again at the time ($n = 74$) and those who had insufficient responses on the physical activity measure to categorize their physical activity levels ($n = 33$), for a final sample size of 1581 participants.

Measures

Physical activity.—Physical activity was assessed at the T2 visit (24-39 weeks postpartum) using the short 9-item form of the International Physical Activity Questionnaire (IPAQ). Participants were asked to recall activities performed for at least 10 minutes during the last seven days. This measure assesses time spent in physical activity in combined work, housework, transportation, and leisure domains and at three different intensities: vigorous, moderate, and walking. Participants were provided with examples of activities that represent each intensity (e.g., "vigorous physical activities like heavy lifting, aerobics, or fast bicycling") and then asked to report the number of days and number of hours and/or minutes per day they had spent doing each activity for a minimum of ten minutes over the previous 7 days.

Using the instrument's well-validated scoring protocol, participants were then classified into categories representing low, moderate, and high levels of physical activity. Briefly, participants were classified as moderately active if they reported 3 or more days of vigorous activity of at least 20 minutes per day, 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day, or 5 or more days of any intensity activity totaling at least 600 MET-minutes per week. Participants were classified as highly active if they reported vigorous activity on at least 3 days and achieving at least 1500 MET-minutes/week or 7 or more days of any intensity activity accumulating at least 3000 MET-minutes/week. Participants who reported no activity or some activity but less than the moderate criteria were assigned to the low activity category.

The IPAQ short has acceptable test-retest reliability and demonstrates fair to moderate associations with concurrent accelerometry measures (Ainsworth et al., 2000, 2006; Hagstromer, Oja, & Sjostrom, 2006).

Stress measures.

Financial stress.: A financial stress index was created from five questions administered during the T1 interview. These items included the following: (1) "To what extent were worries about food, shelter, health care, and transportation stressful for you during your pregnancy?"; (2) "To what extent were money worries like paying bills stressful for you

during your pregnancy?"; (3) "In the past year, did you have serious problems with money (such as a major loss of income or a debt that cannot be repaid)?"; (4) "How difficult is it for (you/your household) to meet the monthly payments on your (household's) bills?"; (5) "How much do you worry that your total (household) income will not be enough to meet your (household's) expenses and bills? (taken from the National Survey of Families and Households). Participants' responses to these five items were averaged to create a composite score with a range of 1 to 4 with higher scores indicating higher levels of financial stress. Cronbach's α for this composite score was .77.

Chronic life stress: Participants completed the semi-structured CCHN Life Stress Interview (LSI) (Tanner Stapleton et al., 2015) at T2. Participants responded to open-ended questions regarding *neighborhood environment, family relationships, co-parenting* and *partner relationship* in the previous six months (or since the child's birth). Based on the objective conditions reported by the participant, interviewers assigned overall ratings in each domain. For each domain, interviewers assigned a score using a five-point Likert scale ranging from 1 (*exceptionally positive conditions*) to 5 (*exceptionally negative conditions*). Trained CCHN interviewers conducted all scoring during or immediately after administration of the interview. Interviews were also audio-recorded for later reliability and content analysis, and field stress ratings have subsequently demonstrated acceptable reliability and validity (Tanner Stapleton et al., 2015). Chronic stress summary scores (i.e., total LSI scores) were computed by averaging ratings over the four domains of Neighborhood, Family, Partner, and Co-parenting.

Perceived stress.: Perceived stress was measured at T1 and T2 using the 10-item version of the Perceived Stress Scale (PSS; 30). Responses to the 10 items were each rated by participants on a scale ranging from 1 (*never*) to 5 (*almost always*) and summed after four positively worded items were reverse-coded. T1 and T2 scores ($r = .57$, $p < .0001$) were averaged to create a composite measure of perceived stress during the first six months after the birth of the index child, and this measure had a Cronbach's α of .89.

Everyday racial discrimination.: Reports of experiences of discrimination were measured at T1 using the Everyday Racism Scale (Forman, Williams, & Jackson, 1997). This measure assesses frequency of experiences of discrimination in everyday life such as being treated with less courtesy than others and receiving poorer service in restaurants or stores. In addition to the 9 items of the original scale, an item "being followed around the store" was added by CCHN. Respondents used a 6-point frequency scale ranging from 1 (*almost everyday*) to 6 (*never*). Participants who answered "a few times a year" or more to at least one of 10 items were then asked what they thought was the main reason for these experiences (e.g., race, gender, sexual orientation). To create a racial discrimination composite score, 5 (*less than once a year*) and 6 (*never*) categories were combined, and responses to individual items were then reverse-coded so that the item response scale ranged from 0 to 4, with higher scores indicating more frequent experiences of discrimination. The measure used in this study includes the sum of experience ratings the participant attributed to race, skin color, accent, or ancestry, with a possible range of 0 to 40. Cronbach's α for this measure was .81.

Demographic variables.—Demographic variables included participants' self-reported primary racial/ethnic identification at the time of study enrollment (African American/Black, White/Caucasian, or Latina/Hispanic), years of education completed, per capita household income (total household income from all sources before taxes divided by the number of individuals in the household), parity (number of children prior to study child) and study site. Because the distribution of per capita household income was not normally distributed (skew= 7.43, kurtosis = 90.56) and preliminary analyses indicated a non-linear association between income and physical activity, cost-of-living adjusted per capita household income was coded into quintiles based on the sample distribution.

Data analytic plan

Hypotheses were tested using multinomial logistic regression. The multinomial regression models estimated the likelihood of being in the moderate and high activity categories relative to the low activity category as a function of predictor variables. This approach was used rather than ordinal logistic regression because the assumption of proportional odds required for fitting ordinal models was not satisfied (i.e., the associations between a given predictor and physical activity differed across categories of physical activity).

Results

Table 1 displays the characteristics of participants. Thirty-five percent of the sample were in the low activity category, 33% were moderately active, and 32% were highly active.

As Table 2 shows, five of the eight demographic variables achieved statistical significance when entered into a simultaneous multinomial logistic regression (overall model $\chi 2(30, N = 1{,}581) = 101.45$, $p < .001$). African American and Latina women were less likely to be moderately or highly active in comparison to White/non-Hispanic women. Women residing in rural areas were less likely to be moderately or highly active than women living in urban or suburban areas. Having more than one child was associated with lower likelihood of moderate activity, but not with likelihood of high activity. Women who were unemployed or not working by choice were less likely to be highly active than women who were working full- or part-time. Finally, older maternal age was associated with lower likelihood of being highly active. Relationship status was not associated with physical activity in this multivariate model.

Table 3 presents the means for the dimensions of chronic stress by physical activity levels. Financial stress was significantly higher in the high activity group than in the low and moderate activity groups. There were no significant differences among groups on any other stress measures. Each type of chronic stress was then entered along with covariates into a separate multinomial logistic regression model with physical activity as the criterion variable. Table 4 shows that financial stress was significantly associated with greater likelihood of high activity such that each one unit increase in financial stress was associated with 1.4 times the odds of high activity after controlling for race/ethnicity, income, multiparity (having more than one prior birth), type of residential area, employment, and age. Financial stress was not significantly associated with altered odds of moderate activity.

Discussion

A social determinants perspective on health disparities argues that social and physical conditions underlie SES and race/ethnicity differences in health behaviors and health outcomes. In this study, we hypothesized that lower education, lower income, and African American race and Latina ethnicity would each be associated with lower levels of physical activity in postpartum women, consistent with a social determinants explanation of health disparities. We also hypothesized that women in urban areas would have higher physical activity than those in rural areas, and finally, that those with chronic stress would have lower physical activity. All hypotheses were tested in multivariate analyses in a large sample of women who were interviewed in their homes at approximately six months after birth and controlling for age, marital status and cohabitation, and whether it was a first birth. The variables associated with greater likelihood of low levels of physical activity (as compared to high) were self-identification as African American or Latina, residence in rural areas, unemployment, not working by choice, and older age. In addition, likelihood of low (as opposed to moderate) physical activity was associated with identifying as African American or Latina, living in a rural area, and multiparity. Unrelated to physical activity were the indicators of SES (income, education), and marital/cohabitation status.

The differences in self-reported levels of physical activity by race/ethnicity are consistent with past findings from nationally representative samples (Carlson et al., 2010; Schiller, Lucas, Ward, & Peregoy, 2012). We extended these findings by studying physical activity in the six months following a birth and by using multivariate models which demonstrated that differences in physical activity by race/ethnicity are not fully explained in this relatively low income sample by confounding factors of income and education, nor are they explained by marital status or cohabitation, age, parity, type of residential area, and employment status (Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; Mathieu et al., 2012). These findings are largely consistent with theory on social determinants of health disparities that views social factors and their social-structural correlates as larger cause of health disparities and posits mechanisms involving psychosocial and behavioral processes such as racism, stress, and low resource neighborhoods. Although income and education were not significant predictors of physical activity in this largely low-income sample, this does not rule out differences when the full SES continuum in the US population is considered. Moreover, we did find differences in this sample in levels of physical activity between non-Hispanic white women and women of color when many other relevant factors were controlled, that were consistent with a social determinants view of health disparities.

These racial/ethnic differences in physical activity are likely due to differences in social and environmental factors that differentially influence physical activity and other health behaviors in women as articulated by social determinants and related theories. For example, research suggests that African American and Latina women, especially those of low-income, are more likely than White women to live in neighborhoods that lack facilities such as parks or recreation centers, and that pose safety risks for being outside, thus providing fewer opportunities for exercise (Baruth, Sharpe, Parra-Medina, & Wilcox, 2014; Eyler et al., 1998; Fleury & Lee, 2006). Second, disparities in infant and maternal health status during the year after childbirth may play a role in physical activity patterns. Women who identify as

African American or with certain Latina subgroups are more likely to experience complications in pregnancy and adverse birth outcomes, and these pervasive maternal-child health disparities patterned by race/ethnicity would contribute to postpartum recovery, health, and to physical activity. Thus, women may return to physical activity more slowly if there were complications during labor and delivery such as preeclampsia, or when caring for a preterm or low birthweight infant. Third, certain specific social and cultural norms may influence physical activity. For example, the cultural importance of the caregiver role among Latinas emphasizes putting the needs of others before the needs of the self, and this expectation may discourage women from engaging in self-care behaviors including physical activity (Im et al., 2010; Juarbe, 1998; King et al., 2000). Cultural attitudes about changes a woman's weight and body shape over the life course may or may not also play a part (Mama et al., 2011; Viladrich, Yeh, Bruning, & Weiss, 2009; Wolfe, 2000).

Counter to predictions, most stress measures were not significantly associated with physical activity levels; in fact, of the eight stress variables examined, only financial stress was significantly associated with physical activity, and the direction of this effect ran counter to hypotheses. That is, greater financial stress was associated with being more highly active. Although analyses controlled for employment status, financially-stressed participants may work a greater number of hours at more physically demanding jobs out of necessity. Transportation options may be more limited among women experiencing financial stress, resulting in reliance on public transportation and walking. Assistance from others with physically demanding household chores and childcare duties may also be more limited in those reporting financial stress, requiring additional energy expenditure to complete the activities of daily life. In sum, women with fewer economic resources may be able to afford fewer necessities and conveniences than women who have greater resources, and this may result in exerting more physical activity during their daily tasks.

Of note, the other seven measures of stress that captured perceived stress, overall life stress, and neighborhood, family, co-parenting, and partner relationship chronic stress as well as discrimination were not associated with physical activity as hypothesized based on theory and prior studies (Hamer, Endrighi, & Poole, 2012; Ng & Jeffery, 2003; Penedo & Dahn, 2005). While some research suggests that individuals who live in chronically stressful environments may cope by engaging in unhealthy behaviors (Jackson, Knight, & Rafferty, 2010; Kershaw, Mezuk, Abdou, Rafferty, & Jackson, 2010; Mezuk et al., 2010), we did not find support for an association between physical activity and multiple forms of chronic stress including everyday discrimination in this sample of postpartum women. Nonetheless, these forms of chronic stress are typically associated with low SES as they were in this sample (Dunkel Schetter et al, 2013) and evidence suggests they contribute to health disparities broadly.

Notably, we also did not find associations of physical activity with perceived stress, which was surprising given evidence of the stress-reducing effects of regular exercise. One possible explanation for this finding is that physical activity as a part of daily activities does not have the same stress-reducing effects as more purposeful exercise. Although activity that is performed as part of job or household responsibilities is likely to provide physical health benefits because it engages the same cardiovascular and metabolic systems as recreational

exercise, it may not result in the relaxation and/or mental health benefits that are associated with leisure-time activity. As evidence, four population surveys in the United States and Canada showed that recreational physical activities but not household chores were associated with better psychological well being (Stephens, 1988). This point is well-illustrated by a quote from a participant in a qualitative study of physical activity in minority women conducted by Eyler et al. (1998):

> I'm a fast walker [at work] because I have to get where I'm going in a hurry. So I walk a lot, but it's not like being on a tread[mill] at the rec center or fitness center. It's totally different because what you can do during that time walking, not only are you working your body, but you're working with your mind at the same time. (p. 643)

Evidence from animal models also suggests that not all physical activity is equally beneficial. Forced treadmill running or swimming does not seem to have the same benefits as voluntary wheel running. In fact, forced treadmill running (but not voluntary wheel running) results in physiological adaptations associated with chronic stress,which suggests that involuntary physical activity may exacerbate rather than help with stress (Moraska & Fleshner, 2001).

This study also shows that living in an urban or rural area may contribute to levels of physical activity. The highest rates of physical inactivity were observed in the rural North Carolina site where participants reported 50% lower likelihood of being moderately or highly active than did urban residents, after adjusting for race/ethnicity, SES, parity, relationship status, employment status, and age. This finding is consistent with results from national cross-sectional studies showing lower physical activity among residents of less densely populated areas and may be due to lack of access to indoor exercise facilities, lack of sidewalks on neighborhood streets, or lower likelihood of walking as a means of transportation (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Parks, Housemann, & Brownson, 2003; Wilcox, Castro, King, Housemann, & Brownson, 2000).

This study is limited by not having data from pre-pregnancy to know if pregnancy and subsequent parenting responsibilities altered patterns of women's physical activity, and by the assessment of physical activity through self-report, which may be inaccurate. Future studies with objective assessments of physical activity using accelerometers together with daily diaries could address methodological problems with self-reported physical activity. Also, the instrument used here was not designed to differentiate between leisure and required activities and the inclusion of non-leisure activities in our assessment of physical activity, whereas past studies have primarily focused on physical activities engaged in during leisure-time. By including exercise due to everyday activities, women who were working full-or part-time were more likely to be highly active than women who were unemployed or not working by choice. Thus, a higher level of activity among employed women may also be due to additional movement from traveling to and from work, and may reflect physical activities demanded by the types of jobs the women held in this sample of predominantly low-income families. Thus, we do not know if the counter-intuitive results for income and education are due to the relatively low-income sample, or that physical activity measure included non-leisure activities. Additionally, this study examined mostly individual-level

predictors of physical activity, although physical activity is likely shaped by factors at multiple levels including family, neighborhood, and region. Future studies can consider neighborhood-level predictors of physical activity and examine the importance of cultural norms around physical activity during the first postpartum year. Similarly, future research should consider the extent to which health care providers provide health promotion advice, especially the importance of achieving the recommended weekly levels of physical activity, to this population and should seek to document the barriers, objective and perceived, to achieving optimal levels of physical activity.

These results have potential implications for understanding and improving maternal health. More than one-third of the women in this sample reported low levels of physical activity. Because inadequate physical activity is so strongly linked to adverse cardiovascular outcomes in general, women who do not engage in much moderate to vigorous physical activity during the first postpartum year appear may face greater short- and long-term risks. The findings from this study suggest that optimal routine postpartum care should integrate physical activity assessment and promotion. Unfortunately, standard medical care after the birth of a child is focused almost exclusively on the infant and postpartum maternal self-care is rarely emphasized, representing a missed opportunity to enhance women's health and well-being. Moreover, increased focus on preconception health is occurring in maternal-child health policy and practice (Johnson et al., 2006; Lu, 2007). Health behaviors such as diet, smoking, and others may be especially important during the postpartum period among women who are planning to have additional children because this time is also a preconception period for the next child (Ramey et al., 2015). For these reasons, the postpartum period is an ideal time to focus efforts on improving women's lifelong health. The findings from this study support the recommendation that African American, Latina, rural-dwelling, and non-working women are important target populations for effective physical activity promotion efforts, ideally starting before pregnancy, continuing during pregnancy, and extending well into the first post-partum year.

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Table 1.

Characteristics of the study sample (n = 1581)

Categorical Variables	***n***	**(%)**
Race/ethnicity		
African American/Black	861	(54.5)
White/Caucasian	368	(23.3)
Hispanic/Latina	352	(22.2)
Per capita household income quintiles		
Q1 ($0-2,083)	309	(19.5)
Q2 ($2,100-4,875)	310	(19.6)
Q3 ($5,167-9,375)	305	(19.3)
Q4 ($9,500-20,833)	332	(21.0)
Q5 ($21,250-500,000)	325	(20.6)
Employment status		
Working part-time	250	(16.1)
Working full-time	445	(28.7)
Not working by choice	416	(26.8)
Unemployed	440	(28.4)
Relationship status		
Not married or cohabitating	684	(43.3)
Cohabitating, not married	396	(25.1)
Married	501	(31.7)
Site		
Baltimore	363	(25.1)
Lake County, IL	396	(12.1)
Los Angeles County	191	(19.4)
Eastern North Carolina	306	(20.6)
Washington, DC	325	(25.1)
Type of Residential Area		
Urban	879	(55.6)
Suburban	396	(25.1)
Rural	306	(19.4)
Parity		
One	675	(45.6)
Two	557	(37.6)
Three	238	(16.1)
Four	12	(0.8)
Continuous variables	*M*	(*SD*)
Age	25.8	(5.7)
Education (years completed)	13.0	(2.8)

Table 2.

Multivariate Multinomial Logistic Regression Models Predicting Physical Activity Categories from Demographic Variables (n = 1581)

	OR for moderate activity vs. low activity		OR for high activity vs. low activity	
	OR	**(95 % CI)**	**OR**	**(95 % CI)**
Race/Ethnicity				
White	Ref.			
Black	0.44***	(0.30-0.67)	0.45***	(0.30-0.69)
Latina	0.58*	(0.37-0.92)	0.58*	(0.37-0.91)
Per capita household income				
Q1	Ref.			
Q2	0.86	(0.56-1.31)	1.36	(0.90-1.87)
Q3	1.16	(0.76-1.77)	1.21	(0.54-1.16)
Q4	0.78	(0.51-1.18)	0.77	(0.57-1.36)
Q5	0.95	(0.59-1.53)	0.96	(0.59-1.56)
Education (years completed)	1.01	(0.95-1.07)	1.01	(0.94-1.07)
Residential Area				
Urban	Ref.			
Suburban	0.61**	(0.44-0.85)	0.83	(0.59-1.17)
Rural	0.43***	(0.29-0.62)	0.49***	(0.34-0.70)
Multiparity	0.75*	(0.56-0.99)	1.21	(0.91-1.62)
Relationship Status				
Not married or cohabitating	Ref.			
Cohabitating, Not Married	0.83	(0.58-1.16)	0.79	(0.56-1.10)
Married	1.08	(0.73-1.60)	0.84	(0.56-1.24)
T2 employment				
Not working by choice	Ref.			
Working part-time	1.21	(0.80-1.82)	1.55*	(1.03-2.34)
Working full-time	1.26	(0.88-1.80)	1.75**	(1.22-2.52)
Unemployed	0.93	(0.65-1.34)	0.94	(0.65-1.36)
Age	1.01	(0.98-1.04)	0.97*	(0.94-1.00)

* $p < 0.05$;

** $p < 0.01$;

*** $p < .001$

Table 3.

Descriptive Statistics for Stress Variables, by Physical Activity Level

	Physical Activity (T2)						
	Low		Moderate		High		
Variables	**M**	**(SD)**	**M**	**(SD)**	**M**	**(SD)**	***p***
Financial Stress	1.80_a	(0.67)	1.82_a	(0.68)	1.98_b	(0.72)	<.001
Life Stress							
Neighborhood Stress	2.12	(0.88)	2.13	(0.87)	2.14	(0.89)	.91
Family	1.86	(0.80)	1.83	(0.81)	1.94	(0.87)	.09
Co-parenting	2.17	(1.36)	2.01	(1.28)	2.16	(1.29)	.08
Partner relationship	1.82	(0.83)	1.77	(0.86)	1.84	(0.85)	.41
Total	1.99	(0.64)	1.93	(0.70)	2.02	(0.67)	.10
Discrimination	2.39	(4.47)	2.42	(4.60)	2.37	(4.44)	.98
Perceived Stress	13.29	(6.00)	12.83	(5.58)	13.60	(5.67)	.10

Table 4.

Multinomial Logistic Regression Model Testing Financial Stress as a Predictor of Physical Activity Categories

	OR for Moderate Activity vs. low activity		OR for High Activity vs. low activity	
Variable	**OR**	**(95 % CI)**	**OR**	**(95 % CI)**
Unadjusted				
Financial Stress	1.02	(0.85-1.22)	1.42***	(1.20-1.69)
Adjusted				
Financial Stress	1.05	(0.89-1.39)	1.40***	(1.15-1.70)
Race/Ethnicity				
White	Ref.			
Black	0.47***	(0.31-0.75)	0.48***	(0.32-0.72)
Latina	0.50**	(0.31-0.81)	0.53**	(0.34-0.82)
Per capita household income				
Q1	Ref.			
Q2	0.95	(0.59-1.55)	1.38	(0.77-1.94)
Q3	1.34	(0.84-2.14)	1.20	(0.65-1.69)
Q4	0.88	(0.54-1.44)	0.81	(0.52-1.39)
Q5	1.04	(0.60-1.79)	1.10	(0.50-1.55)
Residential area				
Urban	Ref.			
Suburban	0.76**	(0.43-1.85)	0.78	(0.57-1.27)
Rural	0.44***	(0.30-0.64)	0.49***	(0.30-0.71)
Multiparity	0.76	(0.60-1.00)	1.18	(0.89-1.56)
T2 employment				
Not working by choice	Ref.			
Working part-time	1.17	(0.60-1.15)	1.55*	(1.03-2.35)
Working full-time	1.17	(0.74-1.86)	1.73**	(1.20-2.49)
Unemployed	0.82	(0.55-1.24)	0.93	(0.65-1.34)
Age	1.01	(0.98-1.04)	0.96**	(0.93-0.99)

* $p < 0.05$;

** $p < 0.01$;

*** $p < .001$